DEPARTMENT OF
HOUSING AND HUMAN CONCERNS
COUNTY OF MAUI

ALAN M. ARAKAWA
Mayor
JO-ANN T. RIDAO
Director
JAN SHISHIDO
Deputy Director

2200 MAIN STREET • SUITE 546 • WAILUKU, HAWAII 96793 • PHONE (808) 270-7805 • FAX (808) 270-7165
MAILING ADDRESS: 200 SOUTH HIGH STREET • WAILUKU, HAWAII 96793 • EMAIL: director.hhc@mauicounty.gov

June 23, 2015

RECEIVED
'15 JUN 29 P2:57
OFC. OF ENVIRONMENTAL QUALITY CONTROL

FILE COPY
JUL 23 2015

Ms. Jessica Woolsey, Director
Office of Environmental Quality Control
Department of Health, State of Hawaii
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

Dear Ms. Woolsey:

SUBJECT: MAALAEA PLANTATION SUBDIVISION, WAILUKU DISTRICT, MAUI, HAWAII; TMK (2) 3-6-001:018 (EA 2015/0003)

With this letter, Maui County, Department of Housing and Human Concerns (Department) hereby transmits the Draft Environmental Assessment (EA) and Anticipated Findings of No Significant Impact (FONSI) per Section 11-200-11.1, Hawaii Administrative Rules (HAR), Notice of Determination for Draft Environmental Assessments, for the proposed Maalaea Plantation Subdivision as noted above. The proposed project will be processed pursuant to 201H-38, Hawaii Revised Statutes. The Department is requesting publication in the next available edition of the Environmental Notice.

Enclosed is a completed Office of Environmental Quality Control (OEQC) Publication Form, one (1) hard copy of the Draft EA Report, an Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS WORD.

Thank you for your cooperation. If additional clarification is needed, please contact our office at (808) 270-7805 or email Mr. Buddy Almeida at buddy.almeida@mauicounty.gov.

Sincerely,

JO-ANN T. RIDAO
Director of Housing and Human Concerns

Attachments
xc: Buddy Almeida, Assistant Housing Administrator
Vince G. Bagoyo, Jr., Bagoyo Development Group
Douglas Spencer (MVI, LLC)

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

Project Name: Ma`alaea Plantation Affordable Housing Subdivision
Island: Maui
District: Wailuku
TMK: (2) 3.6.001:018
Permits: State Land Use District Boundary Amendment and 201H-38, HRS
Approving Agency: Maui County Department of Housing and Human Concerns
2200 Main Street, Ste. 546, Wailuku, HI 96793
Contact and Phone: Ms. JoAnn Ridao, (808) 270-7805
Applicant: MVI, LLC
67 E. Waiko Road, Wailuku, HI 96793
Contact and Phone: Douglas Spencer, (808) 283-5242
Consultant: V. Bagoyo Development Consulting Group
1500 Kilinoe Pl., Wailuku, HI 96793
Contact and Phone: Vince Bagoyo, (808) 357-3842
Status (check one only):

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

Summary: Applicant is requesting the necessary land use entitlement approvals for the development for its proposed residential housing subdivision consisting of 58 affordable single-family residential project and 55 market demand lots on approximately 257 acres located in the State Ag district mauka of Honoapiilani Highway at Ma`alaea, Wailuku, Maui. The proposed residential project application will be processed pursuant to 201H-38, Hawaii Revised Statutes (HRS). The proposed affordable housing units will be made available to qualified individuals earning within the 80% to 120% of Maui's median income per DHHC's Affordable Sales Price Guidelines and will have a minimum lot size of 10,000 s.f. and for the proposed market demand lots will have lot size ranging from 1 to 2 acres consistent of preserving the rural character of the area and will promote and encourage the continuation of agricultural farming within the subdivision. The proposed subdivision also includes a neighborhood park consisting of approximately 2.8 acres. Related infrastructure improvements consist of internal roads, drainage retention basins, utilities, IWS, etc. The remaining portion of the project site that is not part of the application consisting of approximately 85 acres will remain in agriculture.

Draft
Environmental Assessment (EA)

For

Proposed Mā'alaea Plantation Affordable Housing Project & Related Improvements

Proposed Project to be Processed Pursuant to 201H-38, Hawai'i Revised Statutes

TMK: (2) 3-6-001:018
Mā'alaea, Maui, Hawai'i

Prepared for:

MVI LLC

Accepting Authority:

County of Maui, Department of Housing and Human Concerns

Prepared by:

BAGOYO
DEVELOPMENT CONSULTING GROUP

1500 Kilinoe Place · Wailuku Maui Hawai'i 96793 · (808) 357-3842 · Fax (808) 242-8985

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Notarized Letter of Authorization

Mr. William Spence
Director
Planning Department
County of Maui
2200 Main Street, Suite 303
Wailuku, HI 96793

Subject: Maalaea Plantation Rural Residential Subdivision
TMK: (2) 3-6-001:18; TMK: (2) 3-6-004:003 (por.), and 008 (por.)
Maalaea, Wailuku, Island of Maui, Hawaii

Dear Mr. Spence:

MVI LLC (Owner) hereby authorizes V. Bagoyo Development Consulting Group, LLC (Consultant) and its representatives to prepare, file, and process all land use entitlement approvals for the above subject proposed project.

Should you have any questions or need additional information, please feel free to all me at (808)283-5242.

Sincerely,

Douglas R. Spencer

cc: V. Bagoyo Development Consulting Group

Subscribed and sworn to me before me
this 17 day of July, 2014

RENONA K. BARROZO NOTARY PUBLIC No. 92-180 STATE OF HAWAII

Renona K. Barrozo
Notary Public, State of Hawaii
Renona K. Barrozo

My Commission expires: 2-14-2018

RENONA K. BARROZO NOTARY PUBLIC No. 92-180 STATE OF HAWAII

Doc. Date: 7/17/14 # Pages: 1
Renona K. Barrozo Second Circuit
Doc. Description letter to Mr. William Spence

Renona K. Barrozo 7/17/14
Notary Signature Date
NOTARY CERTIFICATION

Proof of Ownership

M

R-659 STATE OF HAWAII
BUREAU OF CONVEYANCES
RECORDED
OCT 23, 2008 11:00 AM
Doc No(s) 2008-163635

/s/ NICKI ANN THOMPSON
ACTING REGISTRAR
CTax (30): $31440.00

20 2/3 Z9

LAND COURT SYSTEM | REGULAR SYSTEM

Return by Mail (X) Pickup ( ) To:

MR JESSE SPENCER
MVI, LLC
P O BOX 97
KIHEI, HI 96753

TG: 200832916 -S
TGE: A8-204-0643
Dorie A. Kekaha

RS
2

Tax Key: (2) 3-6-001-018 Total No. of Pages: 13

LIMITED WARRANTY DEED

KNOW ALL MEN BY THESE PRESENTS:

That MAALAEA PROPERTIES, LLC, a Hawaii limited liability company, whose address is P. O. Box 1870, Manteca, California 95336, hereinafter called the "Grantor," in consideration of the sum of Ten Dollars ($10.00) and other good and valuable consideration to Grantor paid by MVI, LLC, a Hawaii limited liability company, whose address is P. O. Box 97, Kihei, Hawaii 96753, hereinafter called the "Grantee," the receipt whereof is hereby acknowledged, does hereby grant and convey

unto the Grantee, as a tenant in severalty, the real property described in Exhibit "A" and "B" attached hereto and by this reference incorporated herein; subject, however, to all encumbrances noted on Exhibit "A".

TO HAVE AND TO HOLD the same, together with any improvements thereon and the rights, easements, privileges, and appurtenances thereunto belonging or appertaining unto the Grantee, the heirs, representatives, administrators, successors and assigns of the Grantee, forever.

AND the Grantor covenants with the Grantee that the former is now seised in fee simple of the property granted; that the latter shall enjoy the same without any lawful disturbance; that the same is free from all encumbrances made by persons claiming by, through or under the Grantor, except the liens and encumbrances hereinbefore mentioned, and except also the liens and encumbrances created or permitted by the Grantee after the date hereof; and that the Grantor will WARRANT and DEFEND the Grantee against the lawful claims and demands of all persons claiming by, through or under the Grantor, except as aforesaid.

The terms "Grantor" and "Grantee", as and when used herein, or any pronouns used in place thereof, shall mean and include the masculine or feminine, or neuter, the singular or plural number, individuals or corporations, and their and each of their respective successors, heirs, personal representatives,

and permitted assigns, according to the context hereof. If these presents shall be signed by two or more Grantors or by two or more Grantees, all covenants of such parties shall for all purposes be joint and several.

IN WITNESS WHEREOF, the Grantor has executed these presents on this 21 day of October, 2008.

APPROVED AS TO FORM:
MANCINI, WELCH & GEIGER LLP

By Paul R. Mancini

MAALAEA PROPERTIES, LLC

By _____
LARRY W. ANDERSON
Its Manager

By _____
WILLIAM S. FILIOS
Its Manager

Grantor

and permitted assigns, according to the context hereof. If these presents shall be signed by two or more Grantors or by two or more Grantees, all covenants of such parties shall for all purposes be joint and several.

IN WITNESS WHEREOF, the Grantor has executed these presents on this 21 day of October, 20 08.

APPROVED AS TO FORM:
MANCINI, WELCH & GEIGER LLP

By Paul R. Mancini

MAALAEA PROPERTIES, LLC

By _____
LARRY W. ANDERSON
Its Manager

By _____
WILLIAM S. FILIOS
Its Manager

Grantor

STATE OF HAWAII)
) SS.
COUNTY OF MAUI)

On this 21st day of October, 2008, before me personally appeared LARRY W. ANDERSON, to me personally known, who, being by me duly sworn or affirmed, did say that such person(s) executed the foregoing instrument as the free act and deed of such person(s), and if applicable, in the capacities shown, having been duly authorized to execute such instrument in such capacities.

Joyce M. Takitani

Printed Name: Joyce M. Takitani
Notary Public, State of Hawaii.
My Commission expires: 8/16/11

JOYCE M. TAKITANI NOTARY PUBLIC No. 79-562 STATE OF HAWAII

NOTARY PUBLIC CERTIFICATION
Joyce M. Takitani Second Circuit
Doc. Description: Limited Warranty Deed (Maalaea Properties, LLC, MVI, LLC)
No. of Pages: 12 Date of Doc. undated
Joyce M. Takitani 10/28/08
Notary Signature Date

JOYCE M. TAKITANI NOTARY PUBLIC No. 79-562 STATE OF HAWAII

State of California)
)
County of San Joaquin)

On October 20, 2008, before me, Susan Martin, notary public, personally appeared WILLIAM S. FILIOS, who proved to me on the basis of satisfactory evidence to be the person whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his authorized capacity, and that by his signature on the instrument the person, or the entity upon behalf of which the person acted, executed the instrument.

I certify under PENALTY OF PERJURY under the laws of the State of California that the foregoing paragraph is true and correct.

WITNESS my name and official seal.

Notary Public

EXHIBIT "A"

All of that certain parcel of land (being all of the land(s) described in and covered by Land Patent Grant S-13975 to Wailuku Sugar Company; Land Patent Grant 11067 to Wailuku Sugar Company; Land Patent Grant 10962 to Wailuku Sugar Company; Land Patent Grant 10745 to Wailuku Sugar Company; Land Patent Grant 10497 to Wailuku Sugar Company; Land Patent Grant 10294 to Wailuku Sugar Company; and Land Patent Grant 9794 to Wailuku Sugar Company; and portion(s) of the land (s) described in and covered by Land Patent Grant Number 3152 to H. Cornwell) situate, lying and being at Ukumehame, District of Lahaina, Island and County of Maui, State of Hawaii, containing an area of 256.903 acres, more or less, and being more particularly described in Exhibit "B" attached hereto and made a part hereof.

Being the premises acquired by Limited Warranty Deed from Lodi Development, Inc., a California corporation, as Grantor, to the Grantor herein, as Grantee, dated July 31, 2006, recorded in the Bureau of Conveyances of the State of Hawaii as Document No. Document No. 2006-161641.

SUBJECT, HOWEVER, to the following:

1. Roadway, as shown on Land Patent Grant No. 9794.

2. Notice of Imposition of Conditions By the Land Use Commission dated December 9, 1992, recorded as Document No. 92-200449.

3. The terms and provisions contained in the Declaration dated January 25, 1993, recorded in the said Bureau of Conveyances as Document No. 93-014788.

4. Grant to Maui Electric Company, Limited, a Hawaii corporation, dated November 1, 1995, recorded in the said Bureau of Conveyances as Document No. 95-161279, granting a perpetual right and easement for utility purposes as shown on the map attached thereto.

Said Grant was amended by instrument dated July 1, 1998, recorded as Document No. 98-101152 and more particularly described as follows:

EASEMENT B

For Overhead Electrical Transmission Purposes
In Favor of Maui Electric Company
Affecting Portions of Grant 3152 to Henry Cornwell and
Grant 9794 to Wailuku Sugar Co.
Situated at Waikapu, Ukumehame, Wailuku, Maui, Hawaii

Beginning at the Northeast corner of this easement, on the West side of Honoapiilani Highway (F.A.P. No. 13-G), being also the southeast corner of Lot 2 of "Waikapu Hema Large Lot Subdivision", the coordinates of said point of beginning referred to Government Survey Triangulation Station "LAINA" being 29,405.90 feet South and 54,921.88 feet East, and thence running by azimuths measured clockwise from True South:

1.	Along the West side of Honoapiilani Highway (F.A.P. No. 13-G), on a curve to the right, with a radius of 34,342.50 feet, the chord azimuth and distance being:				
	5°	56'	34.98"	126.15	feet;
2.	157°	51'		71.11	feet;
3.	98°	26'	30"	149.08	feet;
4.	258°	36'	53"	191.10	feet along Lot 2 of the "Waikapu Hema Large Lot Subdivision" to the point of beginning and containing an area of 6949 square feet.

5. The terms and provisions contained in Agreement for Allocation of Future Subdivision Potential dated January 3, 2002, recorded in the said Bureau of Conveyances as Document No. 2003-059347, by and between Wailuku Agribusiness Company, Inc. ("Subdivider") and County of Maui, through its Department of Public Works and Waste Management, a political subdivision of the State of Hawaii ("County").

6. The terms and provisions contained in Limited Warranty Deed dated August 10, 2004, recorded in the said Bureau of Conveyances as Document No. 2004-165726.

7. The terms and provisions contained in the Declaration of Covenants, Conditions, Easements, Reservations and Restrictions dated effective as of August 10, 2004, recorded in the said Bureau of Conveyances as Document No. 2004-165727.

The foregoing includes, but is not limited to, matters relating to water reservation, farming reservation; easements.

Assignment of In Gross Reservations effective October 1, 2005, recorded as Document No. 2005-229077, by and between Wailuku Agribusiness Co., Inc., a Hawaii corporation, "Assignor", and Wailuku Water Company, LLC, a Hawaii limited liability company, doing business as Wailuku Water Company, "Assignee".

8. Claims arising out of customary and traditional rights and practices, including without limitation those exercised for subsistence, cultural, religious, access or gathering purposes, as provided for in the Hawaii Constitution or the Hawaii Revised Statutes.

9. Any unrecorded leases and matters arising from or affecting the same.

10. Discrepancies, conflicts in boundary lines, shortage in area, encroachments or any other matters which a correct survey or archaeological study would disclose.

END OF EXHIBIT "A"

Tax Key: (2) 3-6-001-018

EXHIBIT "B"

Land situated on the westerly side of Honoapiilani Highway (N.R.H. 13-C and F.A.P. 13-G) at Ukumehame, Waikapu, Wailuku, Maui, Hawaii.

Being all of Grant S-13975 to Wailuku Sugar Company, Grant 11067 to Wailuku Sugar Company, Grant 10962 to Wailuku Sugar Company, Grant 10745 to Wailuku Sugar Company, Grant 10497 to Wailuku Sugar Company, Grant 10294 to Wailuku Sugar Company and Grant 9794 to Wailuku Sugar Company, and a portion of Grant 3152 to Henry Cornwell.

Beginning at a point at the northeasterly corner of this parcel of land, the coordinates of said point of beginning referred to Government Survey Triangulation Station "LUKE" being 23,709.07 feet South and 3,760.16 feet West and running by azimuths measured clockwise from true South:

1. Thence along the westerly side of Honoapiilani Highway (F.A.P. 13-G) on a curve to the right, with the point of curvature azimuth from the radial point being: 275° 52' 12.4" and the point of tangency azimuth from the radial point being: 278° 14' 56", having a radius of 34,342.50 feet, the chord azimuth and distance being: 7° 03' 34.2" 1,425.71 feet to a point;

2. 8° 14' 56" 1,823.79 feet along same to a point;

3. Thence along same on a curve to the right, having a radius of 34,342.50 feet, the chord azimuth and distance being: 9° 22' 41" 1,353.53 feet to a point;

4. 10° 30' 26" 504.25 feet along same to a point;

5. 14° 07' 22" 743.00 feet along the westerly side of Honoapiilani Highway (F.A.P.

13-G and N.R.H. 13-C) to a point;

6. 105° 46' 29" 10.00 feet along the westerly side of Honoapiilani Highway (N.R.H. 13-C) to a point;

7. Thence along same on a curve to the right, with the point of curvature azimuth from the radial point being: 285° 46' 29" and the point of tangency azimuth from the radial point: 296° 19' 59", having a radius of 5,647.97 feet, the chord azimuth and distance being: 21° 03' 14" 1,039.32 feet to a point;

8. 296° 16' 56" 18.00 feet along same to a point;

9. Thence along same on a curve to the right, with the point of curvature azimuth from the radial point being: 296° 19' 59" and the point of tangency azimuth from the radial point being: 297° 44' 17", the chord azimuth and distance being: 27° 02' 08" 138.94 feet to a point;

10. 117° 47' 19" 18.00 feet along same to a point;

11. Thence along same on a curve to the right, with the point of curvature azimuth from the radial point being: 297° 44' 17" and the point of tangency azimuth from the radial point being: 299° 21' 03", having a radius of 5,647.97, the chord azimuth and distance being: 28° 32' 40" 158.98 feet to a point;

12. 299° 18' 18.00 feet along same to a point;

13. Thence along same on a curve to the right, with the point of curvature azimuth from the radial point being: 299° 21' 02" and the point of tangency azimuth from the radial point being: 301° 05' 41", having a radius of 5,665.97 feet, the chord azimuth and distance being: 30° 13' 21.5" 172.47 feet to a point;

14. 31° 05' 41" 603.65 feet along same to a point;

15. 121° 05' 41" 15.00 feet along same to a point;

16. 31° 05' 41" 75.00 feet along same to a point;

17. 301° 05' 41" 15.00 feet along same to a point;

18. 31° 05' 41" 286.00 feet along same to a point;

19. Thence along same on a curve to the left, with the point of curvature azimuth from the radial point being: 121° 05' 41" and the point of tangency azimuth from the radial point being: 118° 20' 52.6", having a radius of 11,539.55 feet, the chord azimuth and distance being: 29° 43' 16.8" 553.16 feet to a point;

20. 153° 40' 17" 209.46 feet along portion of Government Land of Ukumehame to a point;

21. 169° 48' 47" 376.44 feet along same to a point;

22. 165° 07' 47" 112.44 feet along same to a point;

23. 167° 31' 47" 394.87 feet along same to a point;

24. 105° 51' 47" 103.85 feet along same to a point;

25.	184°	08'	47"	400.00	feet along same to a point;
26.	176°	24'	47"	1,520.00	feet along same to a point;
27.	177°	16'	47"	246.00	feet along same to a point;
28.	216°	09'	47"	413.00	feet along same to a point;
29.	185°	14'	47"	254.00	feet along same to a point;
30.	177°	22'	47"	506.00	feet along same to a point;
31.	217°	16'	47"	437.00	feet along same to a point;
32.	210°	02'	47"	470.00	feet along same to a point;
33.	190°	15'	17"	1,179.70	feet along same to a point;
34.	197°	01'	47"	467.15	feet along same to a point;
35.	235°	55'	47"	349.70	feet along same to a point;
36.	220°	15'	47"	280.20	feet along same to a point;
37.	208°	33'	47"	216.10	feet along same to a point;
38.	193°	09'	47"	570.10	feet along same to a point;
39.	203°	49'	47"	164.90	feet along same to a point;
40.	187°	16'	47"	301.10	feet along same to a point;
41.	258°	57'	41"	864.14	feet along Grant 3152 to Henry Cornwell and along the remainder of Grant 3152 to Henry Cornwell, being also along Lot 6 of Waikapu Hema Large Lot Subdivision to the point of beginning and containing an area of 256.903 acres.

END OF EXHIBIT "B"

Preface and Executive Summary

Preface

MVI, LLC, ("Owner") is proposing the development of a residential subdivision on approximately 257 acres of land pursuant to 201H, Hawaii Revised Statutes (HRS). The proposed subdivision consists of 113 residential lots. 58 units (approximately 51% of the total unit count) will be sold as house and lot package pursuant to Maui County's Affordable Sales Price Guidelines to individuals earning within the 80% to 120% of Maui's median income. The affordably-priced residential lots will have a minimum lot size of 10,000 square feet. The remaining 55 lots (approximately 49% of the total unit count) will be offered for sale in accordance with market demand. These market-priced lots will have a minimum lot size of 1 acre and will be sold in fee as lots only. The primary purpose of keeping the market demand units with larger size lots is to preserve the rural character of the area that allow small scale agricultural uses of the property. Also, approximately 2.8 acre area will be developed for neighborhood park use as part of the 201H , HRS application.

The Maui County Department of Housing and Human Concerns will be the accepting agency of the environmental assessment (EA) for the proposed project pursuant to 201H, HRS. The owner, in coordination with the Department of Housing and Human Concerns, will seek exemptions from certain statutes, ordinances,, charter provisions, and rules relating to planning, zoning, construction standards for subdivision, development and improvement of land, and the construction of dwelling units thereon as provided by Section 201H-38, HRS. These exemptions request by the owner will be processed through the County of Maui with the approval to be granted by the Maui County Council.

The proposed project site is located at Ma`alaea, Wailuku, Island of Maui, Hawaii further identified as TMK: (2) 3-6-001:018. The subject property is 257 acres and the owner plans to subdivide the property upon approval of its 201H application and State Land Use District Urban Boundary reclassification designation application. The remaining portions of the property will remain in agriculture for agricultural, drainage, and other allowable uses. The project site is presently located on lands classified as

"Agricultural" by the State Land Use Commission. The subject property is designated for residential development as Project District 12 in the 1998 Kihei-Makena Community Plan District, and Maui County zone Agriculture. The project site is currently not in the "Rural and Urban" growth boundary of the Maui Island Plan. The subject property is currently fallow and vacant and formerly used for cultivating sugar by the Wailuku Agribusiness Company and more recently used by small independent farms along the northern portion of the project site. Currently, portion of the project site is used for cattle and horse grazing. The subject property was previously planned for 1,100 residential homes and commercial development. Due to community concerns regarding the high density and the potential impact of the project density and working with various community stakeholders, the applicant has substantially reduced the project density by over 90% from its previous conceptual plan. The number of lots totaling 113 and the inclusion of affordable housing component within the proposed project is in response to several meetings held with various community associations and stakeholders.

To implement the proposed project as envisioned by the Owner, a State Land Use Commission District Boundary Amendment from the "Agricultural" District to "Urban" District pursuant to 201H-38(4), Hawaii Revised Statutes. Per 201H-38(4), "the land use commission shall approve, approve with modification, or disapprove a boundary change within forty-five days after the corporation has submitted a petition to the commission as provided in section 205-4." Hence, the district boundary change triggers a preparation of Environmental Assessment (EA) consistent with the provisions within chapter 343, HRS. Appendix C, identified as Preliminary Site Plan conceptually defines the proposed subdivision lots for the Ma`alaea Plantation project: Below is the following breakdown of the proposed project: Please note that the agricultural lots will remain in agriculture and are not part of the proposed project's 201H, HRS application.

Affordably-priced units: Lots 55-112 (58 lots)	(16.9 acres)
Market-priced units: Lots 1-54 & lot 117 (55 lots)	(110 acres)
Park:	(2.8 acres)
Drainage retention reserves:	(30 acres)

Roads:	(13.2 acres)
Agricultural: Lots 113, 115, & 116	(84.8 acres)
Total Acreage:	**257.7 acres**

This environmental assessment is prepared pursuant to Chapter 343, Hawaii Revised Statutes (HRS) and in compliance with the requirements for the processing of State Land Use District Boundary reclassification and the processing of project's 201H, HRS application. Accordingly, this report documents the proposed action and addresses potential impacts and mitigation measures anticipated in connection with the implementation of the proposed subdivision project. Since the project will be processed pursuant to 201H, HRS application, the Department of Housing and Human Concerns, County of Maui is the processing and accepting authority for the environmental assessment prepared for this project.

Executive Summary

Project Name:	Proposed Ma`alaea Plantation Affordable Housing Project and Related Improvements
Type of Document:	Draft Environmental Assessment 201H, Hawaii Revised Statutes Affordable Housing Application
Accepting Authority:	Department of Housing and Human Concerns County of Maui 2200 Main Street, Suite 546 Wailuku, Hawaii 96793 Contact: Ms. Jo-Ann Ridao, Director Phone: (808) 270-7805
Applicable Environmental Assessment Review "trigger":	State Land Use District Urban Boundary Amendment
Location:	TMK: (2) 3-6-001:018 Ma'alaea, Wailuku Island of Maui, Hawaii
Owner:	MVI, LLC
Applicant:	MVI, LLC
Consultant:	V. Bagoyo Development Consulting Group, LLC. 1500 Kilinoe Place Wailuku, Hawaii 96793 Contact: Vince G Bagoyo, Jr. Phone: (808) 357-3842 Email: vbagoyo-devgroup@hawaii.rr.com
Project Summary:	The applicant ("MVI, LLC") is proposing the development of a residential subdivision on approximately 257 acres of land located at located

at Ma`alaea, Wailuku, Island of Maui, Hawaii further identified as TMK: (2) 3-6-001:018. The proposed subdivision would contain 113 residential lots. 51% of these units will be made available to qualified individuals earning within the 80% to 120% of Maui median income as set forth by the County of Maui, Department of Housing and Human Concerns' Affordable Sales price Guidelines. The remaining 49% of the total units will be offered for sale in accordance with market demand. The affordably-priced units will be sold as house and lot package and the market demand units will be sold as lots only. The affordably-priced lots will have a minimum lot size of 10,000 square feet and the market-priced lots will have a minimum of 1 acre. The project will also include approximately 2.8-acre neighborhood park. Related infrastructure improvements, but not limited to, grading, drainage systems, internal roadway, utilities, and construction of the affordable residential dwelling units. Individual wastewater system (IWS) for the affordably-priced residential dwelling units will be installed by the developer and IWS for the market demand units will be installed by individual lot owners.

The subject property is located mauka of Honoapiilani Highway in Ma`alaea. Southeast of the project site is the Ma`alaea commercial complex and Maui Ocean Center and further east of the project site are various multi-family residential

developments. To the south of the project site is the Ma`alaea Small Boat Harbor, while agricultural lands are located to the north.

The proposed Ma`alaea Plantation subdivision will be processed pursuant to 201H-38, Hawaii Revised statutes, hence, this document has been prepared to serve as project's 201H and State Land Use district urban boundary reclassification designation applications. It provides a basis for review and analysis of the proposed Ma`alaea Plantation project.

I. Project Overview

I. PROJECT OVERVIEW

A. PROPERTY LOCATION, EXISTING LAND USES AND LAND OWNERSHIP

The applicant for the 201H, Hawaii Revised Statutes application is MVI, LLC ("Applicant") and whose mailing address is 67 E. Waiko Road, Wailuku, Hawaii 96793, is proposing the development of a residential subdivision, including a neighborhood park and related improvements on approximately 257 acres of land, identified as Tax Map Key (2) 3-6-001:018. The subject parcel for the proposed projects is located at Ma'alaea, Wailuku, Island of Maui, Hawaii (See Appendix C referred to as Preliminary Site Plan). The proposed project consists of 113 residential lots with 51% of these units will be available to qualified individual earning within 80% to 120% of Maui median income as set forth by the Maui Department of Housing and Human Concerns' Affordable Sales Price Guidelines. The remaining 49% of the total units will be offered for sale in accordance with market demand.

The subject property is bordered on the east by Honoapiilani Highway and to the south of the project area are the Ma`alaea commercial complex, the Maui Ocean Center aquarium and Ma`alaea Small Boat Harbor. There are various residential uses (mostly multi-family complexes) along Hauoli Street. The west side of the project area is bordered by State Conservation District lands. The project site is currently designated as Project District 12 in the Kihei-Makena Community Plan, State Land Use "Agricultural", and Maui County zoned "Agriculture". The project area is the site for the proposed Ma`alaea Plantation project.

The subject property is presently vacant and fallow with overgrown bufflegrass and currently used for grazing.

The proposed project site encompasses approximately 257 acres and owned in fee by MVI, LLC.

B. PROPOSED ACTION

The applicant (MVI, LLC) is requesting necessary land use entitlements approvals per 201H, HRS for the use of the subject property for its proposed Ma`alaea Plantation residential subdivision. Upon receipt of approvals of project's 201H application and State Land Use District Boundary Amendment, the applicant proposes to develop approximately 113 fee simple residential lots (see Appendix C referred to as preliminary conceptual site plan). This proposed project will be known as Ma`alaea Plantation, and will include 58 affordable residential housing units with a minimum lot size of 10,000 square and 55 market-priced units with a minimum lot size of 1acre. The proposed affordable units will be sold as house and lot package and will be made available for sale to qualified individuals earning within the 80% to 120% of Maui median income as set forth by the County of Maui, Department of Housing and Human Concerns' Affordable Sales Price Guidelines. The market-priced units (55 lots) will be sized based on rural zoning standards after discussing the revised plan with various community organizations and government agencies in order to provide the community with a low density development which will preserve the rural character of the area. Please note that the conceptual plan is very preliminary. Also planned are related infrastructure improvements required for the proposed residential subdivision, such as construction of internal roadways, drainage retention systems, utilities, and site grading work. No mass grading within the market-priced units; there will be some grading within the proposed affordable housing units. Individual wastewater system (IWS) will be provided by individual lot owners in compliance with State Department of Health standards. The proposed subdivision project will not construct any sewer systems, treatment facilities or injection wells.

The proposed larger lots for the market-priced units with a minimum lot size of 1 acre will preserve the rural character of the area consistent with the purpose and intent under Chapter 19.29.010, Maui County Code that states, *"The purpose of the rural districts is to implement the goals and policies of the Maui County general plan and community plans; to provide low density development which preserves the rural character of certain areas; to allow small-scale agricultural uses and the keeping of animals; and to serve as a transition between standard residential or other urban density development and agricultural lands".* This project will meet the intent and purpose of the Maui County Code by providing larger rural residential lots that encourage some form of active small-scale agriculture.

The proposed 58 affordable residential housing dwelling units within the project will help meet the current demand for affordable housing on the Island of Maui for Maui's working families per Chapter 2.96 of the Maui County Code.

The remaining portions of the property will remain in agriculture for agricultural, drainage, and other allowable uses.

A market demand study for the proposed Ma`alaea Plantation residential subdivision was prepared by ACM consultants, Inc. dated April 21, 2014 (See attached Appendix Q). The purpose of the market demand analysis were: (1) to define and delineate the market area; (2) to identify and analyze the current supply and demand conditions specific to the subject market; and (3) identify, measure and forecast the effect of anticipated developments or other factors on future supply.

According to market study by ACM Consultants, the demand for residential lots in the Central Maui area is extremely high, with projects usually sold out prior to completion of construction. The market study further notes that there are currently no on-going rural or agricultural subdivisions being developed on Maui

at this time. Based on current strong economic and real estate conditions, forecasts by Hawaii economists, as well as immediate demand for rural lots on Maui, the subject proposed 55-lot rural lots and 58 affordable residential housing units subdivision should be well positioned to capitalize on the recovery of the real estate market and help to provide a short term solution to the housing needs of Maui's workforce. ACM's market study confidently concluded that if the proposed 55-lot rural and 58-lot affordable residential housing subdivision project were to be available today, it would likely incur strong demand due to the extremely limited supply of rural lots available on Maui, and historically strong demand for similar properties in the past.

According to the Hawaii Housing Planning Study, 2011, prepared by SMS Research and Marketing Services, Inc. for the County of Maui, among Maui's 53,621 households in 2011, about 56 percent were homeowners. The study further reports that a "significant number of Maui households live in overcrowded conditions or are double-up with families". The County of Maui Socio-Economic Forecast (2006) estimates that the total housing demand in Maui County will increase from 53,793 units in 2005 to 89,890 units in 2030, an increase of approximately 67 percent over 25 years. Further, according to SMS Research, the study notes that nearly 45 percent of all Maui County households expressed a desire to move to a new home in the near future. The applicant's proposed rural residential subdivision will undoubtedly help meet the housing demand on the island and while preserving the rural character of Ma`alaea, and allow and encourage lot owners to pursue agricultural uses on the land. The preliminary layout of the proposed rural subdivision based on the proposed larger lot sizes does in fact preserve and protect open space in the subject area.

The applicant's market demand consultant has researched the current prevailing sales prices for similar rural subdivisions on Maui and Central Maui in particular. Based on the findings, the estimated price range per rural lot within the proposed subdivision is approximately $400,000 to $900,000 dollars per lot. However,

final sales prices are contingent upon market conditions at the time the project is completed, as well as conditions and subdivision improvements associated with land use entitlement approvals which may be imposed by the State Land Use Commission and/or County of Maui. The Applicant will seek various exemptions from County, State, and Federal standards and statutes in accordance with 201H, HRS application process. The market-priced lots will be sold as fee simple. For the proposed affordable residential housing units will be sold in fee to qualified individuals pursuant to the County of Maui, Department of Housing and Human Concerns' Affordable Housing Guidelines.

Depending on market demands for such rural in character and residential subdivision development and economic conditions, the proposed project may be completed in phases to respond appropriately to market conditions.

According to the Hawaii Housing Planning Study, 2011 prepared by SMS Research and Marketing Services, Inc. for the County of Maui, there's a great demand for affordably-priced single family residential housing project on Maui. To meet this strong demand for affordable housing project, the applicant is proposing to develop 58 improved lots and single-family dwelling units within the proposed Ma`alaea Plantation project and will be sold as house and lot package in fee simple. The proposed 58 single-family housing project will be 100 percent affordable to qualified individuals earning within the 80 percent to 120 percent of the Maui median income as set forth by the County of Maui, Department of Housing and Human Concerns Sales Price Guidelines. The lot sizes for these affordable housing units will have a minimum of 10,000 square feet.

As reflected in the attached preliminary site map (refer to Appendix C, access to the subdivision will be at two locations along Honoapiilani Highway. One will be at the existing signalized intersection with N. Kihei Road. The second will be at the existing signalized intersection with Kapoli Street. Proposed improvements within the project include roadways, underground water, drainage, electrical, and

telephone systems, and landscaping. Also, the proposed project will require the construction of a private offsite potable water system which includes an existing offsite water source and storage facilities. It may also include the installation of reverse osmosis (RO) system. Other proposed improvement to mitigate potential traffic impacts on Honoapiilani Highway along the project frontage is additional lanes, revised striping, and traffic signal modifications and convert the two existing three-legged intersections to four-legged intersections..

Below, provides the preliminary breakdown of the proposed land uses and allocated acreages within the proposed Ma`alaea Plantation project:

Project Site Land Use Allocations

Affordably-Priced Units:	16.9 acres
Market-Priced Units:	110 acres
Park:	2.8 acres
Drainage Retention Reserves:	30.0 acres
Roads:	13.2 acres
Agricultural:	84.8 acres
TOTAL ACREAGE:	**257.7 acres**

Project Residential Lot Allocations

Affordably-Priced Units	58 lots
Market-Priced Units	55 lot
TOTAL LOTS	**113 Lots**

As noted earlier in this report, the remaining portions of the property site will remain in agriculture for agricultural purposes and other allowable uses and it is not part of the 201H, HRS application.

C. ANTICIPATED DEVELOPMENT SCHEDULE

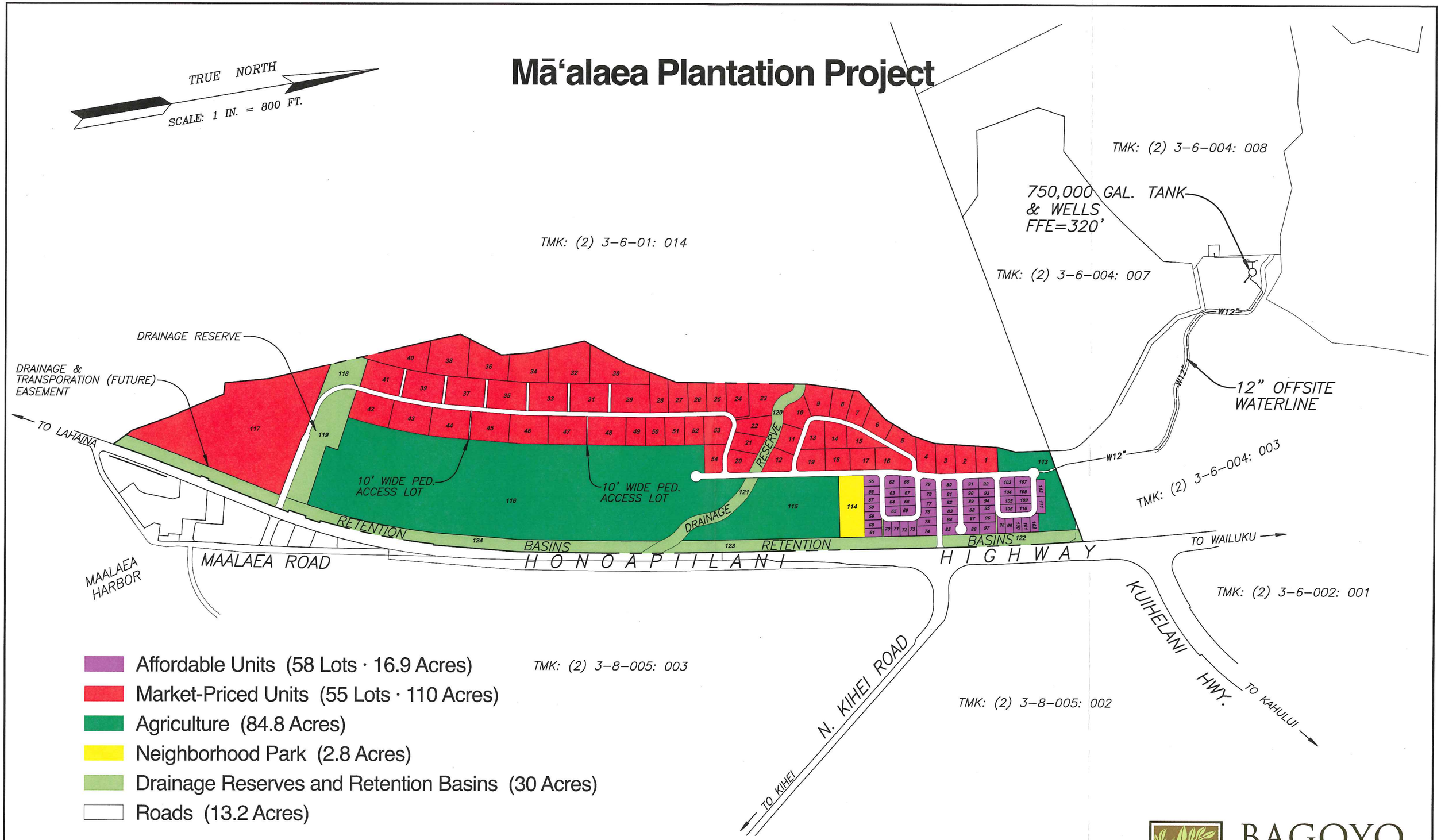
The estimated cost of the subdivision improvements which include drainage, utilities, and roadways is approximately $6 million and the estimated cost for the construction of the affordable housing units is approximately $8.7 million. Construction of the subdivision improvements and related infrastructure improvements is anticipated to begin as soon as all permitting approvals have been received. The water well sources which include three wells known as Pohakea Wells 1, 2, and 3, also identified by State Nos. 4930-01, -02, and -03, respectively, are completed for the proposed project as well as water storage tank and transmission waterlines. The applicant anticipates that the completion of subdivision improvements is expected to take approximately 18 months to 24 months to complete, barring no unanticipated delays. Individual housing units for the market-priced rural lots within the proposed subdivision will be done by lot owners upon completion of all subdivision improvements and site work. For the 58 affordable housing dwelling units will be done by the applicant upon completion of the subdivision improvements.

D. REASONS FOR JUSTIFYING THE REQUEST

The project site is located at Ma`alaea, Maui Hawaii. The area is bordered on the east side by Honoapiiliani Highway between Ma`alaea and to just beyond the North Kihei Road junction. To the south of the project area is the Ma`alaea Small Boat Harbor, while agricultural lands are located to the north. State Conservation District lands border the project area to the west. See Appendix A. The project site is designated as "Project District 12" in the Kihei-Makena Community Plan District and is the location for the proposed Ma`alaea Plantation project. Refer to Appendix B.

According to the market demand study prepared by ACM Consultant, Inc. for the project, if the proposed 55 market-priced rural lots subdivision project were to be

Mā'alaea Plantation Project



Preliminary Site Plan

BAGOYO
DEVELOPMENT
CONSULTING GROUP

available today, it would likely incur strong demand due to the extremely limited supply of rural lots available on Maui. Historically, there was a strong demand for similar properties in the past. What makes this proposed project desirable is it provides the community with low density development, which will preserve the rural character of the area and allow small-scale agricultural uses as intended by State Land Use and County zoning.

In the Hawaii Housing Planning Study Update, 2011 prepared for Maui County by SMS Research and Marketing Services, Inc., provided further evidence of the need for additional housing in Maui County. According to the SMS report, nearly 47 percent of all Maui County households expressed a desire to move to a new home in the near future, up from 45 percent in 2006. Approximately 15 percent stated they wanted to move out of state. As such, effective demand was said to be 33 percent of all Maui County households in 2011. The Maui Countywide Policy Plan adopted by Ordinance No. 3732 and took effect on March 24, 2010, states in its goals, objectives, policies, and action to *"expand housing opportunities for residents"*. Because of the project's location and its proposed low density rural subdivision development that preserves the rural character of the area and allows small-scale agricultural pursuits with competitively priced fee simple lots that meet the housing needs of Maui residents, the proposed land use changes by the applicant will allow this unmet demand for housing to be solved.

Similarly, the proposed 58 affordable housing project within the proposed Ma`alaea Plantation subdivision will undoubtedly meet the growing demand for affordably-priced housing on Maui. The entire 58 housing dwelling units proposed within the project will be 100 percent affordable. It will be sold in fee simple to those earning 80 percent to 120 percent of Maui's median income families with sales price according to Maui Department of Human Concerns' Affordable Sales Guidelines. With this proposed affordable housing project, it will allow families the opportunity to purchase a home that they can comfortably afford. According to the Maui Countywide Policy Plan, states in its goals,

objectives, policies, and action to *"expand housing opportunities for residents"* in order to *"reduce the affordable housing deficit for residents"*. With the applicant's proposed affordable housing project within the proposed Ma`alaea Plantation project will meet a significant community need on Maui as stated in the Maui Countywide Policy Plan.

As noted in this report, approximately 51% of the proposed project unit counts will be affordable residential dwelling units and these units will be made available to qualified individuals earning within the 80% to 120% of Maui median income as set forth by the County of Maui, Department of Housing and Human Concerns' Affordable Sales Price Guidelines. This is consistent with the intent and purposes pursuant to 201H, HRS.

This environmental assessment (EA) will evaluate the potential impacts, if any, of the proposed Ma`alaea Plantation project on the natural and human environment. The EA will also provide mitigative measures that will address and respond to all potential impacts on the natural and human environment.

E. ENTITLEMENTS APPROVALS REQUIRED

The applicant is requesting that a portion of the 257-acre parcel to be developed as envisioned by the Applicant to meet the housing demand on the Island of Maui with special emphasis on affordably-priced housing project (refer to Appendix C). The proposed Ma`alaea Plantation project has been developed to meet the criteria for a Section 201H-38, Hawaii Revised Statutes project in close coordination with the Department of Housing and Human Concerns, Maui County. Per 201H-38, HRS promotes the delivery of affordable housing project by providing exemptions from *"all statutes, ordinances, charter provisions, and rules of any government agency relating to planning, zoning, construction standards for subdivisions, development and improvement of land, and the construction of dwelling units thereon"* provided that the proposed housing project is consistent

with the purpose and intent of 201H-38, HRS, and meets minimum requirements of health and safety. This proposed project will be consistent and in compliance with the requirements pursuant to 201H, HRS.

As such, a Section 201H-38, HRS application will be filed with the Maui County Council to seek exemptions from Community Plan District Amendment, Change-In-Zoning, Project District processes, Maui Island Plan growth boundary designation, as well as other County requirements to support the timely implementation of the proposed project.

The current State Land Use designation for the project site is "Agricultural", hence, the Applicant will simultaneously file a petition for a district boundary amendment (DBA) with the State Land Use Commission (SLUC) to reclassify portions of the subject parcel from "Agriculture" to the "Urban" district and will follow the provisions of Section 15-15-97 of the Land Use Commission Rules, pertaining to Section 201H-38, HRS processing of the project's application.

Due to the scope of the proposed project, the Maui County, Department of Housing and Human Concerns has determined that an EA be prepared to evaluate and mitigate potential environmental impacts in connection with the implementation of the proposed project. Hence, the EA has been prepared pursuant to Chapter 343, HRS. As the sponsoring agency for the project's Section 201H application, the County of Maui, Department of Housing and Human Concerns will act as the Accepting Authority for the environmental assessment prepared for this project. The EA will act as the primary technical supporting document for the 201H application and district boundary amendment (DBA) petition.

II. Description of the Existing Environment

II. DESCRIPTION OF THE EXISTING ENVIRONMENT

A. PHYSICAL SETTING

1. Project Site History

The project site was initially proposed for 1,100 residential housing units and a village commercial town center earlier named as Ohana Kai Village. It was planned to be developed under Section 201H-38, Hawaii Revised Statutes. On September 28, 2010, the Department of Housing and Human Concerns (DHHC) for the County of Maui as the accepting agency found that the Final Environmental Impact Statement ("FEIS") for the earlier proposed 1,100 Ohana Kai Village affordable housing project and village commercial town center satisfied the requirements of Haw. Admin. R. 11-200-23B. The adequacy of the FEIS was challenged by the plaintiffs, Ma`alaea Community Association and Maui Tomorrow Foundation, Inc. On April 19, 2011, Judge Joel August of the Second Circuit Court, State of Hawaii rendered an Order under Civil No. 10-1-0779 (1) "Granting Plaintiffs' Motion For Partial Summary Judgment On Inadequacy Of Final Environmental Impact Statement" . The court found that the FEIS for the earlier proposed Ohana Kai Village project does not contain the content required by Haw. Admin. R. 11-200-23B or Haw. Rev. Stat. Chapter 343. "In particular, the court found that the FEIS is inadequate in two substantial areas: (1) the environmental impact and potential effect of the injection wells is not adequately addressed; and (2) the potential for increased salinity in the three drinking water wells and the remediation of the potential salinity problems is not adequately discussed".

After careful review of the court order and further meetings with community organizations, government agencies and the plaintiffs, the

applicant has revised its plan to develop the project site. Instead of its earlier proposal to develop 1,100 residential housing units and a village commercial town center, the applicant has reduced its project density over 90 percent of its initial plan. The revised preliminary plan is now proposed to consist of 55 market-priced rural residential lots and 58 affordable residential housing dwelling units and a neighborhood park. The remaining portions of the subject property will remain in agriculture for agricultural, drainage, and other allowable uses. The primary objectives of the revised preliminary plan are: (1) to reduce the density of the project in order to minimize the potential impact of the project to its environs; (2) provide the community with a low density development which will preserve the rural character of the area; (3) allow small-scale agricultural uses within the market-priced units consistent with Maui County Rural Zoning District, Chapter 19.29.010, Maui County Code; and (4) to develop needed affordable housing units for families earning 80 percent to 120 percent of Maui's median income. In light of the reduced project density of the proposed project, the injection wells have been removed from the proposed project to address the court's order (refer to Appendix D, Preliminary Engineering Report for more detailed information). In addition, to respond to court's order regarding remediation to address potential increased salinity of the water wells for the project, the applicant proposes to install reverse osmosis (RO) to further reduce the salinity of the water sources for the proposed project. The objective of the treatment process is to produce a blend of RO product water and untreated well water which has chlorides of 100 MG/L or less and total dissolved solids (TDAS) of 300 MG/L or less. (See Appendix N, report from Tom Nance Water Resources Engineering for detailed information and discussion on proposed RO for the project). A water detailed analysis and pump tests of the existing Pohakea wells 1, 2, and 3 were conducted by Tom Nance Water Resource Engineering to ensure that the water sources are adequate to meet the projected water demand for the

proposed project. Equally important, that the water quality of the water meets all applicable federal, state and county laws and standards. Important points to note from the study data confirmed the following summary results:

- No organic contaminants were detected in any of the samples;
- None of the concentrations of detected constituents exceeded the regulatory maximum allowable contaminant level (MCL); and
- Nitrate-nitrogen levels, while well under the MCL, may reflect input from past agricultural practice.

For more detailed information of the water report entitled "Adequacy of Water supply for the Proposed Ma`alaea Plantation Rural Subdivision" by Tom Nance Water Resource Engineering, please refer to Appendix M.

The project area is situated on the southwest coast of the island of Maui, about eight miles from the commercial and business center of Kahului. The project area was once a dry native shrubland with scattered trees. It was cleared for agricultural use in the late 1800's and was cultivated for sugarcane. During the 1990's pineapple was cultivated for a few years, after which the area was leased out for small scale agriculture until 2003. For the past several years the land has been used for grazing. The subject property has been vacant and fallow for many years and has not been used for any agricultural cultivation in recent years.

The subject property is formerly owned by Wailuku Sugar Company. It was sold to Ma`alaea Properties, LLC and it was purchased by the applicant, MVI, LLC on October 21, 2008.

2. Surrounding Land Uses

The subject property is located on the mauka side of Honoapiilani Highway in Ma`alaea, island of Maui. Honoapiilani Highway runs in a general north-south direction, in the vicinity of the project area, and connects Wailuku and Waikapu to the Ma`alaea neighborhood. It then continues westward to the communities lying within the West Maui region.

The community of Ma`alaea is situated along Maui's southern coastline. Central to this neighborhood is the Ma`alaea Small Boat Harbor, which is home to a number of fishing and sightseeing charter boats, as well as private recreational vessels. The U.S. Coast Guard has a small office and a dock for its ships. Included within the Ma`alaea community are a small number of older oceanfront residences, and ten oceanfront condominium projects. The condominium developments within the Ma`alaea community account for approximately 560 residential apartment units, the majority of which are rented on a short-term hotel basis. The Ma`alaea Triangle commercial complex located makai of the project site is home to a variety of commercial uses, and predominantly caters to tourism, including shops, restaurants, a small amusement park, and the Maui Ocean Center Aquarium. The nearest employment centers, shopping centers and schools are located in Kihei, Kahului, and Wailuku, a 10-minute drive from the project site. The project site is located approximately fifteen miles southeast of Lahaina and approximately eight miles southwest of Maui's main airport in Kahului.

Northeast of the project site are agricultural lands, predominantly used for sugarcane cultivation. Immediately north of the project site is the King Kamehameha Golf courses. Waikapu is located approximately three miles to the north, and the town of Wailuku and the Maui County governmental

center are located about one mile north of Waikapu village. North Kihei Road and Honoapiilani Highway intersection is located in the southeast with the Maui construction and demolition landfill located adjacent to the north Kihei Road and Honoapiilani Highway intersection.

As noted earlier in this report, the project site was formerly used for sugarcane cultivation and more recently for small scale agricultural farming. A portion of the project site is currently used for horse pasture and cattle grazing under a license agreement with tenants on a month-to-month basis.

3. Climate

Like most areas of Hawaii, Maui's climate is relatively consistent throughout the year. The island's climate varies from terrain. Characteristic of most of Maui's climate, the proposed project site experience mild and uniform temperatures year-round, moderate humidity and consistent northeasterly trade winds. The mean annual temperature of the island is about 75 degrees Fahrenheit at all locations near sea level. Temperatures recorded at Kahului airport range from low 60's to high 80's degrees Fahrenheit. August is historically the warmest month, while January and February are the coolest.

A high proportion of the rainfall that Maui receives annually falls on the northeast facing shores leaving the south and southwest coastal areas relatively dry. The estimated annual rainfall in the project site averages 14 to 16 inches, with the bulk rainfall precipitation occurring between the months of November and April (Armstrong, 1983). As noted above, winds blow predominantly out of the northeasterly direction.

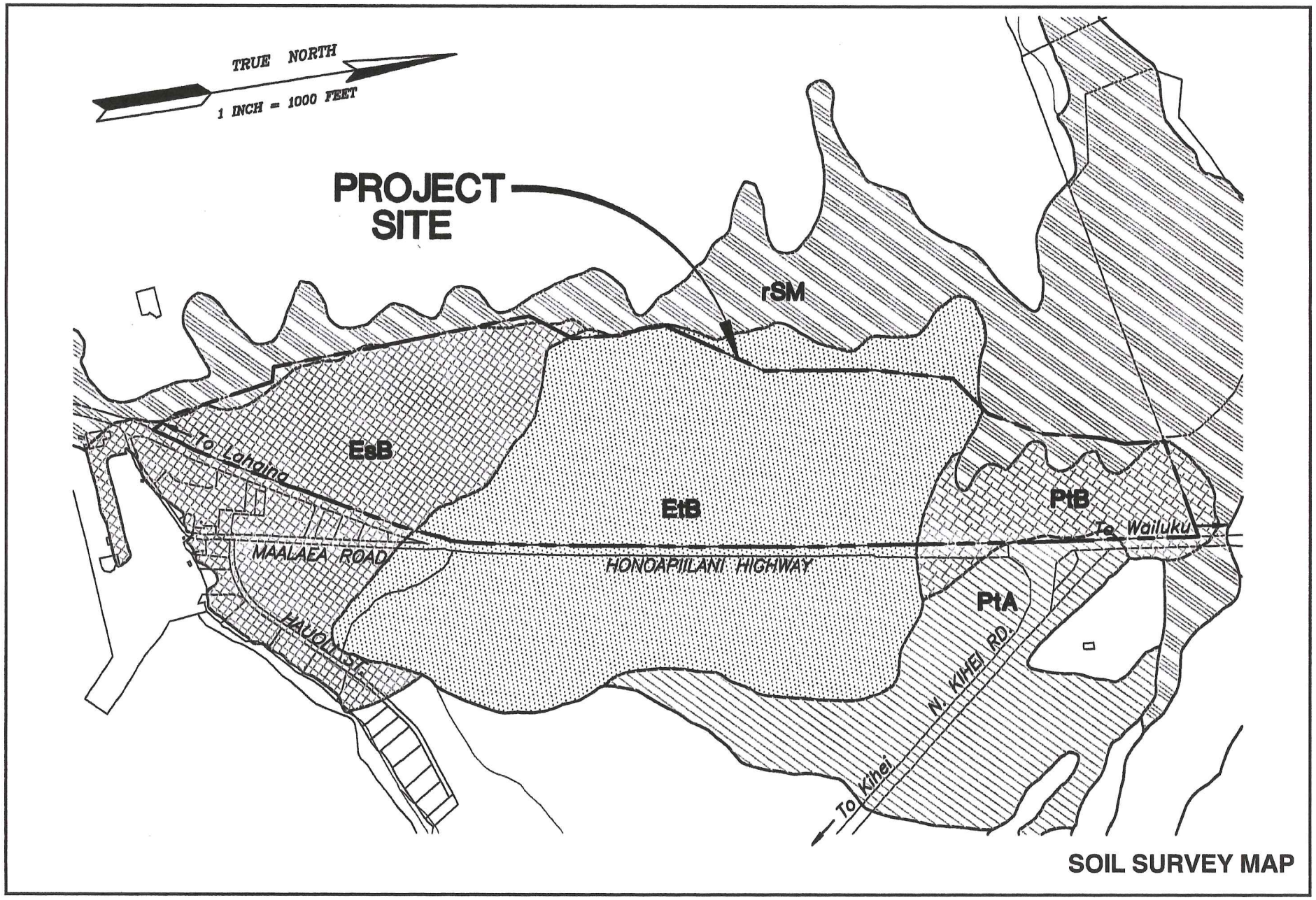
4. Topography and Soils Characteristics

The project site's existing ground slopes in an northwest to southeast direction from an elevation of 210 feet above mean sea level at the north western corner of the property to an elevation of 40 feet at Honoapiilani Highway (southeastern boundary), with an average slope of approximately 6.5%. The project site is currently vacant and previously used for sugarcane cultivation by the Wailuku Agribusiness Company and more recently used for cattle grazing and horse pasture.

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 soils within the project site are classified as Ewa Silty Clay (EsB), Ewa Cobbly Silty Clay (Etb), Pulehu Cobbly Clay Loam (PtB), and Stony Alluvial Land (rSM). Ewa Silty Clay, 3 to 7 percent slopes, is described as having very slow runoff with no more than a slight erosion hazard. Ewa Cobbly Silty Clay and Pulehu Cobbly Clay Loam are characterized as having moderate permeability and slow runoff with a slight erosion hazard. Stony Alluvial Land is high in permeability and consists of stones, boulders, and soil deposited by streams along the bottom of gulches and on alluvial fans.

5. Agriculture

The State Department of Agriculture has established three categories of Agricultural Lands of Importance to the State of Hawaii (ALISH). These are: "Prime" agricultural lands which have soil quality, growing season, and the moisture supply needed to produce a sustained high yield of crops economically when treated and managed according to farming methods; "Unique" agricultural lands which have the special combination of soil quality, location, growing season, moisture supply, and is used to produce



Proposed Mā'alaea Plantation
Affordable Housing Project

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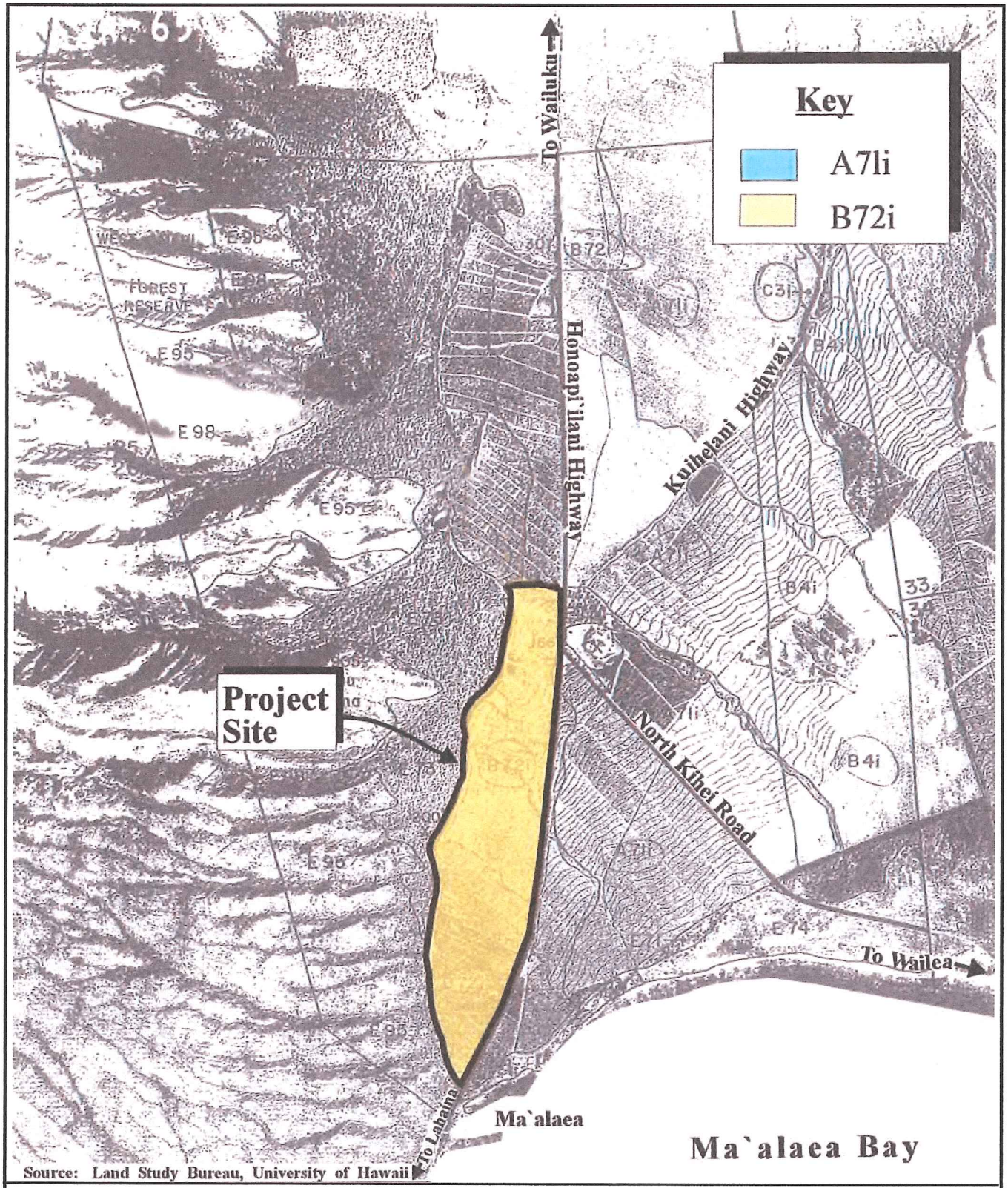

Source: Land Study Bureau, University of Hawaii

NOT TO SCALE

Proposed Mā‘alaea Plantation Affordable Housing Project

Detailed Land Classification Map

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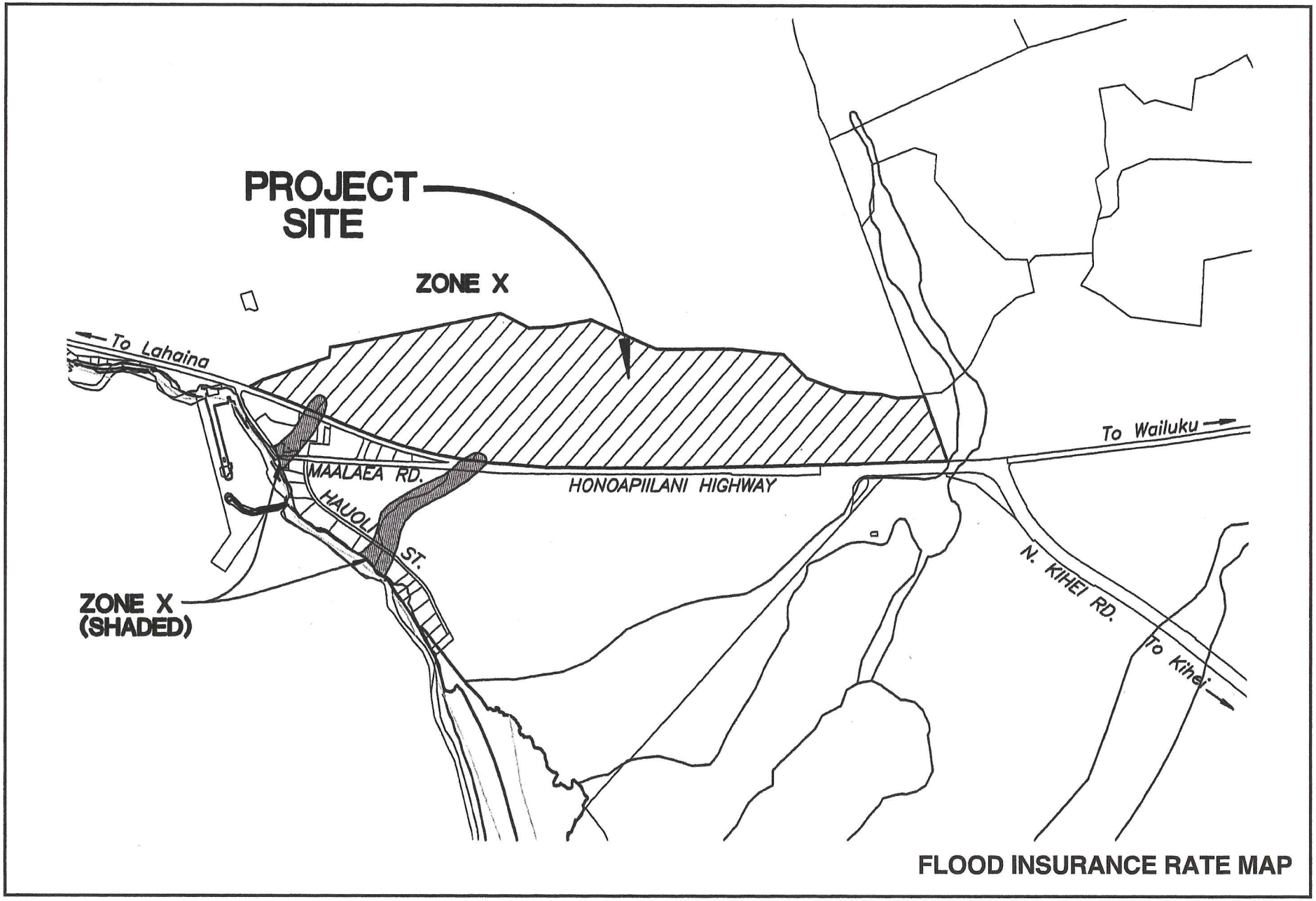
sustained high quality and high yields of specific crop when treated and managed according to modern farming methods; and, "Other" important agricultural lands are lands other than Prime or Unique agricultural lands that are also of statewide or local importance for agricultural use.

As indicated by the ALISH map (refer to Appendix T), a major portion of the subject property falls within the "Prime" agricultural lands although small portions of the project site fall into the "Other" and "Unclassified" agricultural lands categories. The Land Study Bureau (LSB) classification utilizes clear, quantifiable criteria based on underlying soil characteristics, specifically for predominant crops in Hawaii. The University of Hawaii, LSB developed the overall productivity rating, in association with the detailed land classification for the island of Maui, which classifies soils according to 5 levels, with "A" representing the highest productivity soils and "E" representing the lowest rating. These classification letters are followed by numbers which further classify the soil types: texture, drainage, and stoniness.

The project site is located on lands designated as "B72i" by the Land Study Bureau (refer to attached Land Classification Map). B72i designated lands are characterized as stony, well-drained lands moderately suited for machine tillability. These lands are most frequently used for sugarcane cultivation and grazing.

6. Flood and Tsunami Hazard

The project site is located near the base of the West Maui Mountains. According to Panel Numbers 150003 0556F and 558F of the Flood Insurance Rate Map (FIRM), dated September 19, 2012 and prepared by the United States Federal Emergency Management Agency (FEMA), the subject parcel is situated in Flood Zone X. Flood Zone X represents areas



Proposed Mā'alaea Plantation Affordable Housing Project

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outside of the 0.2% annual chance floodplain. Two small portions of the property within two existing drainageways are designated in Flood Zone X, with areas of 0.2% annual chance flood, areas of 1% annual chance flood with average depths less than one foot or with drainage areas is less than one square mile, or areas protected by levees from 1% annual chance flood.

The classification of the subject property as Flood Zone X is further confirmed by the Maui County Planning Department's Zoning and Flood Confirmation Form (refer to Appendix U) and no flood development permit is required.

7. Flora and Fauna

As noted in this report, the subject property is vacant and fallow. It was formerly used for sugarcane cultivation, and more recently used for cattle grazing and horse pasture.

Biological Resources survey was conducted at the property by Robert W. Hobdy (Environmental Consultant) on March 2014 (refer to Appendix K). Flora and fauna survey field work of the project site was performed by Robert W. Hobdy. A walk-through botanical survey method was used by the consultant following a route to ensure complete coverage of the area. The primary purpose of the field survey was to determine if there were any federally listed endangered, threatened, proposed, or candidate flora and fauna species within the proposed project site. The objectives of the field survey were to: (1) document what plant and animal 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 of 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; and (5) make recommendations to the landowner with respect to any sensitive species or habitats found in the project site.

According to the flora and fauna field survey by Mr. Robert Hobdy, the vegetation throughout the entire proposed project area is open grassland consisting primarily of two abundant grasses, guinea grass and bufflegrass, along with a variety of other herbaceous species and a few shrubs and trees. Also common were Carolina lovegrass, bristly foxtail, spiny amaranth, hairy merremia, and cheese weeds. The consultant found that the vegetation throughout the project site is dominated by non-native species. This is a result of over a century of intensive agricultural activity.

As a result of the flora inventory field survey by Mr. Robert Hobdy (Biological Survey Consultant), he has confirmed that *"no officially Listed Threatened or Endangered plants (U.S. Fish and Wildlife Service 2014) are found on the site, nor do any plants proposed as candidates for such status occur on the property"*. No special habitats were found on the property either. The report further states, because the vegetation on the site is dominated primarily by non-native plants and because there are no rare protected native species within the project area, there is of little botanical concern and the proposed project is not expected to have a significant negative impact on the botanical resources in this part of Maui (see Appendix K for more detailed report on flora field survey by consultant).

A walk through fauna survey was conducted by consultant 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. In addition, an evening visit was made to the area by

consultant to record crepuscular activities and vocalizations and to see if there was any evidence of occurrence of the Hawaiian hoary bat in the area. According to the consultant, a total of five mammal species were observed on the project area during two site visits. Several horses were pastured in the southern part of the property. Tracks of axis deer were seen on the dirt road at the top of the property. Dog tracks were seen in the same area. A mouse was seen scurrying through underbrush. During the evening field survey, two areas were surveyed to determine if the native Hawaiian hoary bat, an endemic and endangered species was present in the project area. Bat activity was detected at one of the sites near the middle of the project area.

There was substantial birdlife diversity in the project area, as noted by the consultant. Thirteen species of nonnative birds and one endemic species were observed by consultant, most taking advantage of this seasonal food supply. Two species were common throughout the project area, the zebra dove and chestnut manikin. The remaining species were all uncommon or rare in occurrence. One pair of the endemic and Endangered nene or Hawaiian goose were observed by consultant during the early evening flying north, high above the project area toward the Waikapu golf courses where they are known to feed on grasses and bed down near the golf courses' water features.

Insect life was diverse and abundant throughout the project area, according to the consultant. A total of 28 insect species were recorded during two site visits. One species, the beet webworm moth was abundant throughout the project area. Also common were the three-lined potato beetle and the cabbage butterfly. The remaining 25 species were uncommon or rare in occurrence. Three native insect species were recorded. These included the endemic and Endangered Blackburn's sphinx moth, an unidentified endemic yellow-faced bee and the

indigenous globe skimmer dragonfly. According to the consultant, the fauna species observed within the project area were primarily non-native and of little conservation concern. There were, however, five native species that were recorded, and three of these are of special focus and concern and require consultation with the U.S. Fish and Wildlife Service (see Appendix J for more detailed information of fauna survey results by consultant). Hawaiian hoary bats were detected in the center of the project area, notes consultant. They are highly mobile and move around seasonally following changing food availabilities and climates. Their use of the project area is thus probably incidental, but provisions need to be made that will protect them during the breeding season. According to the consultant, U.S. Fish and Wildlife will be consulted to provide guidelines.

The last of the native fauna were two insects that are not Endangered species, an unidentified Hylaeus bee and the globe skimmer dragonfly. There are many species of Hylaeus in Hawaii, a few of which are of wide distribution on Maui. The globe skimmer has a nearly worldwide distribution and is not conservation concern, noted by consultant.

According to Mr. Hobdy's report, there are no further recommendations regarding fauna species in the project area beyond the initiation of consultation with the U.S. Fish and Wildlife Service regarding the three endangered species discussed above.

8. Streams and Reservoirs

As noted earlier in this report, the entire project area is dry and vegetation consists primarily of open grasslands with a few scattered trees. The subject property was formerly used for sugarcane cultivation. There are four unnamed gullies that pass through the project site and drain to the east of Ma`alaea according Mr. Hobdy (Biological Survey Consultant).

One named gulch, Pohakea Gulch, traverses to the north of the project site. This drainage feature is outside of the proposed project site and drainage flows from the 257-acre project site under existing conditions, but do not currently enter Pohakea Gulch. The gulches flow only during periods of heavy rainfall, when they drain upland slopes.

According to the Biological Resources survey by the project consultant, there are no identified wetlands on the project site. Nothing remotely approaching the three essential criteria that defined a federally-recognized wetland, namely: hydrophytic vegetation, hydric soils, and wetland hydrology occur within this dry project site.

Keala Pond Wildlife Refuge is the nearest regional wetland resource and is located approximately over 1.5 miles to the east of the project site. This wildlife refuge is being managed by the U.S. Fish and Wildlife Service.

9. Air Quality

There are no point sources of airborne emissions within close proximity of the project site. Air quality in the vicinity of the project site may be affected by a variety of sources, including dust from sugar cane cultivation operations to the east, and north of the property, as well as smoke from sugar cane harvesting operation in Central Maui. However, these sources are intermittent and prevailing winds quickly disperse the particulates generated by these temporary sources. There is one notable point source of air contaminants, which is the electric power plant site owned and operated by Maui Electric Company. This power generation plant is located approximately half a mile east of the project site. This source, however, is not considered a major source of pollution due to the prevailing trade winds occurrence along the south coast. Other airborne pollutants that exist are largely attributable from vehicle exhaust from

Honoapiilani Highway and Pohakea quarry site and construction and demolition landfill located nearby. Based on the above consideration, the nearby quarrying, construction/demolition landfill, Maui Electric power plant generation facility, and agricultural operations are not anticipated to present a significant long-term adverse impact on the proposed Ma`alaea Plantation project.

Overall, air quality in the Ma`alaea-Waikapu-Wailuku regions is considered excellent.

10. Noise

Traffic noise from Honoapiilani Highway located east of the project site, the Pohakea quarrying site and the construction/demolition land fill activities located nearby are the predominant sources of noise in the vicinity of the project site. Also, on intermittent basis, noise from vehicle and construction activities at the Ma`alaea Triangle commercial complex is a secondary source of background noise. However, this activity is temporary in nature. Other background noise levels attributed to nearby agricultural sugar cane operations on an intermittent basis, as well as natural conditions such as wind and rain.

11. Scenic and Open Space Resources

West Maui Mountains, including Haleakala Mountain to the east define the scenic resources of the project site. Ma`alaea is located along the southwest coastline of Maui, an area, like many other areas on the island, that offers beautiful scenic views. Surrounding the project site to the east, north and west is open space, primarily sugarcane lands and conservation lands. Immediately southeast of the project site (across Honoapiilani Highway) is presently the Ma`alaea Triangle commercial complex and the

Ma`alaea State Harbor. Approximately 0.5 miles east of the project site is the Kealia Pond bird sanctuary. The subject property has an unobstructed view of the East Maui Mountain and Haleakala Mountain it is noted that the project area is not designated by the County of Maui as a scenic or natural resource requiring special attention.

12. Hazardous Materials

A Phases I and II Environmental Site Assessments and Site Screening Reports were conducted for the subject property by Element Environmental, LLC in November 2006 and August 2007, respectively (refer to Appendix O) for more detailed information and findings on the Phases I and II Environmental Site Assessments and Screening reports.

The Phase I Environmental Site Assessment (ESA) was performed in accordance with the scope and limitations of the American Society of Testing and materials Practice E 1527-05 to determine if the 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. The purpose of the Phase I ESA is to identify recognized environmental conditions associated with the property and include a review of environmental regulatory records in the site vicinity, a review of the site history, a review of the site geology and hydrogeology, a site reconnaissance, and interviews. American Society for Testing and Materials (ASTM) guidance defines *recognized environmental conditions* as the "presence or likely presence of any hazardous substances 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 a ground, groundwater, or surface water of the property" (ASTM,

2005). Recognized environmental conditions do not include *de minims* conditions that generally do not present a threat to human health or the environment and that generally would not be the subject of an enforcement action if brought to the attention of appropriate government agencies (ASTM, 2005).

The Phase I ESA constitutes all appropriate inquiry into the previous ownership and uses of the property consistent with good commercial or customary practice and is intended to permit the Phase I ESA user to satisfy one of the requirements to qualify for the innocent landowner, contiguous property owner, or bona fide prospective purchaser limitations on Comprehensive Environmental Response Compensation and Liability Act (CERCLA) liability, hereinafter, the "landowner liability protections".

According to the Element Environmental LLC's Phase I site assessment report (see Appendix O), the site has historically used for sugarcane cultivation, and more recently, for cattle grazing and horse pasture. The ESA has "*revealed no significant evidence of recognized environmental conditions in connection with the property*" with the exception of fourteen 55-gallon high density polyethylene (HDPE) drums located along the dirt road bordering the southwestern end of the property. It was recommended that the said drums be removed and disposed of by the previous owner in accordance with all applicable state and federal laws, rules and regulation. The said drums were removed and disposed according to applicable laws on November 17, 2006, according to the ESA.

A Phase II Environmental Site Assessment was performed by Element Environmental, LLC on August 2007. The purpose of this Phase II ESA was to evaluate if residual levels of pesticides and herbicides resulting from historic agricultural uses are present in surface soils. In addition, an area where fourteen 55-gallon unmarked drums were identified in the

Phase I ESA was investigated to determine if a release from the drums had occurred. The results of this screening will be used to determine if additional characterization and remediation with regard to the planned future rural and residential subdivision development is necessary to protect human health and the environment.

In line with current State of Hawaii Department of health (HDOH) published guidance documents, the Screening Phase II ESA was completed on "neighborhood-size" decision units utilizing a multi-increment sampling approach by Element Environmental, LLC. The project site was divided into eight decision units approximately 32 acres in size with one multi-increment surface soil sample collected from each unit. The multi-increment samples were analyzed for pesticides and herbicides constituents that may have been applied to the property during the sugarcane cultivation. According to the Phase II ESA (see Appendix O for more detailed reports and findings), the results of the multi-increment sampling analyses indicate that residual pesticides and herbicides are not present at significant levels in the surface soils at the site. The majority of the pesticide and herbicide analyses were not detected in the multi-increment samples. Two discrete samples were also collected from beneath the area where fourteen 55-gallon drums were observed during the Phase I ESA. The two samples were analyzed for a full suite of analyses to determine if a significant release had occurred from the drums. The analytical results did not indicate that a significant release had occurred in the area. Based on these sample results and the fact that the drums were removed and disposed, no further action is recommended for the drum area , according to Element Environmental, LLC's Phase II ESA report.

13. Archaeological Resources

Scientific Consultant Services (SCS), Inc. conducted Archaeological Inventory Survey (AIS) on a 257-acre parcel in Ma`alaea (proposed project site) located at TMK: (2) 3-6-01:18. The AIS was done on April 2005. The AIS work consisted of historical background and archival research; pedestrian survey and inspection of the parcel; mapping and a description of site features; subsurface testing (excavation by backhoe); consultation with State Archaeologist; and analysis, interpretation, and reporting of all relevant data. Field work was conducted on January 31 to February 11, 2005 by Jon Wilson and Eric Pope under the supervision of Principal Investigator Michael F. Dega, PH.D. of SCS, Inc. Archaeological work in the project area was conducted to determine the presence/absence of archaeological features in surface and subsurface contexts through complete pedestrian survey and representative subsurface testing. The ultimate goals of the project were to determine if significant cultural and/or historic resources occurred on the parcel; and, to provide significance assessments and recommendations to the State Historic Preservation Division (SHPD).

According to SCS, Inc., the main results of the AIS were as follows: three historic sites, all related to sugarcane agriculture, were identified, documented for the first time, and assigned SIHP numbers: Site 50-50-09-5657 (clearing mounds), Site 50-50-09-5658 (irrigation modifications), and Site 50-50-095659 (dirt road). These three sites were the only archaeological sites found within the project area. Per AIS report, a 100 percent pedestrian survey concluded that no prehistoric sites exist on the surface of the project area. Subsurface testing was comprised of twenty backhoe trenches (a volume of approximately 292 cubic meters) which did not reveal any subsurface historic, or prehistoric, cultural material. Rather, excavation confirmed the extent, both in physical and temporal

depth, of historic and modern agricultural activity within the project area. No burial features or human remains were observed during pedestrian survey or encountered during subsurface testing.

The following actions were recommended by SCS, Inc: no further archaeological work is necessary within the project area, with the exception of a period of observation during future earth-moving activity. An archaeologist must be on site during the leveling of a representative sample (a minimum of four) of the thirteen clearing mound features that comprise State Site 50-50-09-5657. This archaeological observation is necessitated by the possibility of historic and/or prehistoric features or artifacts having been buried under/within the large clearing mounds. It is important to note that the AIS for the project site performed by SCS, Inc. was reviewed and accepted by the State Historic Preservation Division (SHPD) on June 29, 2005 (see attached approval letter from SHPD identified as Appendix G).

Further discussions and details on the result of the archaeological site assessment survey can be found in SCS, Inc.'s attached AIS report identified as Appendix F.

As a follow up to the approved AIS, the Archaeological Monitoring Plan (AMP) was prepared by Scientific Consultant Services (SCS), Inc. in April 2008 in advance of subsurface construction activities on a 257-acre parcel at the proposed Ma`alaea Plantation rural and residential subdivision. The AMP will ensure that any human remains found during this work are identified and appropriately mitigated, as deemed appropriate and lawful pursuant to Hawaii State Law for the Discovery of Human Remains (pursuant to 13-300-40a, b, c, HAR). Archaeological Monitoring will also ensure that significant cultural resources identified in the project area are adequately sampled, documented, and evaluated for

their historical significance. More detailed information regarding the AMP can be found in SCS Inc.'s attached report identified as Appendix H.

It is important to note, the AMP for the project site prepared by SCS, Inc. has been reviewed and accepted by the State Historic Preservation Division (SHPD) in its letter of May 22, 2008 (see attached acceptance letter from SHPD identified as Appendix I).

14. Cultural Assessment

A Cultural Impact Assessment (CIA) study was prepared on the subject property by Scientific Consultant Services (SCS), Inc. spearheaded by Leann McGerty and Robert Spear. Both are experienced in the cultural and archaeological history of Maui and the State of Hawaii. The cultural impact assessment was conducted by SCS in June 2005.

The purpose of the cultural impact assessment study is to compile a summary based on various historical, cultural and topographical accounts and facts regarding the proposed project site. The assessment contained in the cultural study of the area was acquired by SCS, Inc. through archival research, literature searches, and oral interviews with persons knowledgeable with the immediate project area. The personal experiences of the authors of the cultural impact assessment report are also interspersed within the report narrative.

The CIA report was prepared in accordance with the methodology and content protocol provided in the Guideline for Assessing Cultural Impacts (OEQC 1997). The report contains archival and documentary research, as well as communication with organizations having knowledge of the project area, and its practices and beliefs.

According to the CIA report, analysis of the potential effect of the proposed Ma`alaea Plantation rural and residential subdivision on cultural resources, practices or beliefs, the potential to isolate cultural resources, maintain practices or beliefs in their original setting, and the potential of the project to introduce elements that may alter the setting in which cultural practices take place is a requirement of the OEQC. The project area has not been used for traditional cultural purposes within recent times, according to SCS' report. Based on historical research and the responses of the Maui office of Hawaiian Affairs; Community Resource Coordinator, Maui; the Office of Hawaiian Affairs, Oahu, the Cultural Resource Planner for the Maui Planning Department; and the Maui Civic Club, it is reasonable to conclude, according to SCS, *"that Hawaiian rights related to gathering, access or other customary activities will not be affected and there will be no direct adverse affect upon cultural practices and beliefs"*.

Further information and details of the cultural impact assessment report can be found in Scientific Consultant Services, Inc.'s attached report identified as Appendix J.

B. SOCIO-ECONOMIC ENVIRONMENT

1. Population

The population of the Island of Maui has increased dramatically over the last two (2) decades. In 2000, the population was estimated at 117,644, an increase from 1990 of 91,361 (Maui Island Plan). According to the Maui Island Plan, Maui's resident population is expected to grow from 129,471 in 2005 to 176,687 in 2030. This is a 1.46% annual growth rate, which equates to a 36.5% increase in population over the 25 year period. These projections, according to the Maui Island Plan indicate a population

increase of 16% between 2010 and 2020, and an increase of 12% between 2020 and 2030.

According to the *Socio-Economic Forecast* as noted in the Maui Island Plan, the total population is not expected to increase equally throughout the island, rather, there are specific regions where population growth is more likely to occur. To further illustrate the population growth that will likely occur, there are four community plan regions that are in close proximity of the proposed project site, namely: Kihei-Makena, Wailuku-Kahului, Makawao-Pukalani-Kula, and Paia-Haiku regions. The combined population growths within these regions are illustrated by the following: population in 2005 was 107,621; in 2010 was 112,716, and in 2020 is expected to grow to 130,774, and in 2030 the combined population is these regions are expected to reach a staggering 146,777 (according to Maui Island Plan).

The Kihei-Makena Community Plan region has experienced a significant population growth over the last three decades. In the year 2000, the population of Maui was 117,644, with 22,870 people (19.4 percent) of the island's population residing in Kihei-Makena Community Plan region (SMS, 2002). The growth in the population of the Kihei-Makena Community Plan region since 1970 has been considerable, with the population increasing from 1,636 in 1970, to approximately 7,263 in 1980, and to 15,365 in 1990. Over the past 40 years, the Kihei-Makena Community Plan region has experienced a fourteen-fold increase in resident population, and is expected to rise further over the coming years.

Because the proposed project's unique central location is between the Wailuku- Kahului Community Plan District and Kihei-Makena Community Plan District, and is in close proximity with the Paia and Upcountry Community Plan regions, the proposed project will be a

convenient place to serve the expected population growth in these Maui community plan districts. The proposed project site is centrally-located within the Kihei-Makena community plan area – and in close proximity of the Kahului-Wailuku community plan district. These two community plan district areas remain the economic and population center of the island. In the 1990s, these areas saw significant increases in trade, transportation, communications and utilities, resorts, commercial, high technology, and government jobs. Kahului Harbor is the port through which most cruise ship visitors reach Maui. According to the Maui Island Plan, the socio-economic forecast suggests that the Wailuku-Kahului and Kihei-Makena areas will grow faster than other parts of Maui.

2. Economy

The Wailuku region is the island's center of governmental activities, as well as a focal point for professional and business services. Combined with neighboring Kahului, the region's economic character include a wide range of commercial, service, and governmental activities. Another important economic engine in the Kahului region is the harbor and airport transportation systems critical to Maui's economy. Also, within the Kahului region is the University of Hawaii Maui College and the Maui Center for Cultural Arts that contributes significantly to our economy in the region.

The Kihei-Makena Community Plan region is one of the island's well-planned visitors resort destination, the primary economic engine for the island of Maui. This same region contains the home of the research and technology park which contributes significantly to the island's economy. As we all know, the economy of Maui is heavily dependent upon the visitor industry, and the Kihei-Makena area provides a fine illustration of this characteristic. The presence of a high number of vacation

condominiums along South Kihei Road reflects the growth of the Maui south coast as one of the most popular destinations in the State. The Wailea and Makena Resorts affirm the island's economic dependence on tourism and luxury homes combined with renowned private golf courses.

The Ma`alaea Small Boat Harbor and the Ma`alaea Ocean Center aquarium located immediately east of the project site are another important economic engine as it represents one of the focal points for tourism on the island. At the said harbor, many of the commercial boat operators conduct snorkeling trips to popular destinations, whale-watching tours, and deep-sea fishing expeditions. The popularity of the harbor as a tourist gateway can be attributed to its proximity to the airport in Kahului and the hotel resorts in the Kihei-Makena region. Another important economic engine in close proximity of the project site is the Maui Tropical Plantation located at the base of Waikapu Valley at West Maui Mountains. This tourism-related activity is located approximately one mile north of the project area.

In addition, the region is surrounded by significant agricultural acreages which are currently being cultivated in sugar cane. These vast expanse of agricultural lands, managed by Hawaiian Commercial and Sugar Company (HC&S), is considered a key component of the local economy. Supporting the sugar cane operation is the HC&S factory located approximately four miles east of the proposed project. Also, another important agricultural activity that contributes to Maui's economy is Monsanto Seed Farm located approximately three miles east of the project area.

Another important key economic driver that fuels our economy within the Kahului-Wailuku region and the island of Maui are healthcare-related businesses such as the Maui Medical Group, Keiser Permanente, and the

200+ beds at Maui Medical Center Hospital. There are also elderly long-term residential facilities that substantially contribute to the region's economy such as Hale Makua and Roselani residential complexes. These facilities are located within two to three miles north of the subject project site. It is estimated that these health-care related facilities have a combined number of direct employees of approximately over 2,000.

3. Employment

In the year 2004 and 2008, the unemployment rate for Maui County and the Island of Maui stood at 3.1 percent and 4.5 percent, respectively. (Hawaii Department of Labor and Industrial Relations and Maui County Data Book, 2010). In May 2005, the unemployment rate for Maui County and the Island of Maui (seasonably adjusted) was 2.3 percent and 2.1 percent, respectively (Hawaii Department of Labor and Industrial Relations). Since the recession that hit the island of Maui in 2008, the unemployment rate on Maui County reached a moderate rate of 4.5 percent – still below the state average (Hawaii Department of Labor and Industrial Relations and Maui County Data Book, 2010). According to the economic forecast for 2010 – 2011 by Dr. Leroy Laney, Economic Advisor to First Hawaiian Bank and Professor of Economics and Finance at Hawaii Pacific University, Maui County's economic picture is marked by an impressive tourism industry rebound, which is a key economic driver for Maui's economy. The report by Dr. Laney further confirmed that what distinguishes the Maui economy in 2010 is the impressive rebound in tourism. It leads all other counties in this regard. Maui's residential real estate sales are another area of impressive growth, according to Dr. Laney's report. In same report, an economic recovery is now underway or at least imminent for the Maui economy.

According to the Maui County Data Book, in 2004, total wage and salary jobs in Maui County was approximately 67,000 and most of the jobs were in accommodations and food services, trade, government, agriculture; and other service. In the year 2000, there were a total of 32,851 civilian jobs in the Wailuku-Kahului region, representing 48 percent of the island-wide civilian jobs. Of those jobs, 25,688 were wage and salary positions while 7,163 were self-employed (SMS, 2002). In recent report from Maui County Data Book, 2010, the total civilian labor force in Maui County in 2005 was 75,450 and in 2009 were 76,550, respectively. The civilian labor force for 2010 was 74,900 and the number of employed was 68,700 (Maui County Data Book, 2012). The unemployment rate decreased from 8.6% to 8.3% between 2009 and 2010. According to State Department of labor and Industrial Relations, the 2013 unemployment rate was 5.3% and it dipped to 4.3% in April 2014. This dip of a dramatic unemployment rate is a positive sign of economic recovery in Maui County. According to the project's economic analysis by ACM Consultants, Inc., the project is anticipated to generate both direct and indirect employment opportunities for Maui's residents.

In terms of job employment distribution, the Wailuku-Kahului region generally follows the county-wide trends for the labor force characteristics as shown in the following table:

Occupational Category	**Maui County**	**Wailuku-Kahului**
Agriculture	3%	4%
Manufacturing	2%	5%
Construction	4%	1%
Transportation, Communication, & Utilities	6%	10%
Trade	21%	22%
Banking & Finance	4%	4%

Hotel	14%	1%
Other Services	16%	18%
Government	9%	14%
Self-Employed	21%	22%

(Source: SMS, 2002)

C. PUBLIC SERVICES

1. Police and Fire Protection

Police protection for the Kihei-Makena region is provided by the Maui Police Department (MPD) located along Piilani Highway at the South Maui Station located approximately six miles east of the project site. Another police protection can be provided by its Wailuku Station headquartered at its main station at Kaahumanu Avenue in Wailuku located approximately four miles north of the project area. In addition, a satellite sub-station is located at Market Street, Wailuku, approximately 2.5 miles north of the subject property. The Maui Police Department provides investigative services, uniform patrol services, technical support, and traffic services as stated in its mission to protect the residents of Maui County. Both main and sub-stations are located in very close proximity of the project site.

Fire prevention, protection, rescue, and emergency services for the Kihei-Makena region are provided by the Maui County Department of Fire and Public Safety. The department's two Kihei stations, which services the Ma`alaea and Kihei areas are located on South Kihei Road in central Kihei and Wailea fire station situated on Kilohana Drive. Both are located approximately four and five miles east of the project site, respectively. Other central Maui stations are located in Wailuku town and in Kahului,

Dairy Road both located within approximately three to four miles of the project site.

2. Medical Facilities

State-owned Maui Memorial Medical Center (MMMC), the only major medical facility on the island, services the island of Maui. Acute, general, and emergency care services are provided by the 200+ beds at the MMMC facility located in Mahalani Street, Wailuku, about four miles north of the project site. Also, state owned Kula Hospital located approximately twenty miles east of the subject property provides emergency and long-term care services.

Clinics and offices in the Kihei region offer medical services on a lesser scale. Such clinics include Kihei Clinic and Wailea Medical Services, Kihei Pediatric Clinic, Kihei Physicians and the Kihei-Wailea Medical Center. In addition, Keiser, Maui Medical Group, Maui Medical Clinic, and Liberty Dialysis Clinic serve health care needs for the Island of Maui, all located in Wailuku and Kahului, about four miles north of the subject property. Dental and other medical offices are also located within the Wailuku-Kahului region to serve its residents and visitors, and are within four miles or less from the proposed project site.

3. Schools

The project site is located between the communities of Wailuku-Kahului and Kihei-Makena regions. These community regions are served by the Department of Education's public school system, as well as several privately operated schools accommodating elementary, intermediate, and high school students. The State DOE operates three schools in the Kihei region. Kihei Elementary School and Kamalii Elementary School covers

K to 5, with enrollment of approximately 970 and 620 students, respectively. Lokelani Intermediate School includes grades 6 to 8, with an approximate enrollment population of 573 students. The Kihei Charter School is located in the Kihei region with an approximate enrollment of 500 students.

The State DOE is in its final stages in the planning and design phase to develop a high school in the Kihei region and construction of the new high school is expected to start in 2015.

In addition to the Kihei educational facilities, the State Department of Education (DOE) operates eight schools in the Wailuku-Kahului region, as well as several privately-operated schools serving elementary, intermediate, and high school students. Public school facilities within the Wailuku-Kahului District area include: H. Perrine Baldwin High (grades 9-12), Iao Intemediate (grades 6-8), Wailuku Elementary (K-5), Waihee Elementary (K-5), Maui High (9-12), Pomaikai Elementary (K-5), Kahului Elementary (K-5), Lihikai Elementary (K-5), and Maui Waena Intermediate (6-8).

Privately-operated schools serving Wailuku-Kahului region include St. Anthony School (grades K-12), Kaahumanu Hou Christian School (grades K-12), Emmanuel Lutheran School (K-6), and Maui Adventist School (grades 1-8).

University of Hawaii Maui College (part of University of Hawaii system) located on Kaahumanu Avenue, Kahului serves the college needs of Maui residents. The college has recently became a full pledge four-year university.

According to the Maui County Data Book, 2012, the following public and privately-operated schools 2012 enrollment within the Wailuku-Kahului region is shown in the following table:

Schools	**Enrollment**	**Grades**
Baldwin High School	1,598	9-12
Maui High School	1,870	9-12
Iao Intermediate	841	6-8
Wailuku Elementary	960	K-5
Waihee Elementary	816	K-5
Kahului Elementary	1024	K-5
Lihikai Elementary	982	K-5
Maui Waena Intermediate	1112	6-8
Pomaikai Elementary	675	K-5
St. Anthony School	354	K-12
Kaahumanu Hou Christian	165	K-12
Emmanuel Lutheran	197	K-6
Maui Adventist	38	1-8
Christ the King	131	K-8

Source: Maui County Data Book, 2012 and Hawaii State Department of Education Records

Pu`u Kukui Elementary School located near Wailuku town was recently opened in 2013.

4. Recreational Facilities (Parks)

There are diverse recreational opportunities available in both the Kihei-Makena and Wailuku-Kahului regions. Shoreline activities, such as surfing, snorkeling, fishing, picnicking, swimming, windsurfing, and camping are the predominant forms of recreation in the region. In addition, residents and visitors are drawn to Ma`alaea by small boat

harbor, which provides diverse ocean-related recreational opportunities. There are several County parks located in close proximity of the project site. County's Haycraft Park is located approximately .5 miles southeast of the project site. This said park provides access to the sandy beach at Ma`alaea with paved parking, restrooms, and showers facilities. Other public park facilities within a relatively short driving distance of the project site include Waipuilani, Kalepolepo, Kalama, Kamaole I, II, and III beach parks, and Memorial (Ma Poina) parks, all located approximately three to six miles southeast of the project site. Also, recreational resources available in Kihei and Wailea include the Kihei Community Center and community swimming pool, as well as resort recreational oriented activities that include world-renowned golf courses and tennis centers.

In addition to recreational facilities in the Kihei region, within the Wailuku-Kahului Community Plan District, there are many recreational activities and opportunities as well. These include shoreline and boating activities at the Kahului Harbor and adjoining beach parks, and organized recreational activities provided/offered at County Parks. Within close proximity of the project site is the Waikapu Community Center located about two miles north of the project area. Other Maui County owned parks within the Wailuku-Kahului region are the Papohaku Park, Wailuku Community Center, War Memorial Athletic complex, Wailuku Little League baseball fields, Sakamoto Swimming Pool and Keopuolani Regional Park. All these county owned recreational facilities are all located within approximately four to five miles north of the project site. A nearby park adjacent to the Hale Makana O Waiale Affordable Housing complex contains a baseball field, basketball court, and playground equipment. This park is located about 2.5 miles north of the project site. Other recreational facilities in the Wailuku area include Iao Park, Wells Park, Wailuku Pool, Wailuku Gym, and Wailuku Elementary School Park.

In addition, there are several golf courses in the Wailuku-Kahului region located within close proximity of the project site, namely Kahili and Kamehameha golf courses, The Dunes at Maui Lani Golf Course, and Maui County-owned Waiehu Golf course. These golf courses are within one-half to four miles north of the project site.

5. Solid Waste Disposal

Solid waste collection services for residents are provided by Maui County Department of Environmental Management. For commercial, solid waste is collected by private waste disposal companies. Collected solid waste is disposed at the Maui County's 55-acre Central Maui Landfill, located approximately four to six miles east of the subject property. This county-owned landfill is managed and operated by Maui County Department of Environmental Management.

Privately-owned facilities, such as the Maui Demolition and Construction Landfill and the Concrete Recycling Facility, accept solid waste and concrete from demolition and construction activities. These facilities are located at Ma`alaea, near Honoapiilani Highway's junctions with North Kihei Road and located east of the project site. A green waste recycling facility is located at the Central Maui Landfill and is a privately operated facility.

D. EXISTING INFRASTRUCTURE

1. Roadways

Honoapiilani Highway is under the jurisdiction of the State of Hawaii Department of Transportation and is the main arterial highway which links Central Maui, South, and West Maui. It is a two-way roadway with

varying widths of two and four lanes. In the vicinity of the project site, Honoapiilani Highway is a three-lane highway with two lanes in the north bound direction and one in the south bound direction.

Ma`alaea Road is a two-way, two-lane roadway, which loops onto Honoapiilani Highway along its makai side. It provides access to the apartments and residential areas along the Ma`alaea coastline and Ma`alaea Harbor. At its north terminus with Honoapiilani Highway, only right turn movements are allowed northbound onto Honoapiilani Highway. At its south terminus, only right turn in and right turn out movements are allowed to and from the northbound lane on Honoapiilani Highway.

Kapoli Street runs perpendicular to the project site on the makai side of the highway and connects Honoapiilani Highway and Ma`alaea Road. It is a two-way, four-lane roadway. Honoapiilani Highway is signalized at its intersection with Kapoli Street. Kapoli Street is stop-controlled at its intersection with Ma`alaea Road.

There are two intersections located east of the project site, which lead onto Kuihelani Highway and North Kihei Road. The Kuihelani Highway provides a direct route to Kahului. North Kihei Road transitions into South Kihei Road and Piilani Highway which provides access to the residential, commercial, and resort areas located further along the south coast of Maui, such as Kihei, Wailea, and Makena. A Traffic Impact Analysis Report (TIAR) by Phillip Rowell and Associates was prepared for the purposes of assessing traffic impacts attributed to the proposed project and identifying appropriate measures to mitigate potential impacts (see Appendix E for more detailed information of the TIAR).

2. Drainage

A preliminary drainage report was prepared by Otomo Engineering, Inc. for the proposed Ma`alaea Plantation rural and residential projects (refer to attached Appendix D). The existing ground slopes in an northwest to southeast direction from elevation 210 feet above mean sea level at the north western corner of the subject property to elevation 40 feet at Honoapiilani Highway (southeastern boundary), with an average slope of approximately 6.5%. As noted earlier, the project site is currently vacant and previously used for sugarcane cultivation.

According to the "Soil survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (August, 1972)," prepared by the U.S. Department of Agriculture Soil conservation Service, the soils within the project site are classified as Ewa Silty Clay (EsB), Ewa Cobbly Silty clay (EtB), Pulehu Cobbly Clay Loam (PtB), and Stony Alluvial Land (rSM). Ewa Silty Clay, 3 to 7 percent slopes, is described as having very slow runoff. Ewa Cobbly Silty Clay and Pulehu Cobbly Clay loam is characterized as having moderate permeability and slow runoff. Stony Alluvial Land is high in permeability and consists of stones, boulders, and soil deposited by streams along the bottom of gulches and on alluvial fans.

According to the Flood Insurance Map (FIRM), dated September 19, 2012, prepared by the U.S. Federal Emergency Management Agency (FEMA), the project site is situated in Flood Zone X which represents areas outside the 0.2% annual chance flood; areas of 1% annual chance flood with average depths less than one foot or with drainage areas is less than one square mile; or areas protected by levees from 1% annual chance flood.

There are no drainage improvements within the project site, however there are several unnamed drainageways that traverse the site in the west to east direction which direct both onsite and offsite surface runoff towards Honoapiilani Highway. Outside of the project boundary to the north is the existing Pohakea Stream. Existing runoff from the project site does not flow in the direction of Pohakea Stream.

It is estimated that the present onsite runoff, according to project's drainage report for a 100, 24-hour storm from the entire project site is approximately 534 cfs and approximately 115 acre-ft of runoff volume. As noted earlier, onsite and offsite runoff sheet flows in a west to east direction across the project site. When the runoff reaches the Honoapiilani Highway along the makai or eastern boundary it enters the State Department of Transportation drainage system. (See Appendix D, "Preliminary Engineering Report by Otomo Engineering).

3. Water

There is no Maui County Department of Water Supply's system currently servicing the project site or adjacent properties. There is irrigation water for the parcel which was previously used for the agricultural activities on the property. The proposed project will be served by three existing wells constructed to serve as the source of domestic water for the project site. These three wells are identified as Pohakea wells 1, 2, and 3 and are also identified by State No. 4930-01, 02, and 03, respectively. Pohakea 1 was constructed and initially pump tested in 2004. Pohakea 2 and 3 were completed and initially pump tested in 2007 (see Appendix M, a detailed report by Tom Nance Water Resource Engineering of the water wells for the project). In addition to the three wells, a 750,000 gallons storage tank has been constructed at the well site to service the proposed Ma`alaea Plantation project. State Department of Health approval is required for the

existing wells and storage tank to be used for domestic purposes. The adjacent Ma`alaea Triangle Subdivision and condominiums on the makai side of Honoapiilani Highway are serviced by the County water system. There is a 300,000 gallons storage tank at approximately elevation 220' located to the south of the project site on the adjacent State owned lands that services this area. The existing County facilities are not sufficient to service the proposed project, hence, private water systems have been constructed to service the project site.

For more detailed information and discussion regarding the existing private water system, refer to attached Preliminary Engineering Report identified as Appendix D.

4. Wastewater

There are no existing County wastewater systems on the subject property. The existing Ma`alaea community on the makai side of Honoapiilani Highway such as the Ma`alaea Triangle and the condominiums on Hauoli Street are serviced by independent private wastewater treatment facilities.

For more detailed information and discussion regarding the wastewater systems for Ma`alaea, refer to attached Preliminary Engineering Report identified as Appendix D.

5. Electric and Telephone

There are overhead electrical and telephone lines along the east (makai) side of Honoapiilani Highway. Also, there is an electrical transmission system along the north boundary of the property site. Underground electrical and telephone service have been installed as part of the Ma`alaea Triangle subdivision on the makai side of Honoapiilani Highway.

Electrical power, telephone, and CATV services to the area are provided by Maui Electric Company, Hawaiian Telcom, and Oceanic Time Warner Cable of Hawaii, respectively.

E. PROPOSED INFRASTRUCTURE IMPROVEMENTS

1. Roadways

Access to the proposed Ma`alaea Plantation rural and residential subdivision will be at two locations along Honoapiilani Highway. One will be at the existing signalized intersection with North Kihei Road. The second will be at the existing signalized intersection with Kapoli Street. Traffic impacts on Honoapiilani Highway along the project frontage have been analyzed and mitigation measures have been proposed which include but is not limited to additional lanes, revised striping, and traffic signal modifications at the two existing intersections and convert the two existing three-legged intersections to four-legged intersections. A Traffic Impact Analysis Report (TIAR) by Phillip Rowell and Associates for the proposed Ma`alaea Plantation was completed for the proposed project. The purpose and objective of the TIAR study are: (a) determine and describe the traffic characteristics of the proposed project; (b) quantify and document the traffic related impacts of the proposed project; and (c) if required, identify and evaluate traffic related improvements required to provide adequate access to and egress from the proposed project and to mitigate the project's traffic impacts. For more detailed information and discussion of the TIAR, refer to Appendix E. According to the TIAR report, the following conclusions of the level-of-service (LOS) analysis of the signalized intersections are:

"1. The intersection of Honoapiilani Highway at Kuihelani Highway will operate at LOS C during both peak hours. The northbound and southbound through movements along Honoapiilani Highway will operate at LOS B during both peak hours. There is no change in the LOS of any lane group as a result of project generated traffic. The afternoon volume-to-capacity ratio to below 1.00.1.02. Mitigation will be required to reduce the volume-to-capacity ratio to below 1.00.

2. The intersection of Honoapiilani Highway at North Kihei Road will operate at LOS C during the morning peak hour and LOS D during the afternoon peak hour. The volume-to-capacity ratio of the overall intersection will be 1.04 during the morning peak hour and 1.07 during the afternoon peak hour. Mitigation will be required to reduce the volume-to-capacity ratio to below 1.00.

The northbound through movement along Honoapiilani Highway will operate at LOS C during the morning peak hour and LOS D during the afternoon peak hour. The southbound through movement along Honoapiilani Highway will operate at LOS B during the morning peak hour and LOS A during the morning peak hour.

The final LOS considers improvements that modify the intersection for access and egress from the project. These improvements include the northbound left turn lane, a southbound right turn/deceleration lane, modification of the westbound approach to allow through movements, addition of an eastbound approach and modification of the westbound right to provide a green right turn arrow.

3. The intersection of Honoapiilani Highway at Kopuli Street will operate at LOS B during both peak hours, without and with project traffic. These LOS also consider conditions with improvements to provide

access to and egress from the project. These improvements include northbound left turn lane, a southbound right turn lane, addition of an eastbound approach with a left turn or thru lane and a right turn only lane and modification of the westbound left turn to allow optional left or through movements."

2. Drainage

According to the project's Preliminary Engineering Report (PER) prepared by Otomo Engineering Inc. dated March 2014 (see attached Appendix D, for detailed analysis of project's drainage system), the project's drainage system will be designed and constructed to accommodate the increase runoff generated by the proposed Ma`alaea Plantation rural and residential subdivision project. The drainage improvements will be in accordance with Chapter 4, "Rules for the Design of Storm Drainage Facilities in the County of Maui".

It is estimated per project PER that the post development runoff from the project site for 100-year 24-hour design storm will be 913 cfs and approximately 159 acre-feet of runoff volume, creating an increase of 292 cfs and 26 acre-feet runoff volume. Runoff from the project site will be collected by catch basins and roadside swales and conveyed to the onsite retention basins at the lower portion of the parcel adjacent to Honoapiilani Highway. Overflow from the retention basins will be directed towards the existing drainage culverts along the highway to continue downstream along the existing drainage pattern at no greater than pre-development rates. The retention basins will be located within the 100' wide buffer strip along the highway and each basin will average approximately 60' wide. The total volume of the retention basins will be able to accommodate at least the increase in surface runoff volume due to the proposed development. Surface runoff from the project site does not flow

towards or into the existing Pohakea Stream which is outside and to the north of the project boundary. Three existing drainageways traversing the project site will remain in a natural condition except at road crossing where appropriate sized drainage culverts will be installed to allow runoff to continue downstream. In addition to maintaining the natural vegetation within the drainageways, some areas adjacent to one of the drainageways will be improved as a passive park area creating additional green space within the proposed subdivision.

According to the Preliminary Engineering Report (see attached Appendix D for more detailed information and discussion of project's drainage plan), the design intent of the project will be to limit the need for extensive grading as much as possible. There will be no mass grading of the individual lots as part of the subdivision improvements except for the proposed affordable residential lots which will reduce the amount of disturbed area during the development of the subdivision. Individual lot owners will be responsible for grading their own improvements but must adhere to the drainage plan that will be developed as part of the subdivision improvements. The subdivision retention basins will be sized to accommodate the increase in storm water runoff for the developed lots, therefore, each lot will be allowed to connect to or discharge into the subdivision drainage system.

In addition to the project's proposed drainage improvements, will also include implementation site specific best management practices (BMPs) during construction to provide erosion control and minimize impacts to downstream properties. BMPs which may be implemented would include, but is not limited to:

1. Prevention of cement products, oil, fuel, and other toxic substances from falling or leaching into the water.

2. Prompt and proper disposal of all loosened and excavated soil debris material from drainage structure work.
3. Retention of ground cover until the last possible date.
4. Stabilization of denuded areas by sodding or planting as soon as possible.
5. Early construction of drainage features.
6. Minimize time of construction.

As noted earlier in this report, the proposed drainage system for the project will be designed and constructed in compliance with all applicable county, state, and federal rules and regulations pertaining to drainage improvements, and more specifically, in accordance with Chapter 4, "Rules for the Design of Storm Drainage Facilities in the County of Maui."

3. Wastewater

As previously noted in this report, there is no county sewer system to service the proposed project. There are private individual wastewater systems that are servicing existing individual condominium resorts and commercial projects in Ma`alaea area.

The proposed Ma`alaea Plantation market-priced rural and affordable residential subdivision consisting of approximately 55 market-priced rural lots and 58 affordable residential lots will generate an average of approximately 39,200 gallons per day of wastewater (see Appendix D for more detailed information and discussion). According to the project's Preliminary Engineering Report, each lot will be required to install their own individual wastewater system designed at the time of the individual lot improvements, meeting the requirements of the State of Hawaii,

Department of Health. The subdivision will not construct any sewer systems, treatment facilities or injection wells.

4. Water

The proposed project will be served by a private water system in accordance with the State of Hawaii, Department of Health standards, to provide the domestic and fire flow demands for the proposed Ma`alaea Plantation rural and residential subdivision. The water system consists of three existing wells on the adjacent property at approximately elevation 350' which will be the source of water for the system. The three wells developed to supply the proposed project are known as Pohakea Wells 1, 2, and 3 and are also identified by State No. 4930-01, 02, and 03, respectively. Pohakea 1 was constructed and initially tested in 2004. Pohakea 2 and 3 were completed and initially tested in 2007.

The existing 750,000 gallon water storage tank will provide the necessary storage for both domestic and fire flow demands of the proposed rural subdivision. Approximately 2,600 feet of 12" waterline has been installed from the existing storage tank to the project site where the proposed distribution system will be constructed to service each lot and include the installation of fire hydrants at appropriately spaced intervals along the subdivision roadways.

Based on the preliminary site plan for the project, the average daily demand for both potable and non-potable water for the proposed project is approximately 486,960 gallons per day (see Appendix D, identified as Preliminary Engineering Report for more detailed information and discussion). This demand can be safely met by the use of two of the three existing wells operating at a time with the third on standby. Some modifications and improvements to the system are recommended,

including but not limited to the construction of a reverse osmosis (RO) system. A detailed water system analysis of the existing three wells was conducted by Tom Nance Water Resources Engineering (TNWRE). The reports entitled "Adequacy of Water Supply and Reverse Osmosis for the Proposed Ma`alaea Plantation Rural Subdivision dated December 19, 2014 and May 13, 2014, respectively." (See attached reports identified as Appendices M & N, respectively). Based on the detailed water system analysis from the existing wells by TNWRE, approximately 50 percent of the pumped water will require treatment through the RO system and be blended with direct pumped water to produce acceptable drinking water. Based on a blended system the resulting qualities of the domestic water will have chlorides of an average of 104 to 108 MG/L, which is far below the recommended standard for drinking water. The concentrate from the RO system may be used to irrigate the common areas of the project by means of the non-potable water system.

Based on the water detailed analysis and pump tests of the existing Pohakea wells 1, 2, and 3 that were conducted by Tom Nance Water Resource Engineering (see Appendix M), the water sources are adequate to meet the projected water demand for the proposed project. Equally important, the water quality of the water meets all applicable federal, state, and county laws and standards. Important points to note from the study data by TNWRE confirmed the following summary results:

- No organic contaminants were detected in any of the samples;
- None of the concentrations of detected constituents exceeded the regulatory maximum allowable contaminant level (MCL); and
- Nitrate-nitrogen levels, while well under the MCL, may reflect input from past agricultural practice.

In accordance with the DWS standards, the maximum fire flow demand for the project will be based on the rural and residential development at 1,000 gallons per minute for two hour duration with maximum fire hydrant spacing of 350 feet. The existing 750,000 gallons storage tank is adequate to meet the fire flow demand for the project. As noted earlier, the water systems for the project will meet all applicable county, state, and federal standards relating to domestic water uses and fire protection requirements.

5. Electric and Telephone

The proposed electrical, telephone, and cable TV distribution systems for the subject proposed rural subdivision will be installed underground in accordance with the utility companies' rules and regulations from the existing facilities along Honoapiilani Highway (makai of project site) or the adjacent developments on the makai side of the highway. These facilities will be provided by Maui Electric Company, Hawaiian Telcom, and Oceanic Time Warner Cable of Hawaii, respectively. Street lights will be installed along the subdivision streets in accordance with county standards.

III. Potential Impacts and Mitigative Measures

III. POTENTIAL IMPACTS AND MITIGATIVE MEASURES

A. Impacts to the Physical Environment

1. Surrounding Land Uses

The project site is located on the southwest coast of the island of Maui, approximately six miles from the commercial and business center in Kahului. Approximately four miles north of the project site is the government, professional and medical centers of Wailuku. Approximately two miles north of the project site are two golf courses and the Maui Tropical Plantation. The community of Ma`alaea is situated along Maui's southern coastline. Central to this neighborhood is the Ma`alaea Small Boat Harbor, which is home to a number of fishing and sightseeing charter boats, as well as private recreational vessels. Included within the Ma`alaea community are a small number of older oceanfront residences, and ten condominium projects. The Ma`alaea Triangle commercial complex is a home to the Maui Ocean Center Aquarium, located makai of the project site. This commercial complex is home to a variety of commercial uses, and predominantly caters to tourism related activities, including shops, restaurants, retail stores, and a small amusement park. Approximately six miles east of the project site is the Kihei region and the well renowned Wailea and Makena resorts and commercial complexes. Also, the project site is located approximately fifteen miles southeast of Lahaina.

To the north and northeast of the project site are large agricultural lands, mainly sugarcane cultivations, and west of the project are state owned conservation lands and the West Maui Mountain. Other uses in the vicinity of the project site include the Pohakea quarry and concrete recycling site to the north. The subject property is situated on the mauka side of Honoapiilani Highway which runs in a general north-south direction, and connects Wailuku and Waikapu to the

Ma`alaea neighborhood. It then continues westward to the communities lying within the West Maui region.

As noted earlier in this report, the project site was formerly used for sugarcane cultivation and more recently for cattle grazing and horse pastureland. The site was also used previously for small scale agricultural activities.

The proposed Ma`alaea Plantation project consists of approximately 55 single family market-priced lots based on county rural zoning standards with lot sizes ranging in size from 1.0 acre to 27.5 acres and 58 affordable housing units with a minimum lot size of 10,000 square feet. The market-priced rural lots will be sold as lot only and the affordable residential housing will be sold as house and lot package. The proposed project also includes drainage reserve totaling approximately 30 acres and roadways totaling approximately 13.2 acres. Also included in the proposed project is a neighborhood park site totaling approximately 2.8 acres. The remaining portions of the property will remain agriculture for agricultural and other allowable uses. The proposed action will result in a rural lots and affordable residential subdivision, which is consistent with the purpose and intent under Chapter 19.29.010, Maui County Code that states in part, "to provide low density development which preserves the rural character of certain areas; to allow small-scale agricultural uses and the keeping of animals; and to serve as a transition between standard residential or other urban density development and agricultural lands" and Chapter 2.96, Maui County Code, that encourages the development of affordable housing for Maui's residents. The proposed residential project subdivision is complimentary to the adjacent agricultural land and nearby residential and commercial complex.

The proposed project will meet the intent and purpose of the Maui County Code, Chapter 19.29.010 by providing larger rural residential lots that encourage some form of small-scale active agricultural activities. Similarly, the proposed affordable residential project will also meet the intent and purpose of Chapter

2.96, Maui County Code, by providing affordable workforce housing for Maui's residents. The proposed project will have no anticipated impact on the surrounding land uses.

2. Topography and Landform

According to "Soils Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (August, 1972)" prepared by the U.S. Department of Agriculture Soil Conservation Service, the soil characteristics within the project area are classified as Ewa Silty Clay (EsB), Ewa Cobbly Silty Clay (EtB), Pulehu cobbly clay Loam (PtB), and Stony Alluvial Land (rSM).

EsB occurs around alluvial fans and terraces are generally characterized by a 3 to 7 percent slope, have moderate permeability, and are further described as having very slow runoff. EtB and PtB are similarly characterized as having moderate permeability and slow runoff. Stony Alluvial Land is high in permeability and consists of stones, boulders, and soil deposited by streams along the bottom of gulches and on alluvial fans.

The existing ground slopes in a northwest to southeast direction from an elevation of 210 feet above mean sea level at the north-western corner of the subject property to an elevation of 40 feet at Honoapiilani Highway, with an average slope of approximately 6.5%. The project site is currently vacant and previously used for cultivating sugar by the Wailuku Agribusiness Company and more recently used by small independent farms along the northern portion of the project site. The design intent of the project will be to limit the need for extensive grading as much as possible. There will be no mass grading of the individual rural lots as part of the subdivision improvements except for the proposed affordable residential lots which will reduce the amount of disturbed area during the development of the subdivision. Individual lot owners will be responsible for grading their own improvements, but must adhere to the drainage plan that will be

developed as part of the subdivision improvements. The project's drainage system will be designed to accommodate the increase in runoff generated by the proposed development of the entire project site (see Appendix D, "Preliminary Engineering Report" by Otomo Engineering, Inc., for detailed information of drainage plans). Drainage patterns of proposed improvements will be maintained to ensure impacts to downstream properties are minimized. With the proposed drainage improvements, adverse impacts to topography and landforms resulting from minimum grading activities are not expected. The adjoining and downstream properties will not have any additional increase of runoff due to this proposed development.

In addition to the project's proposed drainage improvements, it will also include implementation site specific best management practices (BMPs) during construction to provide erosion control and minimize potential impacts to downstream properties. These BMPs will include construction of adequate detention basins to capture sedimentation and minimize the quantity of sediments leaving the project site, protecting natural vegetation, and other soil erosion techniques. If allowed by the State, additional retention basins will be constructed near the existing drainageways to help reduce the offsite runoff from entering the project site and continuing downstream. The proposed improvements may also include a low berm along the property boundary as an additional measure to retain offsite runoff and direct overflow towards the existing drainageways prior to entering the project site. With these proposed drainage improvements, potential impacts to topography and landforms and downstream properties are not expected.

3. Wetlands and Streams

According to the project's Biological Resources Survey Report prepared by Robert Hobdy dated March 2014 (see Appendix J for detailed information and discussion), there are no wetlands on the subject property or in the immediate

vicinity of the property. Keala Pond Wildlife Refuge is the nearest wetland resource and is located approximately 1.5 to 2 miles to the east of the project site. This wildlife refuge is being managed by the U.S. Fish and Wildlife Service. This wildlife refuge will not be affected by the proposed project. Drainage generated from the subject property will not be discharged into Keala Pond Wildlife Refuge. According to the Preliminary Engineering Report prepared by Otomo Engineering, Inc. for the proposed project, the drainage improvements and construction of adequate retention basins on the property site will contain all increased runoff within the subject property.

With regards to Pohakea Gulch, this particular drainage feature is located outside of the project site. Surface runoff from the project site under existing condition does not flow towards or into the existing Pohakea Gulch which is outside and to the north of the project boundary.

With the proposed drainage improvements for the project potential impacts on wetlands and streams are not expected.

4. Flood and Tsunami Hazard

As previously stated in this report, the subject site is located in Flood Zone "X" according to the Flood Insurance Rate Map (FIRM), dated September 19, 2012, prepared by the U.S. Federal Emergency Management Agency. Flood Zone "X" represents areas outside of the 0.2% annual chance flood plain. Two small portions of the parcel within two existing drainageways are designated in Flood Zone X with areas of 2.0% annual chance flood; areas of 1% annual chance flood with average depths less than one foot or with drainage areas is less than one square mile; or areas protected by levees from 1% annual chance flood. Best Management Practices (BMPs) will be implemented to mitigate any future or potential flooding on the site. Furthermore, the subject site is not located within the tsunami inundation zone.

5. Flora and Fauna

As a result of the Biological Resources Survey of the project site by Mr. Robert Hobdy (Flora and Fauna Consultant) dated March 2014, he has confirmed that there are no known significant habitats or rare, endangered, or threatened species of flora and fauna located in or within the vicinity of the project site. Also, no officially listed threatened or endangered plants are found on the site, nor do any plants proposed as candidates for such status occur on the property. Further, no wetland areas were identified within the project site. The biological resources survey report further states that the vegetation on the site is dominated primarily by non-native plants and because there are no rare or protected native species within the project area, there is of little botanical concern and the proposed project is not expected to have a significant negative impact on the botanical resources in the project site. The proposed improvements on the property are not anticipated to impact wetland areas and wildlife habitats. It has been determined through our biological resources survey that removal of vegetation from the project site is not considered an adverse impact on these components of the natural environs. For more detailed information, refer to Appendix K, Biological Resources Survey by Mr. Robert Hobdy, Environmental Consultant dated March 2014.

6. Air Quality

Based on the existing and surrounding commercial complex at Ma`alaea Triangle, residential condominiums and Ma`alaea Small Boat Harbor within close proximity of the project site, as well as agricultural sugarcane operations to the north and east of the project site, the following assessment was made with regards to potential impacts, if any, of air quality.

Emissions from construction equipment and vehicles used during construction activities may temporarily affect the ambient air quality within the immediate vicinity of the project site. However, these temporary air quality affects can be

minimized by instituting Best Management Practices (BMPs) during project construction. In addition, dust control will be instituted such as dust barriers, watering graded areas, and/or sprinklers to control dust during construction of the project.

On a long term basis, upon completion of the proposed rural and residential subdivision project, it is not anticipated to generate adverse impact on air quality on or in close proximity of the project site.

7. <u>Noise</u>

Ambient noise conditions may be temporarily affected during construction activities at project site. Construction equipment machinery will likely be the dominant noise-generating source during construction period. Best Management Practices (BMPs) will be instituted, including equipment maintenance and vehicle maintenance, and are anticipated to reduce noise levels. Construction activities will be limited to daytime working hours. In addition, heavy trucks, dump trucks, and material transport vehicles will be advised to use Kuihelani Highway away from the residential and commercial to minimize noise in the residential and commercial area of Ma`alaea.

Construction-period noise will be mitigated in accordance and strict adherence with Title 11, Administrative Rules, Chapter 46, Community Noise Control of the State Department of Health. All construction equipment and onsite vehicles will be equipped with mufflers as required in Section 11-46 (b)(1)(A). Required permit conditions for construction activities may include, where appropriate:

> "No permit shall allow construction activities creating excessive noise before 7:00 A.M. and after 6:00 P.M. of the same day"

"No permit shall allow construction activities which emits noise in excess of ninety-five dB(A) except between 9:00 A.M. and 5:30 P.M. of the same day"

Once the project is completed, the proposed rural and residential subdivision project is not anticipated to generate significant long term adverse noise conditions. There are no existing residential uses north and northeast of the project site. Also, there are no residential uses west of the project site. The proposed project is not expected to have any significant impact relative to noise on its surrounding land uses.

8. Scenic and Open Space Resources

As previously noted in this report, the West Maui Mountains, and Haleakala Mountain define the scenic resources of the project site. Surrounding the project site to the east, north and west of the project site is open space, primarily sugarcane lands and conservation lands. The project area is not designated by the County of Maui as a scenic or natural resource requiring special attention. The proposed residential project is rural in nature, and with very low density residential development. There are 58 affordable residential lots at the northern portion of the project site with a minimum lot size of 10,000 square feet to meet the intent of Chapter 2.96, Maui County Code. The proposed market-priced rural lots, with lot sizes ranging in size from 1.0 acre to 27.5 acres subdivision proposes to encourage small-scale agriculture consistent with the purpose and intent of Chapter 19.29.010, Rural District, Maui County Code. Most of the makai portions of the property will remain in agriculture for agricultural, drainage and other allowable uses. With the proposed lot size configurations and keeping a large portions of the property in agricultural use will provide adequate open spaces that allow view plain to the West Maui Mountains. In addition, retention basins proposed on makai portion of the project area along Honoapiilani Highway Maui Mountains.

As such, the proposed rural and residential project is not anticipated to have an adverse impact upon the visual character of the surrounding areas.

9. Hazardous Materials

As noted earlier in this report, the subject project site was not listed on any hazardous database listings. The subject property was formerly used for sugarcane cultivation, and more recently for cattle grazing and horse pasture. There was no evidence of any historic misuse or significant spills of hazardous or regulated substances on the subject property, with the exception of fourteen 55-gallon drums located along the dirt road bordering the southwestern end of the property. It was recommended that the said drums be removed and disposed. The said drums were removed and disposed according to applicable laws as recommended by the project's environmental consultant.

As mentioned earlier in this report, a Phase I and II Environmental Site Assessments (ESA) and Site Screening Report was conducted on the property by Element Environmental, LLC in November 2006 and August 2007, respectively (see Appendix O for detailed information and discussion of the environmental site assessment). Based on its findings as a result of the environmental site investigation, there are no hazardous or regulated substances found on the property site. The report also revealed no significant evidence of recognized environmental conditions in connection with the property. According to Element Environmental, LLC, based on its survey and analysis of the project site no further action is required.

10. Assessment of Cultural Impacts

As reported earlier, a Cultural Impact Assessment (CIA) study was conducted by Scientific Consultant Services (SCS), experienced in cultural and archaeological

history of Maui and the State of Hawaii. The cultural impact assessment was conducted in June 2005 (see Appendix J for detailed information and discussion).

No continuing cultural practices are currently occurring within the project site based upon the findings of investigations, conducted for the subject area and its immediate surrounding environs, as well as oral testimonies obtained from various individuals and government agencies interviewed as part of the cultural assessment prepared by SCS. It has been noted that the subject site and its immediate surrounding areas have been used for sugar cane cultivations and the project site is presently being used for cattle grazing and horse pasture. The project area has not been used for traditional cultural purposes within recent times, according to SCS report.

Based on the community response, archival research, and historic land alteration as a result of agricultural cultivations, it is reasonable to conclude that pursuant to Act 50, the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or customary activities will not be affected by construction on the project site. Because there were no historic cultural activities found on the project site, the cultural impact assessment prepared by SCS (refer to Appendix J) concluded that there are no adverse impacts. No further action is being recommended by the CIA consultant. As appropriate, coordination with the cultural advisor will be undertaken during the plans preparation phase of work for development of the proposed project.

11. <u>Archaeological Resources</u>

As noted earlier in this report, an archaeological inventory survey (AIS) was conducted by Scientific Consultant Services, Inc. (SCS) for the project site. According to SCS, Inc., the main results of the AIS were as follows: three historic sites, all related to sugarcane agriculture, were identified, documented for the first time, and assigned SIHP numbers: Site 50-50-09-5657 (clearing mounds),

Site 50-50-09-5658 (irrigation modifications), and Site 50-50-09-5659 (dirt road). These three sites were the only archaeological sites found within the project area. Per AIS report, a 100 percent pedestrian survey concluded that no prehistoric sites exist on the surface of the project area. Subsurface testing comprised of twenty backhoe trenches, and did not reveal any subsurface historic, or prehistoric, or cultural material. No burial features or human remains were observed during pedestrian survey or encountered during subsurface testing (see Appendix F for further discussion and details of the AIS for the property site).

The archaeological inventory survey for the project site performed by SCS, Inc. has been reviewed and accepted by the State Historic Preservation Division (SHPD) on June 29, 2005 (see attached approval letter identified as Appendix G).

An archaeological monitoring plan (AMP) has been prepared for the project site in accordance with the recommendations of the SHPD approved AIS (see approved AMP identified as Appendix H. The AMP for the project site was approved by SHPD on May 22, 2008 (see Appendix I, Approval of Monitoring Plan from SHPD).

According to SCS, Inc., no further archaeological investigation appears to be warranted of the site based upon the consultant's assessment survey results of the project site. As a precautionary measure, archaeological consultant recommended archaeological monitoring during construction and ground-altering activities as a prudent course of action. Should any discoveries be made during construction of the project site, work in the immediate area will be halted and qualified archaeologist brought in to determine appropriate procedures with consultation with the State Historic Preservation Division of DLNR.

B. Impacts To The Socio-Economic Environment

1. Population and Local Economy

The proposed project is expected to create immediate short-term benefits as a result of design and construction employment during the subdivision development of the project. Initial estimated construction costs for the site work portion during the subdivision improvements of the project (excluding vertical construction) will be approximately $6 million. As noted above, the proposed project will create construction jobs for local residents during the development of the project. This projected employment will have a multiplier effect on local material suppliers and retail businesses that can be expected to benefit from the proposed project. Other potential direct economic impacts of the project were reviewed and identified in an economic forecasting study for the project prepared by ACM Consultants, Inc. Refer to Appendix R for detailed information of project's economic impact. In addition to the revenues generated for the subdivision improvements, it is anticipated that the vertical construction of residential units for the individual lots would also support the local construction industry. Although the developer intends to sell lots only, it is assumed that potential buyers will build a home on each lot. In this case, according to the assessment of economic and fiscal impacts prepared by ACM, Inc. (Consultant) forecasted an average size dwelling of 1,900 square feet would be built on each lot at an average cost of about $300,000 per home. Based on this assumption, vertical construction expenditures for homes totaled approximately $28,000,000. It is expected to take a period of four years for full build out of the proposed project. The estimated construction expenditures for the project totaled approximately $33,000,000, with an average of approximately $8,000,000 per year, based on a 4-year infrastructure and home construction period.

In the long-term, the proposed project will provide needed, reasonably-priced rural residential lots that are centrally-located for Maui's residents. The proposed

project is being developed based on the projected housing demand on Maui. Based on the project's economic impact analysis prepared by ACM, Inc. dated July 2014 (see Appendix R for detailed information and discussion), the proposed will provide approximately 59 direct net jobs during the construction of the subdivision for Maui's construction industry. According to the project's assessment of economic and fiscal impacts, based on State economic multipliers, indirect jobs on Maui were forecasted to be 79 jobs, resulting is a total of 138 Maui jobs directly and indirectly tied to the development of the project. In addition, indirect employment on Oahu could possibly add 29 jobs, for an overall tally of 167 jobs during the 4-year project build out.

The proposed action should not significantly affect/increase population parameters within the Kihei-Makena and Kahului-Wailuku Community Plan Districts on both long and short-term basis. Based on the county average of three persons per household (Maui County Data Book, 2009), approximately 336 persons are calculated to occupy the 113 market-priced rural and affordable residential lots at full project build out. Based on the project's market demand analysis, most, if not all potential buyers of the proposed residential project are expected to be current Maui residents. No mitigative measures are necessary in response to the anticipated increased short-term as well as long-term employment, and no additional mitigative measures are required regarding the population since the proposed project's potential buyers are expected to be currently Maui residents. Hence, the project will not significantly increase the population parameters.

2. Agriculture

The proposed market-priced rural and affordable residential project site is presently designated agricultural use by the State Land Use Commission and the Maui County zoning. It is however designated as a residential Project District (Project District 12) in the Kihei-Makena Community Plan district.

As noted earlier in this report, the project site was formerly used for sugarcane cultivation until Wailuku Sugar Company ceased its agricultural operation on Maui. The site has been vacant and fallow ever since Wailuku Sugar Company stopped its sugarcane operation. The site is presently used for cattle grazing and horse pasture. As indicated by the ALISH map (see Appendix T) for the project site, the majority of the site consists of lands that have been classified as "Prime" agricultural lands although small portions of the project site fall into the "Other" and "Unclassified" categories. As discussed earlier in this report, the project site is located on lands designated as "B72i". This type of land designation is characterized as stony, well-drained lands suited for machine tillability. These types of land are most frequently used for sugarcane cultivation and grazing. The proposed rural and residential project is consistent with the purpose and intent under Chapter 19.29.010 of the Maui County Code that states in part, *to allow small-scale agricultural uses and keeping of animals"*, hence, will allow and encourage the continuation of agricultural activities on the proposed project site per Maui County Code Rural District Zoning District. It is important to note that portions of the property (approximately half of the property) will remain in agriculture for agricultural and other allowable uses.

Use of the project site for a rural residential subdivision, which allows small-scale agricultural uses per Chapter 19.29.010, Maui County Code, the proposed project allows and encourages the continuation of agricultural use, hence, is not anticipated to have a significant adverse impact on the inventory of lands available for agricultural cultivation, nor will it adversely impact agricultural productivity on the island. Since the proposed action will not affect agricultural production on the island, no further mitigative measures are expected to be required.

3. Police, Fire, and Medical Services

The proposed action is not anticipated to impact the service capacity and capability of police, fire, and emergency medical operations. The project will not expand nor extend the existing service area limit for emergency medical services. There are existing police, fire, and medical facilities in very close proximity of the project site that are within the Kahului-Wailuku and Kihei-Makena Community Plan Districts. Additionally, internal roadways within the proposed rural and residential subdivision will be constructed in accordance with Maui Fire Department standards. No further mitigative measures are expected to be required.

4. Recreational and Educational Resources

As noted earlier in this report, there are diverse recreational opportunities and facilities in both the Kihei-Makena and Kahului-Wailuku Community Plan regions. There are several County beach parks and regional recreational facilities located in very close proximity of the project site and within the Kihei-Makena and Kahului-Wailuku community plan regions. There are also several County community center facilities available for use by Maui residents all located within the Central and South Maui regions. In addition, Kealia Pond Wildlife Refuge, managed and operated by the U.S. Fish and Wildlife is located east of the project site and just a few minute drive from the proposed project. Additionally, recreational resources such as golf, tennis, and snorkeling are available in the regions. The Lahaina Pali Trail provides a recreational and leisurely hiking trail located at the west boundary of the project site. The trail offers hikers scenic views of the island of Lanai and Kahoolawe. Based on comments and suggestions received during the community meetings with residents in the regions, the applicant is committed in preserving and enhancing access opportunities to this important cultural and recreational resource. Hence, the applicant will work with the residents and the State Department of Land and

Natural Resources (DLNR) to ensure that the project design and layout will have adequate access and parking facilities incorporated in the design to meet the current and projected use of the trail. In addition, greenbelts and a passive park located makai and on the southwestern portion of the property site, respectively, (see Appendix C, preliminary site plan) within the subdivision will be included in the planned layout of the project. Also, a community neighborhood park approximately 2.8 acre in size will be developed within the project site for the residents in the area. As such, with proposed neighborhood park and with the existing county, federal and state recreational facilities within the Kahului-Wailuku and Kihei-Makena Community Plan regions there are adequate recreational facilities available for the proposed Ma`alaea Plantation rural subdivision. There are no anticipated impacts to existing recreational facilities or resources in the area. No further mitigative measures are expected to be required.

As noted earlier in this report, the project site is located between the communities of Kahului-Wailuku and Kihei-Makena community plan regions. These regions are served by the State Department of Education's public school system, charter schools, as well as several privately operated schools accommodating elementary, intermediate, and high school students. In addition to the existing public and private schools mentioned earlier in this report, Pu`u Kukui Elementary School located in Wailuku-Kahului region recently opened during 2013-14 school year. A new proposed Kihei High School, to be located in the Kihei-Makena region is currently under design. Land use entitlement approvals and a recently received a funding appropriation in the amount of approximately $130 million from the State are available for the construction of the proposed high school facility. The proposed project anticipates that the potential buyers of the rural residential lots are mostly current Maui residents that are looking for lots that are centrally located and reasonably-priced residential lots within the Wailuku-Kahului and Kihei regions. Hence, the project does not anticipate to significantly increase student population within the two community plan regions. The current and future planned school facilities within the Kihei-Makena and Kahului-Wailuku

regions are adequate to serve the students that will be generated by the proposed project. There are no anticipated adverse impacts to existing and future educational facilities. No further mitigative measures are expected to be required.

5. Hydrology

There will be no anticipated short-term impact to groundwater as a result of construction activities on the project site. Therefore, no mitigation measure is expected to be required.

As a precautionary measure, Best Management Practices (BMPs) will be strictly enforced during the project construction. The applicant will implement mitigating measures during construction to further protect the wells located upstream (mauka) and the underlying aquifer, in addition to those BMPs required to address soil erosion from construction according to Maui County Code Chapter 20.08. In addition, the applicant will implement conservation measures per Department of Water Supply's water conservation policy in order to alleviate water demand from the Ma`alaea aquifer. Per Tom Nance Water Resource Engineering report (refer to Appendix N) concentrate from the proposed RO system for the project will be used to irrigate stormwater detention basins and other common areas within the project to minimize the use of potable water for irrigation.

6. Solid Waste Disposal

As noted earlier in this report, the County of Maui operates two landfills and one waste transfer station on the island of Maui. Single-family residential solid waste collection service is provided by the County of Maui and disposed at the County's Central Maui landfill located approximately four miles east of the project site. Also, privately-owned facilities, such as the Maui Demolition and Construction landfill and the Pohakea Concrete Recycling Facility, accept solid waste and concrete from demolition and construction activities. These facilities are located

at Ma`alaea, at the junction of Honoapiilani Highway and North Kihei Road, just immediately across the project site. It is anticipated that residential solid waste from the project site will be collected and disposed by the County of Maui's Environmental Management Department.

A solid waste management plan will be developed pursuant to Maui County's Environmental Management Department policies and guidelines for the disposal of any construction materials during the subdivision and development of the proposed project. It is anticipated that construction materials generated from the project site will be disposed at the privately-owned facility located across the project site. This action will reduce construction materials from the County's landfill facility.

After the subdivision is completed, lot owners and tenants will be encouraged to implement waste recycling programs to reduce the amount of waste to the County's Central Maui Landfill site. There is no significant anticipated adverse impact to the County's solid waste facilities. Hence, no further mitigative measures are expected to be required.

C. Impacts to Infrastructure

1. Roadways

The project site is served by the adjacent Honoapiilani Highway, the single route of access for vehicles travelling between West Maui and Central Maui. Honoapiilani Highway is a two-lane highway for the majority of its length; however, it widens into a four-lane highway fronting the project site that extends into Kuihelani Highway.

Access to the proposed subdivision will be at the existing signalized intersection with North Kihei Road. The second access will be at the existing signalized intersection with Kapoli Street located at the southwestern portion of the project

site. According to the project's preliminary engineering report (PER) prepared by Otomo Engineering, Inc. dated December 2014 (see Appendix D identified as PER), traffic impacts on Honoapiilani Highway along the project frontage have been analyzed and mitigation measures have been proposed which include but is not limited to additional lanes, revised striping, and traffic signal modifications at the two existing intersections.

A detailed Traffic Impact Assessment Report (TIAR) for the proposed Ma`alaea Plantation rural and residential subdivision was completed by Phillip Rowell and Associates. Refer to Appendix E for detailed traffic assessment for the project. The following methodology and study approach by traffic consultant was used for the TIAR:

- A preliminary trip generation was performed to determine the scope of the traffic analysis required and the intersections to be studied. This analysis estimated that the project could generate 128 trips during the morning peak hour and 175 trips during the afternoon peak hour. This implies that the scope of work should be a "small development assessment" as described by the Institute of Transportation Engineers.
- A field reconnaissance was performed to confirm existing roadway cross-sections, intersection lane configurations, traffic control devices, and surrounding land uses.
- A level-of-service analysis of the study intersections was performed using the methodology described in the Highway Capacity Manual (HCM). The purpose of this analysis was to identify and existing traffic operating deficiencies.
- Existing weekday morning and afternoon peak hour volumes for the study intersections were obtained from manual traffic counts of the study intersections.
- Traffic studies for other known projects in the area were obtained and reviewed to gain an understanding of historical traffic growth along the

roadways in the area, primarily Honoapiilani Highway. This information was used to estimate traffic growth at the study intersections.

- Peak hour traffic volumes that the proposed project will generate were estimated using procedures described in the Trip Generation Handbook and data provided in Trip generation.
- A level-of-service analysis of future traffic conditions including traffic generated by the other known developments at the study intersections without project generated traffic performed. This process insures that any required mitigation improvements will be assessed against the appropriate project.
- The impacts of traffic generated by the proposed project at the study intersections were quantified by analyzing the changes in peak hour traffic volumes and by performing a level-of-service analysis of future traffic conditions without and with project generated traffic.

Based upon the TIAR by Phillip Rowell and Associates for the proposed rural and residential project, specific recommendations are being provided by the traffic consultant to mitigate potential traffic concerns as a result of the development of the proposed project. Please refer to Appendix E – TIAR for more detailed information.

Based on the proposed revised project density, the TIAR concludes that the proposed Ma`alaea Plantation rural and residential subdivision is not anticipated to have adverse traffic impacts on Honoapiilani Highway in the vicinity of the project site and said highway will operate at acceptable LOS. There are mitigation measures that are being proposed which include, but are not limited to additional lanes, revised striping, and traffic signal modifications at the two existing signalized intersections.

2. Water

As noted earlier in this report, the proposed rural and residential subdivision project will be served by a private water system in accordance with the State of Hawaii, Department of Health standards, to provide the necessary domestic and fire flow demands for the project. There are currently three existing wells owned by the applicant located on the adjacent property at approximately an elevation of 350' which will be the source of water for the project. The three existing wells developed to supply the proposed subdivision are known as Pohakea Wells 1, 2, and 3 and also identified by State No. 4930-01, 02, and 03, respectively. In addition, there is an existing 750,000 gallon water storage tank that will provide the necessary storage for both domestic and fire flow demands of the proposed rural and residential subdivision. Approximately 2,600 feet of 12" waterline has been constructed from the existing storage tank to the project site where the proposed distribution system will be constructed to service each lot and include the installation of fire hydrants at appropriately spaced intervals along the subdivision roadways.

Based on the daily consumption estimates, the average daily demand for both potable and non-potable water for the proposed project is approximately 486,960 gallons per day (refer to Appendix D, entitled Preliminary Engineering Report by Otomo Engineering, Inc. for more detailed information). According to the water report analysis, the project's projected water demand can be safely met by the use of two of the three existing wells operating at a time with the third on standby. This was confirmed by a detailed water system analysis report of the three existing wells conducted by Tom Nance Water Resources Engineering (TNWRE) (see Appendix M, reports entitled "Adequacy of Water Supply for the Ma`alaea Plantation"). A water detailed analysis and pump tests of the existing Pohakea wells 1, 2, and 3 were conducted by TNWRE to ensure that the water sources are adequate to meet the projected water demand for the proposed project. Equally important, that the quality of the water meets all applicable federal, state, and

county laws and standards. Important points to note from the study data confirmed the following summary results:

- No organic contaminants were detected in any of the samples;
- None of the concentrations of detected constituents exceeded the regulatory maximum allowable contaminant level (MCL); and
- Nitrate-nitrogen levels, while well under the MCL, may reflect input from past agricultural practice.

For more detailed information of the water report by TNWRE, refer to Appendix M. The said water reports recommend the installation of RO to treat approximately 50 percent of pumped water and be blended with direct pumped water that will produce a high quality of domestic water that will meet the recommended standard for drinking water. The concentrate from the RO may be used to irrigate the common areas of the project, thus reducing the use of drinking water for irrigation (see Appendix N for detailed information on proposed RO).

In accordance with DWS standards, the fire flow requirement for the project will be based on the rural and residential development at 1,000 gallons per minute for two hour duration. Per PER, the existing 750,000 gallons storage tank is adequate to meet the fire flow demand for the project.

As noted in this report, the water systems for the project will meet all applicable County, State, and Federal standards relating to domestic water uses. The existing systems are adequate to meet the water demand by the project. Since the water systems will be served by privately-owned and operated facilities, it is not anticipated to have an adverse impact on the County's Department of Water Supply's facilities. Additionally, the existing three wells have been approved by the State Commission on Water Resources Management (CWRM) and are not anticipated to have an adverse impact on the Waikapu and Iao aquifers. No further mitigative measures are required.

3. Wastewater

As noted earlier in this report, there are no county wastewater facilities within the vicinity to service the proposed project. However there are private individual wastewater systems that are servicing individual condominium resorts and commercial projects in Ma`alaea area.

The proposed Ma`alaea Plantation rural and residential subdivision consisting of approximately 55 market-priced rural lots and 58 affordable residential lots, will generate an average of approximately 39,200 gallons per day of wastewater (see Appendix D for more detailed information). According to the project's Preliminary Engineering Report, each lot will be required to install their own individual wastewater system designed at the time of the individual lot improvements, meeting the requirements of the State of Hawaii, Department of Health's standards.

The proposed subdivision will not construct any sewer systems, treatment facilities or injection wells. Individual lot owners will own and maintain its IWS in compliance with all applicable laws and regulations. There are no anticipated impacts on the County's wastewater facilities and no further mitigative measures are required. Equally important, since the project will not construct treatment facilities and injection wells, there are no anticipated impacts on and nearby the Ma`aalea shoreline and the small boat harbor.

4. Drainage

As noted earlier in this report, according to the project's Preliminary Engineering Report (PER) (see Appendix D for further information and discussion), the proposed drainage systems will be designed and constructed to accommodate the increase runoff generated by the proposed Ma`alaea Plantation market-priced

rural and affordable residential subdivision. The drainage improvements will be in accordance with all applicable county, state, and federal rules and regulations.

According to the PER, it is estimated that the post development runoff from the project site for a 100-year 24-hour design storm will be 913 cfs and approximately 159 acre-feet of runoff volume, creating an increase of 292 cfs and a 26 acre-feet runoff volume. Runoff from the project site will be collected by catch basins and roadside swales and conveyed to the onsite retention basins located at the lower portion of the parcel adjacent to Honoapiilani Highway. The retention basins will be located within the 100' wide buffer strip along the highway and each basin will average approximately 60' wide. The total volume of the retention basins will be able to accommodate the increase in surface runoff volume due to the proposed development.

According to the PER, the design intent of the proposed project will be to limit the need for extensive grading as much as possible. There will be no mass grading of the individual market-priced rural lots as part of the subdivision improvements which will reduce the amount of disturbed area during the development of the subdivision. Individual lot owners will be responsible for grading their own improvements but must adhere to the drainage plan that will be developed as part of the subdivision improvements. There will be a limited grading work within the proposed affordable residential lots.

In addition to the project's proposed drainage improvements, it will also include implementation site specific best management practices (BMPs) during construction to provide erosion control and minimize impacts to downstream properties. In addition, it may also include a low berm along the property boundary as an additional measure to retain offsite runoff or direct overflow towards the existing drainage ways prior to entering the project site.

Based on the proposed drainage improvements by project's civil engineer as shown in the PER (see Appendix D) and implementation of BMPs during the construction of the proposed project, the surface runoff from the project will be adequately accommodated by the proposed retention basins located makai of the project site. There will be no increased runoff sheet flowing from the project site after completion of the development. The drainage improvements will be in strict compliance with Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui. Hence, confirmed by the project's civil engineering consultant, there are no anticipated impacts on the downstream properties and Ma`alaea Small Boat Harbor area, and no further mitigative measures are required.

5. Electric, Cable and Telephone System

As noted earlier in this report, the proposed electrical, cable TV, and telephone systems for the proposed rural and residential subdivision will be installed underground from the existing facilities along Honoapiilani Highway of the adjacent developments on the makai side of the highway. The installation of these facilities for the project will be in accordance with the utility companies' rules and regulations. These facilities will be provided by Maui Electric Company, Hawaiian Telcom, and Oceanic Time Warner Cable of Hawaii, respectively. Street lights will be installed along the subdivision street in accordance with County standards.

The applicant will promote energy efficiency and reduce energy use of the proposed project by encouraging lot owners within the project to utilize both solar water heating, photovoltaic technologies, and to the extent possible, encourage the use of wind energy.

The applicant will work closely with the utility companies that will provide services to the project to ensure efficiency and minimize potential impacts on the utility companies' facilities.

There are no anticipated impacts on public utility systems and no further mitigative measures are required.

D. Potential Cumulative Impacts

Cumulative impacts are defined as the potential impact on the environment which results from the incremental impact of action when added to other past, present, and near or long-term foreseeable future actions. This potential cumulative impact analysis evaluates present and reasonably foreseeable future projects in the area that have the potential to contribute to cumulative effects of such actions. The analysis uses the best available information and data to assess these projects and their potential impacts.

The following criteria were considered in identifying the past, present and reasonable foreseeable future projects that could result in potential cumulative impacts to the region's resources:

- Projects that are of a similar nature could affect similar resources or are located in close proximity to the proposed project
- Projects that have the potential to generate environmental impacts and when addressed collectively with the proposed project, could result in potential cumulative impacts to the environment.

To fully assess the potential cumulative impacts, the proposed Ma`alaea Plantation rural and residential subdivision project was grouped with the following projects in the vicinity having similar scope and scale. The first two

projects noted below are located within the Kihei-Makena Community Plan District and in close proximity of the proposed project.

- **Project District 11 (Ma`alaea Village):** Based on one of the elements in understanding the requirement for assessing cumulative impacts, is the need to recognize what constitutes "reasonably foreseeable actions". Project District 11 also known as Ma`alaea Village may have relevance in the overall project impacts. Project District 11 as briefly described in the Kihei-Makena Community Plan District is a 650-acre planned project located east of Honoapiilani Highway at Ma`alaea and extends to the Kealia Pond National Wildlife Refuge. As a master planned residential community, this project proposes to include a mix of single and multi-family residential, and community oriented amenities. To date, no timetable and development parameters in terms of number of units or lot allocations have been detailed for Project District 11. Based on the lack of definitive planning and development information about this project, it is not deemed a "reasonable foreseeable action". Should this project plan to proceed in the future, it should be taken into account the potential cumulative impacts that may exist at that time. It is also important to note that this Project District 11 is NOT included in urban growth boundary within the recently approved Maui Island Plan. This project remains within the agricultural designation in the Maui Island Plan. Based on its current designation and not being in the urban growth boundary, Project District 11 is not considered deemed a "reasonable foreseeable action".

- **Ma`alaea Village Project:** This proposed project is in contrast with Project District 11, but it may fall within the purview of a "reasonably foreseeable future action". The Ma`alaea Village mixed use commercial and residential project is located within the existing Ma`alaea Triangle further located on Honoapiilani Highway across the proposed project site. A project's draft environmental assessment was prepared on December 21,

2007 for this proposed mixed use project. The proposed Ma`alaea Village project will consist of one hundred and ten (110) units within six 2-story, 3-story and 4-story buildings. Live-work residential unit concept was proposed as one part of the overall project design. Due to the recent recession and its economic feasibility the project has been stalled and has not proceeded as planned. Based on the lack of definitive schedule for the project and no activity to date, this project is not considered to be deemed as a "reasonable foreseeable action". If Ma`alaea Village is reinstated in the future, it is anticipated that an environmental analysis will take into account the environment as it exists at that time, and the cumulative impact of the project together with other actions which may be ongoing or planned as reasonably foreseeable.

The following two proposed projects that may have relevance in assessing cumulative impacts and what may constitutes "reasonably foreseeable actions" are both located within the Kahului-Wailuku Community Plan District. These proposed projects are outside of the proposed Ma`alaea Plantation community plan district site, but because of their proximity to the project site assessing their potential cumulative impacts are essential in order to address potential mitigative measures, if required.

- **Kahili Rural Residential:** This proposed rural residential project is included within the rural growth boundary of the Maui Island Plan. According to the Maui Island Plan, this Kahili Rural Residential planned growth area is approximately 218 acres and located mauka of the Kahili Golf course in the foothills of the West Maui Mountain. It is further located approximately a mile north of the proposed Ma`alaea Plantation. The area is bounded by rural and Park (Golf Course) Community Plan designations. The goal of the Kahili Rural Residential planned growth area is to provide low-density rural residential lots with a maximum lot size of 2 acres. To date, no timetable and development parameters in

terms of number of units, and spatial allocations have been detailed for the Kahili Rural Residential project. Based on the lack of definitive planning and development information for this project, it is not considered a project which is deemed a "reasonably foreseeable actions". Once planning is initiated in the future, it is anticipated that environmental impact analysis for this project will take into account the environment as it exists at that time, and the potential cumulative impact of the project. There are no known planning activities for this project, nor any land use entitlements applications being processed. Thus this project is not considered to be deemed "reasonable foreseeable actions". Since such a project has no development plan nor a development timetable, assessing its cumulative impacts is premature at this time.

- **Waikapu Tropical Plantation Town:** According to the Maui Island Plan, this proposed Waikapu Tropical Plantation Town project is within the urban growth boundary designation within the Maui Island Plan. It is situated in the vicinity of the Maui Tropical Plantation, and it includes lands on both the mauka and makai sides of Honoapiilani Highway. The project area is located south of Waikapu along Honoapiilani Highway, and it will incorporate the integrated agricultural and commercial uses of the existing tropical plantation complex. This project is further located approximately two miles north of the proposed Ma`alaea Plantation rural subdivision.

  According to the Maui Island Plan, the proposed Waikapu Tropical Plantation Town project will consist of 360 gross site acreage planned for "Small Town" development and a 142 gross site acreage for "Rural" development project. This project proposes to include a mix of single and multi-family housing types including community amenities with commercial services and parks.

> To date, no timetable and development parameters in terms of spatial allocations have been detailed for Waikapu Tropical Plantation Town. There is no known land use development planning activity for this project at this time, nor in the near future. Based on the lack of definitive planning and development information for this project, it is not considered a project which is deemed a "reasonable foreseeable action". In the event that planning is initiated in the future, it is assumed that environmental analysis for this project will take into account the environment as it exist at that time, and cumulative impact of that project together with other actions which may be ongoing or planned as reasonably foreseeable.

In considering the potential cumulative impacts of the proposed Ma`alaea Plantation market-priced rural and affordable residential subdivision, together with the projects that are listed above, the following parameters were examined: (a) topography; (b) flora and fauna; (c) noise and air quality; (d) visual resources; (e) cultural resources; (f) water quality; (g) public services; and (h) infrastructure. In assessing the potential cumulative impacts of these projects that are listed above, a key element in understanding the requirement for assessing the cumulative impacts, is the need to recognize what constitutes "reasonably foreseeable actions" that have relevance with the proposed project.

As mentioned above, none of projects that are listed above have any definitive development timetable or development plans in terms of number of units, and spatial allocations that have been identified will aid in assessing potential cumulative impacts on the environment. Worth noting, the 650-acre Ma`alaea Village is not included in the urban growth boundary designation within the recently approved Maui Island Plan and said project was kept in its current agricultural designation. Based on the lack of definitive planning and development information for the above noted listed projects, they are not considered projects which are deemed "reasonable foreseeable actions".

Accordingly, the proposed Ma`alaea Plantation rural residential subdivision is not anticipated to have an adverse cumulative impact on the environment resulting from the project. No additional mitigative measures are required.

IV. Consistency and Relationship To Land Use Plans, Policies, And Controls

IV. CONSISTENCY AND RELATIONSHIP TO LAND USE PLANS, POLICIES, AND CONTROLS

A. STATE LAND USE DISTRICTS

Pursuant to Chapter 205, Hawaii Revised Statutes, all lands in the State of Hawaii have been placed into one (1) of four (4) land use districts category by the State Land Use Commission. These land use districts have been designated "Urban", "Rural", "Agricultural", and "Conservation". The proposed Ma`alaea Plantation rural and residential project site is currently classified "Agricultural" by the State Land Use District. A petition for a District Boundary Amendment (DBA) from State "Agricultural" District to the "Urban" District will be submitted to the State Land Use Commission (SLUC) as part of the land use entitlement process for the project. The SLUC petition will encompass with the proposed 201H, HRS proposed project as shown in Appendix C identified as Preliminary Site Plan and will follow the provisions of Section 15-15-97 of the Land Use commission Rules, pertaining to Section 201H, HRS processing.

B. LAND USE COMMISSION RULES, CHAPTER 15-15, HAWAII ADMINISTRATIVE RULES

The reclassifications of portions of the subject property is in conformance with the following standards set forth in Chapter 15-15(18), Standard for Determining "Urban" District Boundary, Hawaii Administrative Rules. As noted earlier in this report, the proposed Ma`alaea Plantation project consisting of affordable residential units and market-priced units will be processed pursuant to 201H-38, Hawaii Revised Statutes in coordination with Maui County, Department of Housing and Human Concerns. The market-priced units will have a minimum lot size of 1 acre consistent with the standards as set forth in Chapter 15-15-(21) relating to rural district.

The proposed reclassifications request of the portions of the subject property site (as shown in Appendix C) from Agricultural to Urban has been analyzed with respect to the criteria, as discussed following below. The market-priced lots will have a minimum lot size of 1 acre to preserve and protect the rural character of the area and to encourage small scale agricultural activity. The remaining portions of the subject property will remain in agriculture for agricultural purposes and other allowable uses.

Chapter 15-15(21)

(1) Areas consisting of small farms; provided that the areas need not be included in this district if their inclusion will alter the general characteristics of the areas.

Discussion and Response:

The proposed project is located in close proximity of Waikapu Village Town approximately 1.5 miles north of the proposed project site. The proposed project is also located adjacent to large agricultural lands and in close proximity to a proposed Kahili Rural Residential Planned growth area within the Maui Island Plan located approximately 0.5 miles north of the project site. As noted in the Maui Island Plan, rural and agricultural lands are intrinsically linked by their physical, economic and cultural connections. Rural communities and agricultural activities evolved to form a symbiotic relationship – each land use benefits from the other. The proposed project will encourage a small-scale agricultural activity and maintain and protect the rural character of the area.

(2) Activities or uses as characterized by low-density residential lots of not less than one-half acre and a density of not more than one single-family dwelling per one-half acre in areas where "city-like" concentration of people, structures, streets, and urban level of services are absent, and where small farms are intermixed with the low-density residential lots.

Discussion and Response:

The project proposes to develop approximately 55 market-priced rural residential lots with a minimum lot size of 1-acre and one approximately 27-acre lot. This proposed rural residential subdivision project will be consistent with the purpose and intent under Chapter 19.29.010, Maui County Code that state, "The purpose of the rural districts is to implement the goals and policies of the Maui County General Plan and community plans; to provide low density development which preserves the rural character of certain areas; to allow small-scale agricultural uses and the keeping of animals; and to serve as a transition between standard residential or other urban density development and agricultural lands". The proposed Ma`alaea Plantation project will meet the intent and purpose of the Maui County Code by providing larger rural residential lots that encourage some form of active agriculture. The proposed market-priced rural residential project is a low density residential development that preserves the rural and agricultural character of the area and preserves some open space corridors by developing larger rural residential lots. By developing larger rural residential lots it will preserve and protect the rural resources, lifestyle, and heritage resources, and are consistent with and compliment the rural character of its neighboring proposed Kahili rural residential project and the village of Waikapu.

Chapter 15-15(18)

(1) It shall include lands characterized by "city like" concentration of people, structures, streets, urban level of services and other related land uses.

Discussion and Response:

As shown in Appendix C, the proposed for reclassification from Agriculture to Urban is adjacent to the existing development at Ma`alaea Triangle and the Ma`alaea Small Boat Harbor, which are located on lands classified as "Urban". Also, Ma`alaea village encompasses condominium projects along Hauoli Street, providing urban setting. As noted earlier in this report, portion of the project site proposed for urban classification will entail the development of approximately 55

market-priced rural residential lots and 58 affordable residential housing units. Infrastructure systems implemented in connection with the proposed project will serve all areas within the limit of the project site. An internal road network and a neighborhood park will be constructed to serve the needs of the subdivision.

(2) Proximity to centers of trading and employment except where the development would generate new centers of trading and employment.

Discussion and Response:

The proposed area for reclassification is located adjacent to the Ma`alaea Commercial Triangle and Ma`alaea Small Boat Harbor. In addition, there are employment and trading opportunities located in close proximity of the project site. The proposed Ma`alaea Plantation project is located approximately 6 miles from the commercial centers of Kihei and Wailea and approximately 4 miles and 5 miles from the commercial and employment centers of Wailuku and Kahului, respectively. Numerous employment opportunities exist in the retail, resort, and service industries in the Kihei-Wailea region while Wailuku-Kahului serve as the central business districts. Additionally, Federal, State, and County government offices, and many non-profit agencies are located in Wailuku-Kahului region.

(3) Availability of basic services such as schools, parks, wastewater systems, solid waste disposal, drainage, water, transportation systems, public utilities, and police and fire protection.

Discussion and Response:

The area proposed for reclassification will be serviced by individual wastewater systems (IWS) which will be installed by individual lot owners during construction of dwelling units. Additionally, water supply for the proposed subdivision will be provided by privately-developed wells within the utility site and will not rely on County sources. These water wells have been developed and tested and found to be adequate to provide the water needs for the proposed

project. The project area is located in close proximity to major roadways such as, Honoapiilani Highway, Kuihelani Highway, and North Kihei Road, which provide access to other community regions on Maui. As noted earlier in this report, the project site is located between the communities of Wailuku-Kahului and Kihei-Makena regions. These community regions are served by DOE's public education system, as well as several privately operated schools accommodating elementary, intermediate, and high school students. There's also charter school located within the Kihei-Makena region. Health care facilities, as well as police and fire protection services, are available in Wailuku and Kahului, as well as in Kihei.

(4) It shall include lands with satisfactory topography, drainage, and reasonably free from danger of any flood, tsunami, unstable soil conditions, and other adverse environmental effects.

Discussion and Response:

The project site containing slopes averaging 6.5%, is suitable for the proposed planned uses. The site proposed for reclassification is located within flood Zone X on the Federal Emergency Management Agency (FEMA), flood Insurance Rate Map (FIRM). Flood Zone X represents areas outside of the 0.2% annual chance flood plain; areas of 1% annual chance flood with average depths less than 1 foot or with drainage areas less than 1 square mile; or areas protected by levees from the 1% annual chance flood. The project area is not subject to tsunami inundation or unstable soil conditions. Drainage improvements for the proposed project will be designed in consultation with applicable governmental agencies to mitigate potential runoff and adverse drainage impacts on environmental resources.

As noted earlier in this report, Phase I Environmental Site Assessment (ESA) reports have been completed for the project site. A Phase II ESA was completed as well to address a recommendation in the Phase I ESA report. All issues identified in the ESA reports have been addressed such that there are no

outstanding environmental conditions currently present within the limits of the project (refer to Appendix O). Hence, the use of the project site for a residential subdivision is not anticipated to present any impacts to public health and safety. No foreseeable adverse environmental effects are anticipated in conjunction with the proposed project.

(5) It shall not include lands, the urbanization of which will contribute toward scattered urban development, necessitating unreasonable investment in public infrastructure or support services.

Discussion and Response:

The proposed development of Ma`alaea Plantation project will not necessitate unreasonable investment in public infrastructure or support systems. All engineering infrastructure systems for the project will be provided and constructed by the applicant, MVI, LLC.

C. HAWAII STATE PLAN, CHAPTER 226, HAWAII REVISED STATUTES

Chapter 226, HRS, also known as the Hawaii State Plan, is a long-range comprehensive plan which serves as a guide for the future long-range development of the State by identifying goals, objectives, policies, priorities, as well as implementation mechanisms. The proposed project is consistent with the following State goals, objectives, and policies of the Hawaii State Plan:

Chapter 226-4, HRS, State Goals

(1) A strong, viable economy, characterized by stability, diversity, and growth, that enables the fulfillment of the needs and expectations of Hawaii's present and future generations.

(2) A desired physical environment, characterized by beauty, cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.

Chapter 226-5, HRS, Objectives and Policies for Population

(b)(2) Encourage an increase in economic activities and employment opportunities on the neighbor islands that are consistent with community needs and desires.

(b)(3) Promote increased opportunities for Hawaii's people to pursue their socio-economic aspirations throughout the islands.

Chapter 226-6, HRS, Objectives and Policies for the Economy

(a)(1) Increased and diversified employment opportunities to achieve full employment, increased income and job choice, and improved living standards for Hawaii's people.

(a)(2) A steadily growing and diversified economic base that is not overly dependent on a few industries, and includes the development and expansion of industries on the neighbor islands.

(b)(6) Strive to achieve a level of construction activity responsive to, and consistent with, State growth objectives.

Chapter 226-10, HRS, Objectives and Policies for the Economy – Potential Growth Activities

(b)(5) Promote Hawaii's geographic, environmental, social, and technological advantages to attract new economic activities into the State.

Discussion and Response:

The proposed project conforms with State goals and the objectives and policies of

HRS 226-4,5,6,&10 for the economy, potential growth activities, and population. The proposed Ma`alaea Plantation rural and residential subdivision project will provide a wide-range of economic activities and opportunities for Maui's residents and more specifically for the Kihei-Makena and Kahului-Wailuku Community Plan regions. The variety of opportunities envisioned from the proposed rural residential project include single-family rural residential lots that encourage small-scale agricultural pursuits consistent with the intent and purposes of Maui County Code Chapter 19.029.010 and Chapter 2.96, Maui County Code (Workforce Housing). The proposed development of approximately 55 market-priced rural residential lots and 58 affordable residential dwelling units will preserve and protect the rural character of the area, but also provides needed affordable housing units for Maui's residents. It is anticipated that the development of this subdivision will generate significant expenditures by the developer of this subdivision. With the infusion of new capital expenditures on this project, these investments are expected to favorably impact Maui's economy on a broad scale, and in multitude of ways. According to the economic study prepared by ACM Consultants, Inc. for this project (see Appendix Q), with the capital investment during the initial phase of the subdivision development, a significant number of direct new, construction job opportunities is expected to be created by this project. Based on State economic multipliers of capital infusion for the initial construction of the rural residential subdivision it is expected that the forecasted annual average directly related to the construction of the subdivision is approximately 59 jobs. In addition, construction of the individual residential dwelling units on the approximately 55 market-priced rural residential lots and 58 affordable residential lots will add substantial new construction jobs. It is forecasted based on State economic multipliers that the annual average jobs directly related to the construction of vertical improvements within the proposed subdivision is approximately 79 jobs. Furthermore, the increase in construction will also create the need for supplementary companies to strengthen their labor force. These additional jobs may be from building supply companies, hardware stores, equipment rental companies, and shipping and warehousing companies.

These are just some of the indirect employment opportunities that are anticipated as a result of this proposed rural residential subdivision project. The proposed development is intended to reflect the strong demand for residential lots that are centrally-located within the Kihei-Makena and Kahului-Wailuku community Plan regions. This proposed rural and residential project embraces the need to protect and preserve the rural character of the area appropriate in scale for the regions. It also encourages residents' desire to pursue small-scale agricultural activities in the region that may aid Maui's economy and provide diversity and stability for the island economy.

Chapter 226-11, HRS, Objectives and Policies for the Physical Environment - Land-Based, Shoreline, and Marine Resources

(a)(2) Effective protection of Hawaii's unique and fragile environmental resources.

(b)(3) Take into account the physical attributes of areas when planning and designing activities and facilities.

(b)(8) Pursue compatible relationships among activities, facilities, and natural resources.

Chapter 226-12, HRS, Objectives and Policies for the Physical Environment-Scenic, Natural Beauty, and Historic Resources

(b)(5) Encourage the design of developments and activities that complement the natural beauty of the islands.

Discussion and Response:

The proposed project meets with stated objective and policies of HRS 226-11 & 12 for physical environment, scenic and historic resources. The planning and design concept of the proposed 55 market-priced rural lots and 58 affordable

residential housing units will reflect the rural character of Ma`alaea, the history, location and topography and setting of the site. View corridors and topographic features will be maintained and highlighted in the project design. The proposed Ma`alaea Plantation project will provide a low density rural and residential development which will preserve the rural character of the area and will allow small-scale agricultural uses on the approximately 55 proposed rural lots to serve as a transition between a standard residential or other urban density development and agricultural lands. This is consistent with the intent and purpose of the rural district zoning ordinance, Chapters 19.029.010 and 2.96, Maui County Code. The historical setting of the region will be reflected in the proposed project's traditionally-based planning and design of the subdivision. The proposed subdivision, consisting of 55 rural residential lots with a minimum lot size of 1 acre will encourage potential lot owners to pursue some form of agriculture. The proposed rural large lot concept within the subdivision will protect and preserve the open space corridors in the area. In addition to the proposed rural lots, the proposed project will include approximately 58 affordable residential housing units to meet the demand for affordable housing units and meet the intent and purposes of Chapter 2.96, Maui County Code (Workforce Housing). The project's design concept will meet the intent of the goals, objectives, and policies of the Maui Island Plan and stated objectives of HRS 226-11 & 12.

Based on thorough field assessments of the site by the applicant's flora and fauna consultant, no rare or endangered plant and animal species or habitats are present on site. Native habitats do not exist on the site given its history of sugarcane agricultural activities of the site.

Chapter 226-13, HRS, Objectives and Policies for the Physical Environment-Land, Air, and Water Quality

(b)(2) Promote the proper management of Hawaii's land and water resources.

(b)(6) Encourage design and construction practices that enhance the physical qualities of Hawaii's communities.

Discussion and Response:

The proposed 55 market-priced rural lots and 58 affordable residential housing units will be designed to be complimentary to the rural character of the area that will serve residents of the Kihei-Makena and Kahului-Wailuku Community Plan regions. The proposed project is located along the main thorough fare to west, south and central Maui and is in very close proximity to the Kahului and Wailuku regions, as well as Paia and South Maui regions. The project is located mauka of Honoapiilani Highway, away from the shoreline, and the proposed project is not expected to have any impact on our shoreline resources. The proposed drainage retention basins that will be constructed for the project will capture the drainage flow generated from the proposed subdivision. Also, the project is in close proximity to existing services and facilities that are critical to the success of the project.

Chapter 226-15, HRS, Objectives and Policies for Facility Systems – Solid and Liquid Wastes

(b)(2) Promote re-use and recycling to reduce solid and liquid wastes and employ a conservation ethic.

(b)(3) Promote research to develop more efficient and economical treatment and disposal of solid wastes.

Discussion and Response:

The project will be designed to meet the best management practices with respect to reducing and recycling solid and liquid waste. Each lot will be required to install their own individual wastewater system designed at the time of the individual lot improvements, meeting the requirements of the State of Hawaii, Department of Health. The proposed Ma`alaea Plantation project will not construct any sewer systems, treatment facilities, or injection wells. Individual lot

owners will be encouraged to recycle solid waste to the furthest extent possible, and drought tolerant plants will be used to minimize the use of landscape irrigation. Conservation measures will be encouraged by utilizing energy-efficient fixtures.

Chapter 226-16, HRS, Objectives and Policies for Facility Systems – Water

(b)(2) Support research and development of alternative methods to meet future water requirements well in advance of anticipated needs.

Discussion and Response:

As noted earlier in this report and in Preliminary Engineering Report prepared by Otomo Engineering, Inc. for the proposed project (see Appendix D), the water service for the proposed project is to construct a private water system in accordance with the State of Hawaii, Department of Health standards. The domestic water demand and fire flow requirements for the proposed project will be provided by the three existing wells on the adjacent property at approximately an elevation 350', which will be the source of water for the system. The existing 750,000 gallon water tank will provide the necessary storage for both domestic and fire flow demands of the proposed subdivision. Approximately 2,600 feet of 12" waterline has been installed from the existing storage tank to the project site where the proposed distribution system will be constructed to service each lot. In addition, based on a preliminary review and analysis of the water from the existing wells by Tom Nance Water Resource Engineering (see Appendix L), approximately fifty percent of the pumped water will require treatment through the reverse osmosis system (RO) and be blended with untreated water to produce a high quality drinking water. The concentrate from the RO system may be used to irrigate the common areas of the project.

Priority Guidelines of the Hawaii State Plan

The proposed project is consistent with the following priority guidelines of the Hawaii State Plan:

Section 226-19, Objectives and policies for socio-cultural advancement – housing. To achieve the housing objectives, it shall be the policy of the State to:

(a) Effectively accommodate the housing needs of Hawaii's people.

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

(c) Increase homeownership and rental opportunities and choices in terms of quality, location, cost, densities, style, and size of housing.

Discussion and Response:

The proposed Ma`alaea Plantation project consisting of approximately 55 market-priced rural lots and 58 affordable residential housing units will serve to meet the demand for housing on Maui and most especially meet the residential workforce housing needs of the region at an attractive and central location in Ma`alaea. Additional housing choices in Maui County will provide healthy competition and allow for a more balanced housing market. The applicant will provide all required engineering infrastructure as part of project implementation. Hence, the proposed project is in conformance and consistent with the above-noted objectives and policies of the Hawaii State Plan.

Chapter 226-103, HRS, Economic Priority Guidelines

(1) Seek variety of means to increase the availability of investment capital for new and expanding enterprises:

A. Encourage investments which:

(i) Reflect long-term commitments to the State;

(ii) Rely on economic linkages within the local economy;

(iii) Diversify the economy;

(iv) Reinvest in the local economy;

(v) Are sensitive to community needs and priorities.

Discussion and Response:

As noted earlier in this report, the proposed Ma`alaea Plantation rural and residential project consisting of approximately 55 rural lots and 58 affordable residential housing units will provide a variety of economic activities for the region. Because of the anticipated large investment capital that will be infused in the development of this subdivision project, employment opportunities in the construction industry and ancillary businesses will be created as a result from the development. As shown in the project's market and economic impact analysis prepared by ACM Consultant's, Inc. (see Appendix Q), the anticipated direct new job opportunities during the initial construction phase of the subdivision by using the State economic multipliers is approximately 59 new jobs. In addition, construction of the individual residential housing units on the 113-lots rural and affordable residential subdivision (estimated construction cost per dwelling unit per lot is $300,000 or a estimated total of $34 million) using the state economic multipliers is forecasted to create an annual average of 80 jobs directly related to the construction of vertical improvements within the proposed subdivision. The proposed project is designed to reflect the rural character of the area and it is anticipated to attract residents within the Kahului-Wailuku and Kihei-Makena Community Plan regions. The project will contribute, because of its infusion of capital investment, to the growth of Maui's economic base.

Chapter 226-104, HRS, Population Growth and Land Resources Priority Guidelines

(a)(1) Encourage planning and resource management to insure that population growth rates throughout the State are consistent with available and planned resource capacities and reflect the needs and desires of Hawaii's people.

(b)(12) Utilize Hawaii's limited land resources wisely, providing adequate land to accommodate projected population and economic growth needs while ensuring the protection of the environment and the availability of the shoreline conservation lands and other limited resources for future generations.

Discussion and Response:

The proposed project is in keeping with the priority guidelines of the Hawaii State's Plan's Economic Priority Guidelines, HRS 226-103. With this proposed Ma`alaea Plantation project and anticipated infusion of capital investment, it will provide needed construction jobs and will provide housing for Maui's residents. The proposed rural subdivision will also encourage small-scale agricultural activity that may provide supplemental income for the lot owners. The project will meet the Population, Growth and Land Resources Priority Guidelines pursuant to HRS 22-104, by encouraging rural residential project that reflects the housing needs of Maui's residents that is rural character in nature as well as preserving open space by developing a large rural lot subdivision. In addition, the proposed project includes the development of approximately 58 affordable housing units to meet the demand for affordable housing for Maui's residents.

The subdivision design will be sensitive to the rural character of the area. It will serve the housing needs of working families who are looking for a rural and affordable residential subdivision that allow small-scale agriculture. The

development of this proposed project will meet the projected growth as stated in the Kihei-Makena and Kahului-Wailuku Community Plan Districts. As previously noted, there are few existing and proposed rural and affordable residential subdivision within the region, and this proposed 113 Ma`alaea Plantation project will not have a significant impact on the population in the regions. The reclassification of the subject property from "Agriculture" to "Urban" will make marginal lands available for residential uses.

STATE FUNCTIONAL PLANS

The State Functional Plans (SFP) define actions for implementation of the Hawaii State Plan through the identification of needs, problems and issues, and recommendations on policies and priorities, which address the identified areas of concern. The draft EA addresses the relationship of the proposed project to the various functional plans. The reclassification request is consistent with the following State Functional Plans:

a. State Agricultural Functional Plan

The proposed project includes the development of a 55 market-priced rural lots subdivision which will preserve and protect the rural character of the area. As noted in this report, a small portion of the project site (approximately 16.9 acres) is planned to be developed for affordable residential housing project. The remaining acreages will remain in Agriculture for agricultural purposes and other allowable agricultural uses. As noted earlier in this report, the subject property is currently fallow and being used for cattle grazing and for horse pasture. The proposed rural lots residential subdivision is consistent with the intent and purposes of the Maui County Code, Chapter 19.029.010, and to implement the purpose of the rural districts goals and policies of the Maui County General Plan and community plans; to provide low density development which preserves the rural character of the area; to allow small-scale agricultural uses and to serve as a transition between standard residential

or other urban density development and agricultural lands. Based on this premise, the proposed Ma`alaea Plantation project provides a reasonable foundation for the proposed action. As noted above, the majority of the subject property that requires reclassification will continue to provide and allow agricultural uses of the property. As shown in Appendix C, that is subject of this application will require reclassification from "Agriculture" to "Urban" district for affordable residential housing project to meet the critical shortage of affordable housing that is currently being experienced in Maui County.

b. State Employment Functional Plan

As previously noted in this report, a market analysis and economic impact analysis of the proposed Ma`alaea Plantation residential project by ACM Consultant's, Inc. and using the State economic multiplier it is estimated that the project will generate approximately 59 direct construction jobs during the subdivision development phase of the project. In addition, according to the said economic analysis report, on a long term basis the project is forecasted to generate approximately79 jobs directly related to the construction of individual dwelling units within the proposed rural residential subdivision. Meanwhile, indirect employment on Oahu could possibly add 29 jobs, for an overall tally of 167 jobs during the 4-year project build out (see Appendix Q for more detailed information of project's economic impacts).

c. State Transportation Functional Plan

Based on the project's Traffic Impact Analysis Report (TIAR) prepared by Phillip Rowell and Associates, there are no anticipated significant impact on the State's highway system from the proposed 55 rural lots and 58-lots affordable residential housing subdivision project. Recommended road improvements fronting the proposed project will be implemented to ensure compliance with State and County requirements. Also, the proposed project has identified within the project site a transportation corridor per the Maui Island Plan transportation plan.

d. State Historic Preservation Functional Plan

The State Historic Preservation Functional Plan deals with the preservation of historic properties, the collection and preservation of historic records, artifacts and oral histories, and the provision of public information and education on the ethnic and cultural heritages and history of Hawaii. Archaeological inventory surveys (AIS) have been completed for the proposed project by Scientific Consultants Services, Inc. in compliance with all applicable historic preservation requirements (see Appendix F). The AIS reports have been reviewed and approved by the State Historic Preservation Division (SHPD), Department of Land and Natural Resources (see Appendix G). Also, an Archaeological Monitoring Plan (AMP) has been prepared and approved by SHPD, and the AMP will be implemented during construction activities for the project in accordance with all applicable laws (see Appendix H).

e. State Housing Functional Plan

As mentioned above, recent policy discussion in amending Chapter 2.96, Maui County Code (Workforce Housing), there is a recognition and acknowledgment by policy makers and residents of the shortage of affordable housing in Maui County especially in Central Maui region. What is more evident is the lack of housing choices available for Maui's residents. The proposed Ma`alaea Plantation project will help address and meet this critical community need.

MAUI COUNTYWIDE POLICY PLAN

The Countywide Policy Plan was adopted by Ordinance No. 3732 (2010) and took effect on March 24, 2010. The policy plan provides broad goals, objectives, policies, and implementing actions that portray the desired direction of the County's future. This includes: (1) a vision statement and core values for the County through to the year 2030; (2) an explanation of the plan-making process; (3) a description and background information regarding Maui County

today; (4) identification of guiding principles; and (5) a list of countywide goals, objectives, policies, and implementing actions related to the following core principles set forth in the Countywide Policy Plan::

- *Excellence in the stewardship of the natural environment and cultural resources;*
- *Compassion for and understanding of others;*
- *Respect for diversity;*
- *Engagement and empowerment of Maui County residents;*
- *Honor for all cultural traditions and histories;*
- *Considerations of the contributions of past generations as well as the needs of future generations;*
- *Commitment to self-sufficiency;*
- *Wisdom and balance in decision-making;*
- *Thoughtful, island-appropriate innovation; and*
- *Nurturance of the health and well-being of our families and our communities.*

In accordance with these core principles, the Countywide Policy Plan identifies a series of broad themes and goals, each supported by more specific objectives, policies, and implementing actions for pertinent functional planning categories, which are identified following below:

- *Protect the natural environment*
- *Preserve local cultures and traditions*
- *Improve education*
- *Strengthen social and healthcare services*
- *Expand housing opportunities for residents*
- *Strengthen the local economy*
- *Improve parks and public facilities*
- *Diversify transportation options*
- *Improve physical infrastructure*
- *Promote sustainable land use and growth management*

- *Strive for good governance*

The proposed Ma`alaea Plantation residential project is consistent and meet the following goals, objectives, policies and implementing actions, and are illustrative of project's compliance with the Countywide Policy Plan:

PROTECT THE NATURAL ENVIRONMENT

Goal:

Maui County's natural environment and distinctive open spaces will be preserved, managed, and cared for in perpetuity.

Policies:

c. Restore and protect forests, wetlands, watersheds, and stream flows, and guard against wildfires, flooding and erosion.

g. Preserve and provide ongoing care for important scenic vistas, view planes, landscapes, and open-space resources.

Objective:

Improve the quality of environmentally sensitive, locally valued natural resources and the native ecology of each island.

Policy:

a. Protect and restore nearshore reef environments and water quality.

Objective:

Improve the stewardship of the natural environment.

Policy:

a. Preserve and protect natural resources with significant scenic, economic, cultural, environmental, or recreational value.

STRENGTHEN THE LOCAL ECONOMY

Goal:

Maui County's economy will be diverse, sustainable, and supportive of community values.

Objective:

Promote an economic climate that will encourage diversification of the County's economic base and a sustainable rate of economic growth.

Policies:

a. Support economic decisions that create long-term benefits.
b. Invest in infrastructure, facilities, and programs that foster economic diversification.
c. Support and promote locally produced products and locally owned operations and businesses that benefit local communities and meet local demand.

Objective:

Diversify and expand sustainable forms of agriculture and aquaculture.

Policy:

d. Assist farmers to help make Maui County more self-sufficient in food production
j. Encourage healthy and organic farm practices that contribute to land health and regeneration.
k. Support cooperative and other types of nontraditional and communal farming efforts.

IMPROVE PARKS AND PUBLIC FACILITIES

Goal:

A full range of island-appropriate public facilities and recreational opportunities will be provided to improve the quality of life for residents and visitors.

Objective:

Expand access to recreational opportunities and community facilities to meet the present and future needs of residents of all ages and physical abilities.

Policy:

a. Protect, enhance, and expand access to the public shoreline and mountain resources.

IMPROVE PHYSICAL INFRASTRUCTURE

Goal:

Maui County's physical infrastructure will be maintained in optimum condition and will provide for and effectively serve the needs of the County through clean and sustainable technologies.

Objective:

Improve water systems to assure access to sustainable, clean, reliable, and affordable sources of water.

Policies:

b. Develop and fund improved water-delivery systems.
c. Ensure a reliable and affordable supply of water for productive agricultural uses.

Objective:

Direct growth in a way that makes efficient use of existing infrastructure and to areas where there is available infrastructure capacity.

Policy:

d. Promote land use patterns that can be provided with infrastructure and public facilities in a cost-effective manner.

Objective:

Improve the planning and management of infrastructure systems.

Policies:

g. Ensure that infrastructure is built concurrent with or prior to development.
j. Promote the undergrounding of utility and other distribution lines for health, safety, and aesthetic reasons.

Objective:

Design all developments to be in harmony with the environment and to protect each community's sense of place.

Policies:

f. Use trees and other forms of landscaping along rights-of-way and and within parking lots to provide shade, beauty, urban-heat reduction, and separation of pedestrians from automobile traffic in accordance with community desires.

g. Where appropriate, integrate public-transit, equestrian, pedestrian, and bicycle facilities, and public rights-of-way as design elements in new and existing communities.

j. Protect rural communities and traditional small towns by regulating the footprint, locations, site planning, and design of structures.

k. Support small-town revitalization and preservation.

Goal:

Expand housing opportunities for residents. Quality, island-appropriate housing will be available to all residents.

Objective:

Reduce affordable housing deficit for residents.

Policies:

a. Ensure that an adequate and permanent supply of affordable housing is made available to our residents and/or workforce population, with special emphasis on providing housing for low to moderate income families.

k. Ensure residents are given priority to obtain affordable housing units developed in their communities, consistent with applicable regulations.

l. Establishing pricing for affordable housing that is more reflective of Maui County's workforce than the U.S. HUD's median income estimates for Maui County.

In summary, the proposed Ma`alaea Plantation residential project is consistent with the themes, values, policies, and principles of the Countywide Policy Plan. The project proposes to develop low-density rural lots subdivision to preserve the rural character of the area and will encourage small-scale agriculture that will assist residents to be self-sufficient. The proposed project is consistent with the intent and purposes of the Maui County Code Chapter 19.029.010, Rural District Zoning. In addition, the proposed project will include the development of affordable housing project to meet the current demand for affordable housing for Maui's workforce population. With the proposed affordable residential housing units within the Ma`alaea Plantation project will be consistent and meet the intent and purposes of Chapter 2.96 of the Maui County Code.

COUNTY OF MAUI COMMUNITY PLANS

Within the County of Maui, there are nine community plan regions. From a General Plan implementation standpoint, each region is governed by a community plan which sets forth desired land use patterns. The proposed rural and residential project site is located within the Kihei-Makena Community Plan region. The Kihei-Makena Community Plan, one of the nine community plans for the County of Maui, reflects current and anticipated conditions in the Kihei-Makena region and advances planning goals, objectives, policies and implementation considerations to guide decision-making in the region, while recognizing the values and unique attributes of the Kihei-Makena area in order to enhance the region's overall living environment.

The land underlying the project site is designated as "Project District 12" by the Kihei-Makena Community Plan. As described in the Kihei-Makena Community

Plan, project districts provide a "flexible and creative planning approach rather than specific land use designations" establishing "continuity in land uses and designs while providing for orderly growth of the community as well as comprehensive and concurrent provision of infrastructural facilities and systems". The proposed Ma`alaea Plantation project is a response to the community desire to preserve and maintain the rural character of the area and to encourage residents to pursue small-scale agricultural activity within the proposed subdivision. In addition, with the proposed affordable housing project within the Ma`alaea Plantation subdivision will meet the critical need for affordable housing for Maui's residents within the regions. The project consists of approximately 55 market-priced rural lots with a minimum 1 acre lot. These large proposed lots will provide adequate open space and preserve a better view of the West Maui Mountain. In addition, the proposed project will include approximately 58 affordable residential housing units with a minimum lot size of 10,000 square feet per lot. Based on recent policy discussion, there's a strong recognition and acknowledgement of the critical need for affordable housing for Maui's residents.

The proposed project is consistent with the following goals, objectives, and policies of the Kihei-Makena Community Plan:

LAND USE

Goal:

A well-planned community with land use and development patterns designed to achieve the efficient and timely provision of infrastructural and community needs while preserving and enhancing the unique character of Ma`alaea, Kihei, Wailea and Makena as well as the region's natural environment, marine resources and traditional shoreline uses.

Objectives and Policies:

m. Provide for limited residential expansion in Ma`alaea which compliment the existing natural and built environment.

p. Prevent urbanization of important agricultural lands.

HOUSING

Goal:

A variety of attractive, sanitary, safe, and affordable homes for Kihei's residents, especially for families earning less than the median income for families within the County. Also, a built environment which provides complementary and aesthetically pleasing physical and visual linkages with the natural environment.

Objectives and Policies:

1. Provide an adequate variety of housing choices and range of prices for For the needs of Kihei's residents, especially for families earning less Than the median income for families within the County, through the Project district approach and other related programs. Choices can be increased through public/private sector cooperation and coordinated development of necessary support facilities and services.
2. Require a mix of affordable and market-priced housing in all major residential projects, unless the project is to be developed exclusively as an affordable housing project.

CULTURAL RESOURCES

Goal:

Identification, preservation, enhancement, and appropriate use of cultural resources, cultural practice, and historic sites that:

b. Preserves and protects native Hawaiian rights customarily and traditionally exercised for subsistence, cultural, and religious purposes in accordance with Article XII, Section 7, of the Hawaii Constitution, and the Hawaii Supreme Court's PASH opinion, 79 Haw. 425 (1995).

Objectives and Policies:

a. Identify, preserve, protect and restore significant historical and cultural sites.

c. Encourage and protect traditional *mauka* and *makai* accesses, cultural practices and rural lifestyles.

f. Preserve and restore historical roads and paths as cultural resources, and require such resources to be available to the public.

PHYSICAL AND SOCIAL INFRASTRUCTURE

Goal:

Provision of facility systems, public services and capital improvement projects in an efficient, reliable, cost effective, and environmentally sensitive manner which accommodates the needs of the Kihei-Makena community, and fully support present and planned land uses, especially in the case of project district implementation. Allow no development for which infrastructure may not be available concurrent with the development's impact.

Objective and Policy (Transportation):

c. Strengthen the coordination of land use planning and transportation planning to promote sustainable development and to reduce dependence on automobiles. New residential communities should provide convenient pedestrian and bicycle access between residences and neighborhood commercial areas, as well as parks and public facilities.

Objective and Policy (Water Distribution):

a. Provide for appropriate water source and transmission improvements concurrent with planned growth of the Kihei-Makena region.

d. Encourage the use of plants that have a relatively low need for water.

Objective and Policy (Liquid and Solid Waste;)

b. Provide efficient, safe and environmentally sounds systems for the reuse, recycling, and disposal of liquid and solid wastes.

c. Reduce the reliance on injection wells for wastewater disposal.

Objective and Policy (Drainage):

a. Design drainage systems that protect coastal water quality by incorporating best management practices to remove pollutants from runoff. Construct and maintain, as needed, sediment retention basins and other best management practices to remove sediments and other pollutants from runoff.

d. Minimize the increase in discharge of storm water runoff to coastal waters by preserving flood storage capacity in low-lying areas, and encouraging infiltration of runoff.

Objective and Policy (Energy and Public Utilities):

a. Promote energy efficiency as the energy resource of first choice, and increase energy efficiency in all sectors of the community.

d. Promote an environmentally and culturally sensitive use of renewable energy resources like biomass, solar, wind, and hydroelectric energy in all sectors of the community.

ENVIRONMENT

Goal:

Preservation, protection, and enhancement of Kihei-Makena's unique and fragile environmental resources.

Objective and Policy:

e. protect the quality of near shore waters by ensuring that land-based discharges meet water quality standards. Continued monitoring of

existing and future waste disposal systems are necessary to ensure their efficient operation. Programs should be implemented to reduce the reliance on injection wells for wastewater disposal.

h. Encourage such land uses as would serve to reduce hazardous fire conditions in the developed community plan areas.

Discussion and Response:

The proposed Ma`alaea Plantation project consists of the development of approximately 55 rural lots and 58 affordable residential housing units. The remaining portions of the project site will remain in agriculture for agricultural purposes and other allowable uses. The project site is located in an area characterized by adjacent urban land uses, both residential and commercial uses. Necessary engineering infrastructure systems and services to serve the proposed project will be developed by the applicant as part of the project implementation. Individual wastewater system (IWS) will be installed by each individual lot owners. There will be no injection wells to be constructed for the project. A comprehensive drainage system will be constructed for the project in accordance with all applicable laws and regulations. With the drainage improvements proposed for the project will present an opportunity to improve existing environmental conditions within the Ma`alaea community. Recreational needs of the proposed project are anticipated to be addressed through the provision of parks, open space, and access to nearby walking trails. Hence, the proposed project is in conformance with the above-stated goals, objectives, and policies of the Kihei-Makena community plan.

COUNTY ZONING

The project site is currently zoned "Agricultural" by the County of Maui. Though the proposed Ma`alaea Plantation is not consistent with the current agricultural zoning, the intent and purposes of the proposed rural lots subdivision and keeping the remaining portion of the project as

agriculture meets and is consistent with the agricultural use of the site. Chapter 19.029.010, Maui County Code states, *"The purpose of the rural districts is to implement the goals and policies of the Maui County General Plan and community plans; to provide low density development which preserves the rural character of certain areas; to allow small-scale agricultural uses and the keeping of animals..."* The project will meet the intent and purposes of the Maui County Code pertaining to agricultural zone uses by the project's proposed rural lots subdivision that encourage the continuation of some form of active agriculture. The remaining portions of the project site will remain in agriculture for agricultural purposes and other allowable uses.

The project site has been out of use for commercial sugarcane cultivation for over ten years. Agricultural uses on the project site was recently used and limited to portions of the site for small-scale cattle grazing activities, but is presently used for horse pasture.

The foregoing assessment indicates that the project site for the proposed Ma`alaea Plantation project meets and is consistent with the intents and purposes of MCC Section 19.30A.20 since the proposed rural lots residential subdivision pursuant to MCC 19.029.010 allows the continuation of agricultural uses of the site. Hence, there are no anticipated impacts on agriculture by the proposed project.

COASTAL ZONE MANAGEMENT

A small portion of the project site, approximately twenty seven acres on the southern tip of the project site is located within the County of Maui's Special Management Area (SMA), (see Figure U, SMA Map).
This portion of the project site located in the southernmost area of the project is planned for a 27-acre rural residential lot. There's no

development plan for this site at this time. The Applicant will seek SMA approval in the future for this site when a development plan is completed and proposed. This EA also addresses SMA requirements for all applicable components of the proposed rural lot residential subdivision project. Chapter 205A, Hawaii Revised Statutes (HRS), Hawaii Coastal Zone Management Program (HCZMP), establishes objectives and policies for the preservation, protection, and restoration of natural resources of Hawaii's coastal zone. Pursuant to Chapter 205A, HRS, this section addresses the project's relationship and consistency to all applicable coastal zone management consideration.

Historic Resources

Objective:

Protect, preserve and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that is significant in Hawaiian and American history and culture.

Policies:

a. Identify and analyze significant archaeological resources;
b. Maximize information retention through preservation of remains and artifacts or salvage operations; and
c. Support state goals for protection, restoration, interpretation, and display of historic resources.

Discussion and Response:

As noted earlier in this report, archaeological inventory surveys (AIS) and a Cultural Impact Assessment (CIA) report were completed for the project site in accordance with the State Historic Preservation rules and regulations (see Appendix F and Appendix I, AIS and CIA Report,

respectively). Both archaeological inventory surveys and the cultural impact assessment report have been reviewed and approved by the State Historic Preservation Division (SHPD). See Appendix G, approval letter from SHPD. As reflected in the approved AIS and CIA documentation, no significant impacts to cultural or historic resources are anticipated from the proposed development within the project site. Pursuant to SHPD requirements, an archaeological monitoring plan was completed, reviewed and approved by SHPD (see Appendix I, approval letter) and said monitoring plan for the project will be implemented prior to initiation of any ground altering activities for the project. Pursuant to Section 6E-43.6, HRS and Chapter 13-300, Hawaii Administrative rules, should any significant deposits or human skeletal remains be encountered during ground altering activities, work will stop in the immediate vicinity and the applicant will contact the State Historic Preservation Division of the Hawaii State Department of Land and Natural Resources.

Coastal Hazards

Objective:

Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution.

Policies:

a. Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and non-point source pollution hazards;
b. Control development in areas subject to storm wave, tsunami, flood, erosion, wind, subsidence, point and non-point pollution hazards;
c. Ensure that developments comply with requirements of the Federal flood Insurance Program; and

d. Prevent coastal flooding from inland projects.

Discussion and Response:

According to Panel Number 150003 0556E and 0558F of the Flood Insurance Map, September 19, 2012, prepared by the United States Federal Emergency Management Agency, the subject parcel is situated in Flood Zone X. Flood Zone X represents areas outside the 0.2% annual chance floodplain. Two small portions of the parcel within two existing drainageways are designated in Flood zone X with areas of 0.2% annual chance flood, areas of 1% annual chance flood with average depths less than one foot or with drainage areas is less than one square mile, or areas protected by levees from 1% annual chance flood.

Drainage improvements will be designed and constructed in accordance with the Drainage Standards of the County of Maui to ensure that the proposed project will not adversely affect downstream properties and coastal water quality (see Appendix D, Preliminary Engineering Report).

Marine Resources

Objective:

Promote the protection, use, and development of marine and coastal resources to assure their sustainability.

Policies:

a. Ensure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;
b. Coordinate the management of marine and coastal resources and activities to improve effectiveness and efficiency;

c. Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;

d. Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and

e. Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Discussion and Response:

As noted earlier in this report, the proposed Ma`alaea Plantation project is situated inland (mauka) of the Honoapiilani Highway and is not a shoreline or coastal abutting property. To evaluate potential impacts on coastal resources by the proposed project, a Water Quality and Marine Biology Survey was completed for the development within the project area by AECOS, Inc. (see Appendix O). With the implementation of appropriate Best Management Practices (BMPs) and erosion control measures during construction, as well as the construction of a permanent drainage system in accordance with all applicable rules and regulations, no significant short-term or long-term adverse impacts on marine or coastal resources are anticipated from the development of the proposed project.

In addition to the foregoing objectives and policies, a SMA permit review criterion pursuant to Act 224 (2005) provides that:

"No special management area use permit or special management area minor permit shall be granted for structures that allow artificial light from floodlights, uplights, or spotlights used for decorative or aesthetic purposes when the light:

1. Directly illuminates the shoreline and ocean waters; or
2. Is directed to travel across property boundaries toward the shoreline and ocean waters.

Discussion and Response:

As discussed earlier in this report, the project site is not a shoreline or coastal abutting property. The preliminary lighting plan for the project will be designed to both comply with all applicable code requirements pertaining to lighting and to ensure that no lighting is directed across property boundaries towards the shoreline.

Recreational Resources

Objective:

Provide coastal recreational opportunities accessible to the public.

Policies:

a. Improve coordination and funding of coastal recreational planning and management;
b. Provide adequate, accessible, and diverse recreational opportunities in the coastal management area by:
    1. Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;
    2. Requiring replacement of coastal resources having significant recreational value including, but not limited to, surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the State for recreational when replacement is not feasible or desirable;

3. Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;
4. Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;
5. Ensuring public recreational uses of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;
6. Adopting water quality standards and regulating point and nonpoint sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;
7. Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and
8. Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, and county authorities; and crediting such dedication against the requirements of section 46-6.

Discussion and Response:

As noted earlier in this report, the project site is not a shoreline or coastal abutting property. Recreational needs of the proposed project will be addressed by developing an active neighborhood park within the project site. The neighborhood park will be privately maintained and operated by the homeowners association, and will be available for use by both subdivision residents and members of the general public. Additionally, the Ma`alaea Plantation residential subdivision project community association will maintain public access opportunities to mauka trails above

the project site. Coordination with DLNR and neighboring residents will be undertaken to identify operational requirements, such as parking for continued access to the Lahaina Pali Trail.

Economic Uses

Objective:

Provide public or private facilities and improvements important to the State's economy in suitable locations.

Policies:

a. Concentrate coastal dependent development in appropriate areas;

b. Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual, and environmental impacts in the coastal zone management area; and

c. Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments, permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

    1. Use of presently designated locations is not feasible;
    2. Adverse environmental effects are minimized; and
    3. The development is important to the State's economy.

Discussion and Response:

As noted earlier in this report, the proposed project is not a shoreline abutting property. The project site is located inland mauka of

Honoapiilani Highway. The proposed residential subdivision project will provide a number of economic benefits through the development of needed housing for Maui's residents. The proposed project will encourage the use of the residential lots for small-scale agricultural activities as envisioned and consistent with Chapter 19.029.010, Maui County Code, Maui Rural District Zone. Equally important, the project will provide needed affordable housing for Maui's residents consistent with the provision of Chapter 2.96, Maui County Code. The proposed project will stimulate Maui's economy through the creation of direct and indirect construction related job opportunities. An Economic Impact Assessment Report (EIAR) has been prepared and completed for the proposed project by ACM Consultants, Inc. (see Appendix R). According to the EIAR the proposed rural subdivision will provide a number of economic benefits through the development of the subdivision and housing units. The estimated cost of the subdivision site work is approximately $6 million dollars. And the total estimated vertical construction cost of the 113 residential homes is estimated at $34 million, according to the economic impact assessment by ACM Consultants, Inc (see Appendix R). It is estimated that the total direct and indirect construction-related jobs to be created by the proposed project is approximately 167 jobs. Another important economic benefits derived from the proposed project is the ability of residential homeowners to use their individual lots for small-scale agriculture. This will provide homeowners a supplemental income and food self-sufficiency. The proposed project is consistent with the objectives and policies for economic use.

Scenic and Open Space Resources

Objective:

Protect, preserve, and wherever desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

a. Identify valued scenic resources in the coastal zone management area;
b. Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline;
c. Preserve, maintain, and wherever desirable, improve and restore shoreline open space and scenic resources; and
d. Encourage those developments that are not coastal dependent to locate inland areas.

Discussion and Response:

The project site for the proposed Ma`alaea Plantation residential subdivision project is located along the lower slopes of the West Maui Mountains above (mauka) the Honoapiilani Highway and Ma`alaea at an elevation ranging from 40 feet above mean sea level, at the south portion of the property, to approximately 210 feet at the north western corner of the property, with an average slope of approximately 6.5%. To minimize the alteration of natural landforms of the project site, there will be no mass grading of the individual lots as part of the subdivision improvements which will reduce the amount of disturbed area during the development of the subdivision. To minimize the potential adverse impacts to the scenic and open space resources, the proposed residential subdivision is designed to be developed with larger lots with a minimum lot size of 1 acre for the market-priced lots, with one 27-acre lot to maintain the rural character of the area. The proposed larger rural lots will provide more open space areas, buffered with landscaping and open green space areas to mitigate potential impact on visual resources. Also, an affordable residential housing project with a minimum lot size of 10,000 square feet is planned

for the proposed project. The remaining makai portions of the project site will remain in agriculture for agricultural purposes and other allowable uses. Hence, the proposed project is not anticipated to have an adverse impact on the scenic and open space resources, and will not impact public views to and along coastal shorelines.

Beach Protection

Objective:

Protect beaches for public use and recreation.

Policies:

a. Locate new structures inland from the shoreline setback to conserve open space, minimize interference with natural shoreline processes, and minimize loss of improvements due to erosion;
b. Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and
c. Minimize the construction of public erosion-protection structures seaward of the shoreline.

Discussion and Response:

The proposed Ma`alaea Plantation residential subdivision project is located inland in the mauka side of Honoapiilani Highway and is not a shoreline or coastal abutting property. The drainage systems for the project will be designed and constructed to retain all project related increases in runoff in accordance with all applicable County drainage rules and regulations. There will be no mass grading of the individual market-

priced lots and a limited grading within the proposed affordable housing project site as part of the subdivision improvements which will reduce the amount of disturbed area during the development of the subdivision. The subdivision retention basins will be sized to accommodate the increase in storm water runoff for the developed lots. Therefore each lot will be allowed to connect to or discharge into the subdivision drainage systems. Development of the project will also include implementation of site specific Best Management Practices (BMPs) during construction to provide erosion control and minimize impacts to downstream properties. 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. As such, the proposed project is not anticipated to present any significant adverse impacts on beach processes.

Public Participation

Objective:

Stimulate public awareness, education, and participation in coastal management.

Policies:

a. Promote public involvement in coastal zone management processes;
b. Disseminate information on coastal management issues by means of educational materials, publish reports, staff contact, and public workshops for persons or organizations concerned with coastal-related issues, developments, and government activities; and
c. Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Discussion and Response:

The EA will be processed in accordance with Chapter 343, HRS, and opportunity for comment by agencies and the public will be provided. The project will meet all applicable rules and regulations pursuant to Chapter, 343, HRS concerning public awareness, education, and participation objectives. Please note that a series of community meetings were held with various community organizations to present the revised preliminary conceptual site plan for the proposed Ma`alaea Plantation subdivision project. The following meetings with representatives from the community organizations:

- Maui Tomorrow Foundation, Inc. – April 21st, June 13, 2014, and January 22, 2015
- Ma`alaea Community Association – May 3rd, September 27, 2014 and February 2, 2015
- Kihei Community Association – June 19, 2014
- Waikapu Community Association – June 9, 2014
- Joint Meeting with Kihei Community Association, Ma`alaea Community Association, and Sierra Club of Maui – July 3, 2014
- Joint Meeting with Maui Tomorrow Foundation, Inc., Ma`alaea Community Association, and Sierra Club of Maui – October 17, 2014, November 17, 2014, and June 10,2015

The purposes of these community meetings were to present the revised preliminary conceptual plan for the proposed project and to solicit input from the community and stakeholders. Input from these meetings have been reviewed by the applicant and the comments were incorporated, wherever feasible, as part of the preparation of the revised development

process for the proposed Ma`alaea Plantation rural and residential subdivision.

As noted earlier in this report, additional input opportunities will also be provided through the State and County 201H, HRS process and applicable land use entitlements permits processes.

V. Alternatives to the Proposed Action

V. ALTERNATIVES TO THE PROPOSED ACTION

The following is a discussion of the various alternative options that have been considered by the applicant as part of the planning process of the revised proposed Ma`alaea Plantation rural and residential subdivision project.

A. PREFERRED ALTERNATIVE

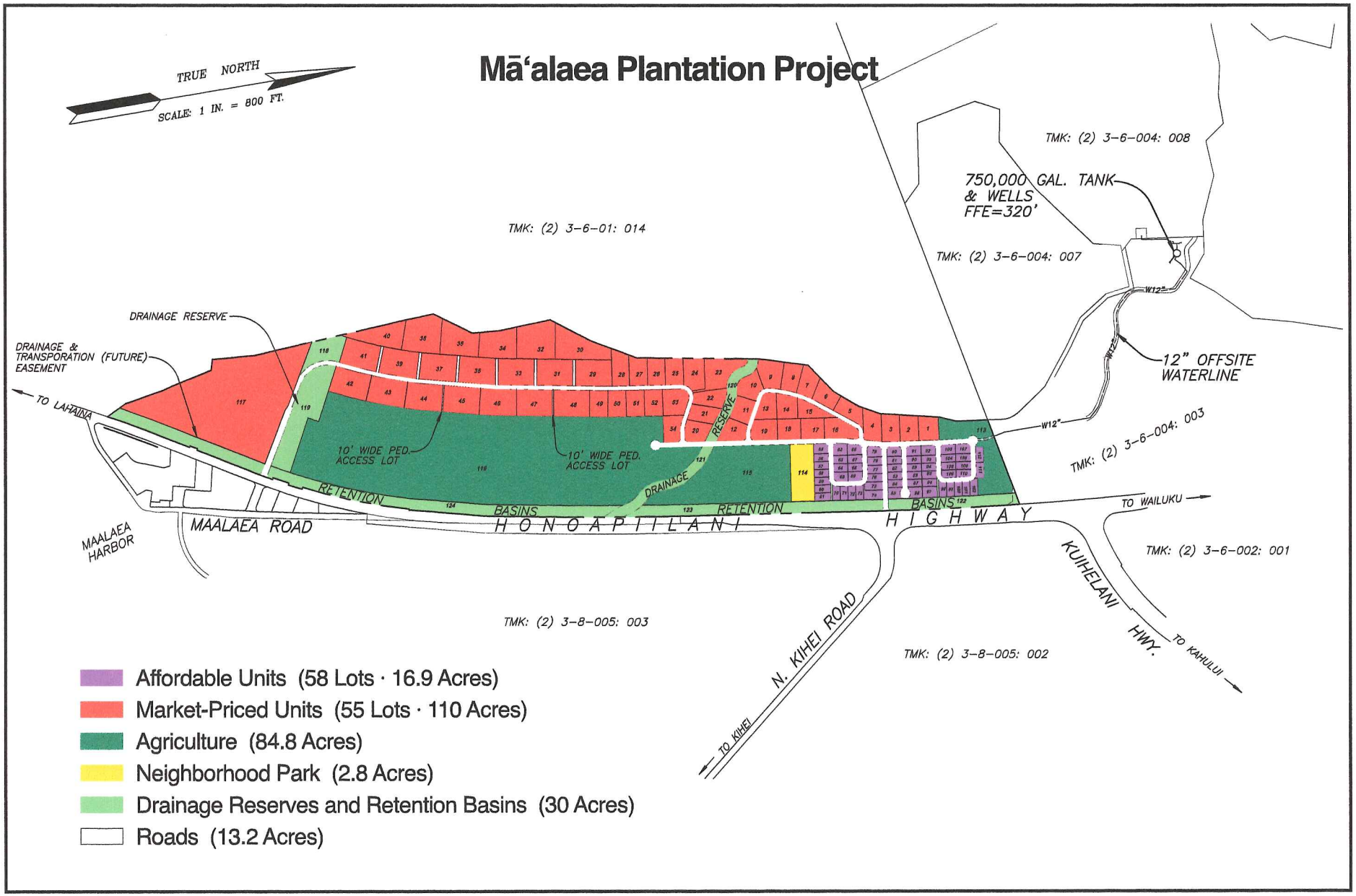
After a series of community meetings with various organizations and stakeholders and community input were considered, the proposed revised preliminary site plan (see Appendix C) represents the preferred alternative option for the proposed project. This alternative, covering approximately 257 acres, provides approximately 55 market-priced rural lots and 58 affordable residential housing units with the following lot summary:

Affordable Units (minimum lot size 10,000 s.f.):	16.9 acres
Market-Price Units (minimum lot size of 1 acre):	110 acres
Park:	2.8 acres
Drainage Reserves & Retention Basins	30.0 acres
Roads:	13.2 acres

As noted earlier in this report, the remaining portion (approximately 84.8 acres) of the project site will remain in agriculture for agricultural purposes and other allowable uses.

The revised preliminary site plan for the proposed Ma`alaea Plantation project represents the comments and suggestions received from a series of community meetings held during the preparation of the draft environmental assessment.

Mā'alaea Plantation Project



Preliminary Site Plan

BAGOYO
DEVELOPMENT CONSULTING GROUP

The preferred alternative seeks to address the concerns and comments received during the meetings held with various community organizations:

1. *Encourage the continuous use of the project site for small-scale agriculture.* MVI, LLC recognizes the importance of encouraging the use of the site for agricultural activities. As such, the proposed rural residential subdivision project will be consistent with the purpose and intent under Chapter 19.29.010, Maui County Code, Rural Districts, which allow small-scale agricultural uses of the project site.

2. *Maintaining the rural character of the project site.* MVI, LLC recognizes the importance of maintaining the rural character of the area. The proposed rural residential subdivision project represents the community desire to maintain the rural character of the area and to ensure that the view plain to West Maui Mountain is preserved.

3. *Provide low density development of the project site.* The proposed revised preliminary plan of the project site recognizes the community desire to limit the development of the project site with low density development which preserves the rural character of the area. The proposed revised plan consists of 55 market-priced rural lots and 58 affordable residential housing units which will substantially reduced from its earlier plan of 1100 residential housing lots and commercial project that the existing Project District 12 designation in the Kihei-Makena Community Plan currently allows.

4. *Provide affordable residential housing units within the proposed project.* The proposed revised preliminary site plan includes the

development of approximately 58 affordable residential housing units to help meet the demand for affordable residential units for Maui's residents within the region.

5. *Encourage community participation and input in the project development process.* Community meetings were held in the preparation of this draft environmental assessment and community input and comments were incorporated in the proposed plan, wherever feasible, and community input will continue to be encouraged and provided through the State and County 201H-38, HRS and SLUC district boundary amendment processes.

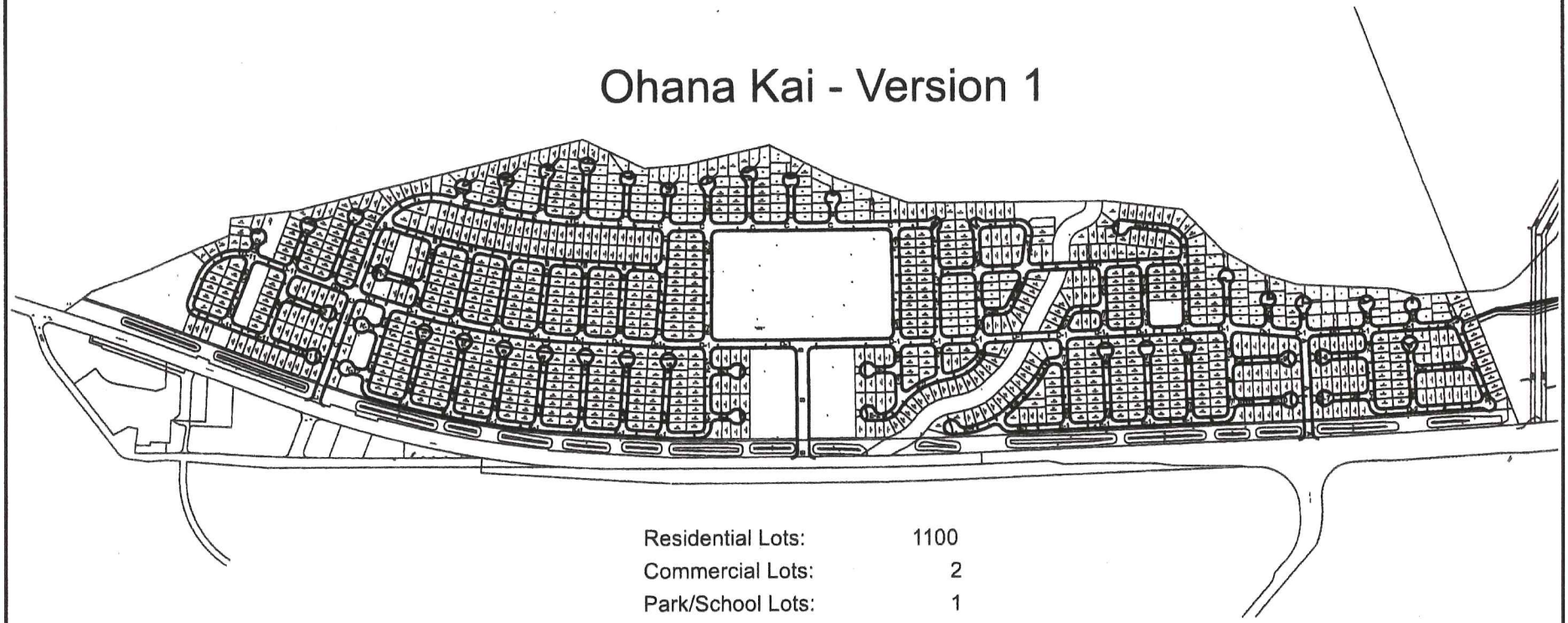
B. PREVIOUS DEVELOPMENT PLAN ALTERNATIVES

The project site was acquired by MVI, LLC on October 21, 2008 from the former owner Ma`alaea Properties, LLC. There are several conceptual plan versions that were considered for project site. Community meetings were held in preparation with the various plan versions. Several alternative land use layouts were initially presented for review and comments by the stakeholders and each of the alternative plans where concerns were raised regarding density and lack of preservation of the rural character of the area.

1. Ohana Kai – Version 1 – Conceptual "A"

This version, covering 257 acres, provides 1,100 housing units within a master-planned community that includes ancillary two commercial sites, parks, and public/quasi-public land uses and school site. An environmental impact statement was prepared for this conceptual plan. The adequacy of the FEIS for this proposed version was challenged by the plaintiffs, Ma`alaea Community

Ohana Kai - Version 1



Residential Lots:	1100
Commercial Lots:	2
Park/School Lots:	1

Conceptual Plan "A"

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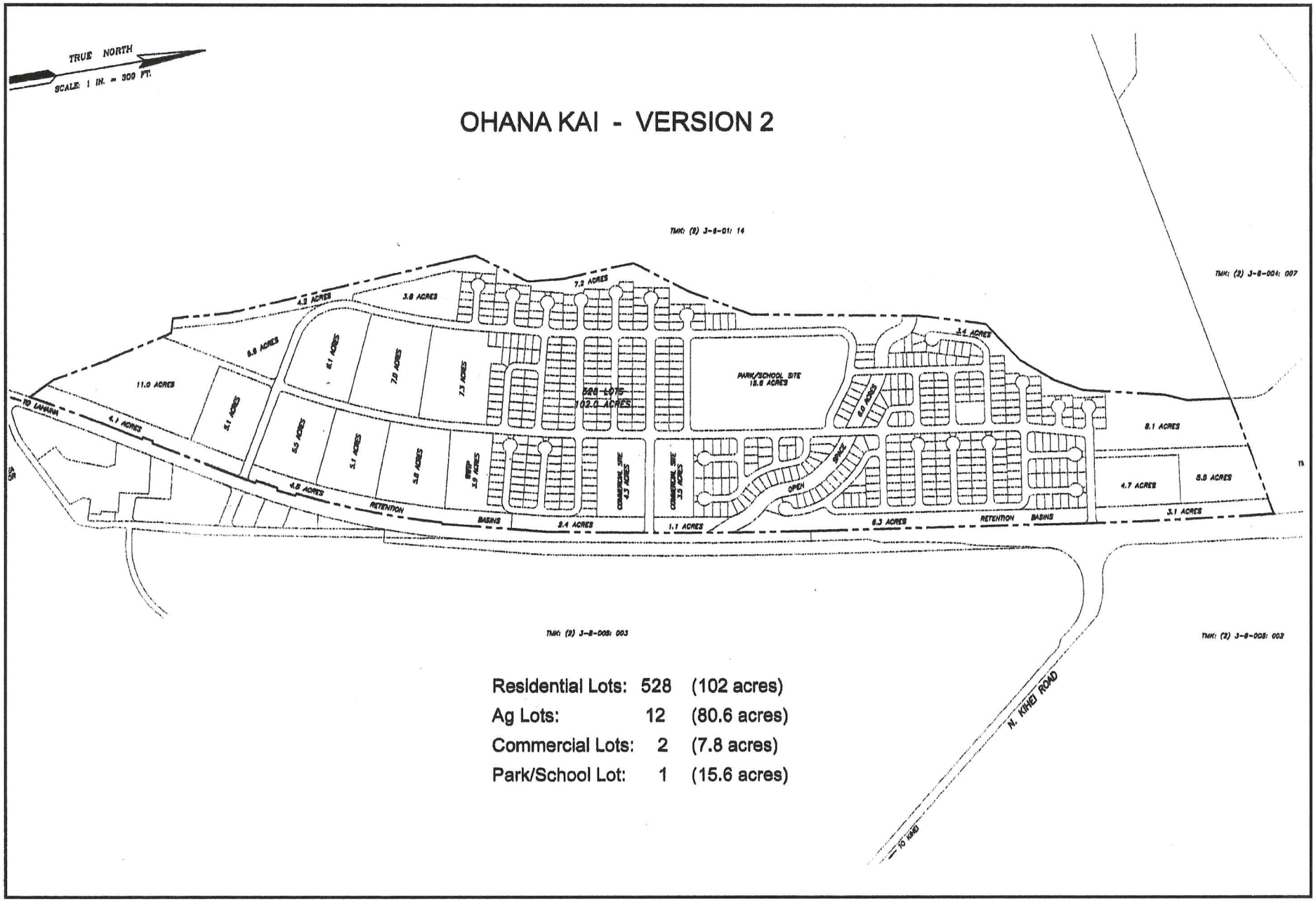
Association, and Maui Tomorrow foundation, Inc. The court in its decision dated April 19, 2011, found that the FEIS for Ohana Kai – version 1 project does not contain the content required by Haw. Admin. R. 11-200-23B or Haw. Rev. Stat. Chapter 343.

2. Ohana Kai – Version 2 _ Conceptual "B"

This alternative version is a modified version of Ohana Kai – version 1 covering 257 acres consisting of approximately 528 residential lots, 12 agricultural lots, 2 commercial sites, and park/school site. This alternative version plan has a much lower density than the version 1 alternative with proposed agricultural lots on the most southern part of the project site. The proposed agricultural lots were planned to provide a limited agricultural activities and to preserve the rural character of a portion of the project site. Similarly with conceptual "A", should the community and policy makers prefer this alternative, the owner may consider this option.

C. NO ACTION ALTERNATIVE

Under the "no action" alternative, the project site will not be developed for rural and residential use and the no action option would involve the continued under utilization of the 257-acre property. As noted in earlier in this report, the project area was once a dry native shrubland with scattered trees. It was cleared for agricultural use in the late 1800's and it was cultivated for sugarcane. During the 1990's pineapple was cultivated for a few years after which the area was leased out to small scale agriculture until 2003. For the past several years the land has been used for grazing. The subject property has been vacant and fallow for many years and has not been used for agricultural cultivation in recent years.



Residential Lots:	528	(102 acres)
Ag Lots:	12	(80.6 acres)
Commercial Lots:	2	(7.8 acres)
Park/School Lot:	1	(15.6 acres)

Conceptual Plan "B"

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With "no action" alternative would involve neither a commitment of resources nor any adverse environmental affects related to residential development. Under this option, there would be no additional demands on infrastructure or public services associated with project implementation. The no action alternative, however, it is not deemed appropriate given the need for residential housing lots for Maui's residents and allow small-scale agricultural use of the proposed rural residential lots. The proposed Ma`alaea Plantation rural and residential subdivision project responds to the need to address the shortage of residential subdivision for Maui's residents and to allow agricultural use of the site, and to preserve the rural character of the area. In addition, the proposed project includes the development of approximately 37 affordable housing units to help meet the demand for affordable housing for Maui's residents.

D. DEFERRED ACTION ALTERNATIVE

Similar to the no action alternative, the deferred action option is not deemed reasonable as it would not address the current demand for rural and affordable residential subdivision for Maui's residents. The proposed Ma`alaea Plantation residential project will also encourage the use of the site for small-scale agricultural uses and the keeping of animals and preserves the rural character of the area consistent with the purpose and intent pursuant to Chapter 19.29.010, Maui County Code. Additionally, the proposed affordable housing units will help meet the demand for affordable housing for Maui's working families and consistent with the intent and purposes of Chapter 2.96 of the Maui County Code.

E. AGRICULTURAL SUBDIVISION ALTERNATIVE

The applicant has evaluated the use of the project site as an agricultural subdivision alternative based on project site current land use designation.

Based on the sliding scale pursuant to Chapter 19.30.A.030, Agricultural Zoning, Maui County Code, this scenario will only produce approximately 21 agricultural lots consisting of minimum 2-acre lots subdivision. Under this scenario, a Community Plan amendment is required to establish land use consistency between County zoning and the Kihei-Makena Community Plan's land use designation, which is currently Project District 12 designation.

The applicant strongly believe that a reasonably-priced rural lots and affordable housing units will provide more opportunities for Maui's residents to own a residential lot to meet the housing shortage on Maui while preserving the rural character of the area. The use of the 257-acre parcel for agricultural subdivision will substantially limit the number of lots available for Maui's residents. Remaining portions of the project site (approximately 84.8 acres) will remain in agriculture for agricultural purposes and other allowable uses.

VI. Community Meetings

VI. COMMUNITY MEETINGS

A series of community meetings were held with various community organizations to present the revised preliminary conceptual plan for the proposed Ma`alaea Plantation rural and residential subdivision project. The following meetings with representatives from various community organizations:

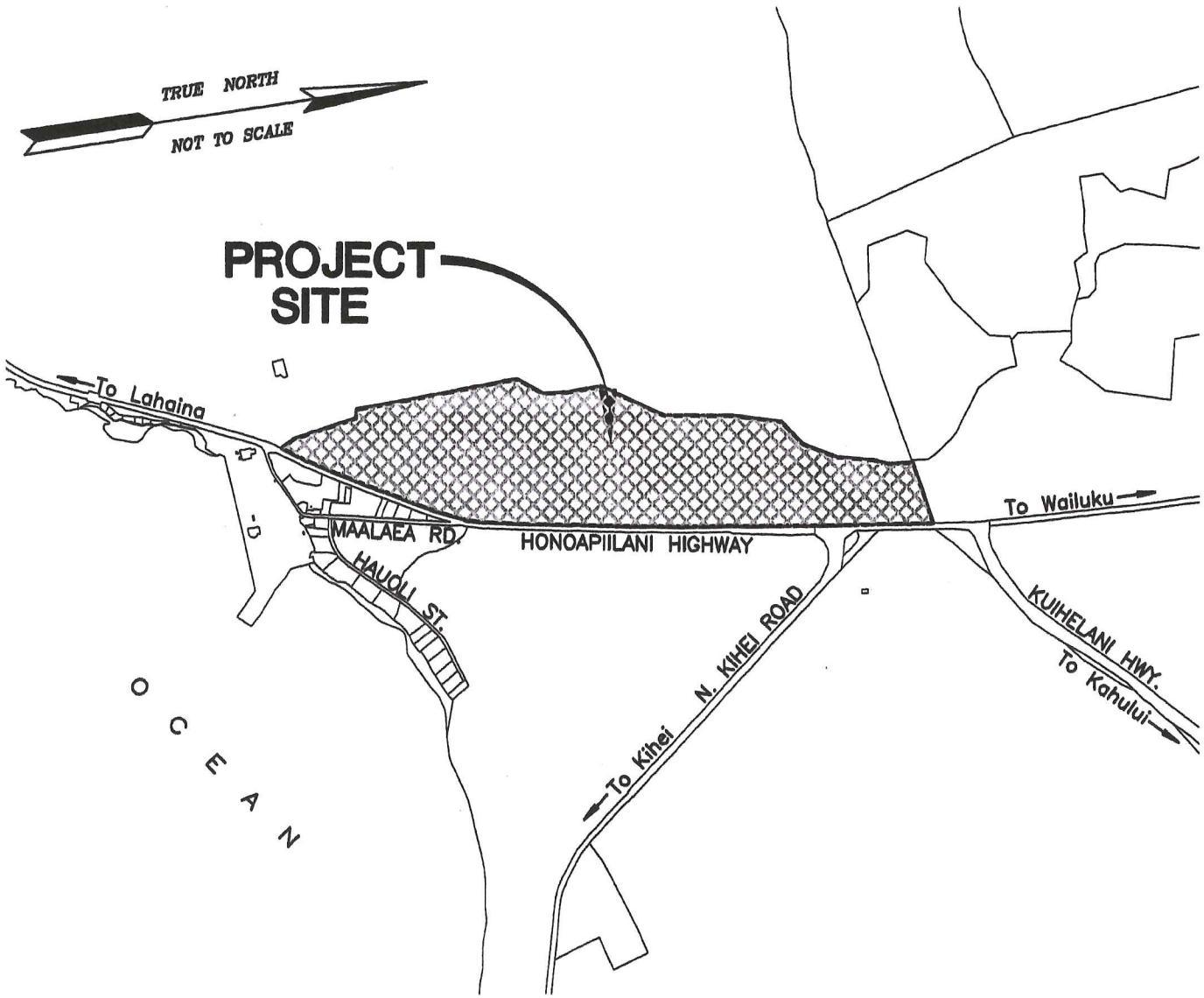
- Maui Tomorrow Foundation, Inc. – April 21st and June 13, 2014, and January 22, 2015
- Ma`alaea Community Association – May 3rd and September 27, 2014, February 12, 2015
- Kihei Community Association – June 19, 2014 and March 19, 2015
- Waikapu Community Association – June 9, 2014
- Joint Meeting with Kihei Community Association, Ma`alaea Community Association, and Sierra Club of Maui – July 3, 2014
- Met with former Vice-Chair of Maui County General Plan Advisory Committee (GPAC) – February 12, 2015
- Waikapu Community Association – March 9, 2015
- Joint Meeting with representatives of Ma`alaea Community Association, Maui Tomorrow Foundation Inc., and Sierra Club of Maui – June 10, 2015

The purposes of these community meetings were to present the revised preliminary conceptual plan for the proposed project and to solicit input from the community and stakeholders. Input from these meetings have been reviewed by the applicant and the comments were incorporated, wherever feasible, as part of the preparation of the revised development process for the proposed Ma`alaea Plantation rural and residential project.

The applicant noted during the community meetings that the revised preliminary plan is in response to community concerns that were raised regarding the density of the earlier proposed project at the site. It was also mentioned by the Applicant at the recent meeting held with representatives from various community associations that the proposed Ma`alaea Plantation project will be processed pursuant to 201H-38, Hawaii Revised Statutes. The new revised plan consists of approximately 55 market-priced rural lots and approximately 58 affordable residential housing units, which is substantially lower in density from its earlier proposed 1,100 housing lots and commercial project. The purpose of the revised preliminary plan is to substantially reduce the density and maintain the rural character of the area. The proposed rural residential lots is consistent with the purpose and intent under Chapter 19.29.010, Maui County Code, Rural District Zoning that is to provide low density development which preserves the rural character of certain areas; to allow small-scale agricultural uses and the keeping of animals and to serve as transition between standard residential or other urban density development and agricultural lands. The proposed revised project will accomplish this objective of preserving agricultural lands and at the same time providing housing needs for Maui's residents. In addition, the proposed project includes the development of affordable housing units to help meet the demand for affordable housing for Maui's working families and consistent with Chapter 2.96 of the Maui County Code. It was also suggested during the community meetings to use native plants for landscaping the green space and drainageways . Also, the applicant will continue to provide access to the Pali Trail through the project site. Finally, one of the key primary concerns of the community that were raised during the community meetings are the provision of injection wells that were initially proposed on the project's earlier plan. The applicant has since removed the injection wells from its revised plan and a treatment plant is no longer needed for the proposed project. Instead, IWS will be used for each individual lot and in compliance with all applicable rules and regulations set forth by the State Department of Health. IWS will be constructed by individual lot owners during the construction of individual dwelling units.

Appendix A

Vicinity Map



VICINITY MAP

Proposed Mā'alaea Plantation
Affordable Housing Project

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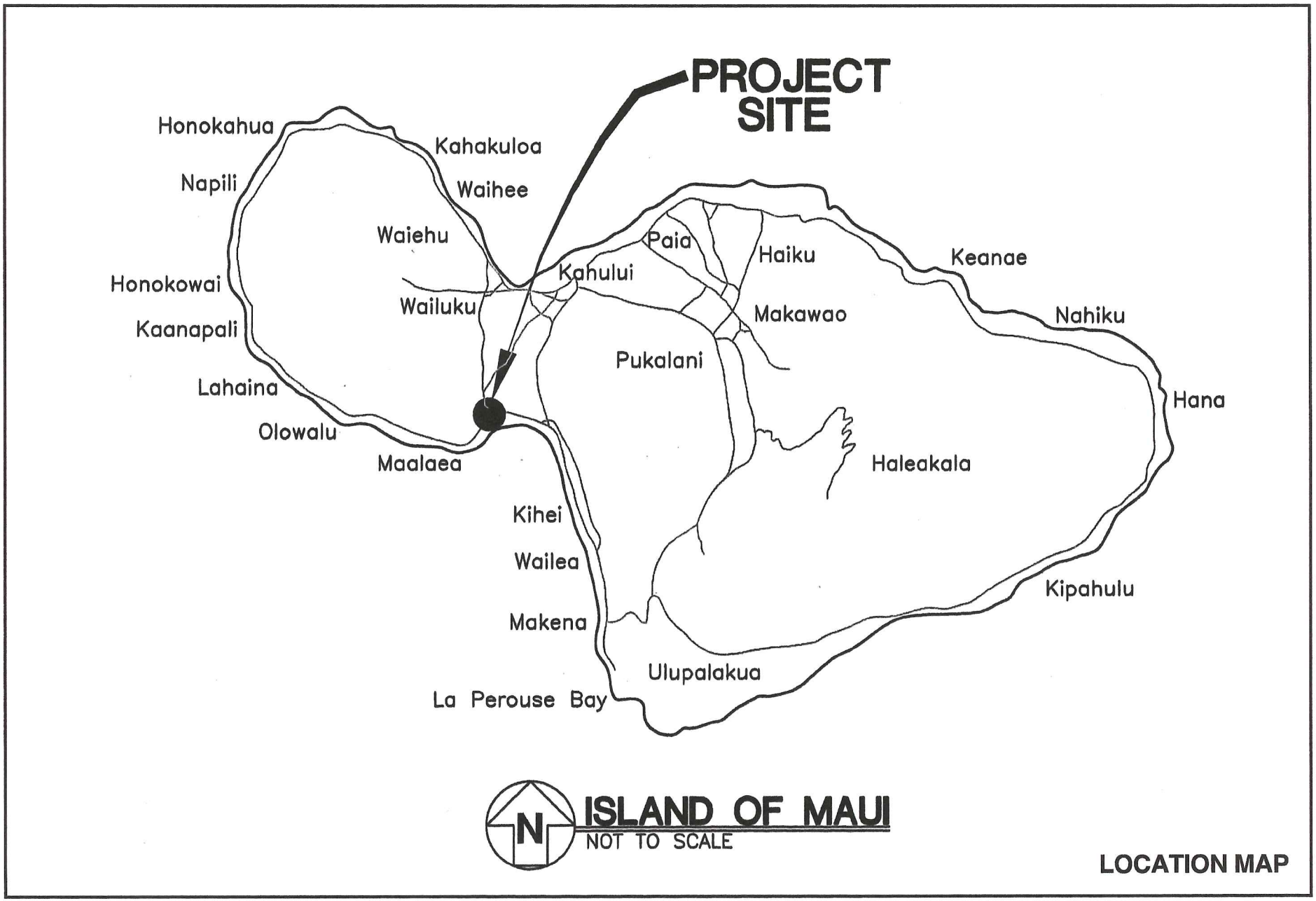
Appendix B

Location Map



LOCATION MAP

Proposed Mā'alaea Plantation Affordable Housing Project

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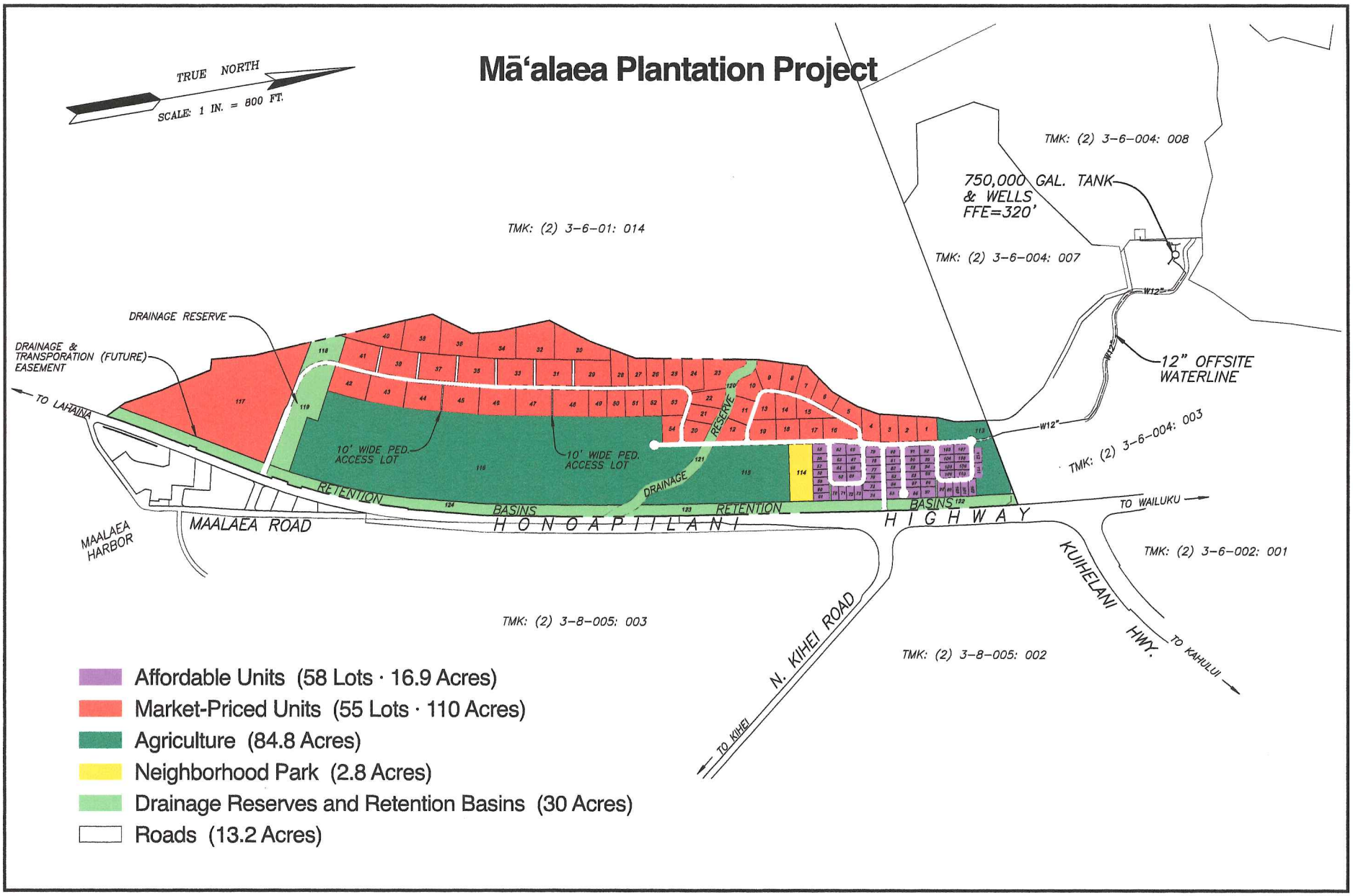
Appendix C

Preliminary Site Plan

Mā'alaea Plantation Project



Preliminary Site Plan

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Appendix D

Preliminary Engineering Report

PRELIMINARY ENGINEERING REPORT

FOR

MA`ALAEA PLANTATION SUBDIVISION

Ma`alaea, Maui, Hawaii

T.M.K.: (2) 3-6-001: 018

Prepared for:

MVI, LLC
P.O. Box 97
Kihei, Maui, Hawaii 96753

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HAWAII, U.S.A.

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December 2014

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PRELIMINARY ENGINEERING REPORT
FOR
MA`ALAEA PLANTATION SUBDIVISION
T.M.K.: (2) 3-6-001: 018

1.0 INTRODUCTION

The purpose of this report is to provide information on the existing infrastructure which will be servicing the proposed subdivision. 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) 3-6-00: 018, which contains a total of approximately 257 acres. It is bordered by unused agricultural lands to the north, Honoapiilani Highway to the east, and State conservation land to the south and west.

The proposed project consists of developing approximately 75 single family lots based on County rural zoning requirements (RU-1 and RU-5), with lot sizes ranging in size from 1.0 acre to 27.5 acres and 37 residential zoned lots. The remaining portions of the property will remain in agriculture for agricultural, drainage, park and other allowable uses. Proposed improvements include roadways, underground water, drainage, electrical, and telephone systems, and landscaping. The project will require the construction of a private offsite potable water system which includes an existing offsite water source and storage facilities. A minimum 100' wide buffer will be created along a majority of the Honoapiilani Highway right-of-way to set the lots back from the highway and to be used for drainage purposes.

2.0 EXISTING INFRASTRUCTURE

2.1 ROADWAYS

Honoapiilani Highway is the major arterial highway which links Wailuku and West Maui. It is a two-way roadway with varying widths of two and four lanes. In the vicinity of the project site, Honoapiilani Highway is a three-lane highway with two lanes in the northbound direction and one in the southbound direction.

Ma`alaea Road is a two-way, two-lane roadway, which loops onto Honoapiilani Highway along its makai side. It provides access to the apartments and residential areas along the Ma`alaea coastline and Ma`alaea Harbor. At its north terminus with Honoapiilani Highway, only right turn

movements are allowed northbound onto Honoapiilani Highway. At its south terminus, only right turn in and right turn out movements are allowed to and from the northbound lane on Honoapiilani Highway.

Kapoli Street runs perpendicular to the project site on the makai side of the highway and connects Honoapiilani Highway and Ma`alaea Road. It is a two-way, four-lane roadway. Honoapiilani Highway is signalized at its intersection with Kapoli Street. Kapoli Street is stop-controlled at its intersection with Ma`alaea Road.

2.2 DRAINAGE

The existing ground slopes in an northwest to southeast direction from elevation 210 feet above mean sea level at the north western corner of the property to elevation 40 feet at Honoapiilani Highway (southeastern boundary), with an average slope of approximately 6.5%. The project site is currently vacant and previously used for cultivating sugar by the Wailuku Agribusiness Company and more recently used by small independent farms along the northern portion of the project site.

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 soils within the project site are classified as Ewa Silty Clay (EsB), Ewa Cobbly Silty Clay (Etb), Pulehu Cobbly Clay Loam (PtB), and Stony Alluvial Land (rSM). Ewa Silty Clay, 3 to 7 percent slopes, is described as having very slow runoff with no more than slight erosion hazard. Ewa Cobbly Silty Clay and Pulehu Cobbly Clay Loam is characterized as having moderate permeability and slow runoff with a slight erosion hazard. Stony Alluvial Land is high in permeability and consists of stones, boulders, and soil deposited by streams along the bottom of gulches and on alluvial fans.

According to Panel Number 150003 0556F and 0558F of the Flood Insurance Rate Map, September 19, 2012, prepared by the United States Federal Emergency Management Agency, the subject parcel is situated in Flood Zone X. Flood Zone X represents areas outside the 0.2% annual chance floodplain. Two small portions of the parcel within two existing drainageways are designated in Flood Zone X with areas of 0.2% annual chance flood; areas of 1 % annual chance flood with average depths less than one foot or with drainage areas is less than one square mile; or areas protected by levees from 1% annual chance flood.

There are no drainage improvements within the project site, however there are several unnamed drainageways that traverse the site in the west to east direction which direct both onsite and offsite surface runoff towards Honoapiilani Highway. Outside of the project boundary to the north is the existing Pohakea Stream. Existing runoff from the project site does not flow in the direction of Pohakea Stream.

It is estimated that the present onsite runoff for a 100-year, 24-hour storm from the entire project site is approximately 534 cfs and approximately 115 acre-ft. of runoff volume. As previously mentioned, onsite and offsite runoff sheet flows in a west to east direction across the project site. When the runoff reaches the Honoapiilani Highway along the makai or eastern boundary it enters the State Department of Transportation (DOT) drainage system. The DOT drainage system consists of grated inlet catch basins and inlet headwall structures which intercept surface runoff along the highway shoulder and conveys it under the highway via six larger concrete box culverts and several smaller drainage culverts. From the makai side of the highway, runoff continues downstream through various drainage systems and ultimately discharges into Ma`alaea Harbor.

2.3 SEWER

There are no existing sewer systems on the subject property. The existing Ma`alaea community on the makai side of the highway such as the Ma`alaea Triangle Subdivision and the condominiums on Hauoli Street are serviced by independent private wastewater treatment facilities.

2.4 WATER

The project site is not currently serviced by any source of domestic water. There is irrigation water for the parcel which was previously used for the agricultural activities on the property.

There are three existing wells on the adjacent parcel (TMK: (2) 3-6-004: 003) constructed to serve as the source of domestic water for the project site. The wells are identified as Pohakea #1, 2, & 3 (State ID No. 4930-01, -02, & -03). A 750,000 gallon storage tank has been constructed at the well site to service the project site and is currently not in use. Department of Health approval is required for the existing wells and storage tank to be used for domestic purposes.

The adjacent Ma`alaea Triangle Subdivision and condominiums on the makai side of Honoapiilani Highway are serviced by the County water system. There is a 300,000 gal. storage tank at approximately elevation 220' located to the south of the project side on the adjacent State owned lands that services this area. The existing County facilities are not sufficient to service the proposed project.

2.5 ELECTRIC, TELEPHONE AND CABLE TV

There are overhead electrical and telephone lines along the east (makai) side of Honoapiilani Highway. Underground electrical and telephone service have been installed as part of the Ma`alaea Triangle Subdivision on that side of Honoapiilani Highway.

3.0 ANTICIPATED INFRASTRUCTURE IMPROVEMENTS

3.1 ROADWAYS

Access to the subdivision will be at two locations along Honoapiilani Highway. One will be at the existing signalized intersection with N. Kihei Road. The second will be at the existing signalized intersection with Kapoli Street. Traffic impacts on Honoapiilani Highway along the project frontage have been analyzed and mitigation measures that will be required include but are not limited to additional lanes, revised striping, and traffic signal modifications convert the two existing three-legged intersections to four-legged intersections.

The interior subdivision streets will have right-of-way widths between 40 ft. to 60 ft. based on the classification and proposed use, and will be improved to County standards. Appropriate striping and signage will be installed in accordance with the Department of Public Works standards.

3.2 DRAINAGE

It is estimated that the post development runoff from the project site for a 100-year 24-hour design storm will be 913 cfs and approximately 159 acre-feet of runoff volume, creating an increase of 292 cfs and 26 acre-feet of runoff volume.

Runoff from the project site will be collected by catch basins and roadside swales and conveyed to the onsite retention basins at the lower portion of the

property adjacent to Honoapiilani Highway. Overflow from the retention basins will be directed towards the existing drainage culverts along the highway to continue downstream along the existing drainage pattern at no greater than pre-development rates. The retention basins will be located within the 100' wide buffer strip along the highway and each basin will average approximately 60' wide. The total volume of the retention basins will be able to accommodate at least the increase in surface runoff volume due to the proposed development.

Three existing drainageways traversing the project site will remain in a natural condition except at road crossing where appropriate sized drainage culverts will be installed to allow runoff to continue downstream. The area around the drainageways will be graded such that it will not have the existing runoff rates increased by the addition of runoff from the subdivision improvements. When the drainageways reach the proposed buffer strip at the makai side of the project adjacent to the highway, the runoff will continue to flow into the State drainage system along the highway as is presently occurring. In addition to maintaining the natural vegetation within the drainageways, some areas adjacent to one of the drainageways will be improved as a passive park area creating additional green space within the subdivision. Surface runoff from the project site does not flow towards or into the existing Pohakea Stream which is outside and to the north of the project boundary.

Immediately mauka of the project site is State owned conservation land. The project is proposing discussions with the State to request utilizing a strip along the western boundary within the State land as a greenway, fire buffer and offsite retention area. If allowed, retention basins will be constructed near the existing drainageways to help reduce the offsite runoff from entering the project site and continuing downstream. The proposed improvements may also include a low berm along the property boundary as an additional measure to retain offsite runoff and direct overflow towards the existing drainageways prior to entering the project site.

The design intent of the project will be to limit the need for extensive grading as much as possible. There will be no mass grading of the individual lots as part of the subdivision improvements except for the proposed residential lots which will reduce the amount of disturbed area during the development of the subdivision. Individual lot owners will be responsible for

grading their own improvements but must adhere to the drainage plan that will be developed as part of the subdivision improvements. The subdivision retention basins will sized to accommodate the increase in storm water runoff for the developed lots therefore each lot will be allowed to connect to or discharge into the subdivision drainage system.

Development of the project will also include implementation of site specific best management practices (BMP's) during construction to provide erosion control and minimize impacts to downstream properties. BMP's which may be implemented would include, but is not limited to:

1. Prevention of cement products, oil, fuel, and other toxic substances from falling or leaching into the water.
2. Prompt and proper disposal of all loosened and excavated soil and debris material from drainage structure work.
3. Retention of ground cover until the last possible date.
4. Stabilization of denuded areas by sodding or planting as soon as possible.
5. Early construction of drainage features.
6. Minimize time of construction.

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."

3.3 SEWER

The proposed project consisting of 75 rural lots and 37 residential lots will generate an average of approximately 39,200 gallons per day of wastewater (See Appendix B). Each lot will be required to install their own individual wastewater system designed at the time of the individual lot improvements, meeting the requirements of the State of Hawaii, Department of Health. The subdivision will not construct any sewer systems, treatment facilities or injection wells.

3.4 WATER

The proposed plan is to construct a private water system in accordance with the State of Hawaii, Department of Health standards, to provide the necessary domestic and fire flow demands for the project. A second non-potable water system will be constructed to meet irrigation needs of the drainage reserves and agricultural lots. The water system consists of the three existing wells on the adjacent property at approximately elevation 350' which will be the source of

water for the system. The existing 750,000 gallon water tank will provide the necessary storage for both domestic and fire flow demands of the proposed subdivision. Approximately 2,600 feet of 12" waterline has been installed from the existing storage tank to the project site where the proposed potable distribution system will be constructed to service each lot and include the installation of fire hydrants at appropriately spaced intervals along the subdivision roadways.

Based on daily consumption estimates, the average daily demand for both potable and non-potable water for the proposed project is approximately 486,960 gallons per day (See Appendix C). This demand can be safely met by the use of two of the three existing wells operating at a time with the third on standby. It is also recommended that the pumps capacities be reduced to achieve stable salinity levels. Other modifications and improvements to the system are recommended, including but not limited to the construction of a reverse osmosis system. Based on a preliminary review of the water from the existing wells, approximately 50 percent of the pumped water will require treatment through the reverse osmosis system and be blended with untreated water to produce acceptable drinking water. The concentrate from the RO system will be used to irrigate the common areas of the project by means of the non-potable water system.

The maximum fire flow demand for the project will be based on the rural and residential development which requires 1,000 gallons per minute for a 2 hour duration with a maximum fire hydrant spacing of 350 feet. There are no existing fire hydrants within or along the project perimeter which can provide fire protection for the project, therefore all fire protection requirements will be met by the private water system within the subdivision.

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 Honoapiilani Highway or the adjacent developments on the makai side of the highway.

EXHIBITS

1 Location Map

2 Vicinity Map

3 Soil Survey Map

4 Flood Insurance Rate Map

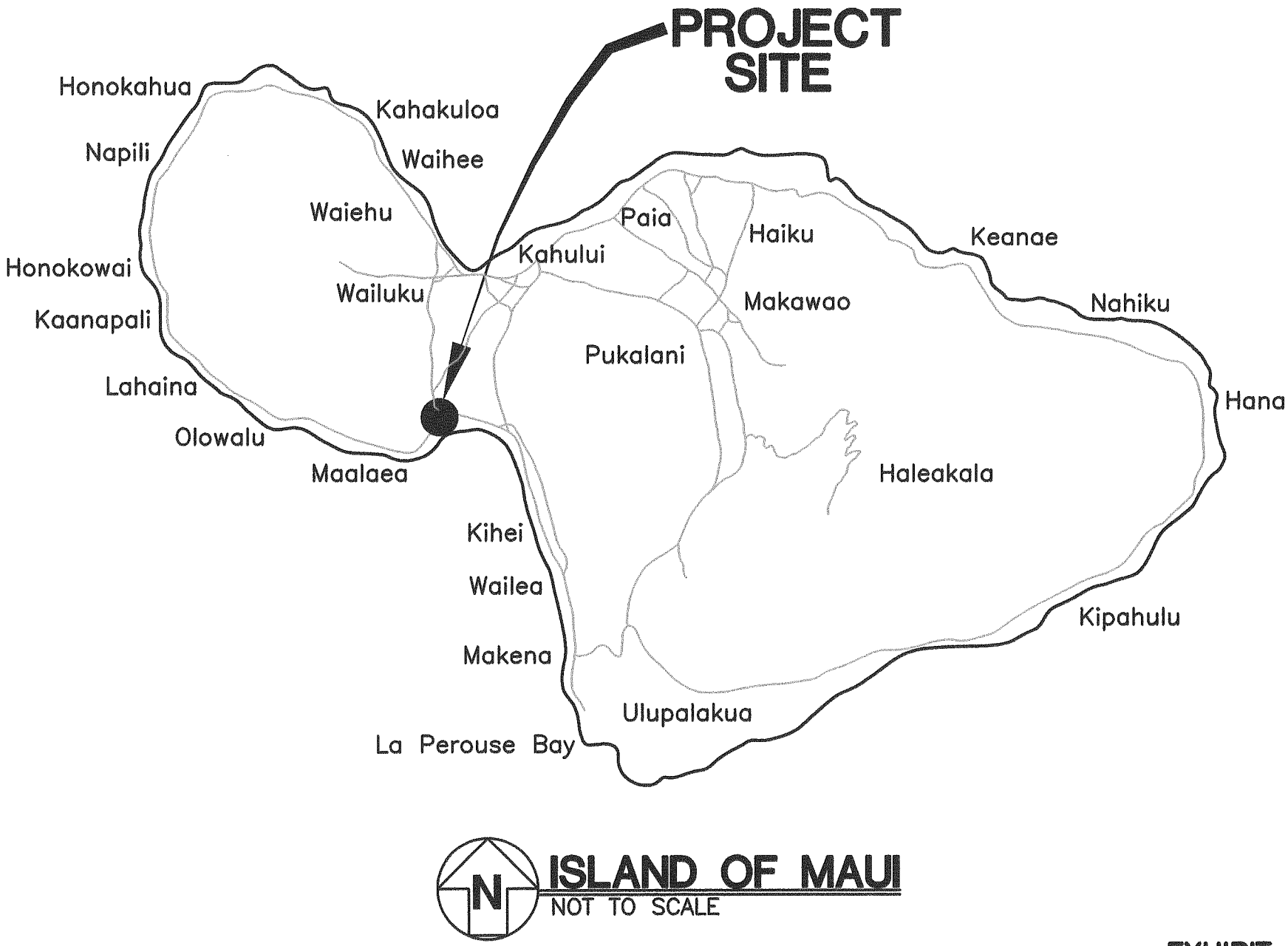
5 Preliminary Site Plan

6 Preliminary Grading Plan

7 Drainage Area Map

8 Retention Basin Exhibit

9 Regional Transportation Network (Maui Island Plan)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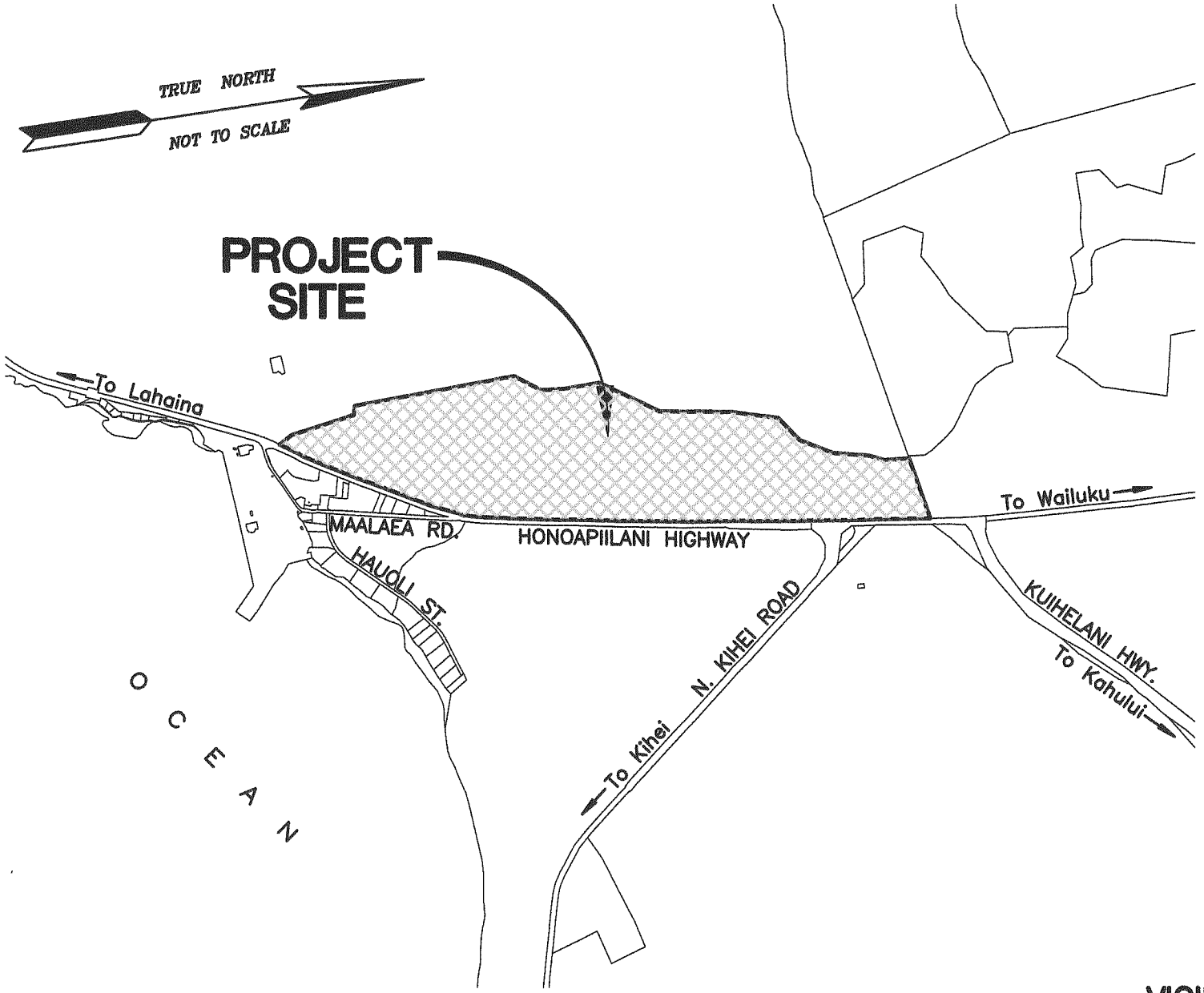
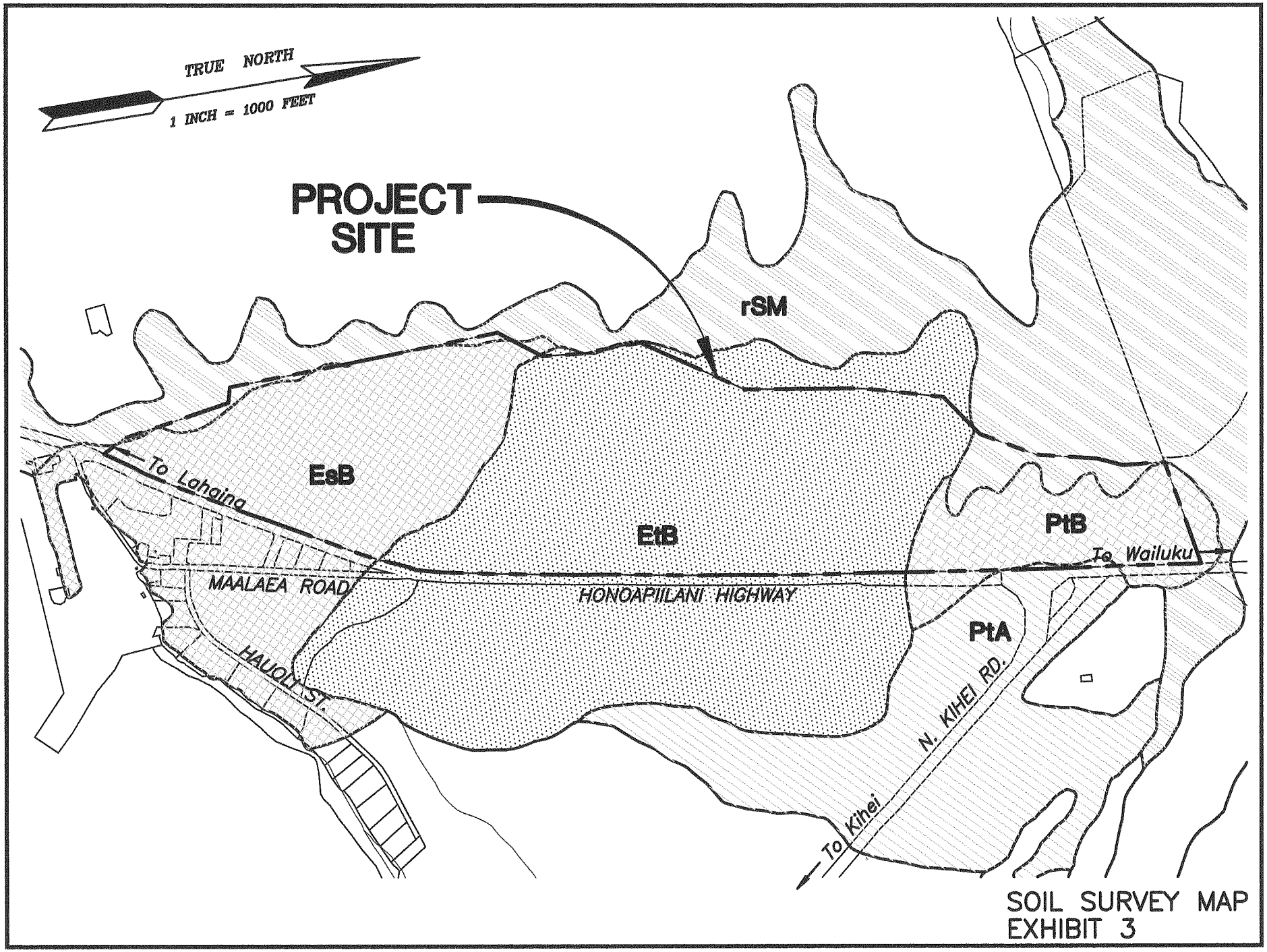
Honokahua
Napili
Honokowai
Kaanapali
Lahaina
Olowalu
Maalaea
Kahakuloa
Waihee
Waiehu
Wailuku
Kahului
Paia
Haiku
Makawao
Pukalani
Keanae
Nahiku
Hana
Haleakala
Kipahulu
Ulupalakua
Kihei
Wailea
Makena
La Perouse Bay
N
ISLAND OF MAUI
NOT TO SCALE

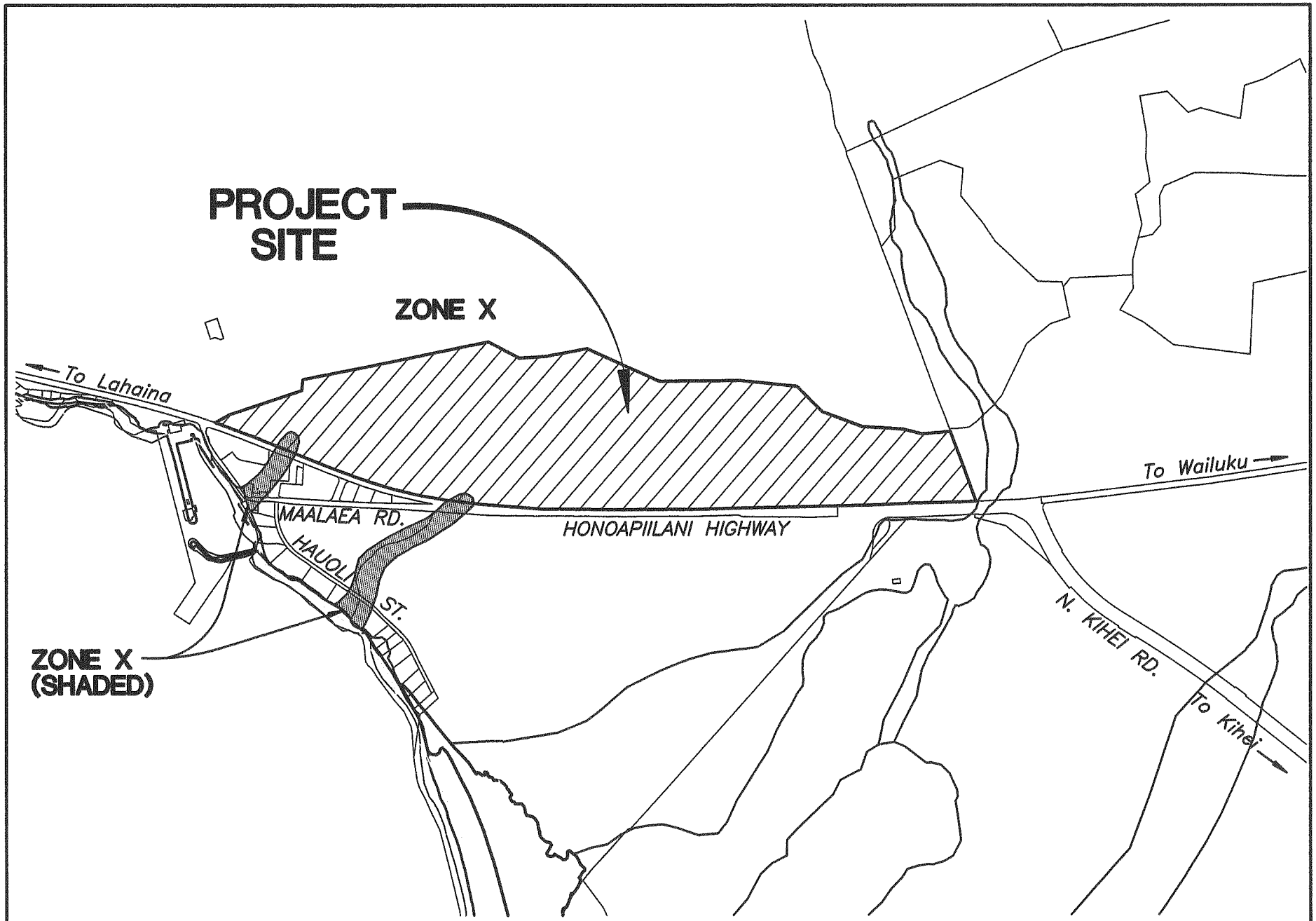
EXHIBIT 1



VICINITY MAP
EXHIBIT 2



SOIL SURVEY MAP
EXHIBIT 3



FLOOD INSURANCE RATE MAP
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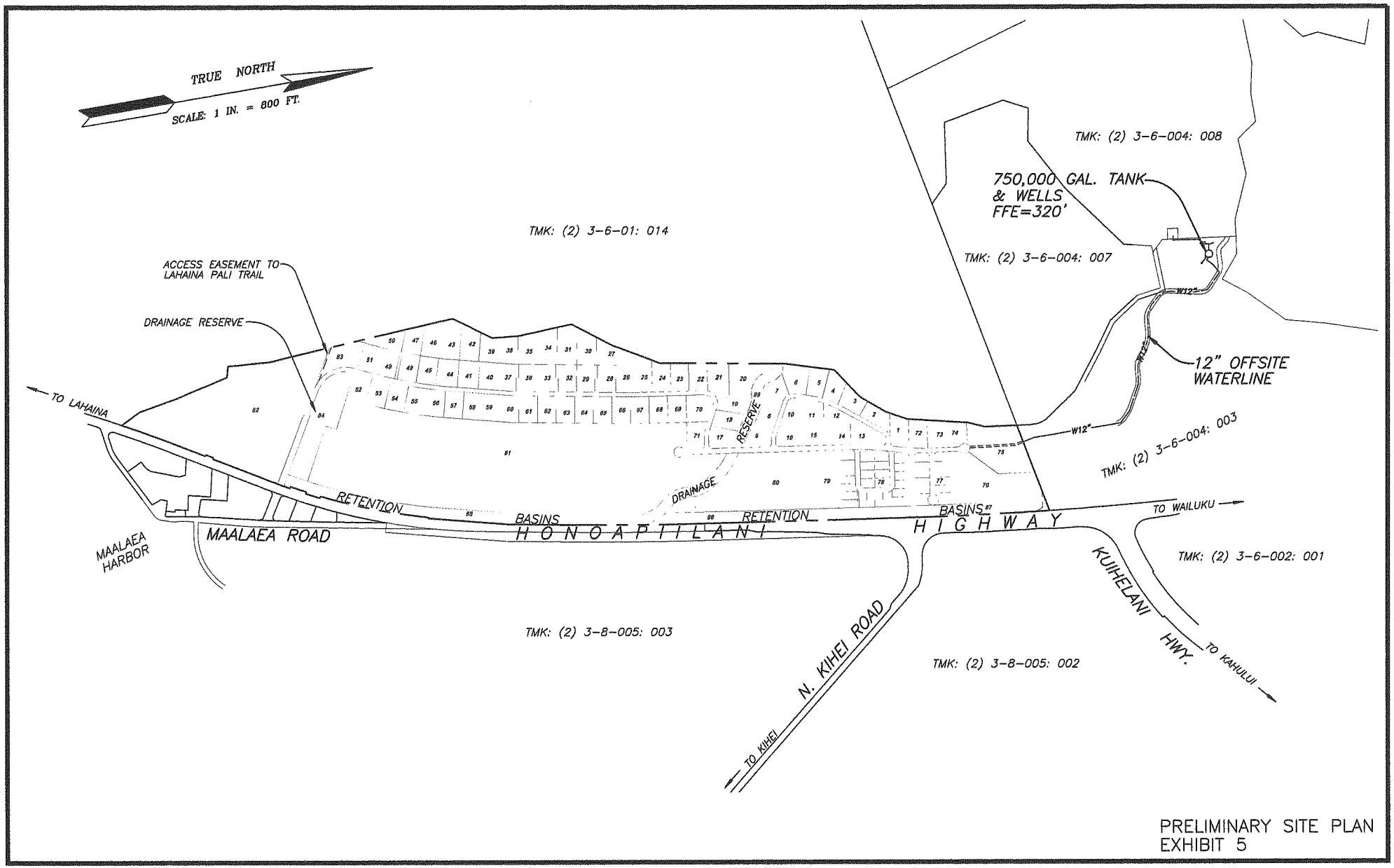
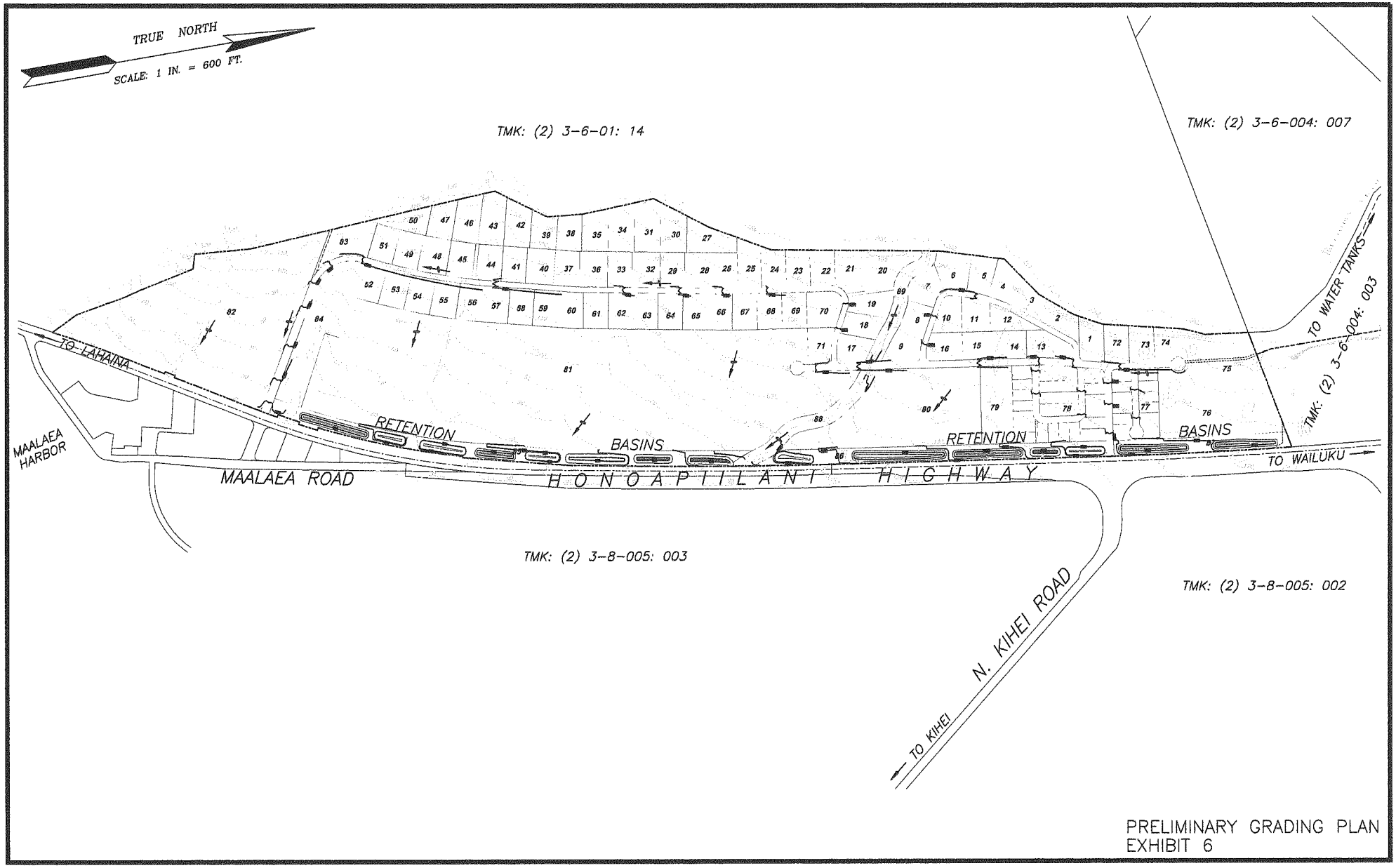
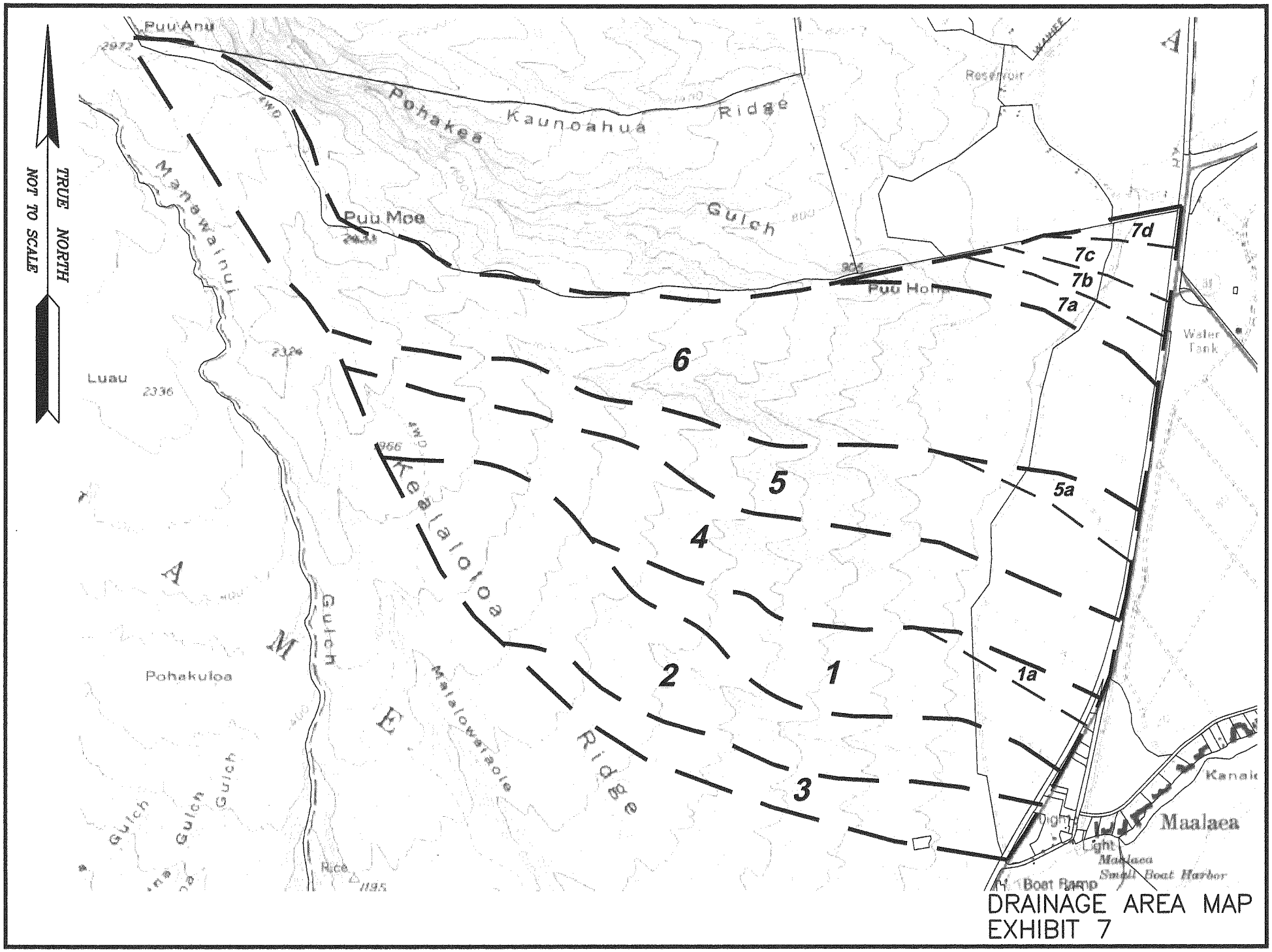


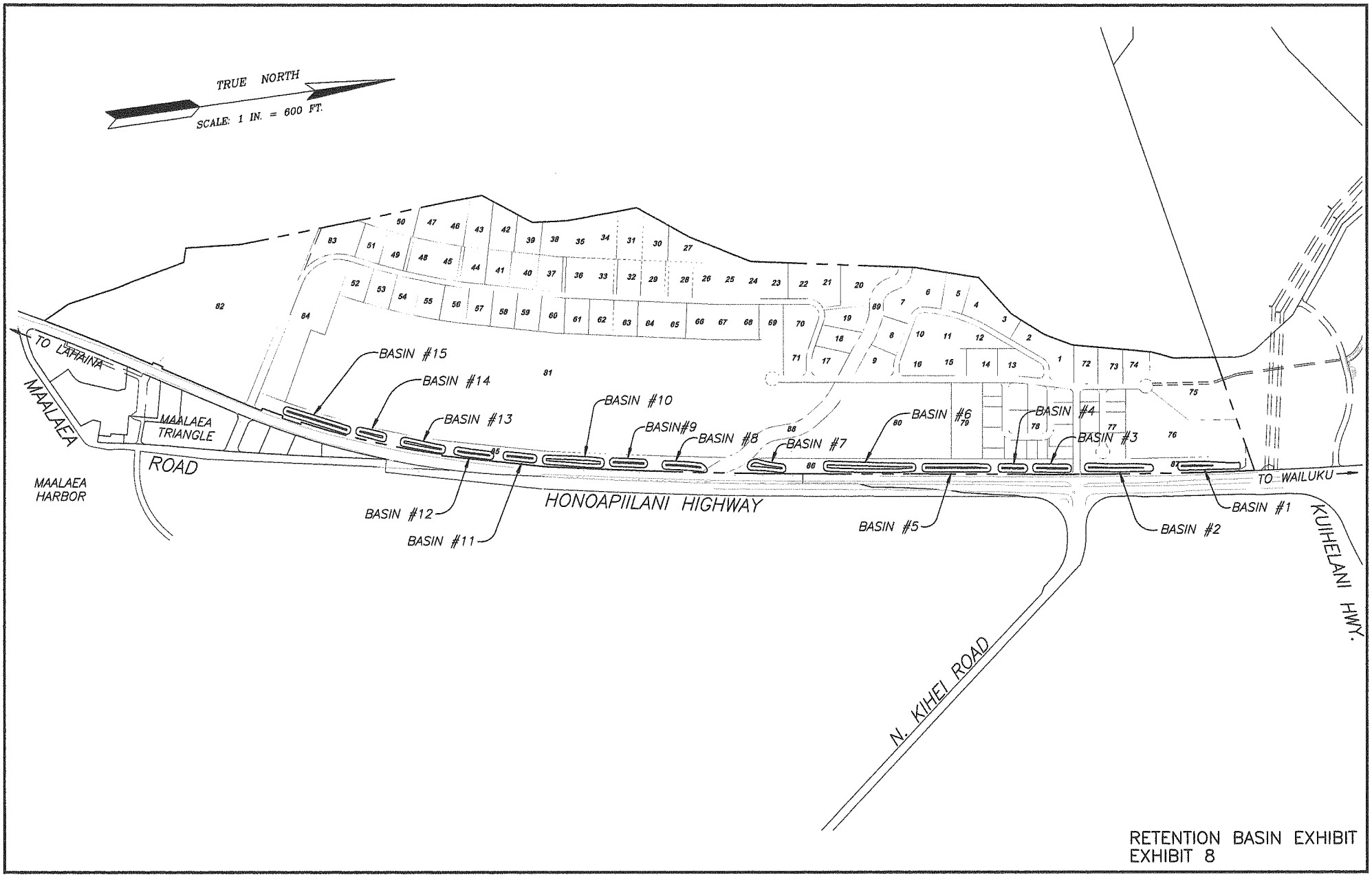
PRELIMINARY SITE PLAN
EXHIBIT 5



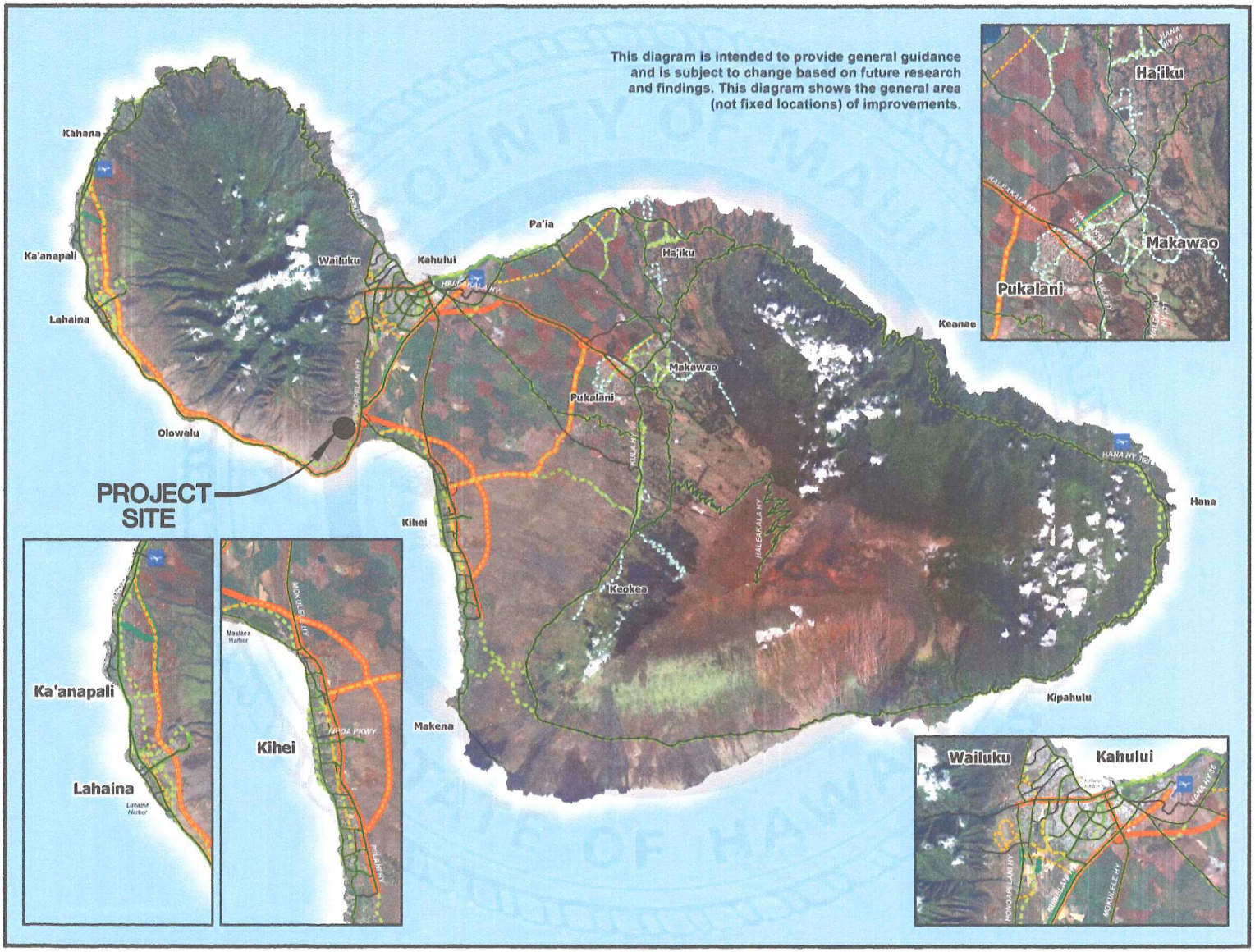
PRELIMINARY GRADING PLAN
EXHIBIT 6



DRAINAGE AREA MAP
EXHIBIT 7



RETENTION BASIN EXHIBIT
EXHIBIT 8



Regional Transportation Network

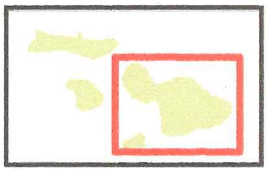
Island of Maui

Legend

- Primary Road
- Secondary Road
- Bike Path
- Airport

Proposed

- Conceptual Transit Station
- Conceptual Transit Corridor
- Lahaina Bypass
- Road or Highway
- Bike Path
- Upcountry Greenways Plan
- Maui Island Plan Greenways



Product Code: M-CET_20120020-in1
Copyright © September 20, 2012

This is not a zoning map. Please contact the Planning Department for Zoning confirmation.

Prepared By:
Long Range Planning Division
Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Diagram 6-1

EXHIBIT 9

APPENDIX A

HYDROLOGIC CALCULATIONS

HYDROLOGIC CALCULATIONS

Purpose: Determine the storage volume required to mitigate the increase in runoff due to the proposed improvements for a 100-year, 24-hour storm. See attached hydrograph calculations.

Runoff created by pre-development conditions = 621 cfs
Runoff Volume created by pre-development conditions = 133 acre-feet

Runoff created by post-developed conditions = 913 cfs
Runoff Volume created by post-development conditions = 159 acre-feet

The required storage volume for the project is 26 acre-feet

Surface runoff storage will be provided by the onsite retention basins, which will be sized to be greater than the increase in runoff volume generated by the development of the project to meet the requirements of the County drainage standards.

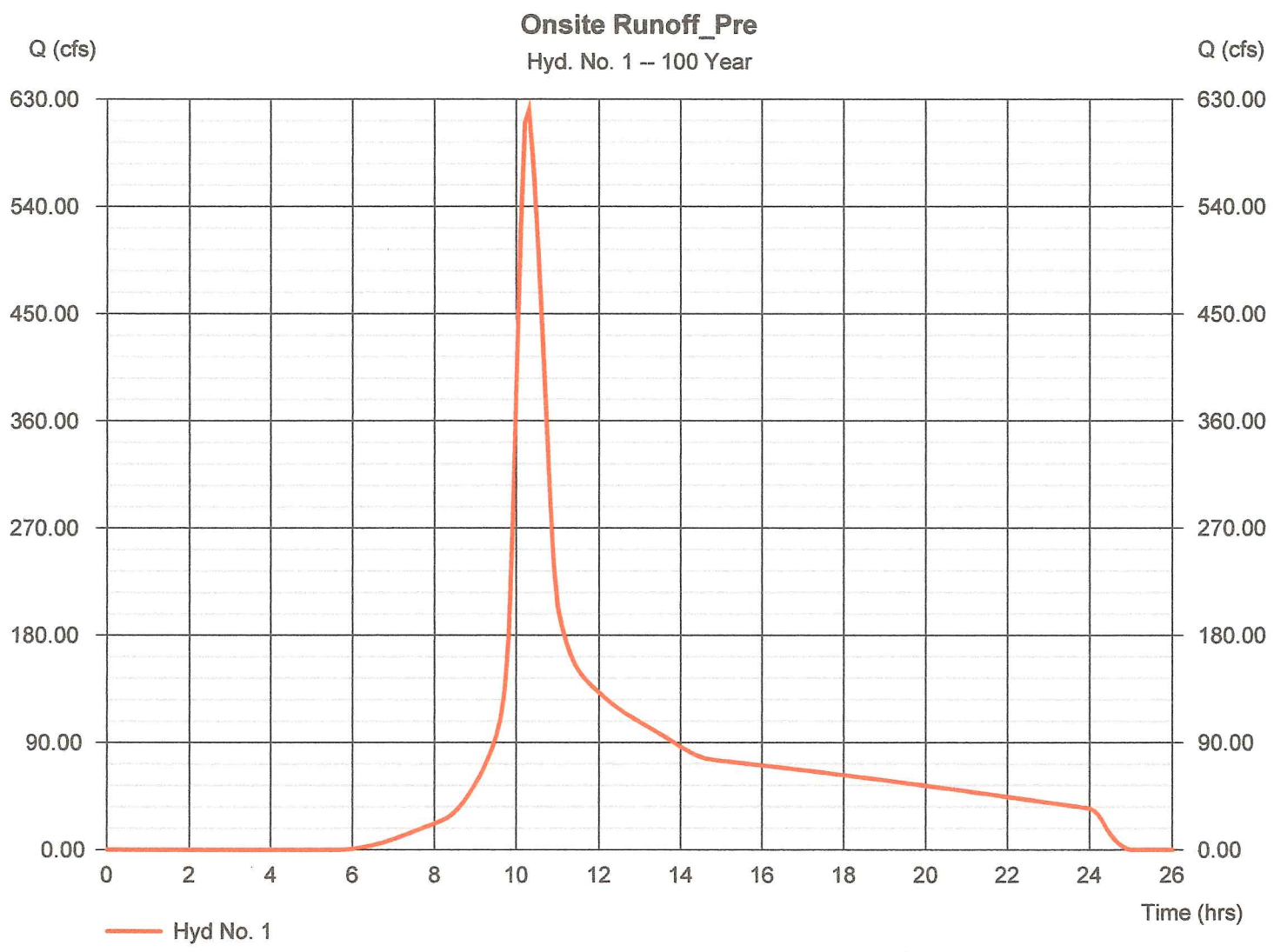
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 1

Onsite Runoff_Pre

Hydrograph type	= SCS Runoff	Peak discharge	= 621.38 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.30 hrs
Time interval	= 6 min	Hyd. volume	= 5,779,353 cuft
Drainage area	= 257.000 ac	Curve number	= 62
Basin Slope	= 6.5 %	Hydraulic length	= 1700 ft
Tc method	= LAG	Time of conc. (Tc)	= 31.42 min
Total precip.	= 11.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 2

Onsite Runoff_Post

Hydrograph type	= SCS Runoff	Peak discharge	= 912.75 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.10 hrs
Time interval	= 6 min	Hyd. volume	= 6,908,254 cuft
Drainage area	= 257.000 ac	Curve number	= 72
Basin Slope	= 6.5 %	Hydraulic length	= 1700 ft
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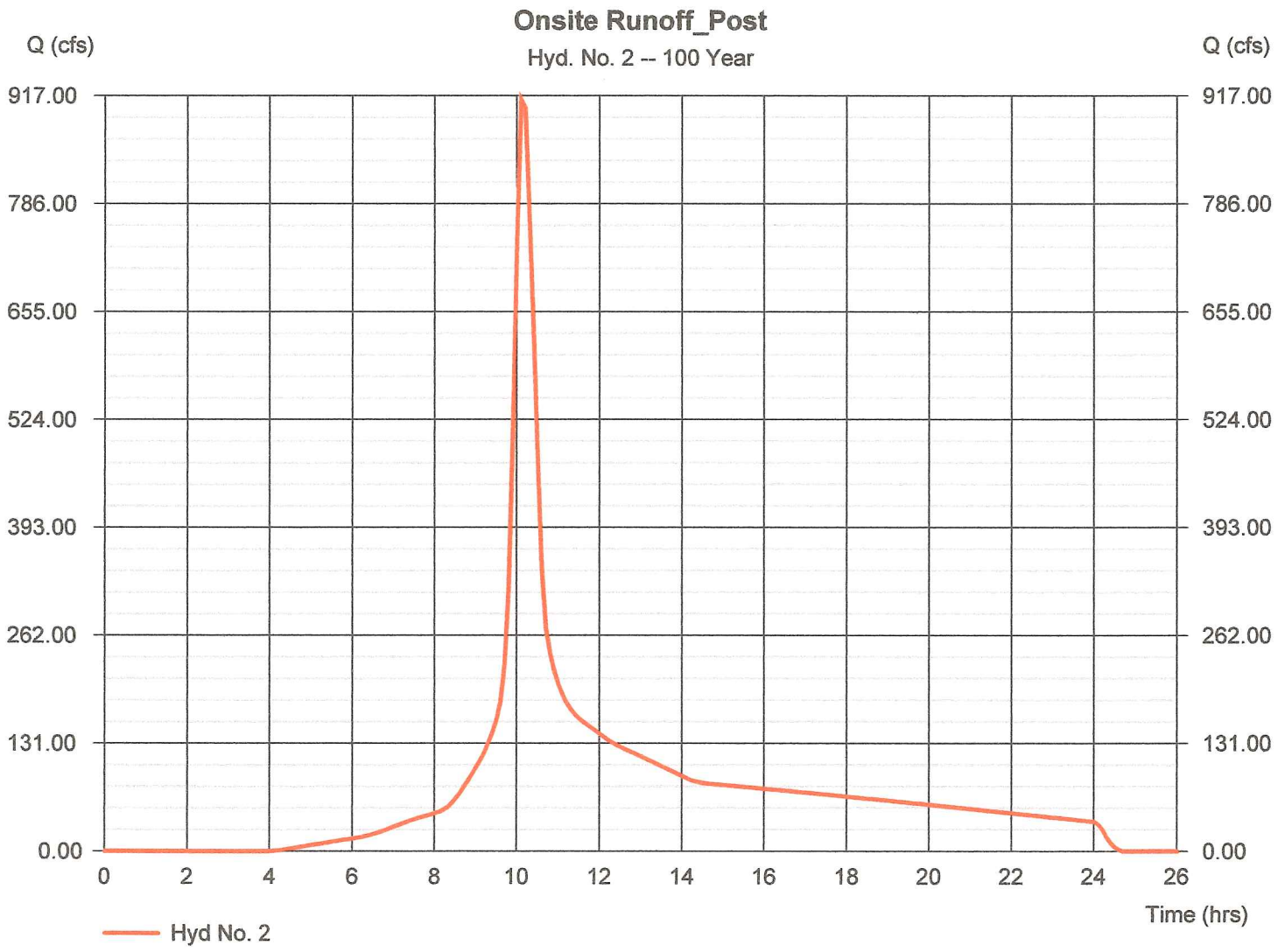
Storm duration	= 24 hrs	Shape factor	= 484



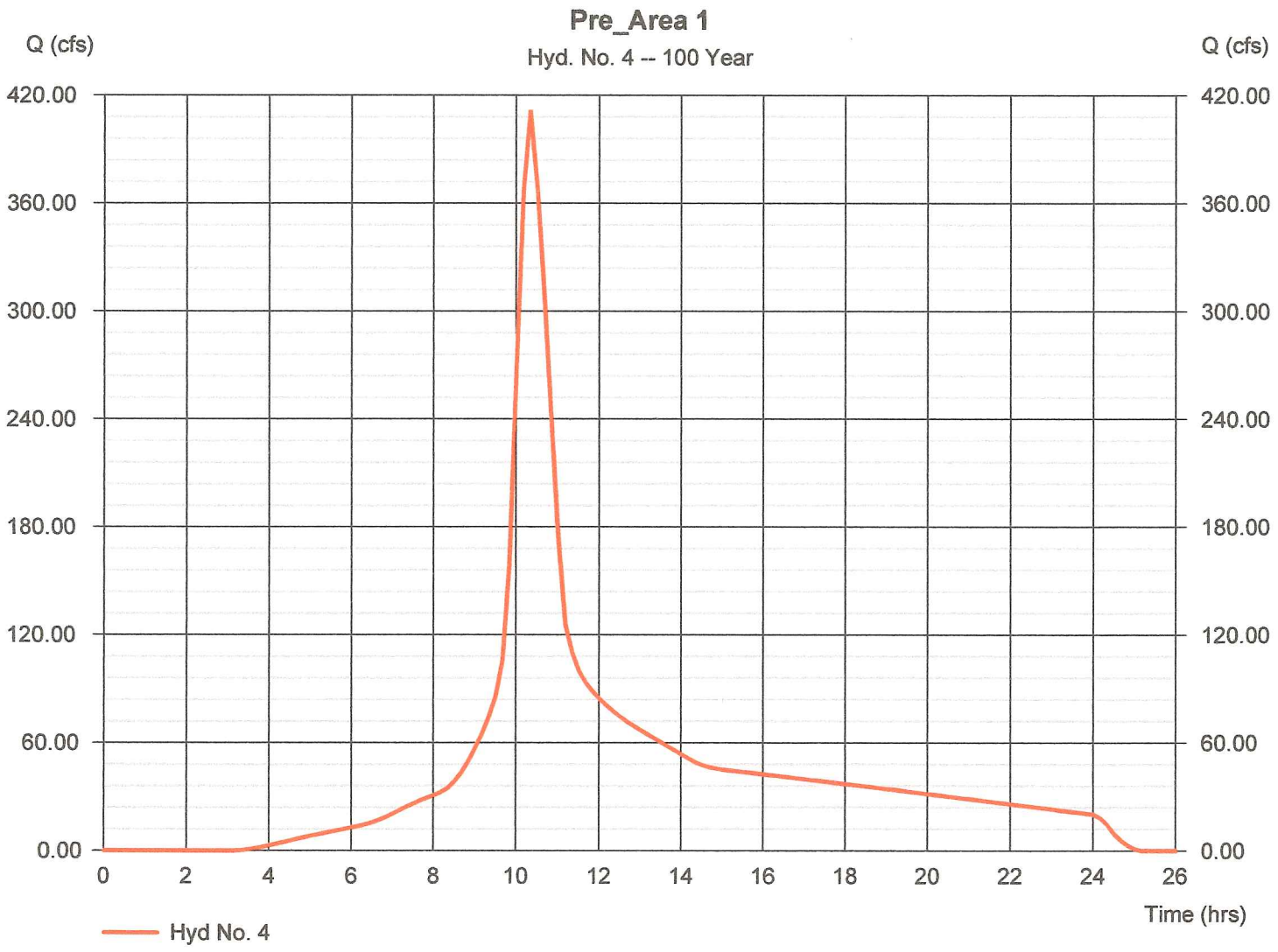
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 4

Pre_Area 1

Hydrograph type	= SCS Runoff	Peak discharge	= 411.84 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.33 hrs
Time interval	= 10 min	Hyd. volume	= 4,055,816 cuft
Drainage area	= 136.000 ac	Curve number	= 78
Basin Slope	= 18.8 %	Hydraulic length	= 7600 ft
Tc method	= LAG	Time of conc. (Tc)	= 39.55 min
Total precip.	= 11.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484



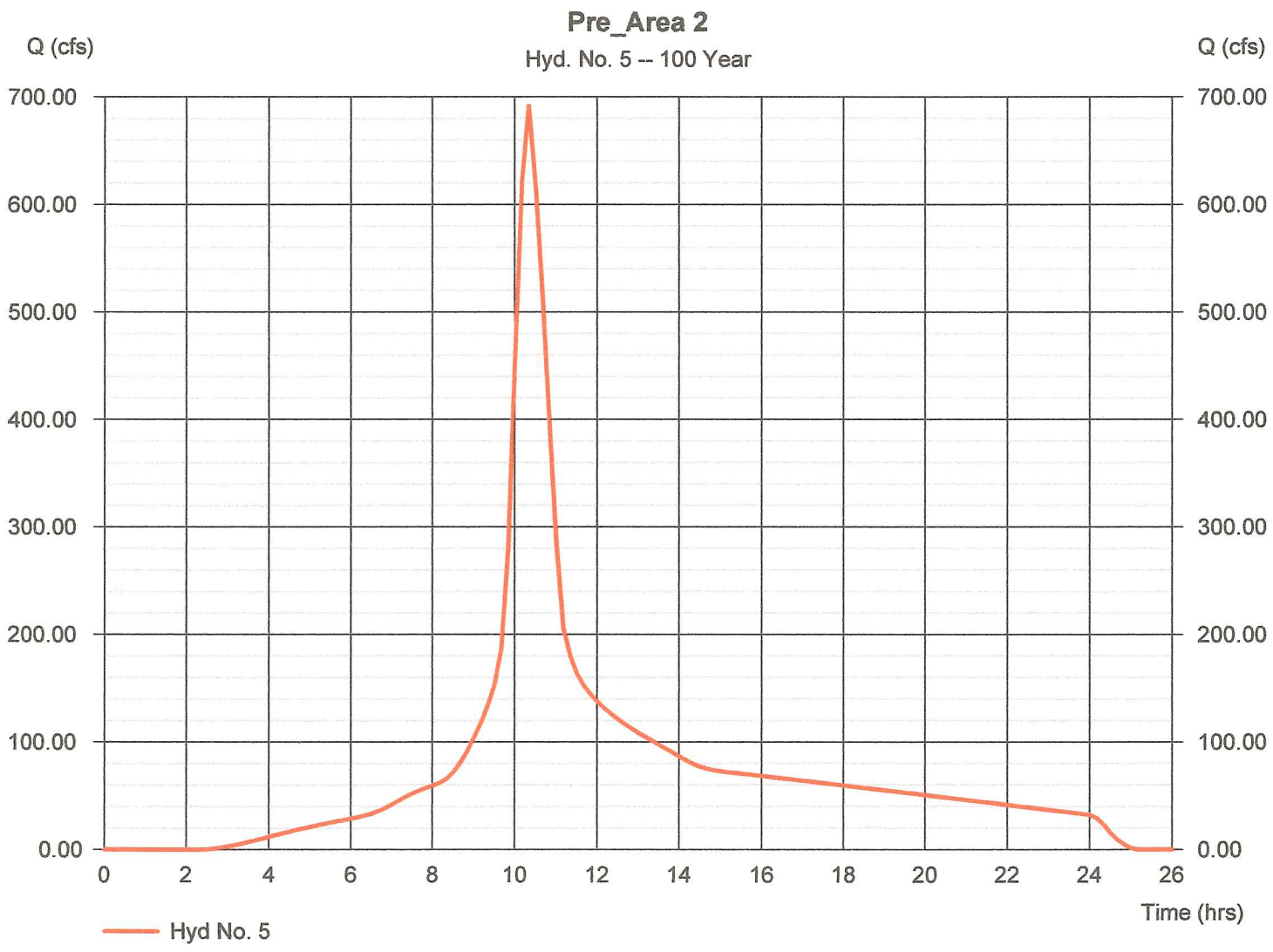
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 5

Pre_Area 2

Hydrograph type	= SCS Runoff	Peak discharge	= 693.19 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.33 hrs
Time interval	= 10 min	Hyd. volume	= 6,861,335 cuft
Drainage area	= 213.000 ac	Curve number	= 83
Basin Slope	= 19.4 %	Hydraulic length	= 9500 ft
Tc method	= LAG	Time of conc. (Tc)	= 39.74 min
Total precip.	= 11.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484



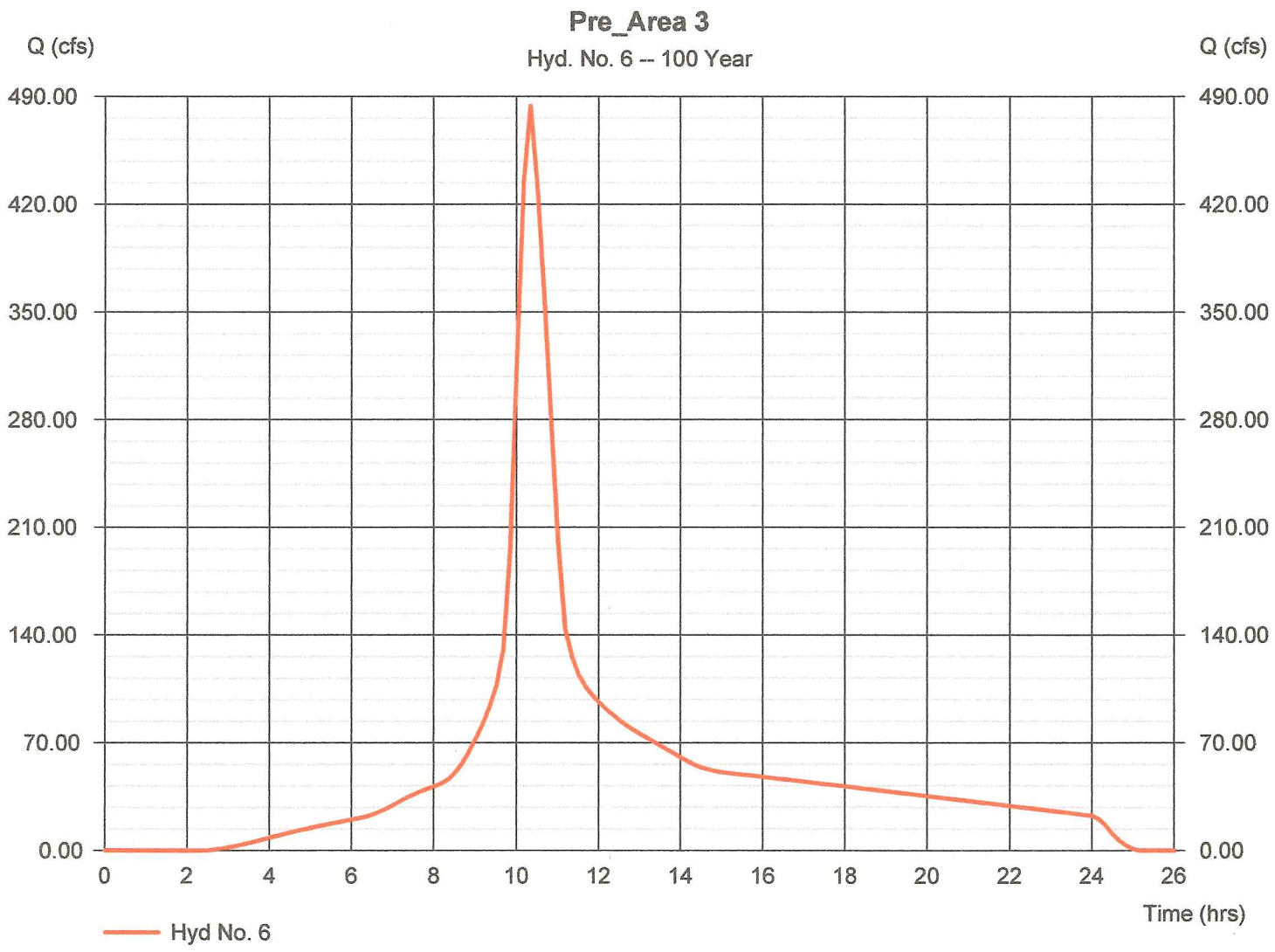
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 6

Pre_Area 3

Hydrograph type	= SCS Runoff	Peak discharge	= 484.90 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.33 hrs
Time interval	= 10 min	Hyd. volume	= 4,799,714 cuft
Drainage area	= 149.000 ac	Curve number	= 83
Basin Slope	= 18.4 %	Hydraulic length	= 10200 ft
Tc method	= LAG	Time of conc. (Tc)	= 43.19 min
Total precip.	= 11.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484



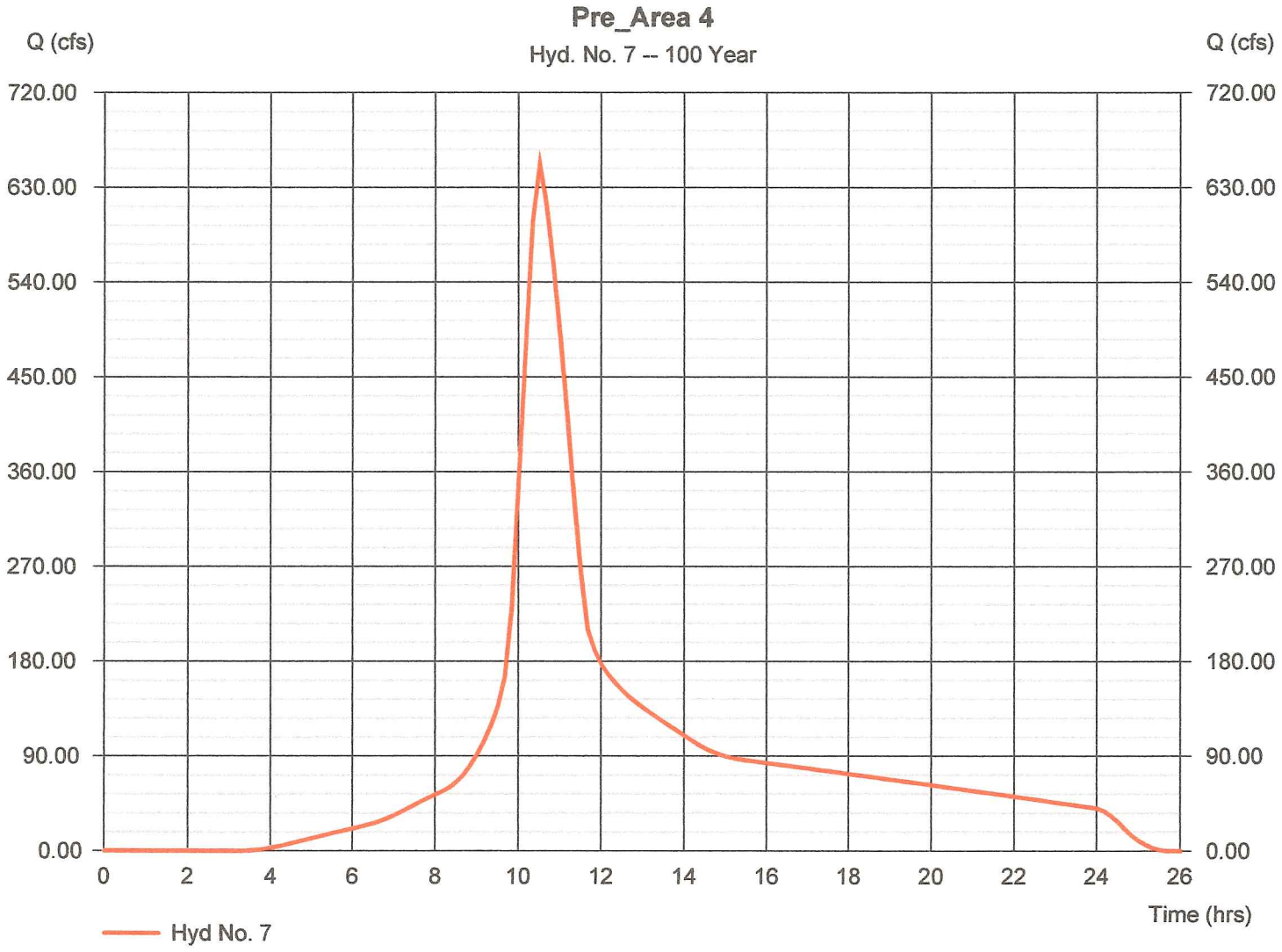
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 7

Pre_Area 4

Hydrograph type	= SCS Runoff	Peak discharge	= 652.25 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.50 hrs
Time interval	= 10 min	Hyd. volume	= 7,775,338 cuft
Drainage area	= 257.000 ac	Curve number	= 77
Basin Slope	= 18.3 %	Hydraulic length	= 10600 ft
Tc method	= LAG	Time of conc. (Tc)	= 53.90 min
Total precip.	= 11.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484



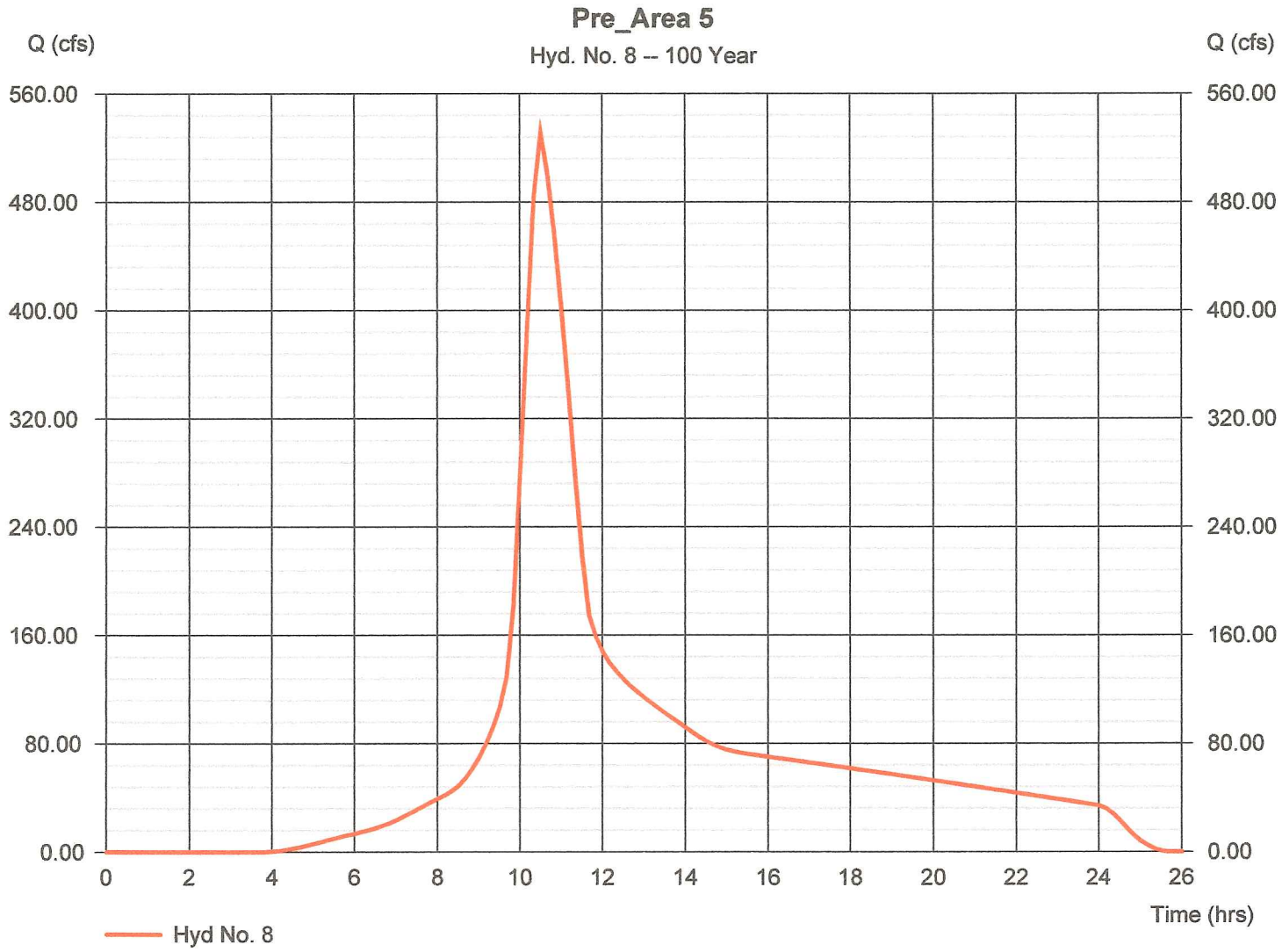
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 8

Pre_Area 5

Hydrograph type	= SCS Runoff	Peak discharge	= 531.24 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.50 hrs
Time interval	= 10 min	Hyd. volume	= 6,351,685 cuft
Drainage area	= 221.000 ac	Curve number	= 74
Basin Slope	= 20.6 %	Hydraulic length	= 11000 ft
Tc method	= LAG	Time of conc. (Tc)	= 57.02 min
Total precip.	= 11.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484



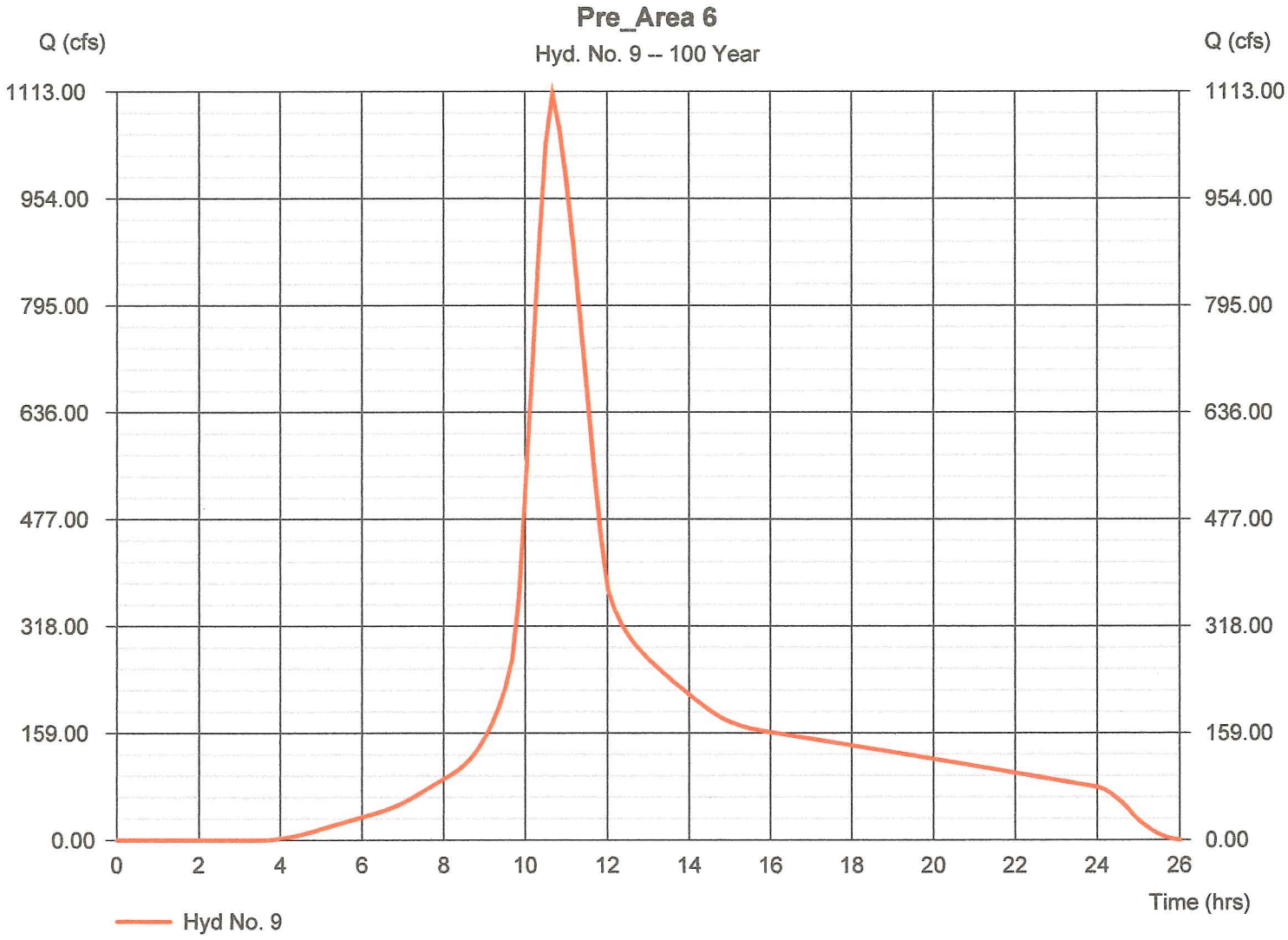
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 9

Pre_Area 6

Hydrograph type	= SCS Runoff	Peak discharge	= 1110.51 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.67 hrs
Time interval	= 10 min	Hyd. volume	= 14,627,170 cuft
Drainage area	= 520.000 ac	Curve number	= 76
Basin Slope	= 18.6 %	Hydraulic length	= 15300 ft
Tc method	= LAG	Time of conc. (Tc)	= 73.77 min
Total precip.	= 11.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 10

Pre_Area 7

Hydrograph type	= SCS Runoff	Peak discharge	= 194.34 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.33 hrs
Time interval	= 10 min	Hyd. volume	= 1,961,384 cuft
Drainage area	= 84.000 ac	Curve number	= 65
Basin Slope	= 18.6 %	Hydraulic length	= 4200 ft
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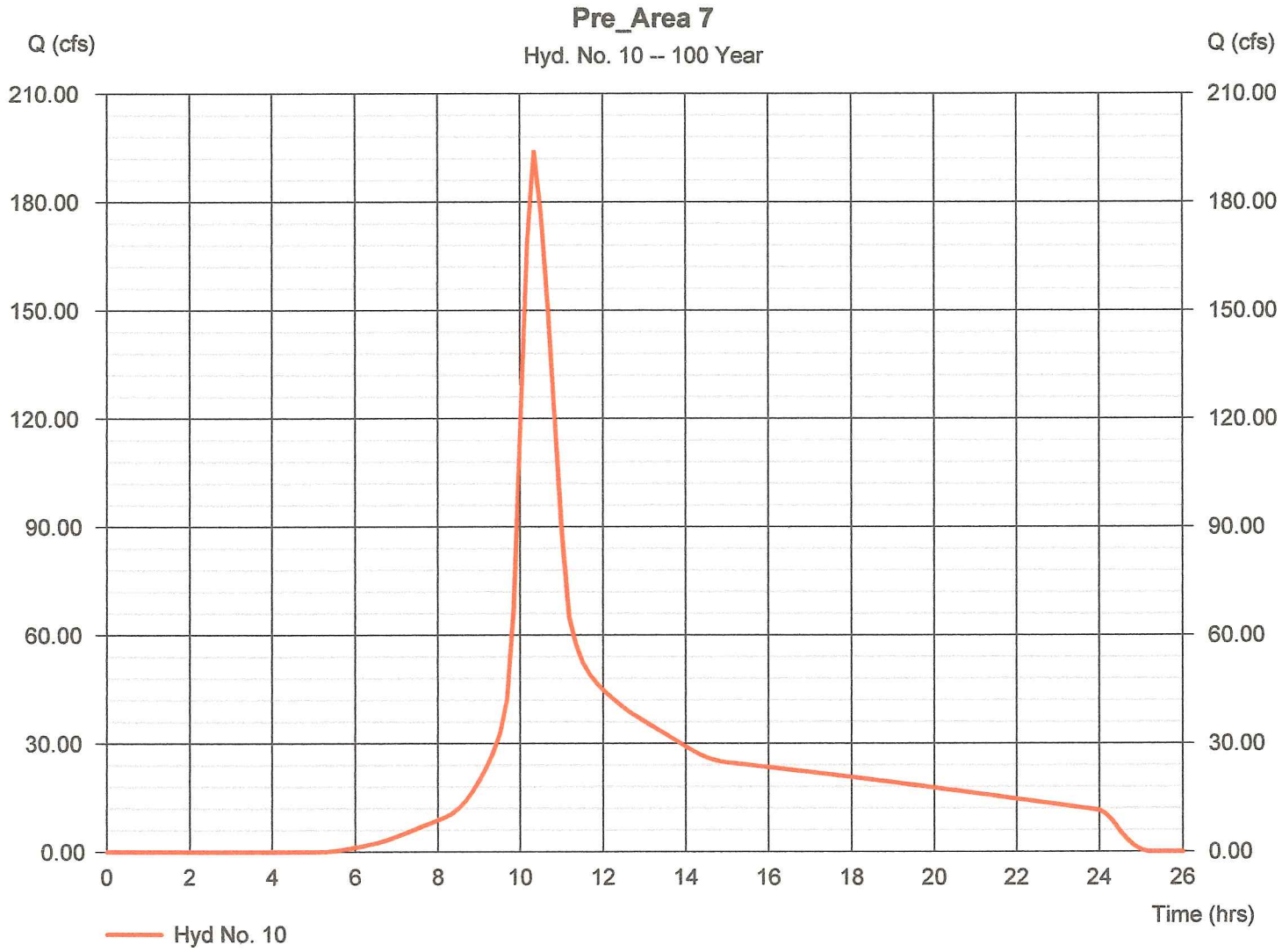
Total precip.	= 11.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484



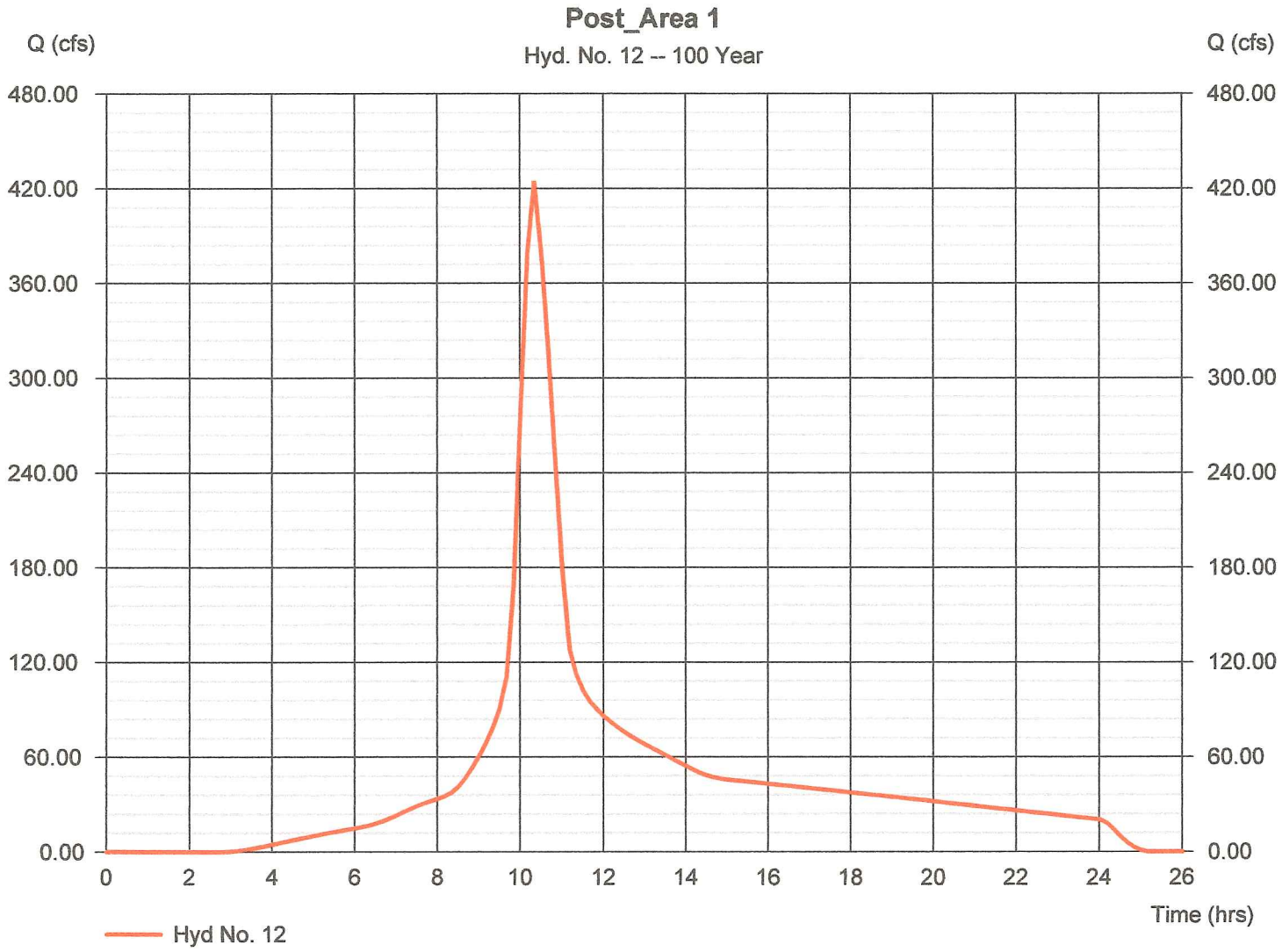
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 12

Post_Area 1

Hydrograph type	= SCS Runoff	Peak discharge	= 424.70 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.33 hrs
Time interval	= 10 min	Hyd. volume	= 4,186,746 cuft
Drainage area	= 136.000 ac	Curve number	= 80
Basin Slope	= 18.8 %	Hydraulic length	= 7600 ft
Tc method	= LAG	Time of conc. (Tc)	= 37.20 min
Total precip.	= 11.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484



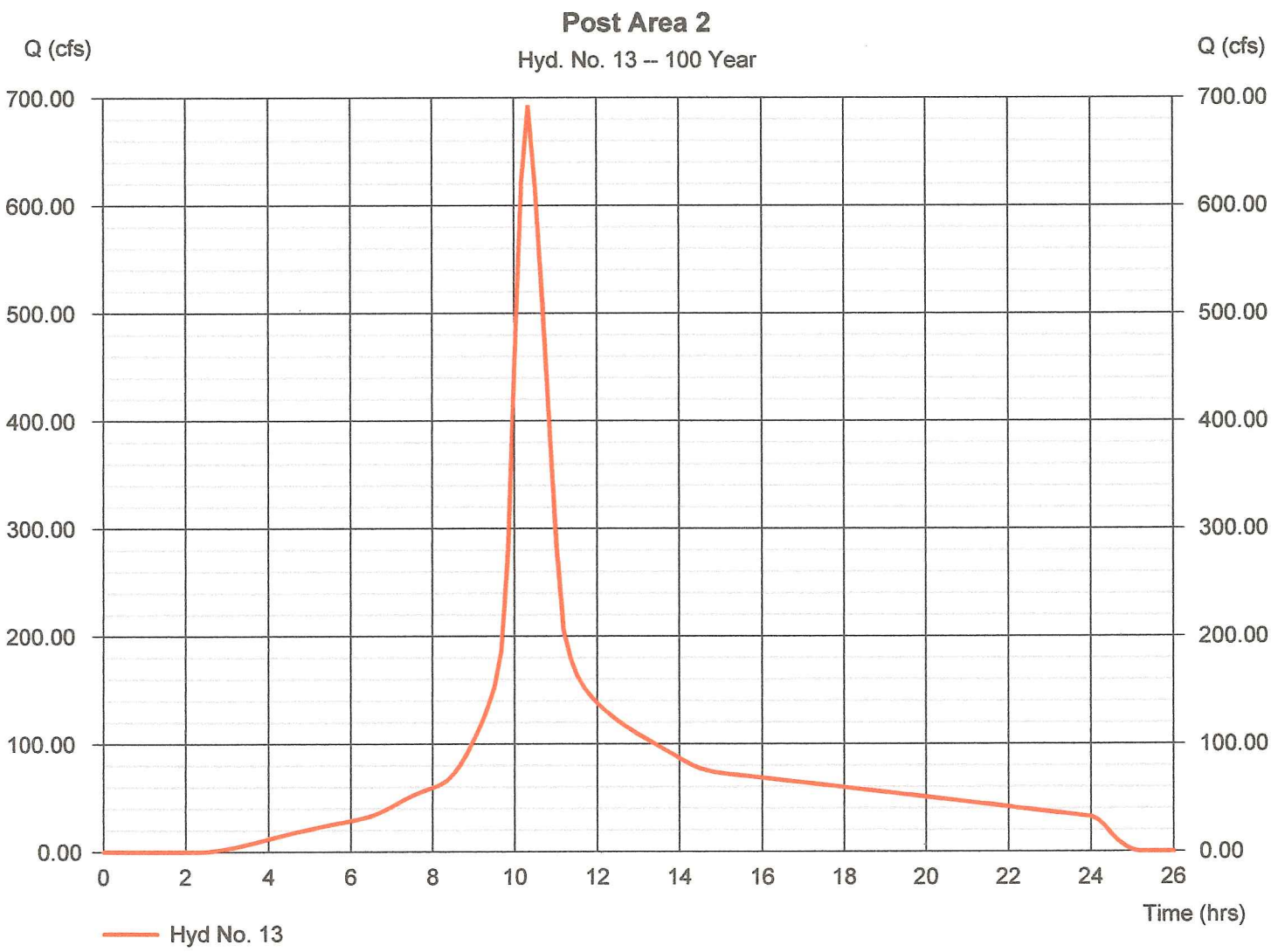
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 13

Post Area 2

Hydrograph type	= SCS Runoff	Peak discharge	= 693.19 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.33 hrs
Time interval	= 10 min	Hyd. volume	= 6,861,335 cuft
Drainage area	= 213.000 ac	Curve number	= 83
Basin Slope	= 19.4 %	Hydraulic length	= 9500 ft
Tc method	= LAG	Time of conc. (Tc)	= 39.74 min
Total precip.	= 11.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484



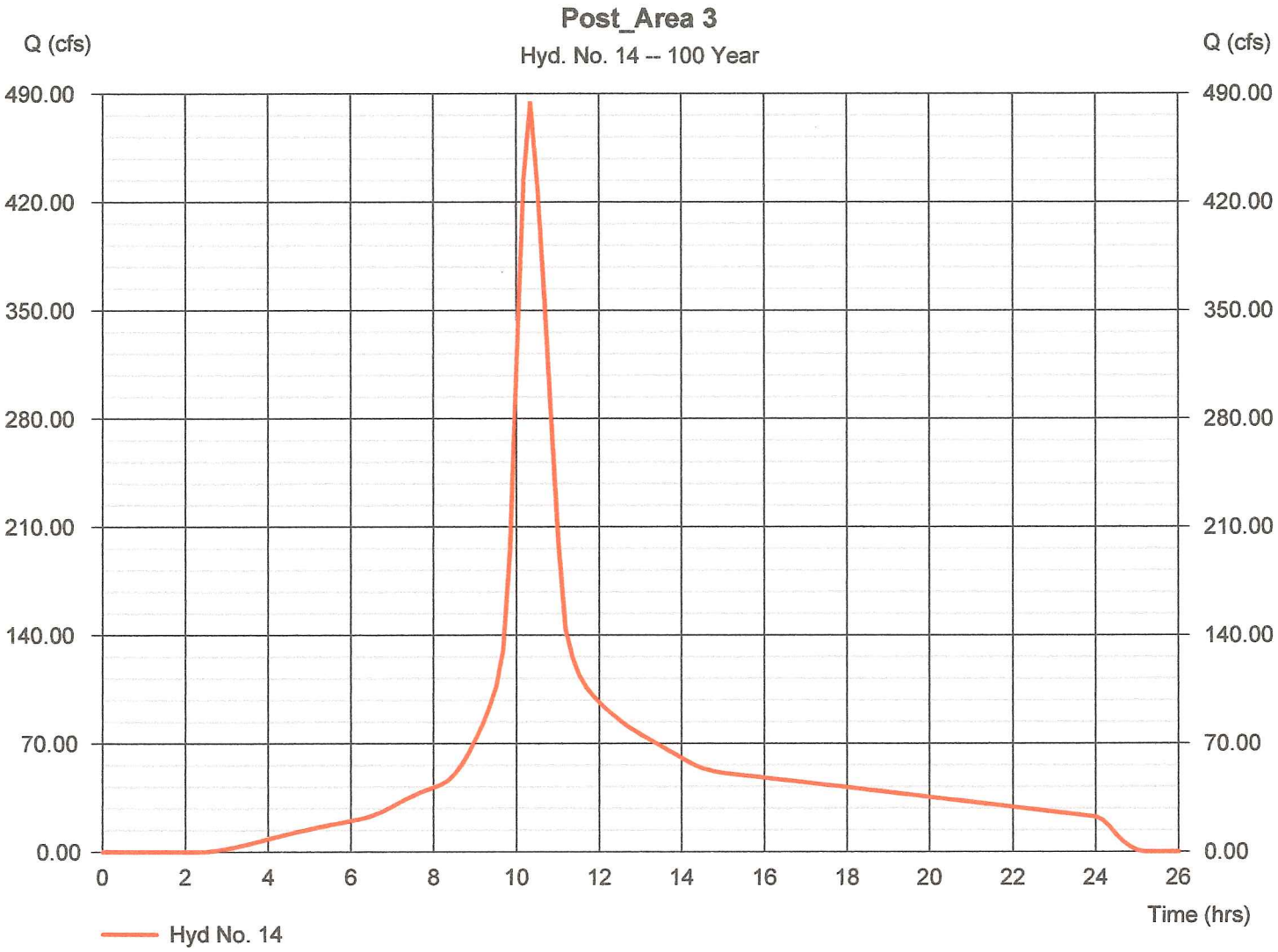
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 14

Post_Area 3

Hydrograph type	= SCS Runoff	Peak discharge	= 484.90 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.33 hrs
Time interval	= 10 min	Hyd. volume	= 4,799,714 cuft
Drainage area	= 149.000 ac	Curve number	= 83
Basin Slope	= 18.4 %	Hydraulic length	= 10200 ft
Tc method	= LAG	Time of conc. (Tc)	= 43.19 min
Total precip.	= 11.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 15

Post_Area 4

Hydrograph type	= SCS Runoff	Peak discharge	= 674.00 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.50 hrs
Time interval	= 10 min	Hyd. volume	= 8,031,688 cuft
Drainage area	= 257.000 ac	Curve number	= 79
Basin Slope	= 18.3 %	Hydraulic length	= 10600 ft
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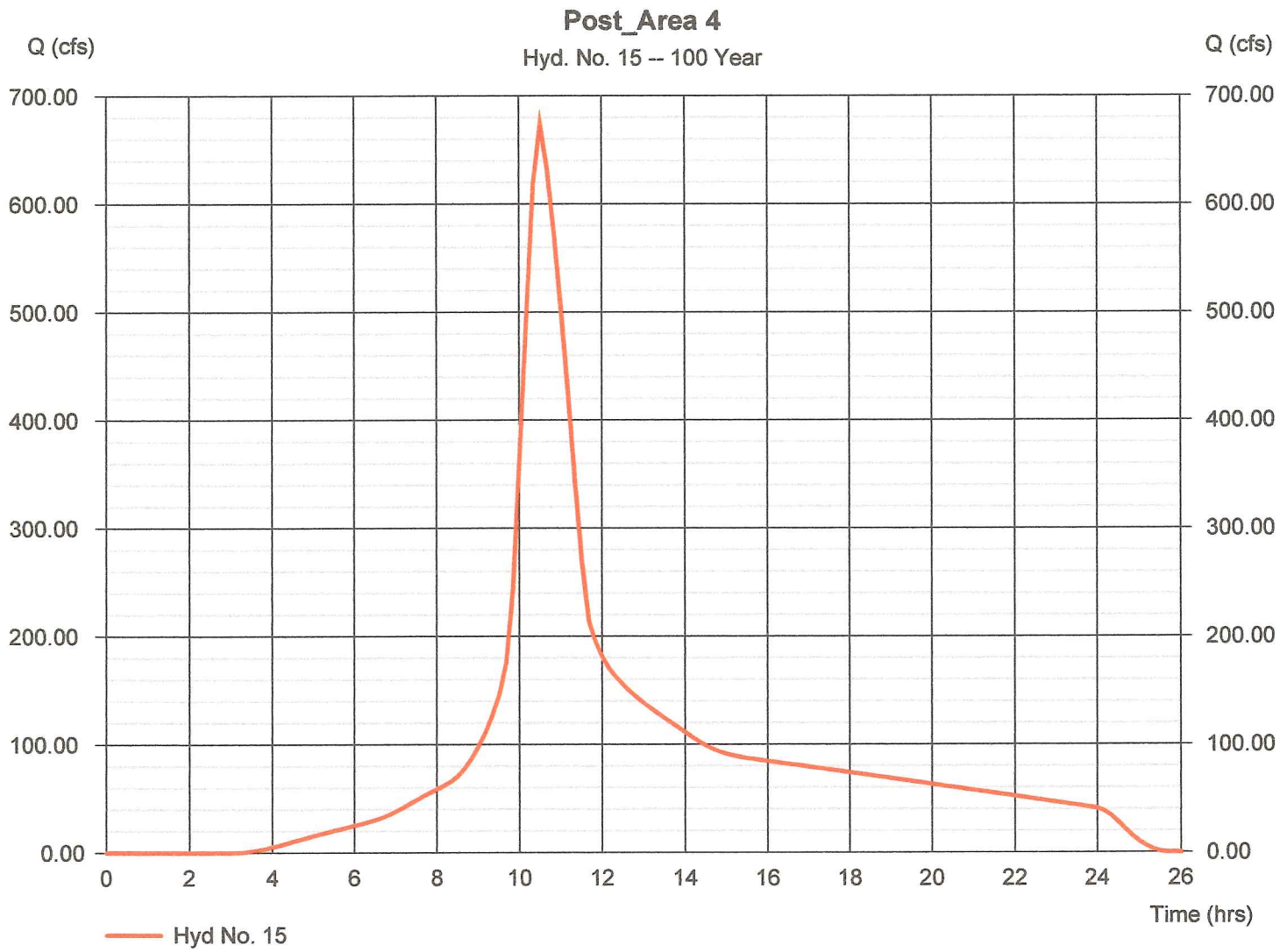
Total precip.	= 11.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484



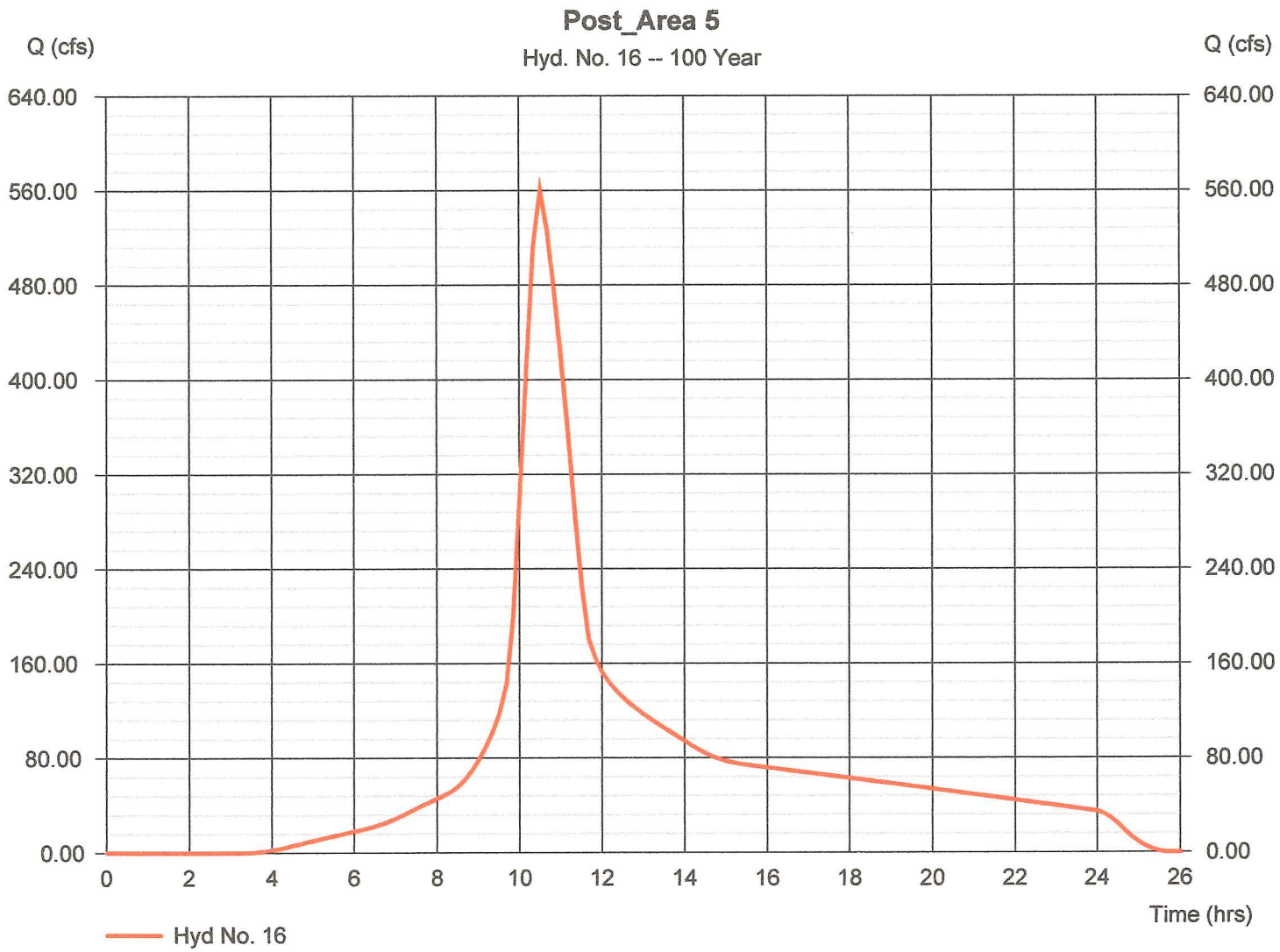
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 16

Post_Area 5

Hydrograph type	= SCS Runoff	Peak discharge	= 560.88 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.50 hrs
Time interval	= 10 min	Hyd. volume	= 6,686,183 cuft
Drainage area	= 221.000 ac	Curve number	= 77
Basin Slope	= 20.6 %	Hydraulic length	= 11000 ft
Tc method	= LAG	Time of conc. (Tc)	= 52.28 min
Total precip.	= 11.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484



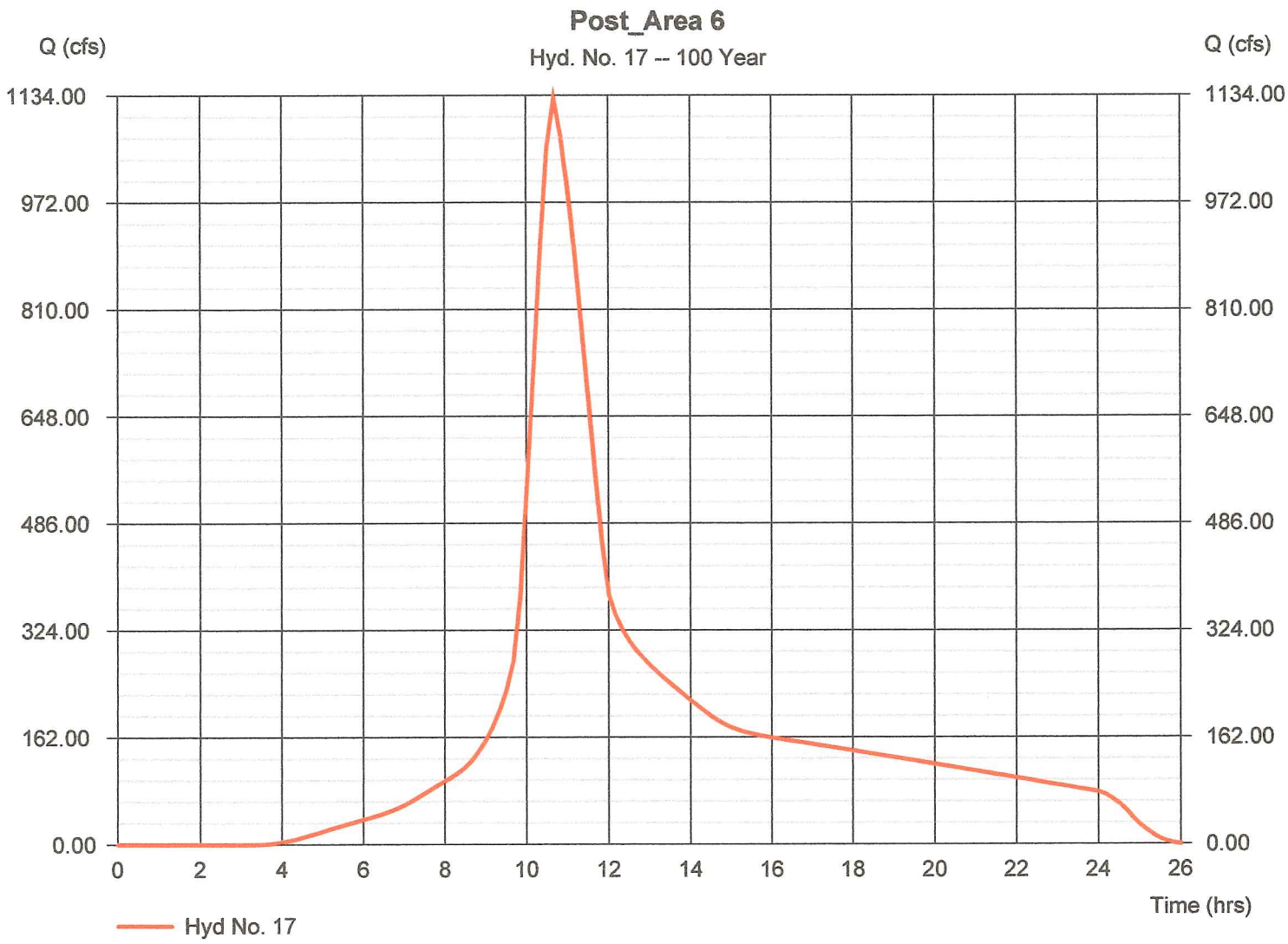
Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 17

Post_Area 6

Hydrograph type	= SCS Runoff	Peak discharge	= 1130.08 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.67 hrs
Time interval	= 10 min	Hyd. volume	= 14,874,080 cuft
Drainage area	= 520.000 ac	Curve number	= 77
Basin Slope	= 18.6 %	Hydraulic length	= 15300 ft
Tc method	= LAG	Time of conc. (Tc)	= 71.63 min
Total precip.	= 11.00 in	Distribution	= Type I
Storm duration	= 24 hrs	Shape factor	= 484



Hydrograph Report

Hydraflow Hydrographs Extension for AutoCAD® Civil 3D® 2014 by Autodesk, Inc. v10.3 Monday, 11 / 24 / 2014

Hyd. No. 18

Post_Area 7

Hydrograph type	= SCS Runoff	Peak discharge	= 263.48 cfs
Storm frequency	= 100 yrs	Time to peak	= 10.17 hrs
Time interval	= 10 min	Hyd. volume	= 1,998,659 cuft
Drainage area	= 84.000 ac	Curve number	= 69
Basin Slope	= 18.6 %	Hydraulic length	= 4200 ft
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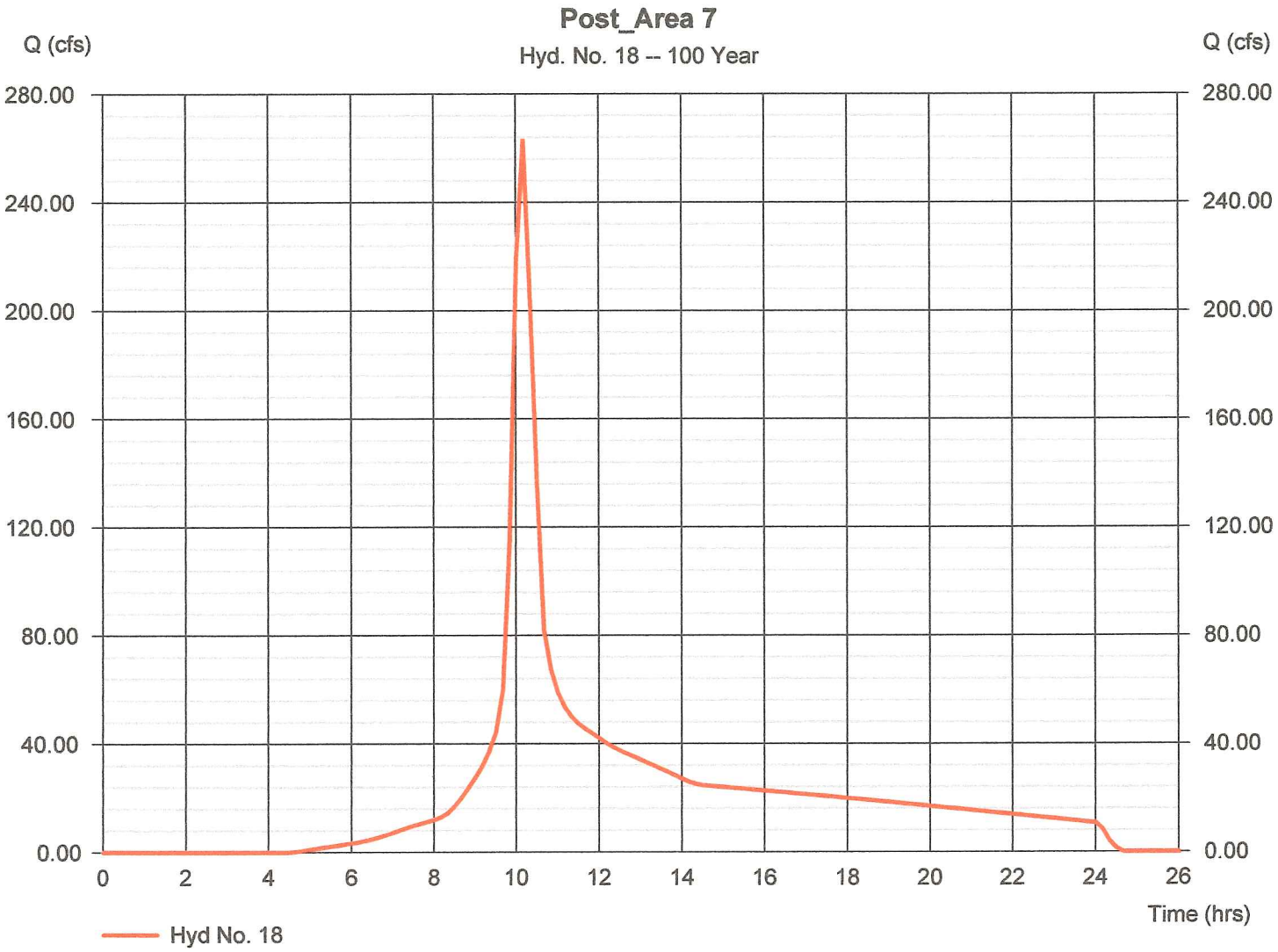

MAALAEA PLANTATION SUBDIVISION

PRELIMINARY RETENTION BASIN VOLUME

BASIN NO.	VOL. (CF)	VOL (ACRE-FT.)
1	97,200	2.2
2	110,550	2.5
3	68,750	1.6
4	50,800	1.2
5	125,800	2.9
6	196,800	4.5
7	76,350	1.8
8	79,200	1.8
9	67,100	1.5
10	96,600	2.2
11	59,000	1.4
12	69,800	1.6
13	92,000	2.1
14	58,900	1.4
15	130,750	3.0
TOTAL	1,379,600	31.7
TOTAL (gal.)	12,159,500	

APPENDIX B

WASTEWATER CALCULATIONS

WASTEWATER CALCULATIONS

Project Data:

112 Rural and Residential lots

Per the 2000 County of Maui Wastewater Flow Standards:

Residential Subdivision = 350 gal/day/home

Wastewater Contribution:

Residential Subdivision	=	112 homes x 350 gal/day/home
	=	39,200 gpd

APPENDIX C

WATER DEMAND CALCULATIONS

WATER DEMAND CALCULATIONS

Project Data:

74 Single Family Rural Lots (82.5 acres)

27.5 acres Large Rural Lots

37 Single Family Residential Lots (10.0 acres)

32.8 acres Parks/Drainage Facilities

91.7 acres Agriculture

Daily Consumption Guidelines:

Single Family Rural Lots = 1,500 gallons/unit (potable)

Large Rural Lot = 2,500 gallons/acre (potable)

Single Family Residential Lots = 600 gallons/unit (potable)

Park/Drainage Facilities = 1,700 gallons/acre (non-potable)

Agriculture = 2,500 gallons/acre (non-potable)

Average Daily Demand (ADD) =

Single Family Rural Lots	= 1,500 x 74 units = 111,000 gallons
Large Rural Lot	= 2,500 x 27.5 acres = 68,750 gallons
Single Family Residential Lots	= 600 x 37 units = 22,200 gallons
Park & Drainage	= 1,700 x 32.8 acres = 55,760 gallons
Agriculture	= 2,500 x 91.7 acres = 229,250 gallons

Total Average Daily Demand = 201,950 gpd (potable)

= 285,010 gpd (non-potable)

= 486,960 gpd (total)

Max. Daily Demand (1.5 x ADD) = 1.5 x 486,960 = 730,440 gpd

Max. Fire Flow = 1,000 gpm (Rural & Residential)

= 500 gpm (Agriculture)

REFERENCES

A. Soil Survey of Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii, prepared by U.S. Department of Agriculture, Soil Conservation Service, August, 1972.

B. Erosion and Sediment Control Guide for Hawaii, prepared by U.S. Department of Agriculture, Soil Conservation Service, March, 1981.

C. Rainfall-Frequency Atlas of the Hawaiian Islands, Technical Paper No. 43, U.S. Department of Commerce, Weather Bureau, 1962.

D. NOAA Atlas 14 Point Precipitation Frequency Estimates.

E. Flood Insurance Rate Maps of the County of Maui, Sept. 19, 2012.

F. Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui, prepared by the Department of Public Works and Waste Management, County of Maui, 1995.

G. Water System Standards, Department of Water Supply, County of Maui, 2002.

H. Traffic Impact Analysis Report for Maalaea Plantation Subdivision, prepared by Phillip Rowell and Associates, November 2014

Appendix E

Traffic Impact Analysis Report (TIAR)

Phillip Rowell and Associates
47-273 'D' Hui Iwa Street Kaneohe, Hawaii 96744 Phone: (808) 239-8206 FAX: (808) 239-4175 Email:prowell@hawii.rr.com

December 12, 2014

Mr. Jesse Spencer
Spencer Homes
P.O. Box 97
Kihei, Maui, Hawaii 96753

Re: **Traffic Impact Analysis Report**
Maalaea Plantation, Maui, Hawaii

Dear Jesse:

Phillip Rowell and Associates have completed the following Traffic Impact Analysis Report (TIAR) for Maalaea Plantation, a proposed agricultural lot development in Maalaea, Maui. The report is presented in the following format:

A. Project location and Description
- B. Purpose and Objective of Study
- C. Study Approach
- D. Description of Existing Roadways and Intersections
- E. Existing Peak Hour Traffic Volumes
- F. Public Transportation
- G. Level-of-Service Concept
- H. Existing (2014) Levels-of-Service
- I. Existing Deficiencies
- J. 2022 Background Traffic Conditions
- K. 2022 Background Levels-of-Service
- L. Project Trip Generation
- M. Background Plus Project Projections
- N. Traffic Impact Assessment
- O. Mitigation
- P. Summary and Recommendations

A. Project location and Description

The proposed action is the construction of the infrastructure for 112 agricultural lots along the west side of Honoapiilani Highway between North Kihei Road and Kapoli Street in the Maalaea area of Maui. The southern part of the site is across the highway from Maalaea Harbor Village. The site is currently vacant.

A schematic site plan is provided as Attachment A. Access and egress will be provided by two new driveways. The first driveway, referred to as Road A, will be at the intersection of Honoapiilani Highway and North Kihei Road. The second entrance, Referred to as Road B, will be at the intersection of Honoapiilani Highway and Kapoli Street. The intersections will be converted from a three-legged, signalized intersection to a four-legged intersection. All traffic movements will be allowed.

There will be 75 rural lots and each rural lot may have one ohana unit each. The remaining 37 lots will be R3 Residential.

B. Purpose and Objective of Study

1. Determine and describe the traffic characteristics of the proposed project.

2. Quantify and document the traffic related impacts of the proposed project.

3. If required, identify and evaluate traffic related improvements required to provide adequate access to and egress from the proposed project and to mitigate the project's traffic impacts.

C. Study Approach

1. A preliminary trip generation analysis was performed to determine the scope of the traffic analysis required and the intersections to be studied. This analysis estimated that the project could generate 128 trips during the morning peak hour and 175 trips during the afternoon peak hour. This implies that the scope of work should be a "small development: traffic impact assessment" as described by the Institute of Transportation Engineers.

   The study area was defined after consultation with State of Hawaii Department of Transportation and includes the following intersections:

   a. Honoapiilani Highway at Kuihelani Highway
   b. Honoapiilani Highway at North Kihei Road
   c. Honoapiilani Highway at Maalaea Road
   d. Honoapiilani Highway at Kapoli Street
   e. Honoapiilani Highway at Hauoli Street

2. A field reconnaissance was performed to confirm existing roadway cross-sections, intersection lane configurations, traffic control devices, and surrounding land uses.

3. Existing weekday morning and afternoon peak hour traffic volumes for the study intersections were obtained from manual traffic counts of the study intersections. Public schools were in session during the counts. Also, the counts were performed after State of Hawaii Department of Transportation completed resurfacing and restriping the roadway during the first part of 2014.

4. A level-of-service analysis of the study intersections was performed using the methodology described in the *Highway Capacity Manual* (HCM). The purpose of this analysis was to identify any existing traffic operating deficiencies.

5. Traffic studies for other known projects in the area were obtained and reviewed to gain an understanding of historical traffic growth along the roadways in the area, primarily Honoapiilani Highway. This information was used to estimated traffic growth at the study intersections. Growth factors were then applied to the traffic movements at the study intersections to estimate future traffic projections without project generated traffic at the study intersections.

6. A level-of-service analysis of future traffic conditions including traffic generated by the other known developments at the study intersections without project generated traffic performed. This analysis was performed to estimate traffic operating levels-of-service and identify any operational deficiencies that may exist whether the proposed project is constructed or not. This process insures that any required mitigation improvements will be assessed against the appropriate project.

7. Peak hour traffic volumes that the proposed project will generate were estimated using procedures described in the *Trip Generation Handbook* [1] and data provided in *Trip Generation*.[2] Project generated trips were distributed and assigned to the appropriate movements at the study intersections. Future traffic projections at the study intersections with project generated traffic were then estimated.

8. The impacts of traffic generated by the proposed project at the study intersections were quantified by analyzing the changes in peak hour traffic volumes and by performing a level-of-service analysis of future traffic conditions without and with project generated traffic.

D. Description of Existing Roadways and Intersections

Attachment B is a schematic drawing indicating the right-of-way controls and lane configurations of the study intersections. Aerial photographs of the study intersections are provided as Attachment C.

Existing Roadways

Honoapiilani Highway is a State highway along the eastern boundary of the project site. Between Kuihelani Highway and Maalaea Road, the highway is four lanes wide. The southbound direction of the highway narrows from four lanes to two lanes between Maalaea Road and Kapoli Street. The northbound direction is two lane north of Hauoli Street.

Kuihelani Highway intersects Honoapiilani Highway approximately 1,900 feet north of the intersection of Honoapiilani Highway at North Kihei Road. Kuihelani Highway is a four-lane divided State highway connecting Kahului and Maalaea. The posted speed limit is 55 miles per hour.

North Kihei Road intersects Honoapiilani Highway in the north end of the project and connects to Piilani Highway and Puunene Highway in the north end of Kihei.

Existing Intersections

The intersection of Honoapiilani Highway at Kuihelani Highway four-way, signalized intersections. The northbound and southbound approaches are Honoapiilani Highway. The westbound approach is Kuihelani Highway and the eastbound approach is an unpaved roadway. The northbound and southbound approaches each have a separate left turn lane, two through land and a right turn lane.

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[1] Institute of Transportation Engineers, *Trip Generation Handbook*, Washington, D.C., , p. 7-12

[2] Institute of Transportation Engineers, *Trip Generation, 8th Edition*, Washington, D.C., 2008

The northbound and southbound left turns are protected. The westbound approach of Kuihelani Highway has one left turn lane, one optional left turn or through lane and one right turn lane. The eastbound approach is one lane, an optional left, through or right turn lane. The eastbound and eastbound phases are split.

The intersection of Honoapiilani Highway at North Kihei Road is a signalized T-intersection. The northbound and southbound approaches are Honoapiilani Highway and the westbound approach is North Kihei Road. The northbound approach has two through lanes and one right turn lane. The southbound approach of Honoapiilani Highway has one left turn lane and two through lanes. The left turns are protected. The westbound approach has two left turn lanes and one right turn lane.

The intersection of Honoapiilani Highway at Kapoli Street is a signalized T-intersection. The northbound and southbound approaches are Honoapiilani Highway and the westbound approach is Kapoli Street. The northbound approach of Honoapiilani Highway has two through lanes and one right turn only lane. The southbound approach of Honoapiilani Highway has one left turn lane and on through lane. The southbound to eastbound left turns are protected. The westbound approach of Kapoli Street has one left turn lane and one right turn lane.

E. Existing Peak Hour Traffic Volumes

Current weekday peak hour traffic volumes at the study intersections were obtained from manual traffic counts. The counts were performed during September 2014. The AM and PM peak hour counts are summarized on Attachment D. The traffic counts include mopeds, motorcycles, buses, trucks and other large vehicles. The traffic counts were performed between 6:30 AM and 8:30 AM and between 3:30 PM and 5:30 PM on either a Tuesday or Thursday.

Pedestrians

No pedestrians were noted during the traffic counts.

F. Public Transportation

A review of Maui Bus routes determined that at the time this report is being written, the area is served by two Maui Bus routes. Route 15, the Kihei Villager connects with the Piilani Shopping Center in Kihei via South Kihei Road, North Kihei Road and Honoapiilani Highway.

Route 20, the Lahaina Islander connects Queen Kaahumanu Shopping Center in Kahului and the Wharf Cinema Center in Lahina via Honoapiilani Highway.

G. Level-of-Service Concept

Signalized Intersections

"Level-of-Service" is a term which denotes any of an infinite number of combinations of traffic operating conditions that may occur on a given lane or roadway when it is subjected to various traffic volumes. Level-of-service (LOS) is a qualitative measure of the effect of a number of factors which include space, speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience.

There are six levels-of-service, A through F, which relate to the driving conditions from best to worst, respectively. The characteristics of traffic operations for each level-of-service are summarized in Table 1. In general, LOS A represents free-flow conditions with no congestion. LOS F, on the other hand, represents severe congestion with stop-and-go conditions. Level-of-Service D is typically considered acceptable for peak hour conditions in urban areas.[3]

Corresponding to each level-of-service shown in the table is a volume/capacity ratio. This is the ratio of either existing or projected traffic volumes to the capacity of the intersection. Capacity is defined as the maximum number of vehicles that can be accommodated by the roadway during a specified period of time. The capacity of a particular roadway is dependent upon its physical characteristics such as the number of lanes, the operational characteristics of the roadway (one-way, two-way, turn prohibitions, bus stops, etc.), the type of traffic using the roadway (trucks, buses, etc.) and turning movements.

Table 1 Level-of-Service Definitions for Signalized Intersections(1)

Level of Service	Interpretation	Volume-to-Capacity Ratio(2)	Stopped Delay (Seconds)
A, B	Uncongested operations; all vehicles clear in a single cycle.	0.000-0.700	<10.0
C	Light congestion; occasional backups on critical approaches.	0.701-0.800	10.1-20.0
D	Congestion on critical approaches but intersection functional. Vehicles must wait through more than one cycle during short periods. No long standing lines formed.	0.801-0.900	20.1-35.0
E	Severe congestion with some standing lines on critical approaches. Blockage of intersection may occur if signal does not provide protected turning movements.	0.901-1.000	35.1-80.0
F	Total breakdown with stop-and-go operation.	>1.001	>80.0

Notes:
(1) Source: *Highway Capacity Manual*, 2000.
(2) This is the ratio of the calculated critical volume to Level-of-Service E Capacity.

Unsignalized Intersections

Like signalized intersections, the operating conditions of intersections controlled by stop signs can be classified by a level-of-service from A to F. However, the method for determining level-of-service for unsignalized intersections is based on the use of gaps in traffic on the major street by vehicles crossing or turning through that stream. Specifically, the capacity of the controlled legs of an intersection is based on two factors: 1) the distribution of gaps in the major street traffic stream, and 2) driver judgement in selecting gaps through which to execute a desired maneuver. The criteria for level-of-service at an unsignalized intersection is therefore based on delay of each turning movement. Table 2 summarizes the definitions for level-of-service and the corresponding delay.

[3] Institute of Transportation Engineers, *Traffic Access and Impact Studies for Site Development, A Recommended Practice*, Washington, D.C., 1991, p.39.

Table 2 Level-of-Service Definitions for Unsignalized Intersections(1)

Level-of-Service	Expected Delay to Minor Street Traffic	Delay (Seconds)
A	Little or no delay	>10
B	Short traffic delays	10.1 to 15.0
C	Average traffic delays	15.1 to 25.0
D	Long traffic delays	25.1 to 35.0
E	Very long traffic delays	35.1 to 50.0
F	See note (2) below	>50.1

Notes:
(1) Source: *Highway Capacity Manual*, 2000.
(2) When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing which may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvement of the intersection.

H. Existing (2014) Levels-of-Service

The existing levels-of-service of the signalized study intersection of Piilani Highway at Kanani Road are summarized in Table 3. Volume-to-capacity ratios, delays and levels-of-service are shown for the overall intersection and each lane group. Even though level-of-service is defined by the delay, the volume-to-capacity ratios are shown as this is a factor in determining whether the traffic signal timing is a factor in estimating the level-of-service of a particular lane group.

The conclusions of the level-of-service analysis of the signalized intersections are:

1. The intersection of Honoapiilani Highway at Kuihelani Highway operates at Level-of-Service B during both peak hours. All lane groups operate at Level-of-Service D, or better, except the southbound to eastbound left turns, which operates at Level-of-Service F during the afternoon peak hour. This movement is only eleven (11) vehicles during the afternoon peak hour. The volume-to-capacity ratio implies Level-of-Service C. The conclusion is that the long delay and therefore the low level-of-service is the result of the traffic signal cycle length.

2. The intersection of Honoapiilani Highway at North Kihei Road operates at Level-of-Service C during both peak hours. All lane groups operate at Level-of-Service D, or better.

3. The intersection of Honoapiilani Highway at Kapoli Street operates as Level-of-Service A during both peak hours. All lane groups operate at Level-of-Service D, or better.

Table 3 Existing (2014) Levels-of-Service - Signalized Intersections

Intersection and Movement	AM Peak Hour[1]			PM Peak Hour[2]		
	V/C[3]	Delay[4]	LOS[5]	V/C	Delay	LOS
Honoapiilani Highway at Kuihelani Highway	Cycle Length = 90 Seconds[5]			Cycle Length = 90 Seconds		
	0.59	***16.7***	***B***	***0.94***	***18.4***	***B***
Eastbound Left, Thru & Right	0.39	39.5	D	0.13	33.9	C
Westbound Left	0.75	29.4	C	0.79	31.0	C
Westbound Left & Thru	0.77	30.7	C	0.79	31.6	C
Westbound Right	0.01	17.7	B	0.00	17.4	B
Northbound Left	0.25	38.9	D	0.31	43.0	D
Northbound Thru	0.43	11.9	B	0.45	12.9	B
Northbound Right	0.24	10.7	B	0.48	14.5	B
Southbound Left	0.19	36.5	D	0.75	138.2	F
Southbound Thru	0.48	12.4	B	0.43	12.7	B
Southbound Right	0.00	8.8	A	0.00	9.5	A
Honoapiilani Highway at North Kihei Road	Cycle Length = 90 Seconds			Cycle Length = 90 Seconds		
	0.87	***21.5***	***C***	***0.90***	***23.0***	***C***
Westbound Left	0.56	32.2	C	0.62	36.8	D
Westbound Right	0.32	30.3	C	0.23	33.0	C
Northbound Thru	0.45	21.0	C	0.66	23.7	C
Northbound Right	0.12	17.7	B	0.29	18.8	B
Southbound Left	0.84	39.1	D	0.87	42.8	D
Southbound Thru	0.36	4.7	A	0.31	3.8	A
Honoapiilani Highway at Kapuli Street	Cycle Length = 90 Seconds			Cycle Length = 70 Seconds		
	0.69	***8.9***	***A***	***0.64***	***9.0***	***A***
Westbound Left	0.51	44.5	D	0.46	34.2	C
Westbound Right	0.03	40.2	D	0.04	31.1	C
Northbound Thru	0.26	4.1	A	0.49	6.8	A
Northbound Right	0.03	3.3	A	0.04	4.2	A
Southbound Left	0.56	55.3	E	0.53	41.7	D
Southbound Thru	0.71	6.3	A	0.66	6.2	A

NOTES:
(1) See Appendix E for Level-of-Service Worksheets for existing AM peak hour traffic conditions.
(2) See Appendix F for Level-of-Service Worksheets for existing AM peak hour traffic conditions.
(3) Volume-to-Capacity ratio.
(4) Delay is in seconds per vehicle.
(5) Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. Level-of-Service is based on delay.
(6) Traffic signal cycle length estimated by timing the traffic signal during peak hours.

The results of the level-of-service analysis of the unsignalized study intersections are summarized in Table 4. For the unsignalized intersections, delays and levels-of-service of the controlled lanes groups are shown. The *Highway Capacity Manual* does not estimated delays or levels-of-service of uncontrolled lane groups. Also shown in the table are the estimated queue lengths. Synchro reports the queue lengths is feet. The queue lengths shown in the table are estimated vehicles using an average vehicle length of 25 feet.

Table 4 Existing (2014) Levels-of-Service of Unsignalized Intersections

	AM Peak Hour			PM Peak Hour		
Intersection, Approach and Movement	Delay (1)	LOS (2)	95th Queue(3)	Delay	LOS	95th Queue
Honoapiilani Highway at Maalaea Road	***1.1***	***A***	***NC***	***2.2***	***A***	***NC***
Southbound Left	9.9	A	<1	14.0	B	<2
Westbound Right	11.3	B	<1	20.0	C	<3
Honoapiilani Highway at Hauoli Street	***0.0***	***A***	***NC***	***0.0***	***A***	***NC***
Westbound Left, Thru & Right	0.0	A	<1	0.0	A	<1

NOTES:
(1) Delay is in seconds per vehicle.
(2) LOS denotes Level-of-Service.
(3) 95th percentile queue in vehicles.
(4) NC = Not calculated

The conclusions of the level-of-service analysis of the unsignalized intersection are:

1. The intersection of Honoapiilani Highway at Maalaea Road operates at Level-of-Service A during both peak hours. The southbound left turns from Honoapiilani Highway at Maalaea operates at Level-of-Service A during the morning peak hour and Level-of-Service B during the afternoon peak hour. The 95th percentile queue is less than one vehicle during the morning peak hour and less than two vehicles during the afternoon peak hour.

   The right turns from westbound Maalaea Road that merge with the northbound Honoapiilani Highway operates at Level-of-Service B during the morning peak hour and Level-of-Service C during the afternoon peak hour. The 95th percentile queue is less than one vehicle during the morning peak hour and less than three vehicles during the afternoon peak hour.

2. The intersection of Honoapiilani Highway at Hauoli Street operates at Level-of-Service A during both peak hours. Left turns from southbound Honoapiilani Highway and left turn from Hauoli Street are not allowed. Right turns from Hauoli Street to northbound Honoapiilani Highway are free right turns so they have no delay.

I. Existing Deficiencies

For signalized intersections, Level-of-Service D is the minimum acceptable Level-of-Service[4] and that this standard is applicable to the overall intersection and major through movements. Minor movements, such as left turns, and minor side street approaches may operate at Level-of-Service E or F for short periods of time during the peak hours so that the overall intersection and major movements along the major highway will operate at Level-of-Service D, or better. All volume-to-capacity ratios must be 1.00 or less[5].

A standard has not be established for unsignalized intersections. Therefore, we have used a standard that Level-of-Service D is an acceptable level-of-service for major controlled lane groups, such as left turns from a major street to a minor street. Side street approaches may operate at Level-of-Service E or F for short periods of time. This is determined from the delays of the individual lane groups. If the delay of any of the side street approaches appears to be so long that it will affect the overall level-of-service of the intersection, then mitigation measures should be accessed.

Using the above standards, no existing deficiencies were identified at the study intersections.

J. 2022 Background Traffic Conditions

Horizon Year

The horizon year is the date for which future background traffic projections were estimated. These projections include traffic generated by other known projects within and adjacent to the study area and background traffic growth, for which a future year must be selected. For projects that will generate less than 500 peak hour trips, the suggested horizon year is the "anticipated opening year, assuming full build out and occupancy."[6]

For this project, the completion date is uncertain as the proposed action is construction of the infrastructure for 111 agricultural lots. It may be some time before the lots are developed. Therefore, 2022 is used as the horizon year for this TIAR so that the conclusions will be consistent with those of the traffic studies for other projects in the Waikapu area (Waiale, Puunani, etc.).

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[4] Institute of Transportation Engineers, *Transportation Impact Analyses for Site Development: A Recommended Practice*, 2006, page 60.

[5] Transportation Research Board, *Highway Capacity Manual*, Washington, D.C., 2000, p. 16-35.

[6] Institute of Transportation Engineers, *Transportation and Land Development*, Washington, D.C., 2002, page 3-13

Background Traffic Growth

Traffic studies for other projects is the area were obtained and reviewed. The purpose of this task was to gain an understanding of historical traffic growth along the roadways in the study area. Traffic forecasts provided in the *Honoapiilani Highway Widening/Realignment Maalaea to Launiupoko, Technical Memorandum #1, Forecast Travel Demand*[7] were used to estimated background traffic growth along Honoapiilani Highway at the study intersections.

This study provided growth rates for Honoapiilani Highway between 2001 and 2030 at a screenline north of North Kihei Road. These growth rates were adjusted to develop a growth rate to estimate the traffic growth between 2014, the date of the counts used in this report, and 2022, the horizon year for this project. A growth rate of 14.05% was calculated for the morning peak hour and a growth rate of 14.5% was calculated for the afternoon peak hour for 2014 to 2022. This growth equates to 1.66% per year and 1.71% per year, which is comparable to the background growth rates used in past studies.

The growth rates above were applied to all movements at the study intersections. The resulting 2022 background traffic projections are summarized on Attachment G.

K. 2022 Background Levels-of-Service

The results of the level-of-service analysis of the signalized intersections for background conditions without project generated traffic are summarized in Table 5. Shown are the volume-to-capacity ratios, average vehicle delays and levels-of-service of the overall intersections and all the lane groups. The level-of-service is defined by the average vehicle delay. The volume-to-capacity ratio is also shown as it is used to determine if the traffic signal timing is a factor in estimating the delay. In some cases, a long delay is the result of a long traffic signal cycle length. In these cases the delay may be long, resulting in a poor level-of-service, but the volume-to-capacity ratio will be low.

The level-of-service analysis concluded that the intersections of Honoapiilani Highway at Kuihelani Highway and Honoapiilani at North Kihei Road will operate at acceptable levels-of-service during the morning peak hour but the afternoon volume-to-capacity ratios of the overall intersections will be greater than 1.00, even though the overall intersections will operate at Level-of-Service C. The high volume-to-capacity ratios are the result of heavy turning volumes during the afternoon peak hours.

Mitigation

An assessment of potential mitigation improvements concluded that increasing the traffic signal cycle length from 90 second to 120 seconds will mitigation the high volume-to-capacity ratios. The results of this change are also shown in the table.

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[7] Austin, Tsutsumi and Associates, Inc., *Honoapiilani Highway Widening/Realignment Maalaea to Launiupoko, Technical Memorandum #1, Forecast Travel Demand*, April 2008

Table 5 2022 Background Levels-of-Service - Signalized Intersections

Intersection and Movement	AM Peak Hour						PM Peak Hour					
	Without Mitigation[1]			With Mitigation[3]			Without Mitigation[2]			With Mitigation[4]		
	V/C[5]	Delay[6]	LOS[7]	V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS
Honoapiilani Highway at Kuihelani Highway	Cycle Length = 90 Seconds			Cycle Length = 120 Seconds			Cycle Length = 90 Seconds			Cycle Length = 120 Seconds		
	0.66	***18.4***	***B***	***0.62***	***20.4***	***C***	***1.08***	***20.5***	***C***	***0.98***	***24.6***	***C***
Eastbound Left, Thru & Rt	0.42	41.4	D	0.52	60.9	E	0.13	34.0	C	0.09	45.6	D
Westbound Left	0.78	30.7	C	0.80	39.1	D	0.81	30.4	C	0.86	46.9	D
Westbound Left & Thru	0.80	32.2	C	0.83	41.2	D	0.82	31.3	C	0.87	48.3	D
Westbound Right	0.01	17.3	B	0.01	22.6	C	0.00	15.9	B	0.00	24.1	C
Northbound Left	0.31	43.2	D	0.36	56.3	E	0.44	50.2	D	0.41	61.4	E
Northbound Thru	0.50	13.7	B	0.44	13.2	B	0.55	15.4	B	0.46	15.6	B
Northbound Right	0.27	12.0	B	0.27	12.0	B	0.55	17.3	B	0.55	18.5	B
Southbound Left	0.19	37.9	D	0.21	48.8	D	0.88	193.6	F	0.58	77.1	E
Southbound Thru	0.56	14.5	B	0.49	13.9	B	0.53	15.1	B	0.44	15.1	B
Southbound Right	0.00	9.7	A	0.00	9.6	A	0.00	10.7	B	0.00	11.1	B
Honoapiilani Highway at North Kihei Road	Cycle Length = 90 Seconds			Cycle Length = 120 Seconds			Cycle Length = 90 Seconds			Cycle Length = 120 Seconds		
	0.99	***22.5***	***C***	***0.95***	***28.0***	***C***	***1.03***	***26.6***	***C***	***0.99***	***31.3***	***C***
Westbound Left	0.57	30.6	C	0.64	43.5	D	0.67	37.9	D	0.74	54.3	D
Westbound Right	0.37	28.8	C	0.36	39.9	D	0.26	32.9	C	0.26	45.4	D
Northbound Thru	0.60	26.1	C	0.50	27.2	C	0.83	31.2	C	0.73	31.7	C
Northbound Right	0.13	20.6	C	0.13	22.5	C	0.38	22.1	C	0.39	25.4	C
Southbound Left	0.87	39.1	D	0.89	51.3	D	0.92	48.6	D	0.92	57.6	E
Southbound Thru	0.42	5.8	A	0.40	5.5	A	0.36	4.3	A	0.34	4.1	A
Honoapiilani Highway at Kapuli Street	Cycle Length = 90 Seconds			No Mitigation Required			Cycle Length = 70 Seconds			No Mitigation Required		
	0.78	***11.0***	***B***				***0.73***	***10.6***	***B***			
Westbound Left	0.54	45.1	D				0.49	34.1	C			
Westbound Right	0.03	39.5	D				0.05	30.6	C			
Northbound Thru	0.30	4.5	A				0.57	7.8	A			
Northbound Right	0.03	3.5	A				0.04	4.4	A			
Southbound Left	0.65	64.0	E				0.61	47.1	D			
Southbound Thru	0.81	9.6	A				0.77	8.8	A			

NOTES:
(1) See Appendix H for Level-of-Service Worksheets for AM peak hour traffic conditions without mitigation.
(2) See Appendix I for Level-of-Service Worksheets for PM peak hour traffic conditions without mitigation.
(3) See Appendix J for Level-of-Service Worksheets for AM peak hour traffic conditions with mitigation.
(4) See Appendix K for Level-of-Service Worksheets for PM peak hour traffic conditions with mitigation.
(5) Volume-to-Capacity ratio.
(6) Delay is in seconds per vehicle.
(7) Level-of-Service calculated using the operations method described in *Highway Capacity Manual*. Level-of-Service is based on delay.

The results of the level-of-service analysis of the unsignalized intersections are summarized in Table 6. The results are comparable to the results for existing conditions except the 95th percentile queue of the merge of northbound Maalaea Road traffic with northbound Honoapiilani Highway traffic increases from three to four vehicles.

Table 6 2022 Background Levels-of-Service - Unsignalized Intersections

	AM Peak Hour(1)			PM Peak Hour(2)		
Intersection, Approach and Movement	Delay (3)	LOS (4)	95th Queue(5)	Delay	LOS	95th Queue
Honoapiilani Highway at Maalaea Road	***1.1***	***A***	***NC***	***2.9***	***A***	***NC***
Southbound Left	10.6	B	<1	16.9	C	<2
Westbound Right	11.9	B	<1	27.3	D	<4
Honoapiilani Highway at Hauoli Street	***0.0***	***A***	***NC***	***0.0***	***A***	***NC***
Westbound Left, Thru & Right	0.0	A	<1	0.0	A	<1

NOTES:
(1) See Appendix H for Level-of-Service Worksheets for AM peak hour traffic conditions.
(2) See Appendix I for Level-of-Service Worksheets for PM peak hour traffic conditions.
(3) Delay is in seconds per vehicle.
(4) LOS denotes Level-of-Service.
(5) 95th percentile queue in vehicles.
(6) NC = Not calculated

L. Project Trip Generation

Future traffic volumes that will be generated by the proposed project were estimated using the methodology described in the *Trip Generation Handbook*[8] and data provided in *Trip Generation*[9]. This method uses trip generation equations or rates to estimate the number of trips that the project will generate during the peak hours of the project and along the adjacent street.

The proposed action is the construction of 112 agricultural lots. *Trip Generation* does not provide trip generation data for agricultural lots. The most comparable land use for which *Trip Generation* provides trip generation data is single-family detached housing. *Trip Generation* defines single-family detached housing as follows:

> *Single-family detached housing includes all single-family detached housing on individual lots. A typical site surveys is a suburban subdivision.*[10]

The trip generation equations for single-family detached housing have been used for agricultural lot subdivisions is the past as they will result in conservative conclusions.

In addition to the single-family units, 75 of the lots may have ohana units. Since there are no trip generation rates for ohana units in *Trip Generation*, trips generated by the ohana units were estimated using trip generation data for apartments. This most likely results in an overestimation of the traffic from these units as some ohana units may be used by family members and some may

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[8] Institute of Transportation Engineers, *Trip Generation Handbook*, Washington, D.C., 2004, p. 7-12

[9] Institute of Transportation Engineers, *Trip Generation, 8th Edition,* Washington, D.C., 2003

[10] Institute of Transportation Engineers, *Trip Generation, 8th Edition*, Washington, D.C., 2003, page 289

be rented as an apartment. Use of the trip rates for apartments should result is conservative conclusions.

Trip Generation provides rates and equations to estimate the number of peak hour trips during the peak hours of the adjacent street and the peak hours of the generator, which may or may not coincide. The AM peak hour of the adjacent street is typically between 7:00 AM and 9:00 AM and PM peak hour is between 4:00 PM and 6:00 PM, typical commute hours. *Trip Generation* does not note the peak hours of the generators. The trip generation rates and equations are based on the number of single-family units (or lots) proposed. For this project, the trip generation equations for the adjacent street have been used so that the trip generation estimate will be concurrent with the peak hours of the adjacent street.

The trip generation rates used for the trip generation analysis and the results are summarized in Table 6. The trip generation analysis estimated that the project will generate a total of 128 trips during the morning peak hour and 175 trips during the afternoon peak hour.

Table 6 Trip Generation Analysis

Period & Direction		Single-Family Detached Housing (Land Use Code 210)			Ohana Units (Apartments) (Land Use Code 210)			TOTAL TRIPS
		Trips per Unit or Percent(1),(2)	Units	Trips	Trips per Unit or Percent(1),(2)	Units	Trips	
AM Peak Hour of Adjacent Street	Total	T = 0.70(X) + 9.74	112	88	T = 0.49(X) + 3.73	75	40	128
	Inbound	25%		22	20%		8	30
	Outbound	75%		66	80%		32	98
PM Peak Hour of Adjacent Street	Total	Ln(T) = 0.90Ln(X) + 0.51		116	T = 0.55(X) + 17.65		59	175
	Inbound	63%		73	65%		38	111
	Outbound	37%		43	35%		21	64

Notes:
(1) Source: Institute of Transportation Engineers, *Trip Generation 8th Edition*, 2008
(2) T=trips, X=number of dwelling units

Project trips were distributed and assigned based on existing traffic patterns as estimated from the traffic counts. The trip distribution pattern based on existing traffic patterns in the study area is summarized in Table 7. The resulting traffic assignments are shown as Attachment L.

Table 7 Trip Distribution

To/From	AM Peak Hour		PM Peak Hour	
	Inbound	Outbound	Inbound	Outbound
Honoapiilani Highway North	15%	20%	20%	20%
Kuihelani Highway East	27%	40%	35%	35%
N. Kihei Road East	38%	15%	20%	17%
Hauoli Street East	0%	1%	1%	1%
Honoapiilani Highway South	20%	24%	24%	27%
Totals	100%	100%	100%	100%

M. Background Plus Project Projections

Background plus project traffic projections were estimated by superimposing the peak hourly traffic generated by the proposed project on the background (without project) peak hour traffic projections. This assumes that the peak hourly trips generated by the project coincide with the peak hour of the adjacent street. This represents a worse-case condition as it assumes that the peak hours of the intersections coincide with the peak hour of the study project. The resulting background plus project peak hour traffic projections are shown in Attachment M.

N. Traffic Impact Assessment

The traffic impacts of the project was assessed by analyzing the changes in traffic volumes and levels-of-service at the study intersections.

Changes in Total Intersection Volumes

An analysis of the project's share of 2018 background plus project intersection approach volumes at the study intersections is summarized in Table 8. The table summarizes the project's share of total 2018 peak hour approach volumes at each intersection. Also shown are the percentages of 2018 background plus project traffic that is the result of background growth and traffic generated by related projects.

Table 8 Analysis of Project's Share of Total Intersection Approach Volumes (1)

Intersection	Period	2014 Existing	2022 Background	2022 Background Plus Project	Background Growth		Project Traffic	
					Trips	Percent of Total Traffic (2)	Trips	Percent of Total Traffic (2)
Honoapiilani Hwy at Kuihelani Hwy	AM	2287	2607	2679	320	11.9%	72	2.7%
	PM	2635	3019	3115	384	12.3%	96	3.1%
Honoapiilani Hwy at N. Kihei Road	AM	2676	3053	3166	377	11.9%	113	3.6%
	PM	3032	3471	3629	439	12.1%	158	4.4%
Honoapiilani Hwy at Kapoli Street	AM	1825	2018	2120	193	9.1%	102	4.8%
	PM	2355	2481	2758	126	4.6%	277	10.0%
Honoapiilani Hwy at Maalaea Road	AM	1769	2018	2075	249	12.0%	57	2.7%
	PM	2166	2481	2558	315	12.3%	77	3.0%
Honoapiilani Hwy at Hauoli Street	AM	1654	1887	1917	233	12.2%	30	1.6%
	PM	2060	2358	2402	298	12.4%	44	1.8%

Notes:
(1) Volumes shown are total intersection approach volumes or projections.
(2) Percentage of total 2022 background plus project traffic.
(3) Data to be provided in final draft report.

Level-of-Service Analysis

The level-of-service analysis was performed for "without project" and "with project" conditions. The incremental difference the two conditions quantifies the impacts of the project generated traffic. The lane configurations and right-of-way controls used in the level-of-service analysis are shown on Attachment N.

The results of the level-of-service analysis of the signalized study intersections are summarized in Table 9. Even though the level-of-service is defined by delay, the volume-to-capacity ratios are shown as it is a factor used to determine whether the delay of a particular traffic movement, or lane group, is the result of the traffic signal timing or the result of a capacity deficiency. The level-of-service analysis also used the existing traffic signal timing plan to assess future conditions.

The conclusions of the level-of-service analysis of the signalized intersections are:

1. The intersection of Honoapiilani Highway at Kuihelani Highway will operate at Level-of-Service C during both peak hours. The northbound and southbound through movements along Honoapiilani Highway will operate at Level-of-Service B during both peak hours. There is no change in the level-of-service of any lane group as a result of project generated traffic. The afternoon volume-to-capacity ratio is 1.02. Mitigation will be required to reduce the volume-to-capacity ratio to below 1.00.

2. The intersection of Honoapiilani Highway at North Kihei Road will operate at Level-of-Service C during the morning peak hour and Level-of-Service D during the afternoon peak hour. The volume-to-capacity ratio of the overall intersection will be 1.04 during the morning peak hour and 1.07 during the afternoon peak hour. Mitigation will be required to reduce the volume-to-capacity ratio to below 1.00.

   The northbound through movement along Honoapiilani Highway will operate at Level-of-Service C during the morning peak hour and Level-of-Service D during the afternoon peak hour. The southbound through movement along Honoapiilani Highway will operate at Level-of-Service B during the morning peak hour and Level-of-Service A during the morning peak hour.

   The final levels-of-service consider improvements that modify the intersection for access to and egress from the project. These improvements include a northbound left turn lane, a southbound right turn/deceleration lane, modification of the westbound approach to allow through movements, addition of an eastbound approach and modification of the westbound right to provide a green right turn arrow. See Attachment P.

3. The intersection of Honoapiilani Highway at Kopuli Street will operate at Level-of-Service B during both peak hour, without and with project traffic. These levels-of-service also consider conditions with improvements to provide access to and egress from the project. These improvements include a northbound left turn lane, a southbound right turn lane, addition of an eastbound approach with a left turn or thru lane and a right turn only lane and modification of the westbound left turn to allow optional left or through movements.

INSERT TABLE 9

The results of the level-of-service analysis of the unsignalized intersections are summarized in Table 10. Shown are the delays and levels-of-service of the overall intersection and each controlled lane group. The methodology for unsignalized intersections does not estimate delays and levels-of-service for uncontrolled movements. Also shown in the table are the estimated queue lengths without and will project generated traffic. Synchro reports the queue lengths is feet. The queue lengths shown in the table are estimated vehicles using an average vehicle length of 25 feet.

Table 10 2022 Background Plus Project Level-of-Service - Unsignalized Intersections

Intersection, Approach and Movement	AM Peak Hour						PM Peak Hour					
	Without Project			With Project			Without Project			With Project		
	Delay (1)	LOS (2)	95th Queue(3)	Delay	LOS	95th Queue	Delay	LOS	95th Queue	Delay	LOS	95th Queue
Honoapiilani Hwy at Maalaea Rd	***1.1***	***A***	***NC***	***1.1***	***A***	***NC***	***2.9***	***A***	***NC***	***3.0***	***A***	***NC***
Southbound Left	10.6	B	<1	10.8	B	<1	16.9	C	<2	17.5	C	<2
Westbound Right	11.9	B	<1	12.1	B	<1	27.3	D	<4	28.6	D	<4
Honoapiilani Hwy at Hauoli St	***0.0***	***A***	***NC***	***0.0***	***A***	***NC***	***0.0***	***A***	***NC***	***0.0***	***A***	***NC***
Westbound Left, Thru & Right	0.0	A	<1	0.0	A	<1	0.0	A	<1	0.0	A	<1

NOTES:
(1) Delay is in seconds per vehicle.
(2) LOS denotes Level-of-Service.
(3) 95th percentile queue in vehicles.
(4) NC = Not calculated

The conclusions of the level-of-service analysis of the unsignalized intersections are:

1. The intersection of Honoapiilani Highway at Maalaea Road will operate at Level-of-Service A during both peak hours without and with project traffic. All controlled lane groups will operate at Level-of-Service B during the morning peak hour. During the afternoon peak hour, the southbound left will operate at Level-of-Service C and he westbound merge will operate at Level-of-Service D. The queue of this movement will be four (4) vehicles without and with project traffic.

2. The intersection of Honoapiilani Highway at Hauoli Street will operate at Level-of-Service A without and with project traffic.

No mitigation will be required at the unsignalized intersections.

O. Mitigation

As noted earlier, Level-of-Service D is the minimum acceptable Level-of-Service[11] for signalized intersections and that this standard is applicable to the overall intersection rather than each controlled lane group. Minor movements, such as left turns, and minor side street approaches may operate at Level-of-Service E or F for short periods of time during the peak hours so that the overall

[11] Institute of Transportation Engineers, *Transportation Impact Analyses for Site Development: A Recommended Practice*, 2006, page 60.

intersection and major movements along the major highway will operate at Level-of-Service D, or better. All volume-to-capacity ratios must be 1.00 or less[12].

A standard has not be established for unsignalized intersections. Therefore, we have used a standard that Level-of-Service D is an acceptable level-of-service for any major controlled lane groups, such as left turns from a major street to a minor street. Side street approaches may operate at Level-of-Service E or F for short periods of time. This is determined from the delays of he individual lane groups. If the delay of any of the side street approaches appears to be so long that it will affect the overall level-of-service of the intersection, then mitigation measures should be accessed.

Mitigation will be required at the intersections of Honoapiilani Highway at Kuihelani Highway and Honoapiilani Highway at North Kihei Road.

1. At the intersection of Honoapiilani Highway at Kuihelani Highway, a right turn arrow should be provided for northbound to eastbound right turns. This right turn arrow should also overlap with the westbound left turn. This improvement will reduce the afternoon overall intersection volume-to-capacity ratio from 1.02 to 0.73.

2. At the intersection of Honoapiilani Highway at North Kihei Road, a right turn arrow should be provided for westbound to northbound right turns. This right turn arrow should overlap with the southbound to eastbound left turns. This improvement will reduce the afternoon overall intersection volume-to-capacity ratio from 1.07 to 0.91.

These recommendations are summarized in Attachment S.

P. Summary and Recommendations

1. The proposed action is the construction of the infrastructure for 112 agricultural lots along the west side of Honoapiilani Highway between North Kihei Road and Kapoli Street in the Maalaea area of Maui. The southern part of the site is across the highway from Maalaea Harbor Village. The site is currently vacant. There will be 75 rural lots and each rural lot may have one ohana unit each. The remaining 37 lots will be R3 Residential.

2. Access and egress will be provided by two new driveways. The first driveway, referred to as Road A, will be at the intersection of Honoapiilani Highway and North Kihei Road. The second entrance, Referred to as Road B, will be at the intersection of Honoapiilani Highway and Kapoli Street. The intersections will be converted from a three-legged, signalized intersection to a four-legged intersection. All traffic movements will be allowed.

3. The year 2022 was used as the design, or horizon, year in order to be consistent with recently completed traffic studies for projects is Waikapu (Waiale, Puunani, etc.). The level-of-service analysis of 2022 background conditions without project related traffic concluded that mitigation will be required at the intersections of Honoapiilani Highway at Kuihelani

[12] Transportation Research Board, *Highway Capacity Manual*, Washington, D.C., 2000, p. 16-35.

Highway and Honoapiilani Highway at North Kihei Road. The recommended improvements include increasing the traffic signal cycle lengths from 90 to 120 seconds.

4. The trip generation analysis estimated that the project will generate a total of 128 trips during the morning peak hour and 175 trips during the afternoon peak hour.

5. The level-of-service analysis of 2022 background plus project conditions concluded that the following mitigation will be required at the intersections of Honoapiilani Highway at Kuihelani Highway and Honoapiilani Highway at North Kihei Road.

   a. At the intersection of Honoapiilani Highway at Kuihelani Highway, a right turn arrow should be provided for northbound to eastbound right turns. This right turn arrow should also overlap with the westbound left turn. This improvement will reduce the afternoon overall intersection volume-to-capacity ratio from 1.02 to 0.73.

   b. At the intersection of Honoapiilani Highway at North Kihei Road, a right turn arrow should be provided for westbound to northbound right turns. This right turn arrow should overlap with the southbound to eastbound left turns. This improvement will reduce the afternoon overall intersection volume-to-capacity ratio from 1.07 to 0.91.

6. In addition to the improvements required for mitigation listed above, the modifications recommended for the intersection of Honoapiilani Highway at Kapoli Street, crosswalks should be included to encourage pedestrian connectivity between the proposed subdivision and Maalaea Harbor Village.

Respectfully submitted,
PHILLIP ROWELL AND ASSOCIATES

Phillip J. Rowell, P.E.
Principal

List of Attachments

A. Project Site Plan

B. Existing Intersection Lane Configurations and Right-of-Way Controls

C. Aerial Photographs of Study Intersections

D. Existing (2013) Peak Hour Traffic Volumes

E. Level-of-Service Worksheets for Existing AM Peak Hour Traffic Volumes

F. Level-of-Service Worksheets for Existing PM Peak Hour Traffic Volumes

G. 2022 Peak Hour Traffic Projections without Project Generated Traffic

H. Level-of-Service Worksheets for 2022 AM Background Traffic Projections without Project Generated Traffic

I. Level-of-Service Worksheets for 2022 PM Background Traffic Projections without Project Generated Traffic

J. Level-of-Service Worksheets for 2022 AM Background Traffic Projections without Project Generated Traffic With Mitigation

K. Level-of-Service Worksheets for 2022 PM Background Traffic Projections without Project Generated Traffic With Mitigation

L. Project Trip Assignments

M. 2022 Peak Hour Traffic Projections with Project Generated Traffic

N. 2022 Lane Configurations and Lane Configurations With Project

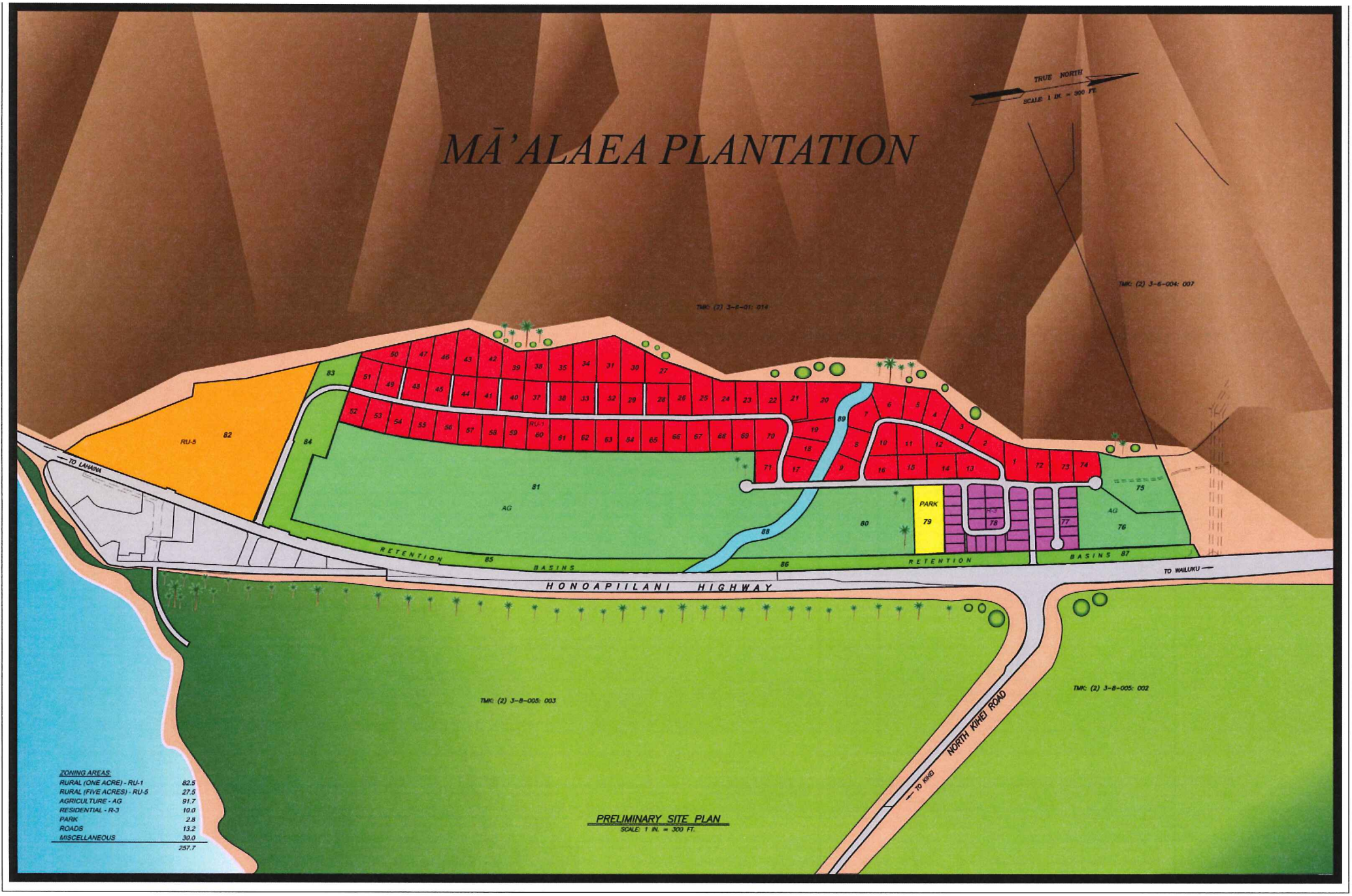
O. Level-of-Service Worksheets for 2018 AM Background Traffic Projections with Project Generated Traffic

P. Level-of-Service Worksheets for 2018 PM Background Traffic Projections with Project Generated Traffic

Q. Level-of-Service Worksheets for 2018 AM Background Traffic Projections with Project Generated Traffic With Mitigation

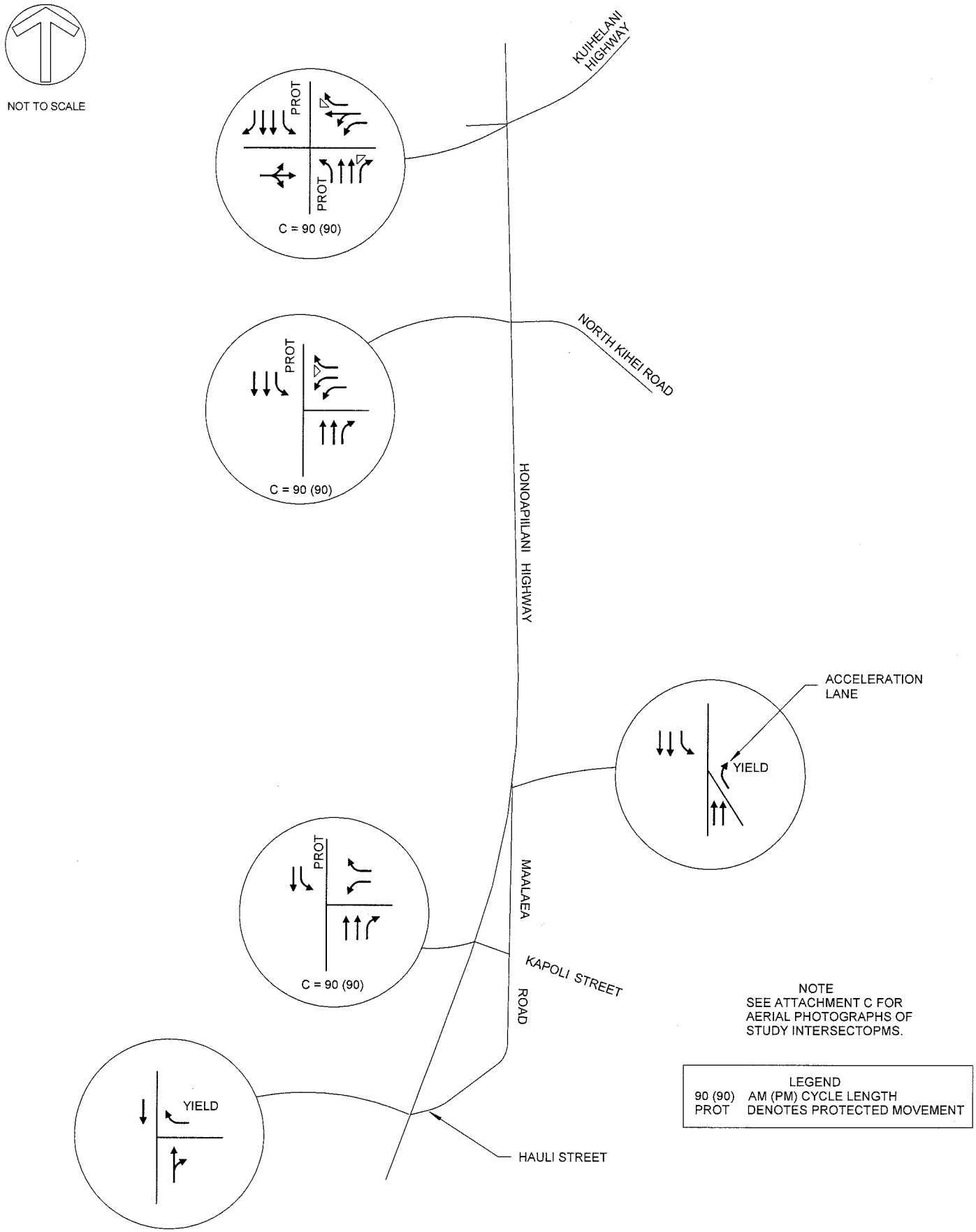
R. Level-of-Service Worksheets for 2018 PM Background Traffic Projections with Project Generated Traffic With Mitigation

S. Summary of Recommended Lane Configurations and Right-of-Way Controls



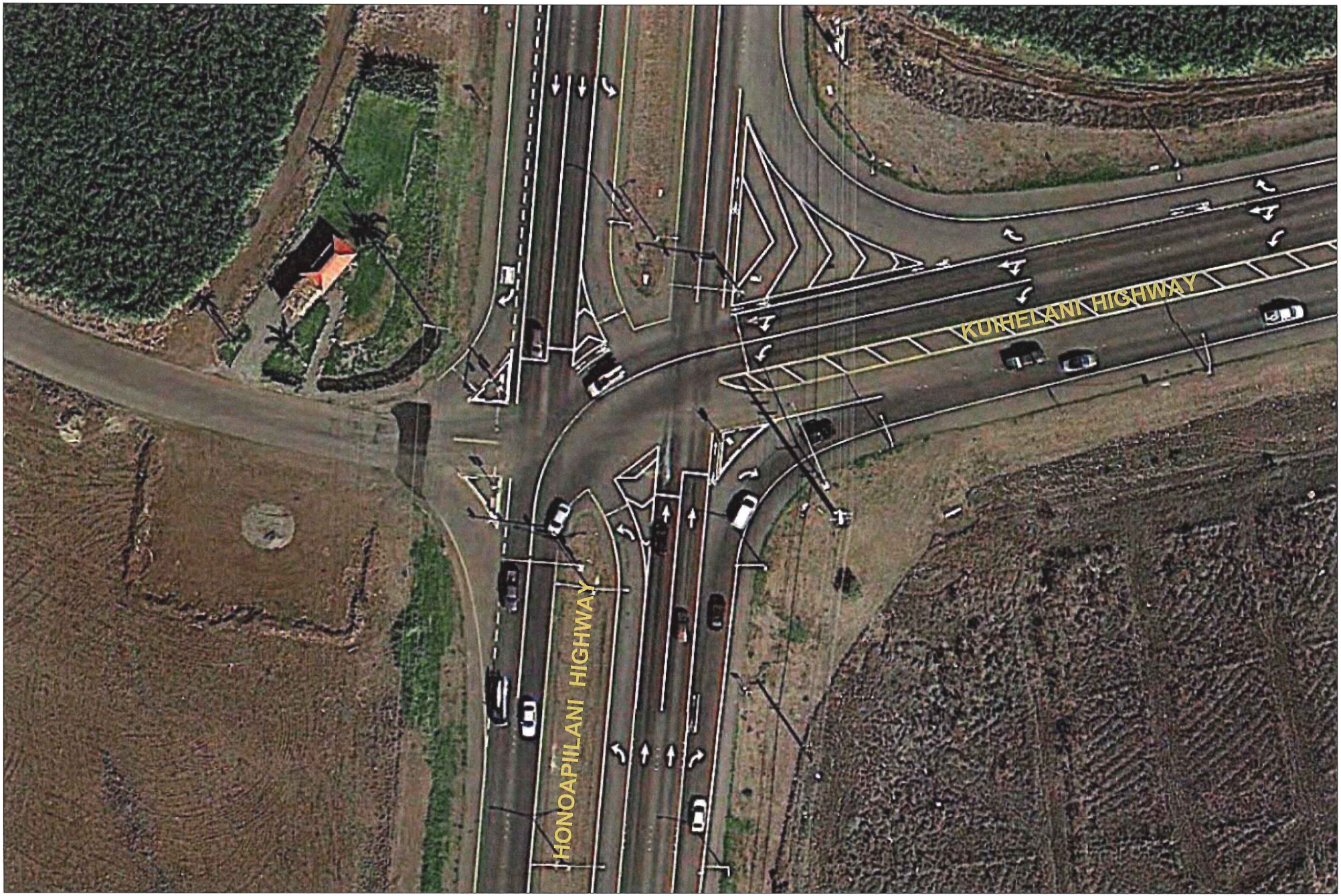
NOTE: SITE PLAN PROVIDED BY OTHERS

Attachment A
PROJECT SITE PLAN



Attachment B
EXISTING (2014) LANE CONFIGURATIONS AND RIGHT-OF-WAY CONTROLS

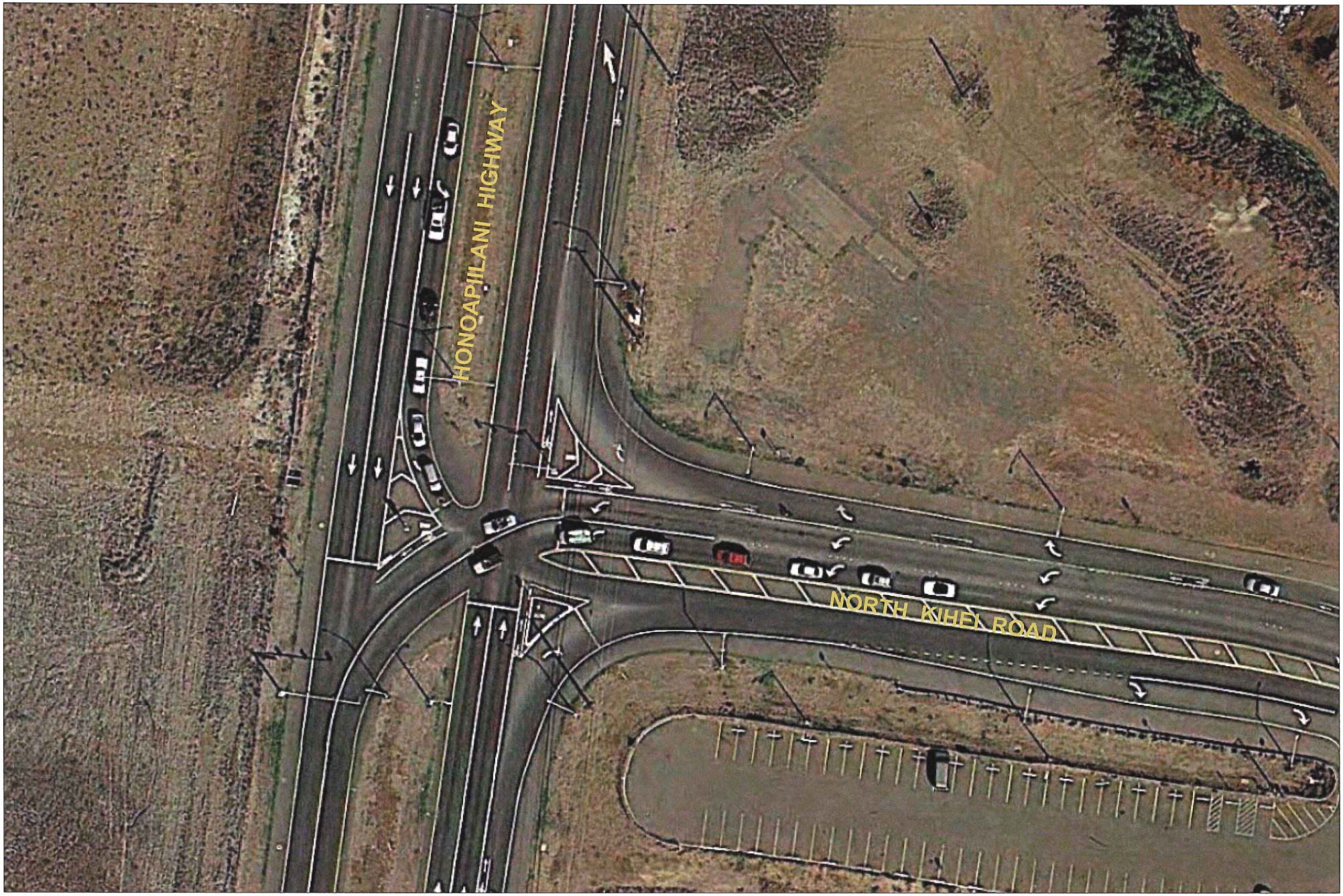
Attachment C
Aerial Photographs of Study Intersections



Source: Google Earth

Attachment C1
AERIAL PHOTOGRAPH
INTERSECTION OF HONOAPIILANI HIGHWAY AT KUIHELANI HIGHWAY

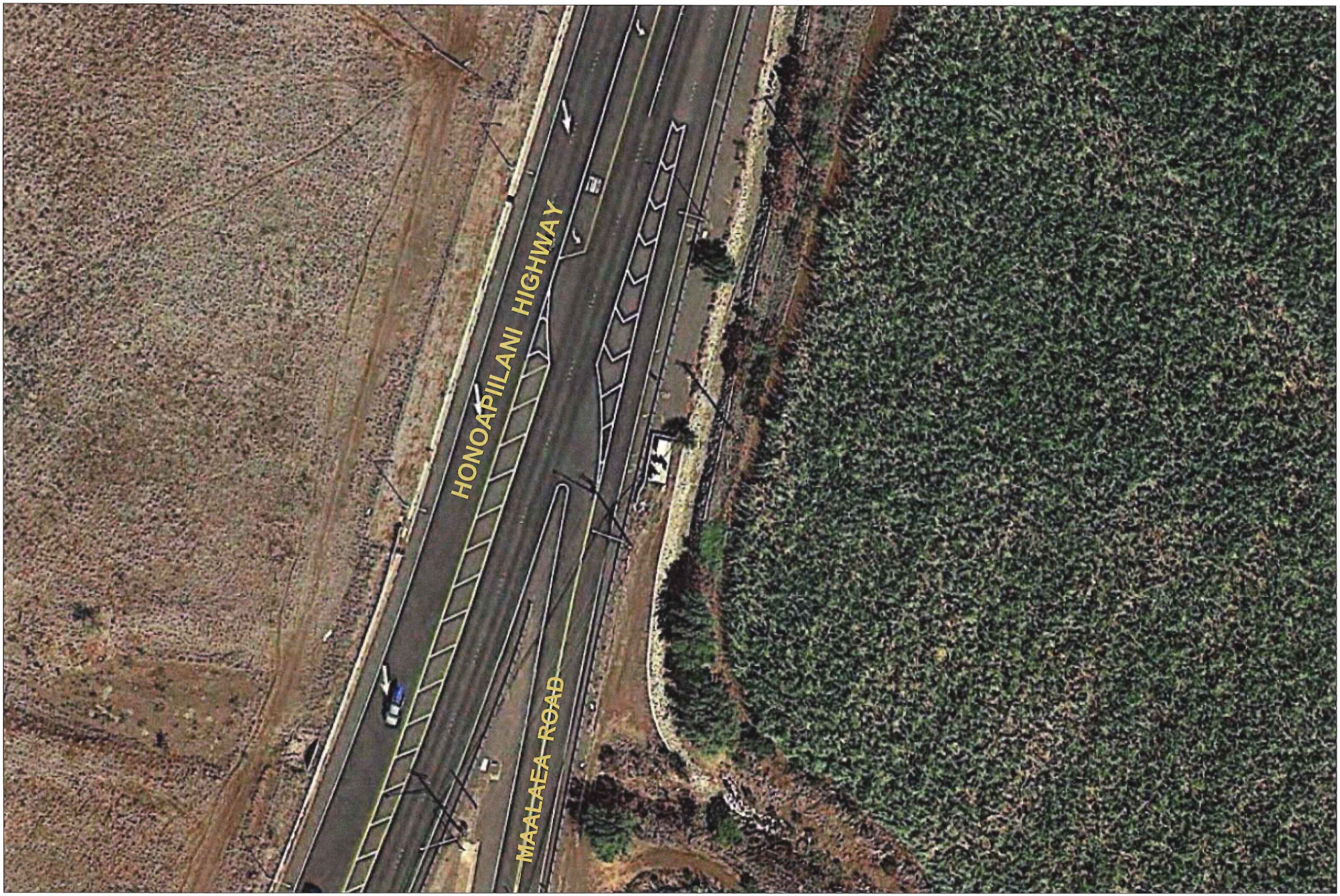
NOT TO SCALE



Source: Google Earth

Attachment C2
AERIAL PHOTOGRAPH
INTERSECTION OF HONOAPIILANI HIGHWAY AT NORTH KIHEI ROAD

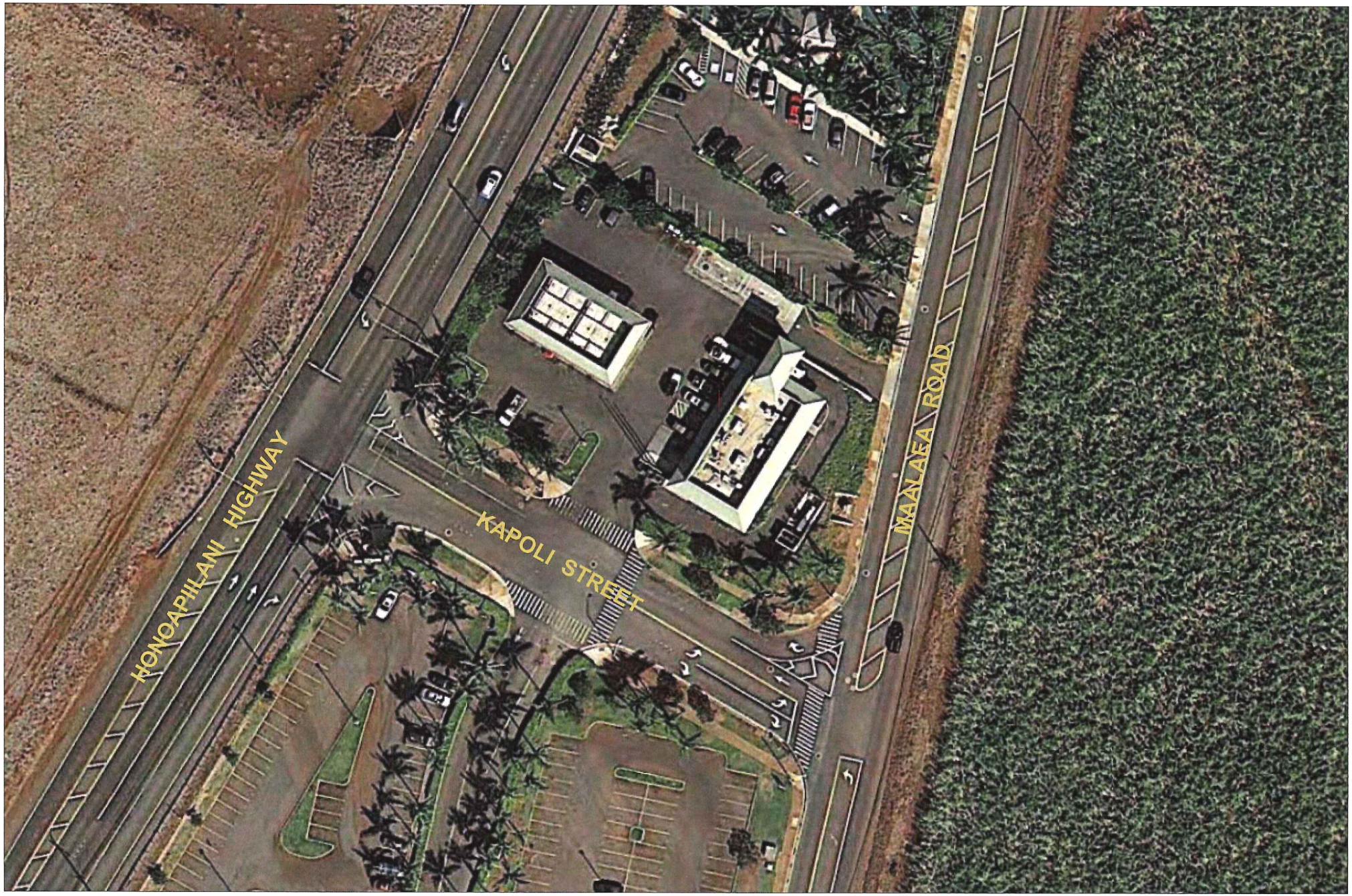
NOT TO SCALE



Source: Google Earth

Attachment C3
AERIAL PHOTOGRAPH
INTERSECTION OF HONOAPIILANI HIGHWAY AT MAALAEA ROAD

NOT TO SCALE



Source: Google Earth

Attachment C4
AERIAL PHOTOGRAPH
INTERSECTION OF HONOAPIILANI HIGHWAY AT KAPOLI STREET

NOT TO SCALE

Source: Google Earth

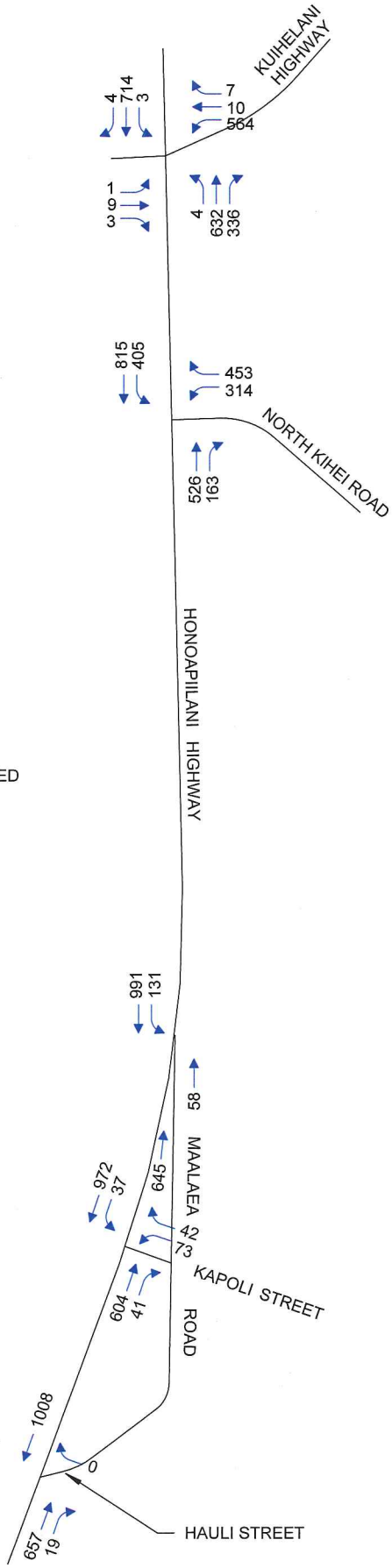
Attachment C5
AERIAL PHOTOGRAPH
INTERSECTION OF HONOAPIILANI HIGHWAY AT HAUOLI STREET

NOT TO SCALE

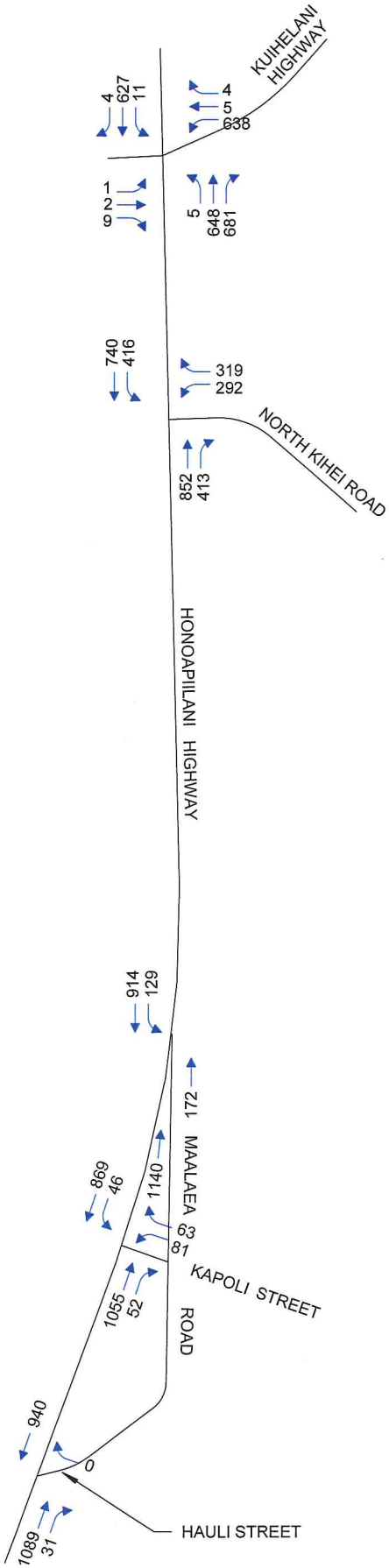
NOT TO SCALE

NOTES

1. TRAFFIC COUNTS WERE PERFORMED DURING SEPTEMBER, 2014.



AM PEAK HOUR



PM PEAK HOUR

Attachment D
EXISTING (2014) PEAK HOUR TRAFFIC VOLUMES

Attachment E
Level-of-Service Worksheets for Existing AM Peak Hour Traffic Volumes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1751		1633	1640	1538	1719	3438	1538	1719	3438	1538
Flt Permitted		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1751		1633	1640	1538	1719	3438	1538	1719	3438	1538
Volume (vph)	1	9	3	564	10	7	4	632	336	3	714	4
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	10	3	613	11	8	4	687	365	3	776	4
RTOR Reduction (vph)	0	3	0	0	0	6	0	0	194	0	0	2
Lane Group Flow (vph)	0	11	0	307	317	2	4	687	171	3	776	2
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		1.0		15.7	15.7	15.7	0.6	29.5	29.5	0.6	29.5	29.5
Effective Green, g (s)		1.0		15.7	15.7	15.7	0.6	29.5	29.5	0.6	29.5	29.5
Actuated g/C Ratio		0.02		0.25	0.25	0.25	0.01	0.47	0.47	0.01	0.47	0.47
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		28		408	410	385	16	1615	722	16	1615	722
v/s Ratio Prot		c0.01		0.19	c0.19		c0.00	0.20		0.00	0.23	
v/s Ratio Perm						0.01			0.24			0.00
v/c Ratio		0.39		0.75	0.77	0.01	0.25	0.43	0.24	0.19	0.48	0.00
Uniform Delay, d1		30.6		21.8	21.9	17.7	30.9	11.0	9.9	30.9	11.4	8.8
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		8.9		7.7	8.8	0.0	8.1	0.8	0.8	5.6	1.0	0.0
Delay (s)		39.5		29.4	30.7	17.7	38.9	11.9	10.7	36.5	12.4	8.8
Level of Service		D		C	C	B	D	B	B	D	B	A
Approach Delay (s)		39.5			29.9			11.6			12.5	
Approach LOS		D			C			B			B	

Intersection Summary

HCM Average Control Delay	16.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.59		
Actuated Cycle Length (s)	62.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	49.0%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3335	1538	3438	1538	1719	3438
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3335	1538	3438	1538	1719	3438
Volume (vph)	314	453	526	163	405	815
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	341	492	572	177	440	886
RTOR Reduction (vph)	0	402	0	111	0	0
Lane Group Flow (vph)	341	90	572	66	440	886
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	15.2	15.2	30.9	30.9	25.3	60.2
Effective Green, g (s)	15.2	15.2	30.9	30.9	25.3	60.2
Actuated g/C Ratio	0.18	0.18	0.37	0.37	0.30	0.72
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	608	280	1274	570	521	2482
v/s Ratio Prot	0.10		c0.17		c0.26	0.26
v/s Ratio Perm		0.32		0.12		
v/c Ratio	0.56	0.32	0.45	0.12	0.84	0.36
Uniform Delay, d1	31.1	29.6	19.8	17.3	27.2	4.3
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.7	1.1	0.4	11.9	0.4
Delay (s)	32.2	30.3	21.0	17.7	39.1	4.7
Level of Service	C	C	C	B	D	A
Approach Delay (s)	31.1		20.2			16.2
Approach LOS	C		C			B

Intersection Summary

HCM Average Control Delay	21.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.87		
Actuated Cycle Length (s)	83.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	55.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1719	1538	3438	1538	1719	1810
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1719	1538	3438	1538	1719	1810
Volume (vph)	73	42	604	41	37	972
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	79	46	657	45	40	1057
RTOR Reduction (vph)	0	42	0	12	0	0
Lane Group Flow (vph)	79	4	657	33	40	1057
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	8.7	8.7	71.9	71.9	4.0	79.9
Effective Green, g (s)	8.7	8.7	71.9	71.9	4.0	79.9
Actuated g/C Ratio	0.09	0.09	0.74	0.74	0.04	0.83
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	155	139	2559	1145	71	1497
v/s Ratio Prot	c0.05		0.19		0.02	c0.58
v/s Ratio Perm		0.03		0.03		
v/c Ratio	0.51	0.03	0.26	0.03	0.56	0.71
Uniform Delay, d1	41.9	40.1	3.9	3.2	45.4	3.5
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.6	0.1	0.2	0.0	9.8	2.8
Delay (s)	44.5	40.2	4.1	3.3	55.3	6.3
Level of Service	D	D	A	A	E	A
Approach Delay (s)	42.9		4.1			8.1
Approach LOS	D		A			A

Intersection Summary

HCM Average Control Delay	8.9	HCM Level of Service	A
HCM Volume to Capacity ratio	0.69		
Actuated Cycle Length (s)	96.6	Sum of lost time (s)	8.0
Intersection Capacity Utilization	61.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Volume (veh/h)	645	0	131	991	0	58
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	701	0	142	1077	0	63
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			701		1524	351
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			701		1524	351
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			84		100	90
cM capacity (veh/h)			872		88	637

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NW 1
Volume Total	351	351	142	539	539	63
Volume Left	0	0	142	0	0	0
Volume Right	0	0	0	0	0	63
cSH	1700	1700	872	1700	1700	637
Volume to Capacity	0.21	0.21	0.16	0.32	0.32	0.10
Queue Length 95th (ft)	0	0	15	0	0	8
Control Delay (s)	0.0	0.0	9.9	0.0	0.0	11.3
Lane LOS			A			B
Approach Delay (s)	0.0		1.2			11.3
Approach LOS						B

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	31.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	657	19	0	1008
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	714	21	0	1096
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	1820	724			735	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	1820	724			735	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	84	420			857	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	735	1096
Volume Left	0	0	0
Volume Right	0	21	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.43	0.64
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	56.4%	ICU Level of Service	B
Analysis Period (min)	15		

Attachment F
Level-of-Service Worksheets for Existing PM Peak Hour Traffic Volumes

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.90		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1615		1633	1638	1538	1719	3438	1538	1719	3438	1538
Flt Permitted		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1615		1633	1638	1538	1719	3438	1538	1719	3438	1538
Volume (vph)	1	2	9	638	5	4	5	648	681	11	627	4
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	2	10	693	5	4	5	704	740	12	682	4
RTOR Reduction (vph)	0	10	0	0	0	3	0	0	400	0	0	2
Lane Group Flow (vph)	0	3	0	347	351	1	5	704	340	12	682	2
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		1.0		17.6	17.6	17.6	0.6	30.0	30.0	0.6	30.0	30.0
Effective Green, g (s)		1.0		17.6	17.6	17.6	0.6	30.0	30.0	0.6	30.0	30.0
Actuated g/C Ratio		0.02		0.27	0.27	0.27	0.01	0.46	0.46	0.01	0.46	0.46
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		25		441	442	415	16	1582	708	16	1582	708
v/s Ratio Prot		c0.01		0.21	c0.21		0.00	0.20		c0.01	0.20	
v/s Ratio Perm						0.00			0.48			0.00
v/c Ratio		0.13		0.79	0.79	0.00	0.31	0.45	0.48	0.75	0.43	0.00
Uniform Delay, d1		31.7		22.1	22.1	17.4	32.1	11.9	12.2	32.2	11.9	9.5
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2.3		9.0	9.5	0.0	10.9	0.9	2.3	106.0	0.9	0.0
Delay (s)		33.9		31.0	31.6	17.4	43.0	12.9	14.5	138.2	12.7	9.5
Level of Service		C		C	C	B	D	B	B	F	B	A
Approach Delay (s)		33.9			31.2			13.8			14.9	
Approach LOS		C			C			B			B	

Intersection Summary

HCM Average Control Delay	18.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.94		
Actuated Cycle Length (s)	65.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	58.8%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3335	1538	3438	1538	1719	3438
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3335	1538	3438	1538	1719	3438
Volume (vph)	292	319	852	413	416	740
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	317	347	926	449	452	804
RTOR Reduction (vph)	0	294	0	267	0	0
Lane Group Flow (vph)	317	53	926	182	452	804
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	13.5	13.5	35.5	35.5	26.6	66.1
Effective Green, g (s)	13.5	13.5	35.5	35.5	26.6	66.1
Actuated g/C Ratio	0.15	0.15	0.41	0.41	0.30	0.75
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	514	237	1393	623	522	2594
v/s Ratio Prot	0.10		0.27		c0.26	0.23
v/s Ratio Perm		0.23		0.29		
v/c Ratio	0.62	0.23	0.66	0.29	0.87	0.31
Uniform Delay, d1	34.6	32.5	21.2	17.6	28.8	3.4
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.2	0.5	2.5	1.2	14.0	0.3
Delay (s)	36.8	33.0	23.7	18.8	42.8	3.8
Level of Service	D	C	C	B	D	A
Approach Delay (s)	34.8		22.1			17.8
Approach LOS	C		C			B

Intersection Summary

HCM Average Control Delay	23.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.90		
Actuated Cycle Length (s)	87.6	Sum of lost time (s)	12.0
Intersection Capacity Utilization	64.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1719	1538	3438	1538	1719	1810
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1719	1538	3438	1538	1719	1810
Volume (vph)	81	63	1055	52	46	869
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	88	68	1147	57	50	945
RTOR Reduction (vph)	0	60	0	18	0	0
Lane Group Flow (vph)	88	8	1147	39	50	945
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	8.8	8.8	53.2	53.2	4.3	61.5
Effective Green, g (s)	8.8	8.8	53.2	53.2	4.3	61.5
Actuated g/C Ratio	0.11	0.11	0.68	0.68	0.05	0.79
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	193	173	2336	1045	94	1422
v/s Ratio Prot	c0.05		0.33		0.03	c0.52
v/s Ratio Perm		0.04		0.04		
v/c Ratio	0.46	0.04	0.49	0.04	0.53	0.66
Uniform Delay, d1	32.5	31.0	6.0	4.1	36.0	3.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.7	0.1	0.7	0.1	5.7	2.5
Delay (s)	34.2	31.1	6.8	4.2	41.7	6.2
Level of Service	C	C	A	A	D	A
Approach Delay (s)	32.9		6.7			8.0
Approach LOS	C		A			A

Intersection Summary

HCM Average Control Delay	9.0	HCM Level of Service	A
HCM Volume to Capacity ratio	0.64		
Actuated Cycle Length (s)	78.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	56.9%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Volume (veh/h)	1140	0	129	914	0	172
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1239	0	140	993	0	187
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1239		2016	620
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1239		2016	620
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			74		100	56
cM capacity (veh/h)			542		36	424

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NW 1
Volume Total	620	620	140	497	497	187
Volume Left	0	0	140	0	0	0
Volume Right	0	0	0	0	0	187
cSH	1700	1700	542	1700	1700	424
Volume to Capacity	0.36	0.36	0.26	0.29	0.29	0.44
Queue Length 95th (ft)	0	0	26	0	0	55
Control Delay (s)	0.0	0.0	14.0	0.0	0.0	20.0
Lane LOS			B			C
Approach Delay (s)	0.0		1.7			20.0
Approach LOS						C

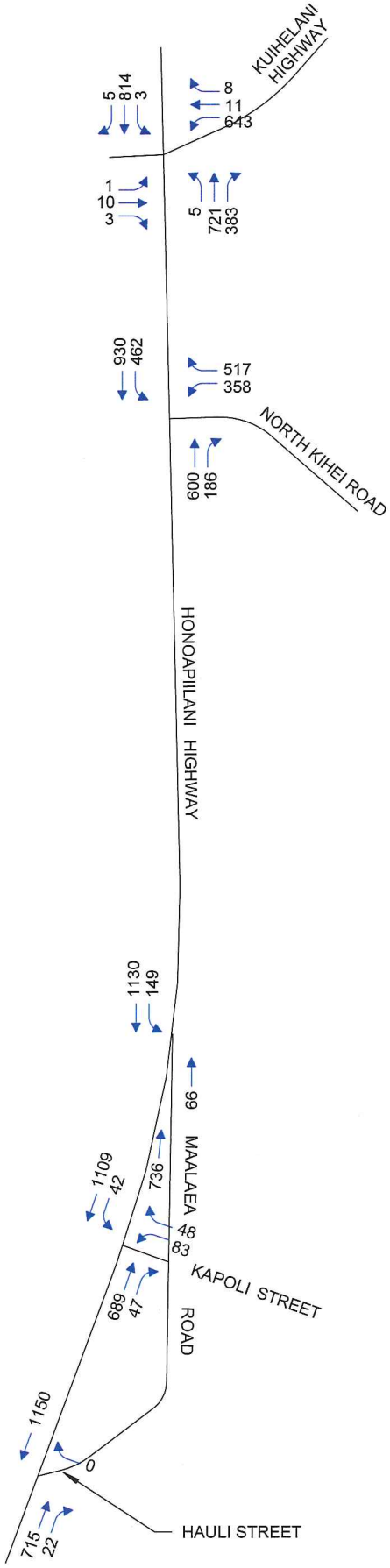
Intersection Summary			
Average Delay	2.2		
Intersection Capacity Utilization	48.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	1089	31	0	940
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1184	34	0	1022
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2222	1201			1217	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2222	1201			1217	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	47	222			562	

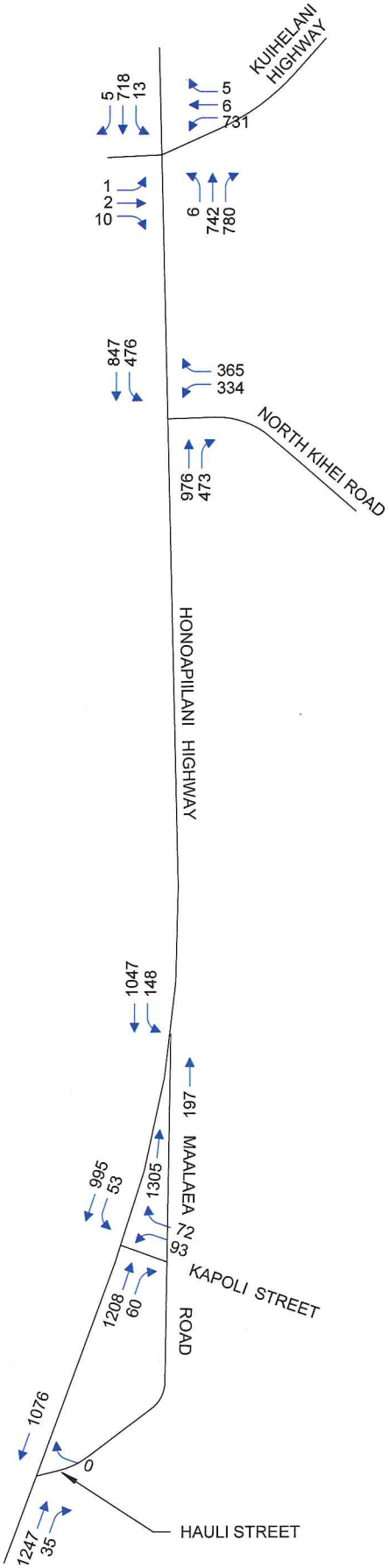
Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	1217	1022
Volume Left	0	0	0
Volume Right	0	34	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.72	0.60
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	62.5%	ICU Level of Service	B
Analysis Period (min)	15		

NOT TO SCALE



AM PEAK HOUR



PM PEAK HOUR

Attachment G
2022 BACKGROUND PEAK HOUR TRAFFIC PROJECTIONS

Attachment H
Level-of-Service Worksheets for 2022 AM Background Traffic Projections Without Project Generated Traffic

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1755		1633	1640	1538	1719	3438	1538	1719	3438	1538
Flt Permitted		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1755		1633	1640	1538	1719	3438	1538	1719	3438	1538
Volume (vph)	1	10	3	643	11	8	5	721	383	3	814	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	11	3	699	12	9	5	784	416	3	885	5
RTOR Reduction (vph)	0	3	0	0	0	7	0	0	226	0	0	3
Lane Group Flow (vph)	0	12	0	350	361	2	5	784	190	3	885	2
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		1.1		18.0	18.0	18.0	0.6	30.0	30.0	0.6	30.0	30.0
Effective Green, g (s)		1.1		18.0	18.0	18.0	0.6	30.0	30.0	0.6	30.0	30.0
Actuated g/C Ratio		0.02		0.27	0.27	0.27	0.01	0.46	0.46	0.01	0.46	0.46
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		29		447	449	421	16	1570	702	16	1570	702
v/s Ratio Prot		c0.01		0.21	c0.22		c0.00	0.23		0.00	0.26	
v/s Ratio Perm						0.01			0.27			0.00
v/c Ratio		0.42		0.78	0.80	0.01	0.31	0.50	0.27	0.19	0.56	0.00
Uniform Delay, d1		32.0		22.0	22.2	17.3	32.3	12.6	11.1	32.3	13.1	9.7
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		9.4		8.7	10.0	0.0	10.9	1.1	0.9	5.6	1.5	0.0
Delay (s)		41.4		30.7	32.2	17.3	43.2	13.7	12.0	37.9	14.5	9.7
Level of Service		D		C	C	B	D	B	B	D	B	A
Approach Delay (s)		41.4			31.3			13.2			14.6	
Approach LOS		D			C			B			B	

Intersection Summary

HCM Average Control Delay	18.4	HCM Level of Service	B
HCM Volume to Capacity ratio	0.66		
Actuated Cycle Length (s)	65.7	Sum of lost time (s)	16.0
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3335	1538	3438	1538	1719	3438
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3335	1538	3438	1538	1719	3438
Volume (vph)	358	517	600	186	462	930
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	389	562	652	202	502	1011
RTOR Reduction (vph)	0	448	0	138	0	0
Lane Group Flow (vph)	389	114	652	64	502	1011
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	16.6	16.6	25.8	25.8	27.4	57.2
Effective Green, g (s)	16.6	16.6	25.8	25.8	27.4	57.2
Actuated g/C Ratio	0.20	0.20	0.32	0.32	0.33	0.70
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	677	312	1084	485	576	2404
v/s Ratio Prot	0.12		c0.19		c0.29	0.29
v/s Ratio Perm		0.37		0.13		
v/c Ratio	0.57	0.37	0.60	0.13	0.87	0.42
Uniform Delay, d1	29.4	28.1	23.7	20.0	25.5	5.2
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.2	0.7	2.5	0.6	13.6	0.5
Delay (s)	30.6	28.8	26.1	20.6	39.1	5.8
Level of Service	C	C	C	C	D	A
Approach Delay (s)	29.5		24.8			16.9
Approach LOS	C		C			B

Intersection Summary

HCM Average Control Delay	22.5	HCM Level of Service	C
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	81.8	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.4%	ICU Level of Service	B
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1719	1538	3438	1538	1719	1810
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1719	1538	3438	1538	1719	1810
Volume (vph)	83	48	689	47	42	1109
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	90	52	749	51	46	1205
RTOR Reduction (vph)	0	47	0	13	0	0
Lane Group Flow (vph)	90	5	749	38	46	1205
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	9.3	9.3	71.0	71.0	4.0	79.0
Effective Green, g (s)	9.3	9.3	71.0	71.0	4.0	79.0
Actuated g/C Ratio	0.10	0.10	0.74	0.74	0.04	0.82
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	166	149	2535	1134	71	1485
v/s Ratio Prot	c0.05		0.22		0.03	c0.67
v/s Ratio Perm		0.03		0.03		
v/c Ratio	0.54	0.03	0.30	0.03	0.65	0.81
Uniform Delay, d1	41.5	39.4	4.2	3.4	45.5	4.6
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.6	0.1	0.3	0.1	18.5	4.9
Delay (s)	45.1	39.5	4.5	3.5	64.0	9.6
Level of Service	D	D	A	A	E	A
Approach Delay (s)	43.0		4.5			11.6
Approach LOS	D		A			B

Intersection Summary

HCM Average Control Delay	11.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.78		
Actuated Cycle Length (s)	96.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	69.6%	ICU Level of Service	C
Analysis Period (min)	15		

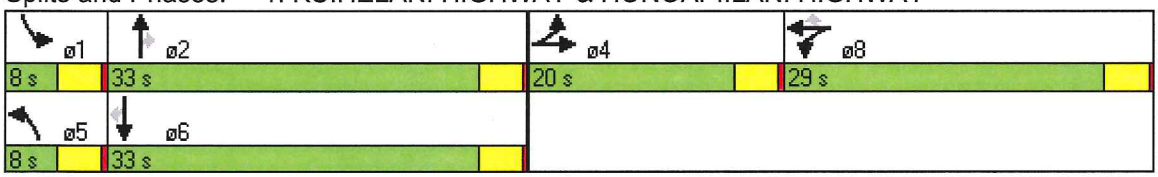
c Critical Lane Group

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	10	643	11	8	5	721	383	3	814	5
Lane Group Flow (vph)	15	350	361	9	5	784	416	3	885	5
Turn Type		Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	8	8		5	2		1	6	
Permitted Phases				8			2			6
Detector Phases	4	8	8	8	5	2	2	1	6	6
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)	20.0	20.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	20.0	29.0	29.0	29.0	8.0	33.0	33.0	8.0	33.0	33.0
Total Split (%)	22.2%	32.2%	32.2%	32.2%	8.9%	36.7%	36.7%	8.9%	36.7%	36.7%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.09	0.70	0.72	0.02	0.05	0.45	0.42	0.03	0.51	0.01
Control Delay	29.0	23.1	23.6	10.1	34.8	13.0	3.4	34.7	13.7	9.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	29.0	23.1	23.6	10.1	34.8	13.0	3.4	34.7	13.7	9.2
Queue Length 50th (ft)	4	101	105	0	2	76	0	1	90	0
Queue Length 95th (ft)	23	266	#282	10	13	233	57	10	271	7
Internal Link Dist (ft)	1440		2589			1820			4559	
Turn Bay Length (ft)										
Base Capacity (vph)	371	627	629	596	107	1745	985	107	1745	783
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.56	0.57	0.02	0.05	0.45	0.42	0.03	0.51	0.01

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 59.2
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: KUIHELANI HIGHWAY & HONOAPIILANI HIGHWAY

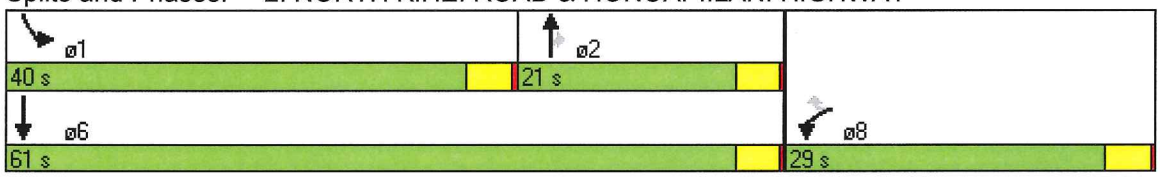


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	358	517	600	186	462	930
Lane Group Flow (vph)	389	562	652	202	502	1011
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Detector Phases	8	8	2	2	1	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	8.0	20.0
Total Split (s)	29.0	29.0	21.0	21.0	40.0	61.0
Total Split (%)	32.2%	32.2%	23.3%	23.3%	44.4%	67.8%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	None	Max
v/c Ratio	0.57	0.74	0.60	0.32	0.87	0.42
Control Delay	30.5	7.2	30.4	6.3	32.1	6.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	30.5	7.2	30.4	6.3	32.1	6.6
Queue Length 50th (ft)	92	0	148	0	233	96
Queue Length 95th (ft)	134	85	#315	57	359	183
Internal Link Dist (ft)	2615		4697			1820
Turn Bay Length (ft)						
Base Capacity (vph)	926	833	1081	622	687	2403
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.42	0.67	0.60	0.32	0.73	0.42

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 81.9
Natural Cycle: 65
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: NORTH KIHEI ROAD & HONOAPIILANI HIGHWAY

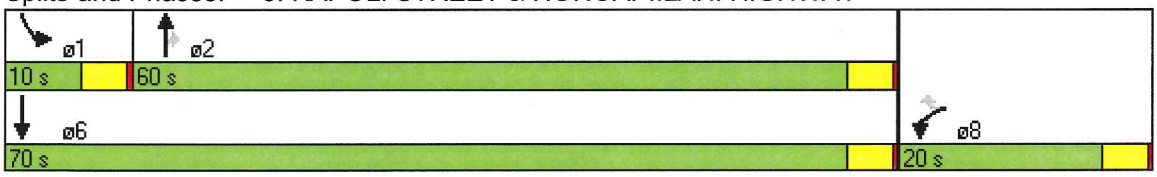


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	83	48	689	47	42	1109
Lane Group Flow (vph)	90	52	749	51	46	1205
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Detector Phases	8	8	2	2	1	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	8.0	20.0
Total Split (s)	20.0	20.0	60.0	60.0	10.0	70.0
Total Split (%)	22.2%	22.2%	66.7%	66.7%	11.1%	77.8%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	None	Max
v/c Ratio	0.49	0.25	0.29	0.04	0.43	0.80
Control Delay	37.7	11.4	5.3	1.9	51.1	11.8
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	37.7	11.4	5.3	1.9	51.1	11.8
Queue Length 50th (ft)	45	0	75	0	24	294
Queue Length 95th (ft)	90	31	120	12	59	#853
Internal Link Dist (ft)	742		1660			1258
Turn Bay Length (ft)						
Base Capacity (vph)	276	290	2609	1180	108	1500
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.33	0.18	0.29	0.04	0.43	0.80

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 94.4
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: KAPOLI STREET & HONOAPIILANI HIGHWAY



Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Volume (veh/h)	736	0	149	1130	0	66
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	800	0	162	1228	0	72
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			800		1738	400
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			800		1738	400
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			80		100	88
cM capacity (veh/h)			800		60	591

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NW 1
Volume Total	400	400	162	614	614	72
Volume Left	0	0	162	0	0	0
Volume Right	0	0	0	0	0	72
cSH	1700	1700	800	1700	1700	591
Volume to Capacity	0.24	0.24	0.20	0.36	0.36	0.12
Queue Length 95th (ft)	0	0	19	0	0	10
Control Delay (s)	0.0	0.0	10.6	0.0	0.0	11.9
Lane LOS			B			B
Approach Delay (s)	0.0		1.2			11.9
Approach LOS						B

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	35.3%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	715	22	0	1150
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	777	24	0	1250
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2039	789			801	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2039	789			801	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	61	386			809	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	801	1250
Volume Left	0	0	0
Volume Right	0	24	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.47	0.74
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	63.9%	ICU Level of Service	B
Analysis Period (min)	15		

Attachment I
Level-of-Service Worksheets for 2022 PM Background Traffic Projections Without Project Generated Traffic

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.89		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1612		1633	1639	1538	1719	3438	1538	1719	3438	1538
Flt Permitted		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1612		1633	1639	1538	1719	3438	1538	1719	3438	1538
Volume (vph)	1	2	10	731	6	5	6	742	780	13	718	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	2	11	795	7	5	7	807	848	14	780	5
RTOR Reduction (vph)	0	11	0	0	0	3	0	0	484	0	0	3
Lane Group Flow (vph)	0	3	0	398	404	2	7	807	364	14	780	2
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		1.0		19.7	19.7	19.7	0.6	28.0	28.0	0.6	28.0	28.0
Effective Green, g (s)		1.0		19.7	19.7	19.7	0.6	28.0	28.0	0.6	28.0	28.0
Actuated g/C Ratio		0.02		0.30	0.30	0.30	0.01	0.43	0.43	0.01	0.43	0.43
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		25		493	494	464	16	1474	659	16	1474	659
v/s Ratio Prot		c0.01		0.24	c0.25		0.00	0.23		c0.01	0.23	
v/s Ratio Perm						0.00			0.55			0.00
v/c Ratio		0.13		0.81	0.82	0.00	0.44	0.55	0.55	0.88	0.53	0.00
Uniform Delay, d1		31.7		21.0	21.1	15.9	32.2	13.9	14.0	32.3	13.8	10.7
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		2.3		9.4	10.1	0.0	18.0	1.5	3.3	161.3	1.4	0.0
Delay (s)		34.0		30.4	31.3	15.9	50.2	15.4	17.3	193.6	15.1	10.7
Level of Service		C		C	C	B	D	B	B	F	B	B
Approach Delay (s)		34.0			30.8			16.5			18.2	
Approach LOS		C			C			B			B	

Intersection Summary

HCM Average Control Delay	20.5	HCM Level of Service	C
HCM Volume to Capacity ratio	1.08		
Actuated Cycle Length (s)	65.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3335	1538	3438	1538	1719	3438
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3335	1538	3438	1538	1719	3438
Volume (vph)	334	365	976	473	476	847
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	363	397	1061	514	517	921
RTOR Reduction (vph)	0	332	0	295	0	0
Lane Group Flow (vph)	363	65	1061	219	517	921
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	14.4	14.4	33.1	33.1	29.0	66.1
Effective Green, g (s)	14.4	14.4	33.1	33.1	29.0	66.1
Actuated g/C Ratio	0.16	0.16	0.37	0.37	0.33	0.75
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	543	250	1286	575	563	2568
v/s Ratio Prot	0.11		0.31		c0.30	0.27
v/s Ratio Perm		0.26		0.33		
v/c Ratio	0.67	0.26	0.83	0.38	0.92	0.36
Uniform Delay, d1	34.8	32.4	25.1	20.2	28.6	3.9
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	3.1	0.6	6.1	1.9	19.9	0.4
Delay (s)	37.9	32.9	31.2	22.1	48.6	4.3
Level of Service	D	C	C	C	D	A
Approach Delay (s)	35.3		28.2			20.2
Approach LOS	D		C			C

Intersection Summary

HCM Average Control Delay	26.6	HCM Level of Service	C
HCM Volume to Capacity ratio	1.03		
Actuated Cycle Length (s)	88.5	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00	0.95	1.00	1.00	1.00
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	1719	1538	3438	1538	1719	1810
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	1719	1538	3438	1538	1719	1810
Volume (vph)	93	72	1208	60	53	995
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	101	78	1313	65	58	1082
RTOR Reduction (vph)	0	69	0	21	0	0
Lane Group Flow (vph)	101	9	1313	44	58	1082
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	9.3	9.3	52.5	52.5	4.3	60.8
Effective Green, g (s)	9.3	9.3	52.5	52.5	4.3	60.8
Actuated g/C Ratio	0.12	0.12	0.67	0.67	0.06	0.78
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	205	183	2311	1034	95	1409
v/s Ratio Prot	c0.06		0.38		0.03	c0.60
v/s Ratio Perm		0.05		0.04		
v/c Ratio	0.49	0.05	0.57	0.04	0.61	0.77
Uniform Delay, d1	32.2	30.5	6.8	4.3	36.1	4.8
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	1.9	0.1	1.0	0.1	11.1	4.1
Delay (s)	34.1	30.6	7.8	4.4	47.1	8.8
Level of Service	C	C	A	A	D	A
Approach Delay (s)	32.6		7.6			10.8
Approach LOS	C		A			B

Intersection Summary

HCM Average Control Delay	10.6	HCM Level of Service	B
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	78.1	Sum of lost time (s)	8.0
Intersection Capacity Utilization	64.2%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

1: KUIHELANI HIGHWAY & HONOAPIILANI HIGHWAY

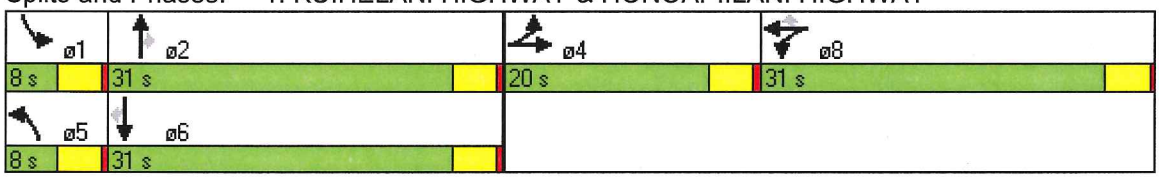
11/12/2014

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	2	731	6	5	6	742	780	13	718	5
Lane Group Flow (vph)	14	398	404	5	7	807	848	14	780	5
Turn Type		Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	8	8		5	2		1	6	
Permitted Phases				8			2			6
Detector Phases	4	8	8	8	5	2	2	1	6	6
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)	20.0	20.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	20.0	31.0	31.0	31.0	8.0	31.0	31.0	8.0	31.0	31.0
Total Split (%)	22.2%	34.4%	34.4%	34.4%	8.9%	34.4%	34.4%	8.9%	34.4%	34.4%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.09	0.73	0.73	0.01	0.07	0.49	0.72	0.13	0.48	0.01
Control Delay	20.5	22.4	22.7	10.2	35.0	14.6	5.9	36.3	14.4	10.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	20.5	22.4	22.7	10.2	35.0	14.6	5.9	36.3	14.4	10.0
Queue Length 50th (ft)	1	111	113	0	2	85	0	4	81	0
Queue Length 95th (ft)	19	#306	#327	7	16	250	103	26	240	7
Internal Link Dist (ft)	1440		2589			1820			4559	
Turn Bay Length (ft)										
Base Capacity (vph)	349	677	679	641	107	1637	1176	107	1637	735
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.04	0.59	0.59	0.01	0.07	0.49	0.72	0.13	0.48	0.01

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 58.8
Natural Cycle: 80
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 1: KUIHELANI HIGHWAY & HONOAPIILANI HIGHWAY



2: NORTH KIHEI ROAD & HONOAPIILANI HIGHWAY

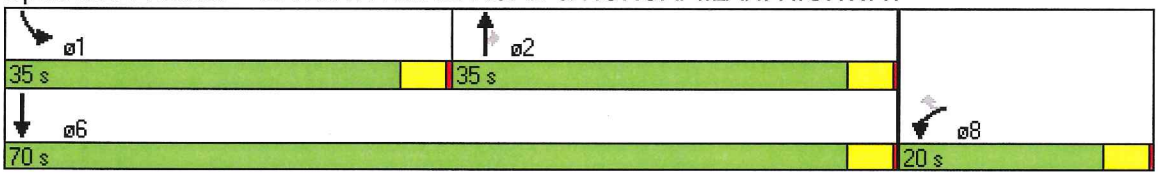
11/12/2014

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	334	365	976	473	476	847
Lane Group Flow (vph)	363	397	1061	514	517	921
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Detector Phases	8	8	2	2	1	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	8.0	20.0
Total Split (s)	20.0	20.0	35.0	35.0	35.0	70.0
Total Split (%)	22.2%	22.2%	38.9%	38.9%	38.9%	77.8%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	None	Max
v/c Ratio	0.67	0.68	0.83	0.59	0.92	0.36
Control Delay	39.6	9.6	33.0	6.4	46.4	4.5
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.6	9.6	33.0	6.4	46.4	4.5
Queue Length 50th (ft)	98	0	296	16	271	82
Queue Length 95th (ft)	144	82	#420	99	#458	108
Internal Link Dist (ft)	2615		4697			1820
Turn Bay Length (ft)						
Base Capacity (vph)	593	600	1286	870	589	2567
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.61	0.66	0.83	0.59	0.88	0.36

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 88.4
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: NORTH KIHEI ROAD & HONOAPIILANI HIGHWAY

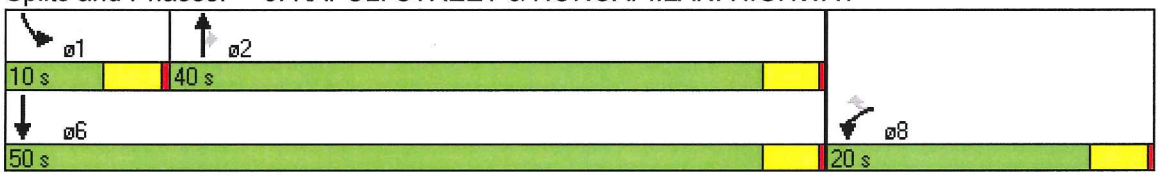


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	93	72	1208	60	53	995
Lane Group Flow (vph)	101	78	1313	65	58	1082
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Detector Phases	8	8	2	2	1	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	8.0	20.0
Total Split (s)	20.0	20.0	40.0	40.0	10.0	50.0
Total Split (%)	28.6%	28.6%	57.1%	57.1%	14.3%	71.4%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	None	Max
v/c Ratio	0.45	0.29	0.55	0.06	0.43	0.76
Control Delay	26.8	7.9	9.0	2.3	37.9	11.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	26.8	7.9	9.0	2.3	37.9	11.4
Queue Length 50th (ft)	36	0	163	0	21	206
Queue Length 95th (ft)	75	32	262	15	56	#617
Internal Link Dist (ft)	742		1660			1258
Turn Bay Length (ft)						
Base Capacity (vph)	345	371	2371	1081	137	1416
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.29	0.21	0.55	0.06	0.42	0.76

Intersection Summary

Cycle Length: 70
Actuated Cycle Length: 76.9
Natural Cycle: 70
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: KAPULI STREET & HONOAPIILANI HIGHWAY



Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Volume (veh/h)	1305	0	148	1047	0	197
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1418	0	161	1138	0	214
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1418		2309	709
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1418		2309	709
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			65		100	42
cM capacity (veh/h)			461		20	370

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NW 1
Volume Total	709	709	161	569	569	214
Volume Left	0	0	161	0	0	0
Volume Right	0	0	0	0	0	214
cSH	1700	1700	461	1700	1700	370
Volume to Capacity	0.42	0.42	0.35	0.33	0.33	0.58
Queue Length 95th (ft)	0	0	39	0	0	88
Control Delay (s)	0.0	0.0	16.9	0.0	0.0	27.3
Lane LOS			C			D
Approach Delay (s)	0.0		2.1			27.3
Approach LOS						D

Intersection Summary			
Average Delay	2.9		
Intersection Capacity Utilization	54.9%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	1247	35	0	1076
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1355	38	0	1170
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2544	1374			1393	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2544	1374			1393	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	29	175			481	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	1393	1170
Volume Left	0	0	0
Volume Right	0	38	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.82	0.69
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	71.1%	ICU Level of Service	C
Analysis Period (min)	15		

Attachment J
Level-of-Service Worksheets for 2022 AM Background Traffic Projections Without Project Generated Traffic With Mitigation

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1755		1633	1640	1538	1719	3438	1538	1719	3438	1538
Flt Permitted		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1755		1633	1640	1538	1719	3438	1538	1719	3438	1538
Volume (vph)	1	10	3	643	11	8	5	721	383	3	814	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	11	3	699	12	9	5	784	416	3	885	5
RTOR Reduction (vph)	0	3	0	0	0	7	0	0	199	0	0	2
Lane Group Flow (vph)	0	12	0	350	361	2	5	784	217	3	885	3
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		1.1		22.3	22.3	22.3	0.7	43.7	43.7	0.7	43.7	43.7
Effective Green, g (s)		1.1		22.3	22.3	22.3	0.7	43.7	43.7	0.7	43.7	43.7
Actuated g/C Ratio		0.01		0.27	0.27	0.27	0.01	0.52	0.52	0.01	0.52	0.52
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		23		435	436	409	14	1793	802	14	1793	802
v/s Ratio Prot		c0.01		0.21	c0.22		c0.00	0.23		0.00	0.26	
v/s Ratio Perm						0.01			0.27			0.00
v/c Ratio		0.52		0.80	0.83	0.01	0.36	0.44	0.27	0.21	0.49	0.00
Uniform Delay, d1		41.1		28.7	28.9	22.6	41.3	12.4	11.2	41.3	12.9	9.6
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		19.8		10.4	12.2	0.0	14.9	0.8	0.8	7.6	1.0	0.0
Delay (s)		60.9		39.1	41.2	22.6	56.3	13.2	12.0	48.8	13.9	9.6
Level of Service		E		D	D	C	E	B	B	D	B	A
Approach Delay (s)		60.9			39.9			13.0			14.0	
Approach LOS		E			D			B			B	

Intersection Summary

HCM Average Control Delay	20.4	HCM Level of Service	C
HCM Volume to Capacity ratio	0.62		
Actuated Cycle Length (s)	83.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	53.9%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3335	1538	3438	1538	1719	3438
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3335	1538	3438	1538	1719	3438
Volume (vph)	358	517	600	186	462	930
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	389	562	652	202	502	1011
RTOR Reduction (vph)	0	459	0	125	0	0
Lane Group Flow (vph)	389	103	652	77	502	1011
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	19.9	19.9	41.5	41.5	35.7	81.2
Effective Green, g (s)	19.9	19.9	41.5	41.5	35.7	81.2
Actuated g/C Ratio	0.18	0.18	0.38	0.38	0.33	0.74
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	608	281	1308	585	562	2559
v/s Ratio Prot	0.12		c0.19		c0.29	0.29
v/s Ratio Perm		0.37		0.13		
v/c Ratio	0.64	0.36	0.50	0.13	0.89	0.40
Uniform Delay, d1	41.3	39.1	25.8	22.0	34.9	5.1
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	2.2	0.8	1.4	0.5	16.4	0.5
Delay (s)	43.5	39.9	27.2	22.5	51.3	5.5
Level of Service	D	D	C	C	D	A
Approach Delay (s)	41.4		26.1			20.7
Approach LOS	D		C			C

Intersection Summary

HCM Average Control Delay	28.0	HCM Level of Service	C
HCM Volume to Capacity ratio	0.95		
Actuated Cycle Length (s)	109.1	Sum of lost time (s)	12.0
Intersection Capacity Utilization	62.4%	ICU Level of Service	B
Analysis Period (min)	15		

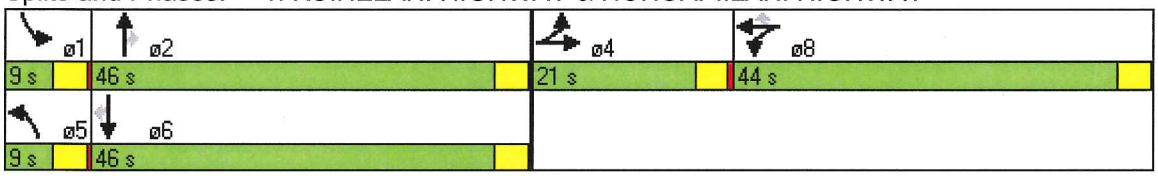
c Critical Lane Group

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	10	643	11	8	5	721	383	3	814	5
Lane Group Flow (vph)	15	350	361	9	5	784	416	3	885	5
Turn Type		Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	8	8		5	2		1	6	
Permitted Phases				8			2			6
Detector Phases	4	8	8	8	5	2	2	1	6	6
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)	20.0	20.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	21.0	44.0	44.0	44.0	9.0	46.0	46.0	9.0	46.0	46.0
Total Split (%)	17.5%	36.7%	36.7%	36.7%	7.5%	38.3%	38.3%	7.5%	38.3%	38.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.11	0.74	0.76	0.02	0.05	0.40	0.40	0.03	0.45	0.01
Control Delay	38.3	27.8	28.1	11.5	45.6	13.7	3.2	45.7	14.4	10.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	38.3	27.8	28.1	11.5	45.6	13.7	3.2	45.7	14.4	10.4
Queue Length 50th (ft)	5	143	149	0	2	86	0	1	101	0
Queue Length 95th (ft)	30	315	326	11	16	296	62	12	344	8
Internal Link Dist (ft)	1440		2589			1820			4559	
Turn Bay Length (ft)										
Base Capacity (vph)	319	699	702	663	104	1947	1051	104	1947	873
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.50	0.51	0.01	0.05	0.40	0.40	0.03	0.45	0.01

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 77.3
Natural Cycle: 80
Control Type: Actuated-Uncoordinated

Splits and Phases: 1: KUIHELANI HIGHWAY & HONOAPIILANI HIGHWAY

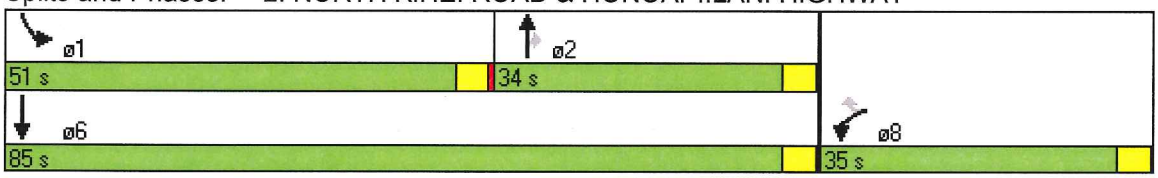


Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	358	517	600	186	462	930
Lane Group Flow (vph)	389	562	652	202	502	1011
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Detector Phases	8	8	2	2	1	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	8.0	20.0
Total Split (s)	35.0	35.0	34.0	34.0	51.0	85.0
Total Split (%)	29.2%	29.2%	28.3%	28.3%	42.5%	70.8%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	None	Max
v/c Ratio	0.64	0.76	0.50	0.28	0.89	0.40
Control Delay	42.7	8.2	30.5	5.7	41.8	6.1
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	42.7	8.2	30.5	5.7	41.8	6.1
Queue Length 50th (ft)	130	0	181	0	327	112
Queue Length 95th (ft)	179	104	308	58	451	198
Internal Link Dist (ft)	2615		4697			1820
Turn Bay Length (ft)						
Base Capacity (vph)	862	814	1305	709	673	2558
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.45	0.69	0.50	0.28	0.75	0.40

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 109.1
Natural Cycle: 65
Control Type: Actuated-Uncoordinated

Splits and Phases: 2: NORTH KIHEI ROAD & HONOAPIILANI HIGHWAY



Attachment K
Level-of-Service Worksheets for 2022 PM Background Traffic Projections Without Project Generated Traffic With Mitigation

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.89		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1612		1633	1639	1538	1719	3438	1538	1719	3438	1538
Flt Permitted		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1612		1633	1639	1538	1719	3438	1538	1719	3438	1538
Volume (vph)	1	2	10	731	6	5	6	742	780	13	718	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	2	11	795	7	5	7	807	848	14	780	5
RTOR Reduction (vph)	0	11	0	0	0	4	0	0	417	0	0	2
Lane Group Flow (vph)	0	3	0	398	404	1	7	807	431	14	780	3
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		2.2		26.4	26.4	26.4	0.9	47.5	47.5	1.3	47.9	47.9
Effective Green, g (s)		2.2		26.4	26.4	26.4	0.9	47.5	47.5	1.3	47.9	47.9
Actuated g/C Ratio		0.02		0.28	0.28	0.28	0.01	0.51	0.51	0.01	0.51	0.51
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		38		462	463	435	17	1748	782	24	1763	789
v/s Ratio Prot		c0.01		0.24	c0.25		0.00	0.23		c0.01	0.23	
v/s Ratio Perm						0.00			0.55			0.00
v/c Ratio		0.09		0.86	0.87	0.00	0.41	0.46	0.55	0.58	0.44	0.00
Uniform Delay, d1		44.6		31.8	31.9	24.1	46.0	14.7	15.7	45.8	14.3	11.1
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.0		15.1	16.4	0.0	15.4	0.9	2.8	31.3	0.8	0.0
Delay (s)		45.6		46.9	48.3	24.1	61.4	15.6	18.5	77.1	15.1	11.1
Level of Service		D		D	D	C	E	B	B	E	B	B
Approach Delay (s)		45.6			47.5			17.3			16.2	
Approach LOS		D			D			B			B	

Intersection Summary

HCM Average Control Delay	24.6	HCM Level of Service	C
HCM Volume to Capacity ratio	0.98		
Actuated Cycle Length (s)	93.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	65.0%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	0.97	1.00	0.95	1.00	1.00	0.95
Frt	1.00	0.85	1.00	0.85	1.00	1.00
Flt Protected	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (prot)	3335	1538	3438	1538	1719	3438
Flt Permitted	0.95	1.00	1.00	1.00	0.95	1.00
Satd. Flow (perm)	3335	1538	3438	1538	1719	3438
Volume (vph)	334	365	976	473	476	847
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	363	397	1061	514	517	921
RTOR Reduction (vph)	0	339	0	259	0	0
Lane Group Flow (vph)	363	58	1061	255	517	921
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Actuated Green, G (s)	17.4	17.4	50.1	50.1	38.9	93.0
Effective Green, g (s)	17.4	17.4	50.1	50.1	38.9	93.0
Actuated g/C Ratio	0.15	0.15	0.42	0.42	0.33	0.79
Clearance Time (s)	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	490	226	1455	651	565	2700
v/s Ratio Prot	0.11		0.31		c0.30	0.27
v/s Ratio Perm		0.26		0.33		
v/c Ratio	0.74	0.26	0.73	0.39	0.92	0.34
Uniform Delay, d1	48.3	44.8	28.5	23.6	38.2	3.7
Progression Factor	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	6.0	0.6	3.2	1.8	19.5	0.3
Delay (s)	54.3	45.4	31.7	25.4	57.6	4.1
Level of Service	D	D	C	C	E	A
Approach Delay (s)	49.6		29.7			23.3
Approach LOS	D		C			C

Intersection Summary

HCM Average Control Delay	31.3	HCM Level of Service	C
HCM Volume to Capacity ratio	0.99		
Actuated Cycle Length (s)	118.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	72.9%	ICU Level of Service	C
Analysis Period (min)	15		

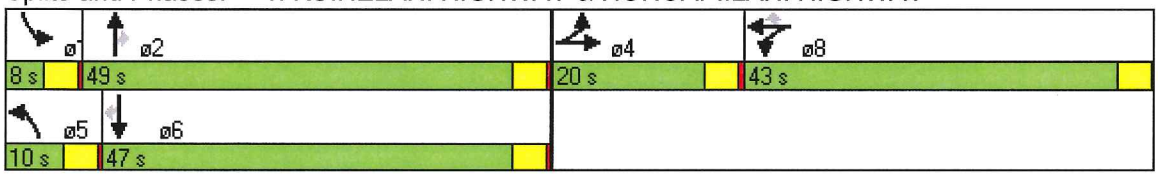
c Critical Lane Group

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	2	731	6	5	6	742	780	13	718	5
Lane Group Flow (vph)	14	398	404	5	7	807	848	14	780	5
Turn Type		Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	8	8		5	2		1	6	
Permitted Phases				8			2			6
Detector Phases	4	8	8	8	5	2	2	1	6	6
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)	20.0	20.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	20.0	43.0	43.0	43.0	10.0	49.0	49.0	8.0	47.0	47.0
Total Split (%)	16.7%	35.8%	35.8%	35.8%	8.3%	40.8%	40.8%	6.7%	39.2%	39.2%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.12	0.81	0.82	0.01	0.07	0.44	0.70	0.18	0.42	0.01
Control Delay	28.5	33.5	33.8	14.4	51.0	17.3	5.2	55.2	16.2	11.6
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.5	33.5	33.8	14.4	51.0	17.3	5.2	55.2	16.2	11.6
Queue Length 50th (ft)	1	181	184	0	3	103	0	7	99	0
Queue Length 95th (ft)	23	377	384	8	20	297	94	32	294	8
Internal Link Dist (ft)	1440		2589			1820			4559	
Turn Bay Length (ft)										
Base Capacity (vph)	263	645	647	611	111	1840	1217	76	1878	843
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.62	0.62	0.01	0.06	0.44	0.70	0.18	0.42	0.01

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 87.8
Natural Cycle: 80
Control Type: Actuated-Uncoordinated

Splits and Phases: 1: KUIHELANI HIGHWAY & HONOAPIILANI HIGHWAY



2: NORTH KIHEI ROAD & HONOAPIILANI HIGHWAY

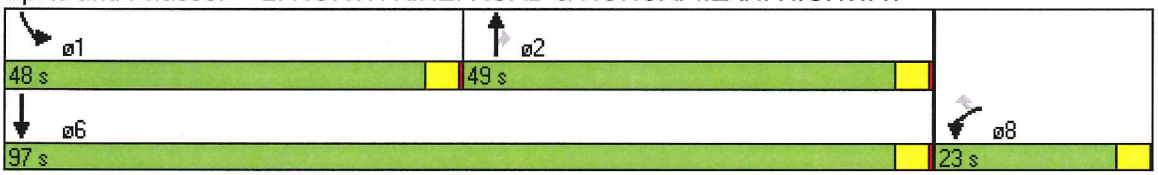
11/21/2014

Lane Group	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Volume (vph)	334	365	976	473	476	847
Lane Group Flow (vph)	363	397	1061	514	517	921
Turn Type		Perm		Perm	Prot	
Protected Phases	8		2		1	6
Permitted Phases		8		2		
Detector Phases	8	8	2	2	1	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	8.0	20.0
Total Split (s)	23.0	23.0	49.0	49.0	48.0	97.0
Total Split (%)	19.2%	19.2%	40.8%	40.8%	40.0%	80.8%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag			Lag	Lag	Lead	
Lead-Lag Optimize?			Yes	Yes	Yes	
Recall Mode	None	None	Max	Max	None	Max
v/c Ratio	0.74	0.70	0.73	0.56	0.92	0.34
Control Delay	55.7	11.2	33.6	7.0	51.3	4.2
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	55.7	11.2	33.6	7.0	51.3	4.2
Queue Length 50th (ft)	138	0	366	31	378	96
Queue Length 95th (ft)	191	97	476	131	#540	120
Internal Link Dist (ft)	2615		4697			1820
Turn Bay Length (ft)						
Base Capacity (vph)	528	578	1455	910	613	2701
Starvation Cap Reductn	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0
Reduced v/c Ratio	0.69	0.69	0.73	0.56	0.84	0.34

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 118.4
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: NORTH KIHEI ROAD & HONOAPIILANI HIGHWAY



NOT TO SCALE

AM PEAK HOUR

PM PEAK HOUR

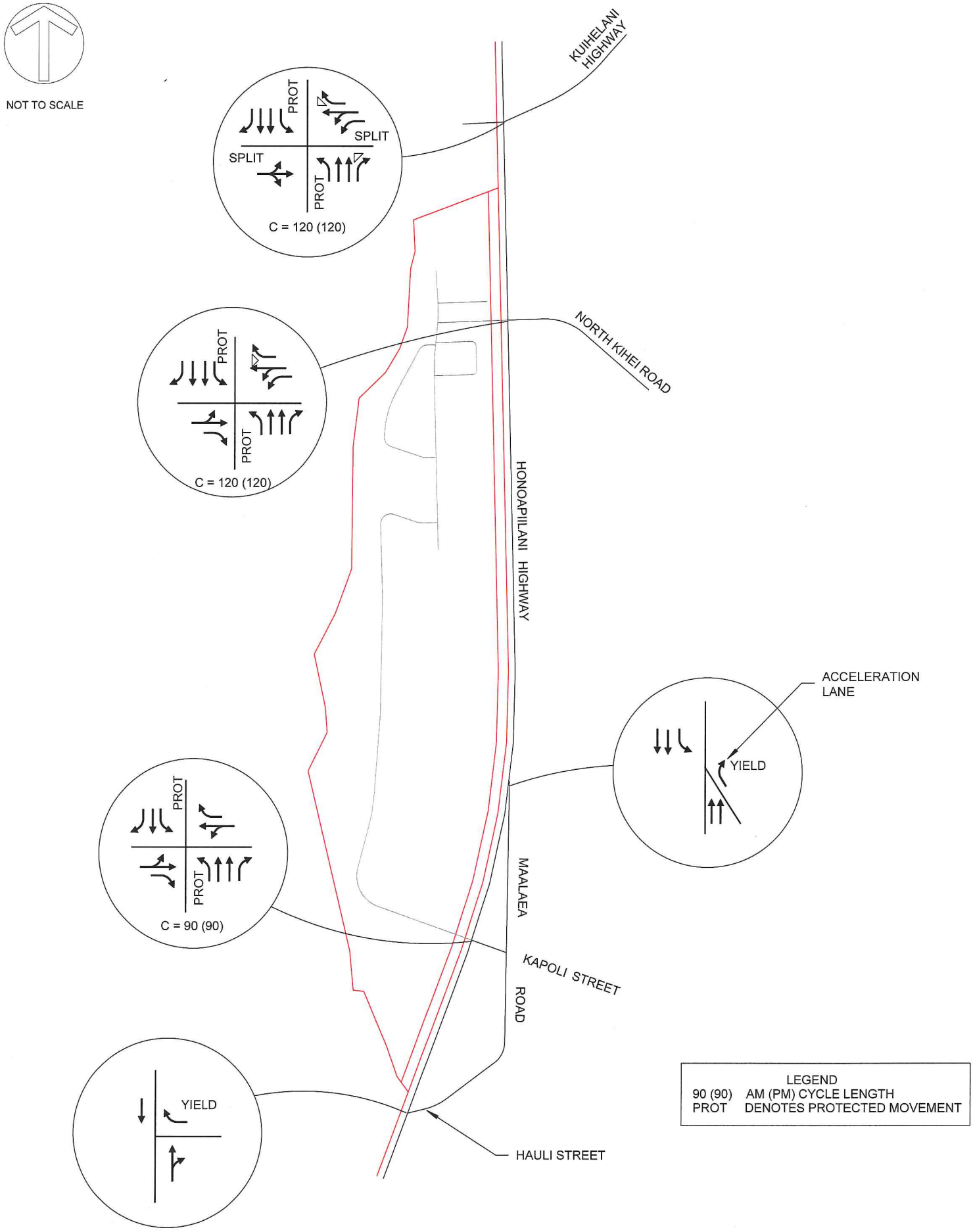
Attachment L
PROJECT TRIP ASSIGNMENTS

NOT TO SCALE

AM PEAK HOUR

PM PEAK HOUR

Attachment M
2022 BACKGROUND PLUS PROJECT PEAK HOUR TRAFFIC PROJECTIONS



Attachment N
2022 LANE CONFIGURATIONS AND RIGHT-OF-WAY CONTROLS

Attachment O
Level-of-Service Worksheets for 2022 AM Background Traffic Projections With Project Generated

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1755		1633	1640	1538	1719	3438	1538	1719	3438	1538
Flt Permitted		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1755		1633	1640	1538	1719	3438	1538	1719	3438	1538
Volume (vph)	1	10	3	651	11	8	5	741	422	3	819	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	11	3	708	12	9	5	805	459	3	890	5
RTOR Reduction (vph)	0	3	0	0	0	7	0	0	216	0	0	2
Lane Group Flow (vph)	0	12	0	354	366	2	5	805	243	3	890	3
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		1.1		23.0	23.0	23.0	0.6	45.6	45.6	0.6	45.6	45.6
Effective Green, g (s)		1.1		23.0	23.0	23.0	0.6	45.6	45.6	0.6	45.6	45.6
Actuated g/C Ratio		0.01		0.27	0.27	0.27	0.01	0.53	0.53	0.01	0.53	0.53
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		22		435	437	410	12	1817	813	12	1817	813
v/s Ratio Prot		c0.01		0.22	c0.22		c0.00	0.23		0.00	0.26	
v/s Ratio Perm						0.01			0.30			0.00
v/c Ratio		0.55		0.81	0.84	0.01	0.42	0.44	0.30	0.25	0.49	0.00
Uniform Delay, d1		42.4		29.6	29.9	23.3	42.7	12.5	11.4	42.6	12.9	9.6
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		25.0		11.1	13.1	0.0	21.8	0.8	0.9	10.7	0.9	0.0
Delay (s)		67.4		40.8	43.0	23.3	64.4	13.3	12.3	53.3	13.9	9.6
Level of Service		E		D	D	C	E	B	B	D	B	A
Approach Delay (s)		67.4			41.7			13.2			14.0	
Approach LOS		E			D			B			B	

Intersection Summary

HCM Average Control Delay	20.8	HCM Level of Service	C
HCM Volume to Capacity ratio	0.65		
Actuated Cycle Length (s)	86.3	Sum of lost time (s)	16.0
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1740	1538	1633	1641	1538	1719	3438	1538	1719	3438	1538
Flt Permitted		0.96	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1740	1538	1633	1641	1538	1719	3438	1538	1719	3438	1538
Volume (vph)	45	11	12	362	8	517	2	614	190	462	934	9
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	12	13	393	9	562	2	667	207	502	1015	10
RTOR Reduction (vph)	0	0	12	0	0	474	0	0	142	0	0	4
Lane Group Flow (vph)	0	61	1	197	205	88	2	667	65	502	1015	6
Turn Type	Split		Perm	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)		7.7	7.7	17.1	17.1	17.1	0.7	34.2	34.2	34.0	67.5	67.5
Effective Green, g (s)		7.7	7.7	17.1	17.1	17.1	0.7	34.2	34.2	34.0	67.5	67.5
Actuated g/C Ratio		0.07	0.07	0.16	0.16	0.16	0.01	0.31	0.31	0.31	0.62	0.62
Clearance Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		123	109	256	257	241	11	1079	483	536	2129	952
v/s Ratio Prot		c0.04		0.12	0.12		0.00	c0.19		c0.29	0.30	
v/s Ratio Perm			0.01			0.37			0.13			0.01
v/c Ratio		0.50	0.01	0.77	0.80	0.37	0.18	0.62	0.13	0.94	0.48	0.01
Uniform Delay, d1		48.8	47.1	44.1	44.3	41.1	53.9	31.8	26.8	36.5	11.2	7.9
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		3.1	0.0	13.0	15.7	0.9	7.8	2.7	0.6	23.9	0.8	0.0
Delay (s)		51.9	47.1	57.1	60.0	42.0	61.7	34.5	27.4	60.4	12.0	7.9
Level of Service		D	D	E	E	D	E	C	C	E	B	A
Approach Delay (s)		51.1			48.9			32.9			27.9	
Approach LOS		D			D			C			C	

Intersection Summary

HCM Average Control Delay	35.5	HCM Level of Service	D
HCM Volume to Capacity ratio	1.04		
Actuated Cycle Length (s)	109.0	Sum of lost time (s)	16.0
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00		1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Frt		1.00	0.85		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.95	1.00		0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1727	1538		1719	1538	1719	3438	1538	1719	1810	1538
Flt Permitted		0.73	1.00		0.74	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1320	1538		1346	1538	1719	3438	1538	1719	1810	1538
Volume (vph)	18	1	12	83	0	48	5	691	47	42	1121	7
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	20	1	13	90	0	52	5	751	51	46	1218	8
RTOR Reduction (vph)	0	0	12	0	0	46	0	0	14	0	0	2
Lane Group Flow (vph)	0	21	1	0	90	6	5	751	37	46	1218	6
Turn Type	Perm		Perm	Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4		4	8		8			2			6
Actuated Green, G (s)		10.5	10.5		10.5	10.5	0.8	71.0	71.0	3.9	74.1	74.1
Effective Green, g (s)		10.5	10.5		10.5	10.5	0.8	71.0	71.0	3.9	74.1	74.1
Actuated g/C Ratio		0.11	0.11		0.11	0.11	0.01	0.73	0.73	0.04	0.76	0.76
Clearance Time (s)		4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		142	166		145	166	14	2506	1121	69	1377	1170
v/s Ratio Prot							0.00	0.22		c0.03	c0.67	
v/s Ratio Perm		0.02	0.01		c0.07	0.03			0.03			0.01
v/c Ratio		0.15	0.01		0.62	0.03	0.36	0.30	0.03	0.67	0.88	0.01
Uniform Delay, d1		39.4	38.8		41.5	38.9	48.0	4.6	3.7	46.1	8.5	2.8
Progression Factor		1.00	1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		0.5	0.0		8.0	0.1	14.9	0.3	0.1	21.7	8.6	0.0
Delay (s)		39.9	38.8		49.5	39.0	63.0	4.9	3.7	67.8	17.1	2.8
Level of Service		D	D		D	D	E	A	A	E	B	A
Approach Delay (s)		39.5			45.7			5.2			18.9	
Approach LOS		D			D			A			B	

Intersection Summary

HCM Average Control Delay	16.0	HCM Level of Service	B
HCM Volume to Capacity ratio	0.86		
Actuated Cycle Length (s)	97.4	Sum of lost time (s)	12.0
Intersection Capacity Utilization	76.9%	ICU Level of Service	D
Analysis Period (min)	15		

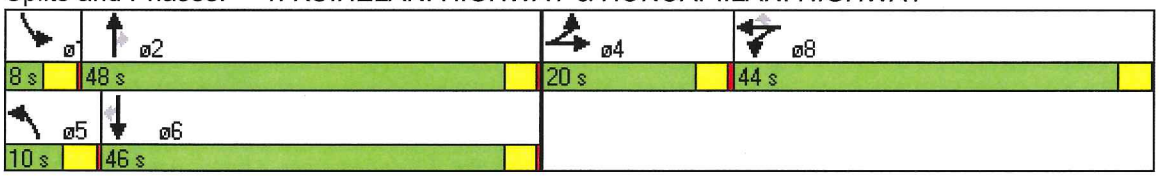
c Critical Lane Group

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	2	770	6	5	6	755	802	13	740	5
Lane Group Flow (vph)	14	419	425	5	7	821	872	14	804	5
Turn Type		Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	8	8		5	2		1	6	
Permitted Phases				8			2			6
Detector Phases	4	8	8	8	5	2	2	1	6	6
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)	20.0	20.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	20.0	44.0	44.0	44.0	10.0	48.0	48.0	8.0	46.0	46.0
Total Split (%)	16.7%	36.7%	36.7%	36.7%	8.3%	40.0%	40.0%	6.7%	38.3%	38.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.12	0.81	0.82	0.01	0.07	0.46	0.72	0.18	0.44	0.01
Control Delay	28.5	33.2	33.4	14.0	51.2	18.4	5.6	55.4	17.2	12.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.5	33.2	33.4	14.0	51.2	18.4	5.6	55.4	17.2	12.0
Queue Length 50th (ft)	1	189	192	0	3	114	0	7	111	0
Queue Length 95th (ft)	23	395	403	8	20	308	100	32	310	8
Internal Link Dist (ft)	1440		2589			1820			4559	
Turn Bay Length (ft)										
Base Capacity (vph)	262	662	663	626	110	1792	1219	76	1830	821
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.63	0.64	0.01	0.06	0.46	0.72	0.18	0.44	0.01

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 88.1
Natural Cycle: 80
Control Type: Actuated-Uncoordinated

Splits and Phases: 1: KUIHELANI HIGHWAY & HONOAPIILANI HIGHWAY

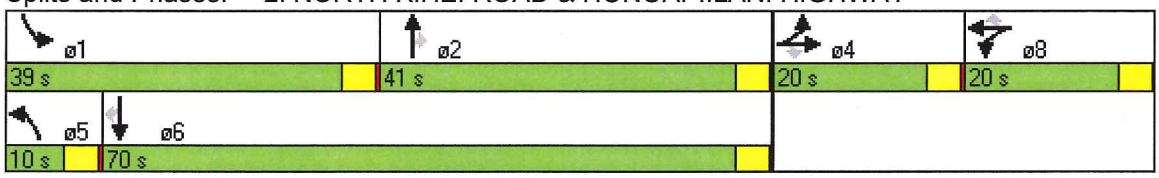


Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	4	12	343	13	365	18	983	479	476	865	43
Lane Group Flow (vph)	34	13	189	198	397	20	1068	521	517	940	47
Turn Type		Perm	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4		8	8		5	2		1	6	
Permitted Phases		4			8			2			6
Detector Phases	4	4	8	8	8	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	20.0	20.0	10.0	41.0	41.0	39.0	70.0	70.0
Total Split (%)	16.7%	16.7%	16.7%	16.7%	16.7%	8.3%	34.2%	34.2%	32.5%	58.3%	58.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag						Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.29	0.11	0.80	0.84	0.71	0.22	0.90	0.63	0.92	0.40	0.04
Control Delay	50.7	23.3	67.7	70.8	11.8	58.2	45.3	9.4	58.9	10.1	3.1
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	50.7	23.3	67.7	70.8	11.8	58.2	45.3	9.4	58.9	10.1	3.1
Queue Length 50th (ft)	24	0	140	147	0	14	388	40	362	140	0
Queue Length 95th (ft)	56	19	#273	#290	97	40	#545	156	#599	250	16
Internal Link Dist (ft)	993			2615			4697			1820	
Turn Bay Length (ft)											
Base Capacity (vph)	232	217	243	245	567	91	1192	822	564	2327	1056
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	0.15	0.06	0.78	0.81	0.70	0.22	0.90	0.63	0.92	0.40	0.04

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 107.2
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: NORTH KIHEI ROAD & HONOAPIILANI HIGHWAY

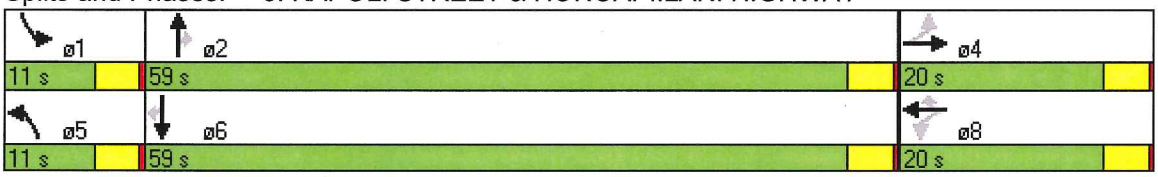


Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	13	1	93	1	72	9	1226	60	53	1007	18
Lane Group Flow (vph)	14	6	0	102	78	10	1333	65	58	1095	20
Turn Type	Perm		Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		4		8		5	2		1	6	
Permitted Phases	4		8		8			2			6
Detector Phases	4	4	8	8	8	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	20.0	20.0	11.0	59.0	59.0	11.0	59.0	59.0
Total Split (%)	22.2%	22.2%	22.2%	22.2%	22.2%	12.2%	65.6%	65.6%	12.2%	65.6%	65.6%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag						Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.09	0.03		0.60	0.29	0.09	0.55	0.06	0.46	0.77	0.02
Control Delay	32.4	21.0		41.7	9.9	42.3	9.6	2.0	49.9	14.2	2.6
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.4	21.0		41.7	9.9	42.3	9.6	2.0	49.9	14.2	2.6
Queue Length 50th (ft)	7	1		52	0	5	198	0	30	268	0
Queue Length 95th (ft)	24	11		102	37	21	296	15	71	#887	8
Internal Link Dist (ft)		959		742			1660			1258	
Turn Bay Length (ft)											
Base Capacity (vph)	201	266		216	319	120	2429	1105	129	1418	1209
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.02		0.47	0.24	0.08	0.55	0.06	0.45	0.77	0.02

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 93.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: KAPOLI STREET & HONOAPIILANI HIGHWAY



Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Volume (veh/h)	756	0	149	1149	0	66
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	822	0	162	1249	0	72
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			822		1770	411
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			822		1770	411
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			79		100	88
cM capacity (veh/h)			784		57	582

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NW 1
Volume Total	411	411	162	624	624	72
Volume Left	0	0	162	0	0	0
Volume Right	0	0	0	0	0	72
cSH	1700	1700	784	1700	1700	582
Volume to Capacity	0.24	0.24	0.21	0.37	0.37	0.12
Queue Length 95th (ft)	0	0	19	0	0	10
Control Delay (s)	0.0	0.0	10.8	0.0	0.0	12.1
Lane LOS			B			B
Approach Delay (s)	0.0		1.2			12.1
Approach LOS						B

Intersection Summary			
Average Delay	1.1		
Intersection Capacity Utilization	35.8%	ICU Level of Service	A
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	721	22	0	1174
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	784	24	0	1276
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2072	796			808	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2072	796			808	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	58	383			805	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	808	1276
Volume Left	0	0	0
Volume Right	0	24	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.48	0.75
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	65.1%	ICU Level of Service	C
Analysis Period (min)	15		

Attachment P
Level-of-Service Worksheets for 2022 PM Background Traffic Projections With Project Generated

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.89		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1612		1633	1638	1538	1719	3438	1538	1719	3438	1538
Flt Permitted		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1612		1633	1638	1538	1719	3438	1538	1719	3438	1538
Volume (vph)	1	2	10	770	6	5	6	755	802	13	740	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	2	11	837	7	5	7	821	872	14	804	5
RTOR Reduction (vph)	0	11	0	0	0	4	0	0	440	0	0	3
Lane Group Flow (vph)	0	3	0	419	425	1	7	821	432	14	804	3
Turn Type	Split			Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases						8			2			6
Actuated Green, G (s)		2.2		27.8	27.8	27.8	0.9	46.5	46.5	1.3	46.9	46.9
Effective Green, g (s)		2.2		27.8	27.8	27.8	0.9	46.5	46.5	1.3	46.9	46.9
Actuated g/C Ratio		0.02		0.30	0.30	0.30	0.01	0.50	0.50	0.01	0.50	0.50
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		38		484	485	456	16	1704	762	24	1719	769
v/s Ratio Prot		c0.01		0.26	c0.26		0.00	0.24		c0.01	0.23	
v/s Ratio Perm						0.00			0.57			0.00
v/c Ratio		0.09		0.87	0.88	0.00	0.44	0.48	0.57	0.58	0.47	0.00
Uniform Delay, d1		44.8		31.2	31.4	23.2	46.2	15.7	16.6	46.0	15.3	11.7
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.0		14.9	16.1	0.0	18.0	1.0	3.0	31.3	0.9	0.0
Delay (s)		45.8		46.2	47.5	23.2	64.2	16.6	19.6	77.3	16.2	11.8
Level of Service		D		D	D	C	E	B	B	E	B	B
Approach Delay (s)		45.8			46.7			18.4			17.2	
Approach LOS		D			D			B			B	

Intersection Summary

HCM Average Control Delay	25.3	HCM Level of Service	C
HCM Volume to Capacity ratio	1.02		
Actuated Cycle Length (s)	93.8	Sum of lost time (s)	16.0
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1733	1538	1633	1643	1538	1719	3438	1538	1719	3438	1538
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1733	1538	1633	1643	1538	1719	3438	1538	1719	3438	1538
Volume (vph)	28	4	12	343	13	365	18	983	479	476	865	43
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	4	13	373	14	397	20	1068	521	517	940	47
RTOR Reduction (vph)	0	0	12	0	0	342	0	0	284	0	0	16
Lane Group Flow (vph)	0	34	1	189	198	55	20	1068	237	517	940	31
Turn Type	Split		Perm	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8		5	2		1	6	
Permitted Phases			4			8			2			6
Actuated Green, G (s)		5.0	5.0	15.5	15.5	15.5	2.3	39.7	39.7	35.2	72.6	72.6
Effective Green, g (s)		5.0	5.0	15.5	15.5	15.5	2.3	39.7	39.7	35.2	72.6	72.6
Actuated g/C Ratio		0.04	0.04	0.14	0.14	0.14	0.02	0.36	0.36	0.32	0.65	0.65
Clearance Time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		78	69	227	229	214	35	1225	548	543	2241	1002
v/s Ratio Prot		c0.02		0.12	0.12		0.01	0.31		c0.30	0.27	
v/s Ratio Perm			0.01			0.26			0.34			0.03
v/c Ratio		0.44	0.01	0.83	0.86	0.26	0.57	0.87	0.43	0.95	0.42	0.03
Uniform Delay, d1		51.8	50.8	46.7	46.9	42.8	54.1	33.5	27.3	37.3	9.3	6.9
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		3.9	0.0	22.2	27.0	0.6	20.6	8.7	2.5	26.9	0.6	0.1
Delay (s)		55.7	50.9	68.9	73.9	43.5	74.6	42.2	29.7	64.2	9.9	7.0
Level of Service		E	D	E	E	D	E	D	C	E	A	A
Approach Delay (s)		54.4			57.3			38.5			28.5	
Approach LOS		D			E			D			C	

Intersection Summary

HCM Average Control Delay	38.6	HCM Level of Service	D
HCM Volume to Capacity ratio	1.07		
Actuated Cycle Length (s)	111.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor	1.00	1.00			1.00	1.00	1.00	0.95	1.00	1.00	1.00	1.00
Frt	1.00	0.88			1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected	0.95	1.00			0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)	1719	1583			1724	1538	1719	3438	1538	1719	1810	1538
Flt Permitted	0.62	1.00			0.72	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)	1118	1583			1311	1538	1719	3438	1538	1719	1810	1538
Volume (vph)	13	1	5	93	1	72	9	1226	60	53	1007	18
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	14	1	5	101	1	78	10	1333	65	58	1095	20
RTOR Reduction (vph)	0	4	0	0	0	69	0	0	19	0	0	5
Lane Group Flow (vph)	14	2	0	0	102	9	10	1333	46	58	1095	15
Turn Type	Perm			Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		4			8		5	2		1	6	
Permitted Phases	4			8		8			2			6
Actuated Green, G (s)	11.1	11.1			11.1	11.1	1.5	68.2	68.2	6.0	72.7	72.7
Effective Green, g (s)	11.1	11.1			11.1	11.1	1.5	68.2	68.2	6.0	72.7	72.7
Actuated g/C Ratio	0.11	0.11			0.11	0.11	0.02	0.70	0.70	0.06	0.75	0.75
Clearance Time (s)	4.0	4.0			4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)	3.0	3.0			3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)	128	181			150	175	27	2410	1078	106	1352	1149
v/s Ratio Prot		0.00					0.01	0.39		c0.03	c0.61	
v/s Ratio Perm	0.01				c0.08	0.05			0.04			0.01
v/c Ratio	0.11	0.01			0.68	0.05	0.37	0.55	0.04	0.55	0.81	0.01
Uniform Delay, d1	38.7	38.2			41.4	38.4	47.4	7.1	4.5	44.3	7.9	3.1
Progression Factor	1.00	1.00			1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2	0.4	0.0			12.0	0.1	8.4	0.9	0.1	5.7	5.3	0.0
Delay (s)	39.0	38.2			53.4	38.5	55.8	8.0	4.6	50.0	13.2	3.2
Level of Service	D	D			D	D	E	A	A	D	B	A
Approach Delay (s)		38.8			46.9			8.2			14.9	
Approach LOS		D			D			A			B	

Intersection Summary

HCM Average Control Delay	13.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.76		
Actuated Cycle Length (s)	97.3	Sum of lost time (s)	8.0
Intersection Capacity Utilization	71.5%	ICU Level of Service	C
Analysis Period (min)	15		

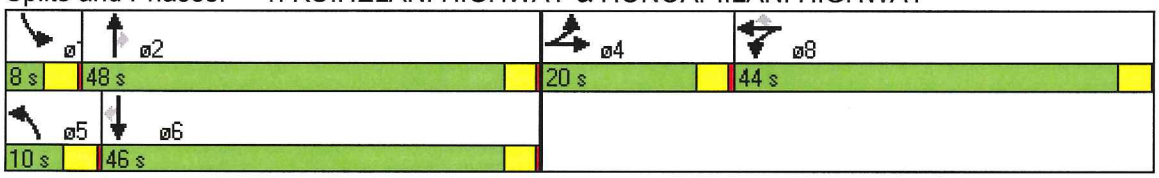
c Critical Lane Group

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	2	770	6	5	6	755	802	13	740	5
Lane Group Flow (vph)	14	419	425	5	7	821	872	14	804	5
Turn Type		Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4	8	8		5	2		1	6	
Permitted Phases				8			2			6
Detector Phases	4	8	8	8	5	2	2	1	6	6
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)	20.0	20.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	20.0	44.0	44.0	44.0	10.0	48.0	48.0	8.0	46.0	46.0
Total Split (%)	16.7%	36.7%	36.7%	36.7%	8.3%	40.0%	40.0%	6.7%	38.3%	38.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag					Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.12	0.81	0.82	0.01	0.07	0.46	0.72	0.18	0.44	0.01
Control Delay	28.5	33.2	33.4	14.0	51.2	18.4	5.6	55.4	17.2	12.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.5	33.2	33.4	14.0	51.2	18.4	5.6	55.4	17.2	12.0
Queue Length 50th (ft)	1	189	192	0	3	114	0	7	111	0
Queue Length 95th (ft)	23	395	403	8	20	308	100	32	310	8
Internal Link Dist (ft)	1440		2589			1820			4559	
Turn Bay Length (ft)										
Base Capacity (vph)	262	662	663	626	110	1792	1219	76	1830	821
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.63	0.64	0.01	0.06	0.46	0.72	0.18	0.44	0.01

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 88.1
Natural Cycle: 80
Control Type: Actuated-Uncoordinated

Splits and Phases: 1: KUIHELANI HIGHWAY & HONOAPIILANI HIGHWAY



Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	4	12	343	13	365	18	983	479	476	865	43
Lane Group Flow (vph)	34	13	189	198	397	20	1068	521	517	940	47
Turn Type		Perm	Split		Perm	Prot		Perm	Prot		Perm
Protected Phases	4		8	8		5	2		1	6	
Permitted Phases		4			8			2			6
Detector Phases	4	4	8	8	8	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	20.0	20.0	10.0	41.0	41.0	39.0	70.0	70.0
Total Split (%)	16.7%	16.7%	16.7%	16.7%	16.7%	8.3%	34.2%	34.2%	32.5%	58.3%	58.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag						Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.29	0.11	0.80	0.84	0.71	0.22	0.90	0.63	0.92	0.40	0.04
Control Delay	50.7	23.3	67.7	70.8	11.8	58.2	45.3	9.4	58.9	10.1	3.1
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	50.7	23.3	67.7	70.8	11.8	58.2	45.3	9.4	58.9	10.1	3.1
Queue Length 50th (ft)	24	0	140	147	0	14	388	40	362	140	0
Queue Length 95th (ft)	56	19	#273	#290	97	40	#545	156	#599	250	16
Internal Link Dist (ft)	993			2615			4697			1820	
Turn Bay Length (ft)											
Base Capacity (vph)	232	217	243	245	567	91	1192	822	564	2327	1056
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	0.15	0.06	0.78	0.81	0.70	0.22	0.90	0.63	0.92	0.40	0.04

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 107.2
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

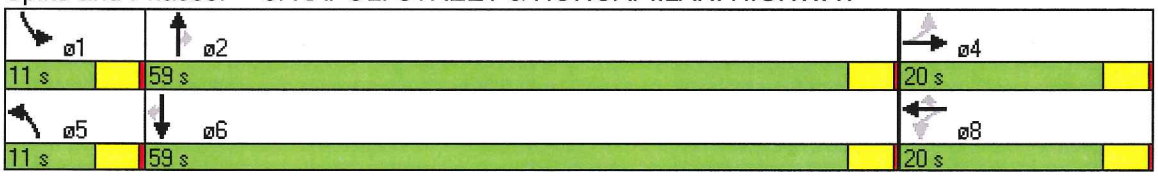
Splits and Phases: 2: NORTH KIHEI ROAD & HONOAPIILANI HIGHWAY

Lane Group	EBL	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	13	1	93	1	72	9	1226	60	53	1007	18
Lane Group Flow (vph)	14	6	0	102	78	10	1333	65	58	1095	20
Turn Type	Perm		Perm		Perm	Prot		Perm	Prot		Perm
Protected Phases		4		8		5	2		1	6	
Permitted Phases	4		8		8			2			6
Detector Phases	4	4	8	8	8	5	2	2	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	20.0	8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	20.0	20.0	11.0	59.0	59.0	11.0	59.0	59.0
Total Split (%)	22.2%	22.2%	22.2%	22.2%	22.2%	12.2%	65.6%	65.6%	12.2%	65.6%	65.6%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag						Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None	None	None	Max	Max	None	Max	Max
v/c Ratio	0.09	0.03		0.60	0.29	0.09	0.55	0.06	0.46	0.77	0.02
Control Delay	32.4	21.0		41.7	9.9	42.3	9.6	2.0	49.9	14.2	2.6
Queue Delay	0.0	0.0		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	32.4	21.0		41.7	9.9	42.3	9.6	2.0	49.9	14.2	2.6
Queue Length 50th (ft)	7	1		52	0	5	198	0	30	268	0
Queue Length 95th (ft)	24	11		102	37	21	296	15	71	#887	8
Internal Link Dist (ft)		959		742			1660			1258	
Turn Bay Length (ft)											
Base Capacity (vph)	201	266		216	319	120	2429	1105	129	1418	1209
Starvation Cap Reductn	0	0		0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0		0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0		0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.07	0.02		0.47	0.24	0.08	0.55	0.06	0.45	0.77	0.02

Intersection Summary

Cycle Length: 90
Actuated Cycle Length: 93.6
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 3: KAPOLI STREET & HONOAPIILANI HIGHWAY



Movement	NBT	NBR	SBL	SBT	NWL	NWR
Lane Configurations						
Sign Control	Free			Free	Yield	
Grade	0%			0%	0%	
Volume (veh/h)	1336	0	148	1077	0	197
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	1452	0	161	1171	0	214
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type					None	
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			1452		2359	726
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			1452		2359	726
tC, single (s)			4.2		6.9	7.0
tC, 2 stage (s)						
tF (s)			2.2		3.5	3.3
p0 queue free %			64		100	41
cM capacity (veh/h)			447		18	360

Direction, Lane #	NB 1	NB 2	SB 1	SB 2	SB 3	NW 1
Volume Total	726	726	161	585	585	214
Volume Left	0	0	161	0	0	0
Volume Right	0	0	0	0	0	214
cSH	1700	1700	447	1700	1700	360
Volume to Capacity	0.43	0.43	0.36	0.34	0.34	0.59
Queue Length 95th (ft)	0	0	40	0	0	92
Control Delay (s)	0.0	0.0	17.5	0.0	0.0	28.6
Lane LOS			C			D
Approach Delay (s)	0.0		2.1			28.6
Approach LOS						D

Intersection Summary			
Average Delay	3.0		
Intersection Capacity Utilization	55.8%	ICU Level of Service	B
Analysis Period (min)	15		

Movement	WBL	WBR	NBT	NBR	SBL	SBT
Lane Configurations						
Sign Control	Yield		Free			Free
Grade	0%		0%			0%
Volume (veh/h)	0	0	1274	35	0	1093
Peak Hour Factor	0.92	0.92	0.92	0.92	0.92	0.92
Hourly flow rate (vph)	0	0	1385	38	0	1188
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None					
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2592	1404			1423	
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2592	1404			1423	
tC, single (s)	6.4	6.2			4.1	
tC, 2 stage (s)						
tF (s)	3.5	3.3			2.2	
p0 queue free %	100	100			100	
cM capacity (veh/h)	27	168			469	

Direction, Lane #	WB 1	NB 1	SB 1
Volume Total	0	1423	1188
Volume Left	0	0	0
Volume Right	0	38	0
cSH	1700	1700	1700
Volume to Capacity	0.00	0.84	0.70
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.0	0.0
Lane LOS	A		
Approach Delay (s)	0.0	0.0	0.0
Approach LOS	A		

Intersection Summary			
Average Delay	0.0		
Intersection Capacity Utilization	72.5%	ICU Level of Service	C
Analysis Period (min)	15		

Attachment Q
Level-of-Service Worksheets for 2022 AM Background Traffic Projections With Project Generated With Mitigation

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.97		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1755		1633	1640	1538	1719	3438	1538	1719	3438	1538
Flt Permitted		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1755		1633	1640	1538	1719	3438	1538	1719	3438	1538
Volume (vph)	1	10	3	651	11	8	5	741	422	3	819	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	11	3	708	12	9	5	805	459	3	890	5
RTOR Reduction (vph)	0	3	0	0	0	6	0	0	93	0	0	2
Lane Group Flow (vph)	0	12	0	354	366	3	5	805	366	3	890	3
Turn Type	Split			Split		Perm	Prot		pt+ov	Prot		Perm
Protected Phases	4	4		8	8		5	2	2 8	1	6	
Permitted Phases						8						6
Actuated Green, G (s)		1.2		24.9	24.9	24.9	0.6	45.5	70.4	0.6	45.5	45.5
Effective Green, g (s)		1.2		24.9	24.9	24.9	0.6	45.5	70.4	0.6	45.5	45.5
Actuated g/C Ratio		0.01		0.28	0.28	0.28	0.01	0.52	0.80	0.01	0.52	0.52
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		24		461	463	434	12	1774	1228	12	1774	793
v/s Ratio Prot		c0.01		0.22	c0.22		c0.00	0.23	0.30	0.00	c0.26	
v/s Ratio Perm						0.01						0.00
v/c Ratio		0.50		0.77	0.79	0.01	0.42	0.45	0.30	0.25	0.50	0.00
Uniform Delay, d1		43.2		29.0	29.2	22.8	43.6	13.5	2.4	43.6	13.9	10.4
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		15.5		7.5	8.9	0.0	21.8	0.8	0.1	10.7	1.0	0.0
Delay (s)		58.7		36.5	38.2	22.8	65.4	14.3	2.5	54.2	15.0	10.4
Level of Service		E		D	D	C	E	B	A	D	B	B
Approach Delay (s)		58.7			37.2			10.3			15.1	
Approach LOS		E			D			B			B	

Intersection Summary

HCM Average Control Delay	18.7	HCM Level of Service	B
HCM Volume to Capacity ratio	0.60		
Actuated Cycle Length (s)	88.2	Sum of lost time (s)	16.0
Intersection Capacity Utilization	54.3%	ICU Level of Service	A
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1740	1538	1633	1641	1538	1719	3438	1538	1719	3438	1538
Flt Permitted		0.96	1.00	0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1740	1538	1633	1641	1538	1719	3438	1538	1719	3438	1538
Volume (vph)	45	11	12	362	8	517	2	614	190	462	934	9
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	49	12	13	393	9	562	2	667	207	502	1015	10
RTOR Reduction (vph)	0	0	12	0	0	127	0	0	141	0	0	4
Lane Group Flow (vph)	0	61	1	197	205	435	2	667	66	502	1015	6
Turn Type	Split		Perm	Split		pt+ov	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8	8 1	5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)		7.7	7.7	17.3	17.3	56.1	0.7	35.4	35.4	34.8	69.5	69.5
Effective Green, g (s)		7.7	7.7	17.3	17.3	56.1	0.7	35.4	35.4	34.8	69.5	69.5
Actuated g/C Ratio		0.07	0.07	0.16	0.16	0.50	0.01	0.32	0.32	0.31	0.62	0.62
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		120	106	254	255	776	11	1094	490	538	2149	961
v/s Ratio Prot		c0.04		0.12	c0.12	c0.37	0.00	c0.19		c0.29	0.30	
v/s Ratio Perm			0.01						0.13			0.01
v/c Ratio		0.51	0.01	0.78	0.80	0.56	0.18	0.61	0.13	0.93	0.47	0.01
Uniform Delay, d1		49.9	48.2	45.1	45.3	19.0	55.0	32.1	27.0	37.1	11.1	7.9
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		3.4	0.0	13.8	16.6	0.9	7.8	2.5	0.6	23.3	0.7	0.0
Delay (s)		53.3	48.2	58.8	61.9	20.0	62.8	34.6	27.6	60.4	11.8	7.9
Level of Service		D	D	E	E	B	E	C	C	E	B	A
Approach Delay (s)		52.4			36.8			33.0			27.8	
Approach LOS		D			D			C			C	

Intersection Summary

HCM Average Control Delay	32.2	HCM Level of Service	C
HCM Volume to Capacity ratio	0.74		
Actuated Cycle Length (s)	111.2	Sum of lost time (s)	12.0
Intersection Capacity Utilization	69.5%	ICU Level of Service	C
Analysis Period (min)	15		

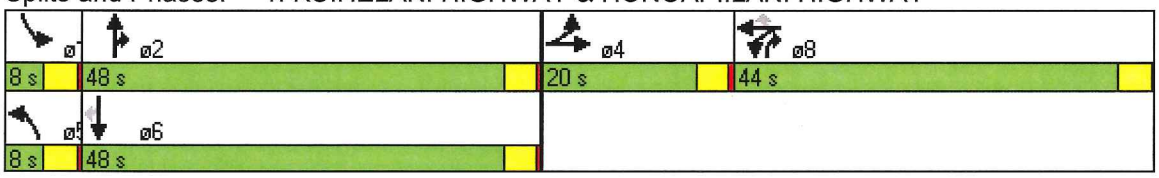
c Critical Lane Group

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	10	651	11	8	5	741	422	3	819	5
Lane Group Flow (vph)	15	354	366	9	5	805	459	3	890	5
Turn Type		Split		Perm	Prot		pt+ov	Prot		Perm
Protected Phases	4	8	8		5	2	2 8	1	6	
Permitted Phases				8						6
Detector Phases	4	8	8	8	5	2	2 8	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	8.0	20.0		8.0	20.0	20.0
Total Split (s)	20.0	44.0	44.0	44.0	8.0	48.0	92.0	8.0	48.0	48.0
Total Split (%)	16.7%	36.7%	36.7%	36.7%	6.7%	40.0%	76.7%	6.7%	40.0%	40.0%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5
Lead/Lag					Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Max		None	Max	Max
v/c Ratio	0.12	0.71	0.73	0.02	0.06	0.42	0.31	0.04	0.46	0.01
Control Delay	39.9	28.3	28.7	11.6	48.8	14.5	0.7	48.3	15.0	10.4
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	39.9	28.3	28.7	11.6	48.8	14.5	0.7	48.3	15.0	10.4
Queue Length 50th (ft)	5	151	158	0	2	104	0	1	118	0
Queue Length 95th (ft)	30	325	337	11	17	302	10	12	342	8
Internal Link Dist (ft)	1440		2589			1820			4559	
Turn Bay Length (ft)										
Base Capacity (vph)	290	685	688	650	80	1919	1484	80	1919	861
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.52	0.53	0.01	0.06	0.42	0.31	0.04	0.46	0.01

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 81.5
Natural Cycle: 80
Control Type: Actuated-Uncoordinated

Splits and Phases: 1: KUIHELANI HIGHWAY & HONOAPIILANI HIGHWAY

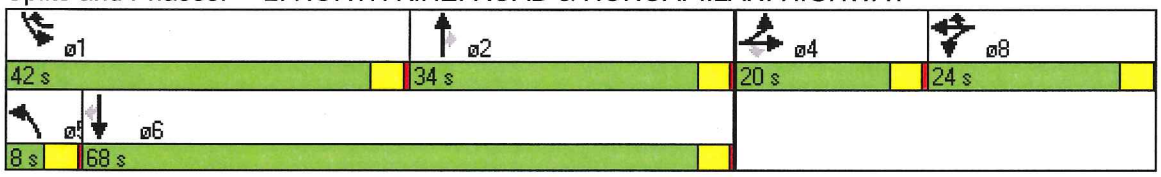


Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	11	12	362	8	517	2	614	190	462	934	9
Lane Group Flow (vph)	61	13	197	205	562	2	667	207	502	1015	10
Turn Type		Perm	Split		pt+ov	Prot		Perm	Prot		Perm
Protected Phases	4		8	8	8 1	5	2		1	6	
Permitted Phases		4						2			6
Detector Phases	4	4	8	8	8 1	5	2	2	1	6	6
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)	20.0	20.0	20.0	20.0		8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	20.0	20.0	24.0	24.0	66.0	8.0	34.0	34.0	42.0	68.0	68.0
Total Split (%)	16.7%	16.7%	20.0%	20.0%	55.0%	6.7%	28.3%	28.3%	35.0%	56.7%	56.7%
Yellow Time (s)	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag						Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None		None	Max	Max	None	Max	Max
v/c Ratio	0.42	0.09	0.75	0.78	0.60	0.03	0.65	0.34	0.90	0.46	0.01
Control Delay	51.7	22.8	55.5	56.7	11.7	57.0	39.1	6.4	49.5	12.1	5.6
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	51.7	22.8	55.5	56.7	11.7	57.0	39.1	6.4	49.5	12.1	5.6
Queue Length 50th (ft)	43	0	143	149	135	1	233	0	341	186	0
Queue Length 95th (ft)	87	19	#253	#268	258	11	315	58	#560	307	8
Internal Link Dist (ft)	891			2615			4697			1820	
Turn Bay Length (ft)											
Base Capacity (vph)	242	225	300	302	963	61	1029	606	596	2230	1001
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	0.25	0.06	0.66	0.68	0.58	0.03	0.65	0.34	0.84	0.46	0.01

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 107.1
Natural Cycle: 90
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: NORTH KIHEI ROAD & HONOAPIILANI HIGHWAY



Attachment R
Level-of-Service Worksheets for 2022 PM Background Traffic Projections With Project Generated With Mitigation

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00		0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		0.89		1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1612		1633	1638	1538	1719	3438	1538	1719	3438	1538
Flt Permitted		1.00		0.95	0.95	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1612		1633	1638	1538	1719	3438	1538	1719	3438	1538
Volume (vph)	1	2	10	770	6	5	6	755	802	13	740	5
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	1	2	11	837	7	5	7	821	872	14	804	5
RTOR Reduction (vph)	0	11	0	0	0	3	0	0	184	0	0	3
Lane Group Flow (vph)	0	3	0	419	425	2	7	821	688	14	804	2
Turn Type	Split			Split		Perm	Prot		pt+ov	Prot		Perm
Protected Phases	4	4		8	8		5	2	2 8	1	6	
Permitted Phases						8						6
Actuated Green, G (s)		2.2		30.9	30.9	30.9	1.0	44.4	75.3	1.9	45.3	45.3
Effective Green, g (s)		2.2		30.9	30.9	30.9	1.0	44.4	75.3	1.9	45.3	45.3
Actuated g/C Ratio		0.02		0.32	0.32	0.32	0.01	0.47	0.79	0.02	0.47	0.47
Clearance Time (s)		4.0		4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Vehicle Extension (s)		3.0		3.0	3.0	3.0	3.0	3.0		3.0	3.0	3.0
Lane Grp Cap (vph)		37		529	531	498	18	1600	1214	34	1633	730
v/s Ratio Prot		c0.01		0.26	c0.26		0.00	0.24	c0.57	c0.01	0.23	
v/s Ratio Perm						0.00						0.00
v/c Ratio		0.09		0.79	0.80	0.00	0.39	0.51	0.57	0.41	0.49	0.00
Uniform Delay, d1		45.6		29.3	29.4	21.8	46.9	17.9	3.8	46.2	17.2	13.2
Progression Factor		1.00		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		1.0		8.0	8.4	0.0	13.4	1.2	0.6	7.9	1.1	0.0
Delay (s)		46.6		37.3	37.9	21.8	60.2	19.1	4.4	54.1	18.2	13.2
Level of Service		D		D	D	C	E	B	A	D	B	B
Approach Delay (s)		46.6			37.5			11.7			18.8	
Approach LOS		D			D			B			B	

Intersection Summary

HCM Average Control Delay	20.1	HCM Level of Service	C
HCM Volume to Capacity ratio	0.73		
Actuated Cycle Length (s)	95.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	66.3%	ICU Level of Service	C
Analysis Period (min)	15		

c Critical Lane Group

Movement	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations												
Ideal Flow (vphpl)	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900	1900
Total Lost time (s)		4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0	4.0
Lane Util. Factor		1.00	1.00	0.95	0.95	1.00	1.00	0.95	1.00	1.00	0.95	1.00
Frt		1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85	1.00	1.00	0.85
Flt Protected		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (prot)		1733	1538	1633	1643	1538	1719	3438	1538	1719	3438	1538
Flt Permitted		0.96	1.00	0.95	0.96	1.00	0.95	1.00	1.00	0.95	1.00	1.00
Satd. Flow (perm)		1733	1538	1633	1643	1538	1719	3438	1538	1719	3438	1538
Volume (vph)	28	4	12	343	13	365	18	983	479	476	865	43
Peak-hour factor, PHF	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92	0.92
Adj. Flow (vph)	30	4	13	373	14	397	20	1068	521	517	940	47
RTOR Reduction (vph)	0	0	12	0	0	129	0	0	284	0	0	16
Lane Group Flow (vph)	0	34	1	189	198	268	20	1068	237	517	940	31
Turn Type	Split		Perm	Split		pt+ov	Prot		Perm	Prot		Perm
Protected Phases	4	4		8	8	8 1	5	2		1	6	
Permitted Phases			4						2			6
Actuated Green, G (s)		5.0	5.0	15.5	15.5	54.7	2.3	39.7	39.7	35.2	72.6	72.6
Effective Green, g (s)		5.0	5.0	15.5	15.5	54.7	2.3	39.7	39.7	35.2	72.6	72.6
Actuated g/C Ratio		0.04	0.04	0.14	0.14	0.49	0.02	0.36	0.36	0.32	0.65	0.65
Clearance Time (s)		4.0	4.0	4.0	4.0		4.0	4.0	4.0	4.0	4.0	4.0
Vehicle Extension (s)		3.0	3.0	3.0	3.0		3.0	3.0	3.0	3.0	3.0	3.0
Lane Grp Cap (vph)		78	69	227	229	755	35	1225	548	543	2241	1002
v/s Ratio Prot		c0.02		0.12	c0.12	0.26	0.01	0.31		c0.30	0.27	
v/s Ratio Perm			0.01						0.34			0.03
v/c Ratio		0.44	0.01	0.83	0.86	0.35	0.57	0.87	0.43	0.95	0.42	0.03
Uniform Delay, d1		51.8	50.8	46.7	46.9	17.5	54.1	33.5	27.3	37.3	9.3	6.9
Progression Factor		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Incremental Delay, d2		3.9	0.0	22.2	27.0	0.3	20.6	8.7	2.5	26.9	0.6	0.1
Delay (s)		55.7	50.9	68.9	73.9	17.8	74.6	42.2	29.7	64.2	9.9	7.0
Level of Service		E	D	E	E	B	E	D	C	E	A	A
Approach Delay (s)		54.4			44.3			38.5			28.5	
Approach LOS		D			D			D			C	

Intersection Summary

HCM Average Control Delay	36.0	HCM Level of Service	D
HCM Volume to Capacity ratio	0.91		
Actuated Cycle Length (s)	111.4	Sum of lost time (s)	16.0
Intersection Capacity Utilization	80.1%	ICU Level of Service	D
Analysis Period (min)	15		

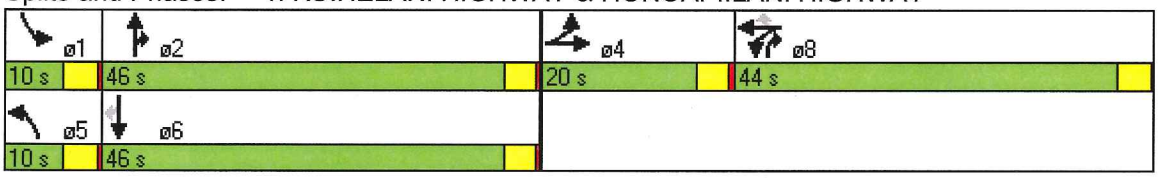
c Critical Lane Group

Lane Group	EBT	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations										
Volume (vph)	2	770	6	5	6	755	802	13	740	5
Lane Group Flow (vph)	14	419	425	5	7	821	872	14	804	5
Turn Type		Split		Perm	Prot		pt+ov	Prot		Perm
Protected Phases	4	8	8		5	2	2 8	1	6	
Permitted Phases				8						6
Detector Phases	4	8	8	8	5	2	2 8	1	6	6
Minimum Initial (s)	4.0	4.0	4.0	4.0	4.0	4.0		4.0	4.0	4.0
Minimum Split (s)	20.0	20.0	20.0	20.0	8.0	20.0		8.0	20.0	20.0
Total Split (s)	20.0	44.0	44.0	44.0	10.0	46.0	90.0	10.0	46.0	46.0
Total Split (%)	16.7%	36.7%	36.7%	36.7%	8.3%	38.3%	75.0%	8.3%	38.3%	38.3%
Yellow Time (s)	3.5	3.5	3.5	3.5	3.5	3.5		3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5	0.5	0.5		0.5	0.5	0.5
Lead/Lag					Lead	Lag		Lead	Lag	Lag
Lead-Lag Optimize?					Yes	Yes		Yes	Yes	Yes
Recall Mode	None	None	None	None	None	Max		None	Max	Max
v/c Ratio	0.12	0.75	0.75	0.01	0.07	0.49	0.59	0.13	0.46	0.01
Control Delay	28.8	31.7	31.9	14.0	51.7	20.6	2.0	51.2	18.6	12.0
Queue Delay	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total Delay	28.8	31.7	31.9	14.0	51.7	20.6	2.0	51.2	18.6	12.0
Queue Length 50th (ft)	2	181	184	0	3	135	0	7	132	0
Queue Length 95th (ft)	23	395	403	8	20	318	12	31	310	8
Internal Link Dist (ft)	1440		2589			1820			4559	
Turn Bay Length (ft)										
Base Capacity (vph)	258	671	673	635	109	1676	1469	110	1738	780
Starvation Cap Reductn	0	0	0	0	0	0	0	0	0	0
Spillback Cap Reductn	0	0	0	0	0	0	0	0	0	0
Storage Cap Reductn	0	0	0	0	0	0	0	0	0	0
Reduced v/c Ratio	0.05	0.62	0.63	0.01	0.06	0.49	0.59	0.13	0.46	0.01

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 89.7
Natural Cycle: 80
Control Type: Actuated-Uncoordinated

Splits and Phases: 1: KUIHELANI HIGHWAY & HONOAPIILANI HIGHWAY

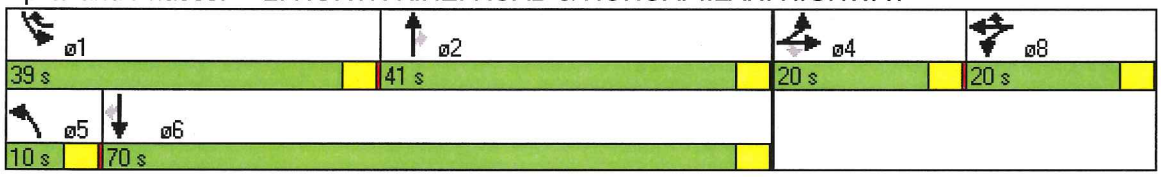


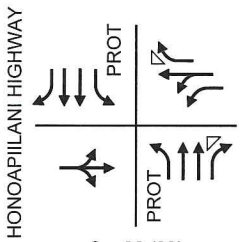
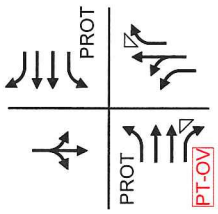
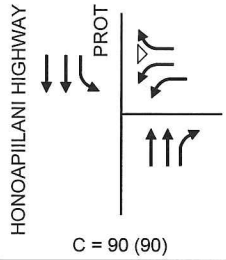
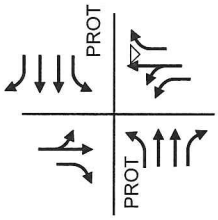
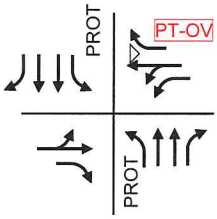
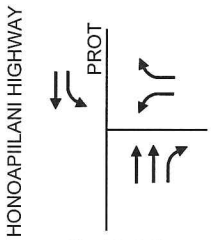
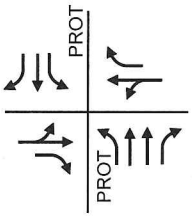
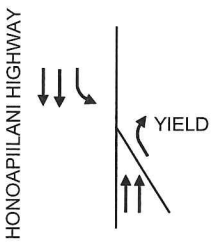
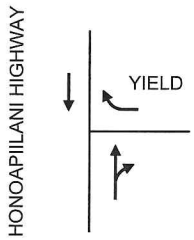
Lane Group	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT	SBR
Lane Configurations											
Volume (vph)	4	12	343	13	365	18	983	479	476	865	43
Lane Group Flow (vph)	34	13	189	198	397	20	1068	521	517	940	47
Turn Type		Perm	Split		pt+ov	Prot		Perm	Prot		Perm
Protected Phases	4		8	8	8 1	5	2		1	6	
Permitted Phases		4						2			6
Detector Phases	4	4	8	8	8 1	5	2	2	1	6	6
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)	20.0	20.0	20.0	20.0		8.0	20.0	20.0	8.0	20.0	20.0
Total Split (s)	20.0	20.0	20.0	20.0	59.0	10.0	41.0	41.0	39.0	70.0	70.0
Total Split (%)	16.7%	16.7%	16.7%	16.7%	49.2%	8.3%	34.2%	34.2%	32.5%	58.3%	58.3%
Yellow Time (s)	3.5	3.5	3.5	3.5		3.5	3.5	3.5	3.5	3.5	3.5
All-Red Time (s)	0.5	0.5	0.5	0.5		0.5	0.5	0.5	0.5	0.5	0.5
Lead/Lag						Lead	Lag	Lag	Lead	Lag	Lag
Lead-Lag Optimize?						Yes	Yes	Yes	Yes	Yes	Yes
Recall Mode	None	None	None	None		None	Max	Max	None	Max	Max
v/c Ratio	0.29	0.11	0.80	0.84	0.44	0.22	0.90	0.63	0.92	0.40	0.04
Control Delay	50.7	23.3	67.7	70.8	7.8	58.2	45.3	9.4	58.9	10.1	3.1
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	50.7	23.3	67.7	70.8	7.8	58.2	45.3	9.4	58.9	10.1	3.1
Queue Length 50th (ft)	24	0	140	147	55	14	388	40	362	140	0
Queue Length 95th (ft)	56	19	#273	#290	135	40	#545	156	#599	250	16
Internal Link Dist (ft)	993			2615			4697			1820	
Turn Bay Length (ft)											
Base Capacity (vph)	232	217	243	245	912	91	1192	822	564	2327	1056
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	0.15	0.06	0.78	0.81	0.44	0.22	0.90	0.63	0.92	0.40	0.04

Intersection Summary

Cycle Length: 120
Actuated Cycle Length: 107.2
Natural Cycle: 120
Control Type: Actuated-Uncoordinated
95th percentile volume exceeds capacity, queue may be longer.
Queue shown is maximum after two cycles.

Splits and Phases: 2: NORTH KIHEI ROAD & HONOAPIILANI HIGHWAY



Existing	Background	Background w/ Mitigation	Background With Mitigation With Project	Background With Mitigation With Project With Mitigation
Honoapiilani Highway at Kuihelani Highway				
 C = 90 (90)	NO CHANGE C = 90 (90)	NO CHANGE C = 120 (120)	NO CHANGE C = 120 (120)	 C = 120 (120)
Honoapiilani Highway at North Kihei Road				
 C = 90 (90)	NO CHANGE C = 90 (90)	NO CHANGE C = 120 (120)	 C = 120 (120)	 C = 120 (120)
Honoapiilani Highway at Kapoli Street				
 C = 90 (90)	NO CHANGE C = 90 (90)	NO CHANGE C = 90 (90)	 C = 90 (90)	NO CHANGE C = 90 (90)
Honoapiilani Highway at Maalaea Road				
	NO CHANGE	NO CHANGE	NO CHANGE	NO CHANGE
Honoapiilani Highway at Hauoli Street				
	NO CHANGE	NO CHANGE	NO CHANGE	NO CHANGE

Attachment S
SUMMARY OF LANE CONFIGURATIONS AND RIGHT-OF-WAY CONTROLS

Appendix F

Archaeological Inventory Survey (AIS)

Zone 3
Section 6

0506 MK 18

4/18/05
5/29/05

SCS Project 534-1

AN ARCHAEOLOGICAL INVENTORY SURVEY REPORT ON 259.903 ACRES IN MA`ALAEA, UKUMEHAME AND WAIKAPU AHUPUA`A, WAILUKU DISTRICT, MAUI ISLAND, HAWAI`I [TMK: (2) 3-6-01:18]

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and
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April 2005

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HAWAII

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ABSTRACT

Scientific Consultant Services (SCS), Inc., conducted Archaeological Inventory Survey on a 259.903-acre land parcel in Ma`alaea, Ʊkumehame and Waikapu Ahupua'a, Wailuku District, Maui Island, Hawai`i [TMK: (2) 3-6-01:18]. The work consisted of historical background and archival research; pedestrian survey and inspection of the parcel; mapping and description of site features; subsurface testing (excavation by backhoe); consultation with state archaeologist Dr. Melissa Kirkendall; and, analysis, interpretation, and reporting of all relevant data. The main objectives of the project were to determine if significant cultural and/or historic resources occurred on the parcel; and, to provide significance assessments and recommendations.

The main results of this study were as follows: Three historic sites, all related to sugarcane agriculture, were identified, documented for the first time, and assigned SIHP numbers: Site 50-50-09-5657 (clearing mounds), Site 50-50-09-5658 (irrigation modifications), and Site 50-50-09-5659 (dirt road). These three sites were the only archaeological sites found within the project area, and all three are considered significant under Criterion D of the Hawaii State and National Register of Historic Places. A 100 percent pedestrian survey concluded that no prehistoric sites exist on the surface of the project area.

Subsurface testing was comprised of twenty backhoe trenches (a volume of approximately 292 cubic meters) which did not reveal any subsurface historic, or prehistoric, cultural material. Rather, excavation confirmed the extent, both in physical and temporal depth, of historic and modern agricultural activity within the project area. No burial features or human remains were observed during pedestrian survey or encountered during subsurface testing.

The following actions are recommended: No further archaeological work is necessary within the project area, with the exception of a period of observation during future earth-moving activity. An archaeologist must be on site during the leveling of a representative sample (a minimum of four) of the thirteen clearing mound features that comprise State Site 50-50-09-5657. This archaeological observation is necessitated by the possibility of historic and/or prehistoric features or artifacts having been buried under/within the large clearing mounds.

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INTRODUCTION

Scientific Consultant Services (SCS), Inc., conducted Archaeological Inventory Survey (AIS) on a 259.903-acre land parcel in Ma`alaea, Ukumehame and Waikapu Ahupua'a, Wailuku District, Maui Island, Hawai`i [TMK: (2) 3-6-01:18] (Figures 1 and 2). The work consisted of historical background and archival research; pedestrian survey and inspection of the parcel; mapping and description of site features; subsurface testing (excavation by backhoe); consultation with state archaeologist Dr. Melissa Kirkendall; and, analysis, interpretation, and reporting of all relevant data. Fieldwork was conducted on January 31–February 11, 2005 by Jon Wilson, B.A. and Eric Pope, B.A. under the supervision of Principal Investigator Michael F. Dega, Ph.D.

Archaeological work in the project area was conducted to determine the presence/absence of archaeological features in surface and subsurface contexts through complete pedestrian survey and representative subsurface testing. The ultimate goals of the project were to determine if significant cultural and/or historic resources occurred on the parcel; and, to provide significance assessments and recommendations to the State Historic Preservation Division (SHPD). Plans for the "Ma`alaea Mauka" residential project by AFK Development utilize nearly the entire project area detailed within this AIS. Included in development plans are over one thousand residential units, a community center, a park and open areas, buffer zones, and roadways.

ENVIRONMENTAL SETTING

PROJECT AREA DESCRIPTION AND LOCATION

Maui's Wailuku District encompasses an area from the eastern half of the West Maui Mountains, north to Kahului Bay, south to Ma`alaea Bay, and includes the entire Kahului Isthmus (Figure 3). Near the southwestern corner of Wailuku District, the boundary separating Ukumehame Ahupua`a and Waikapu Ahupua`a runs from *mauka* to *makai* (roughly west to east). At an elevation of approximately 55 meters (180 feet) the *ahupua`a* boundary sharply angles south toward Ma`alaea Bay. This sharp angle between the two *ahupua`a* marks the northeastern boundary of the current project area. The *ahupua`a* boundary then divides the project area as it continues south, leaving roughly 65 percent of the parcel in Ukumehame Ahupua`a, and 35 percent of the parcel in Waikapu Ahupua`a (see Figure 1).

The "Ma`alaea Mauka" project area consists of one contiguous 259.903-acre parcel that uses the Honoapiilani Highway as its *makai* border. The three-sided project area's southern terminus is a triangular point *mauka* of Ma`alaea Small Boat Harbor. The northern boundary line

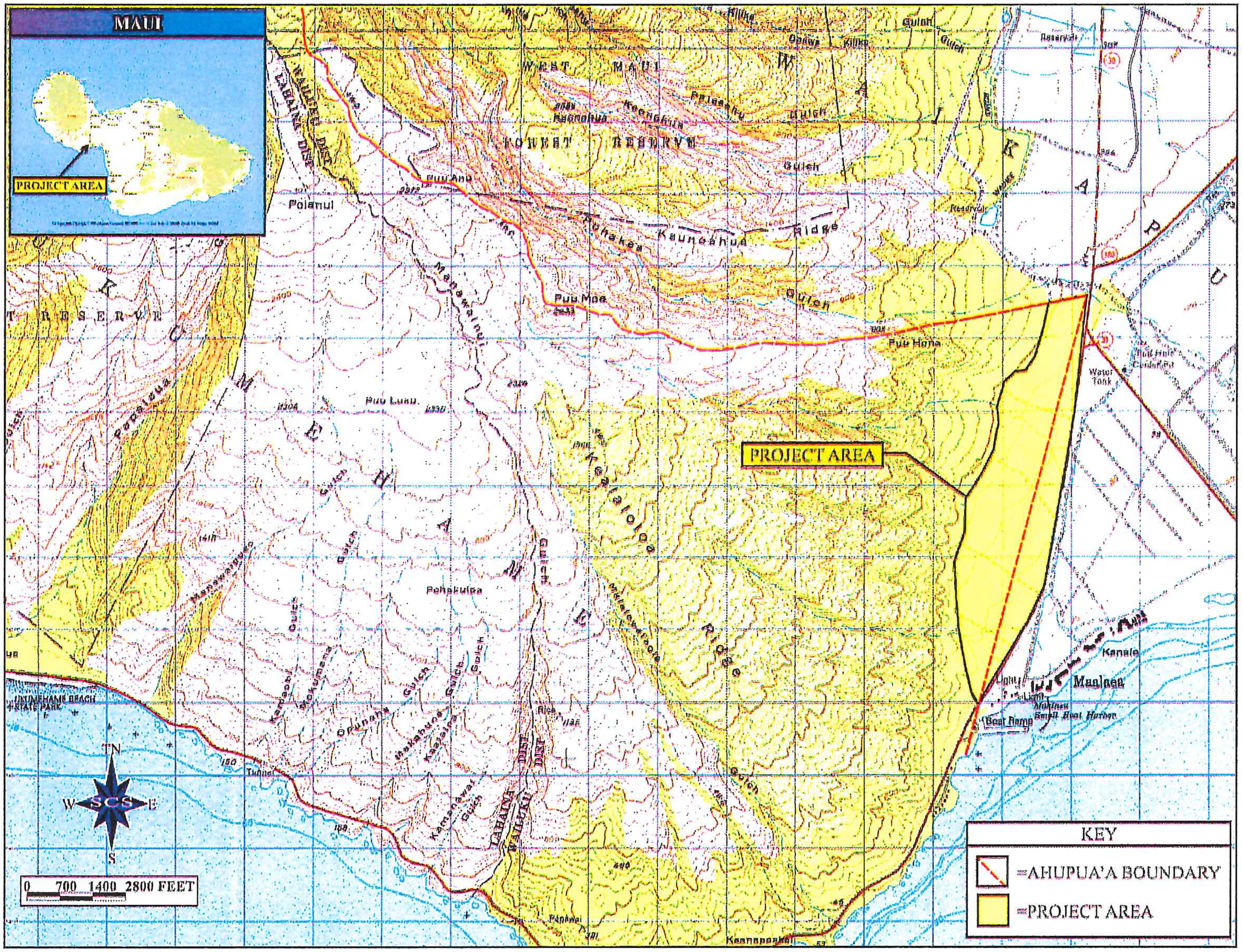

Figure 1: USGS Ma`alaea Quadrangle Showing Project Area Location.

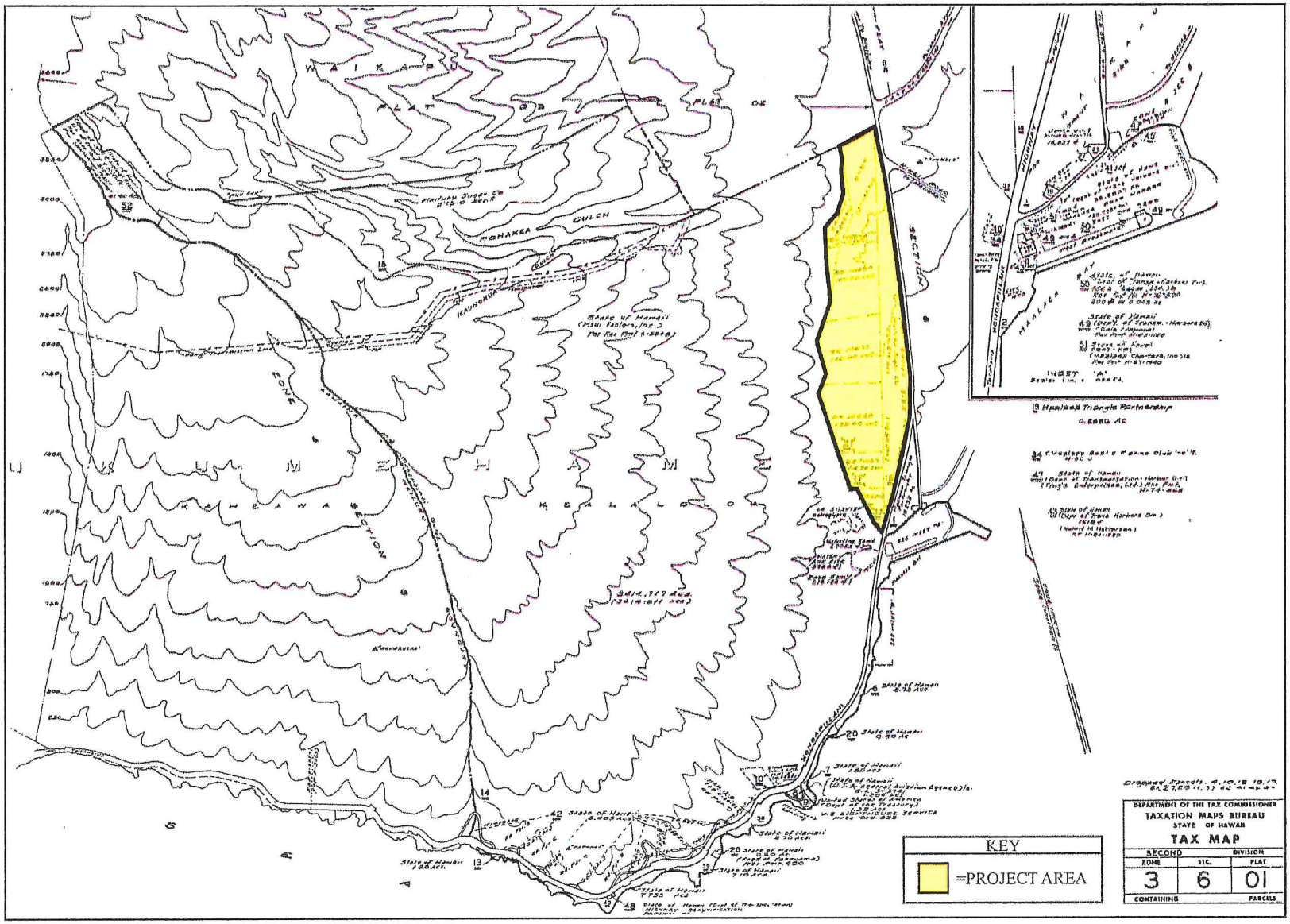

Figure 2: TMK [Tax Map Key] Showing Project Area Location.

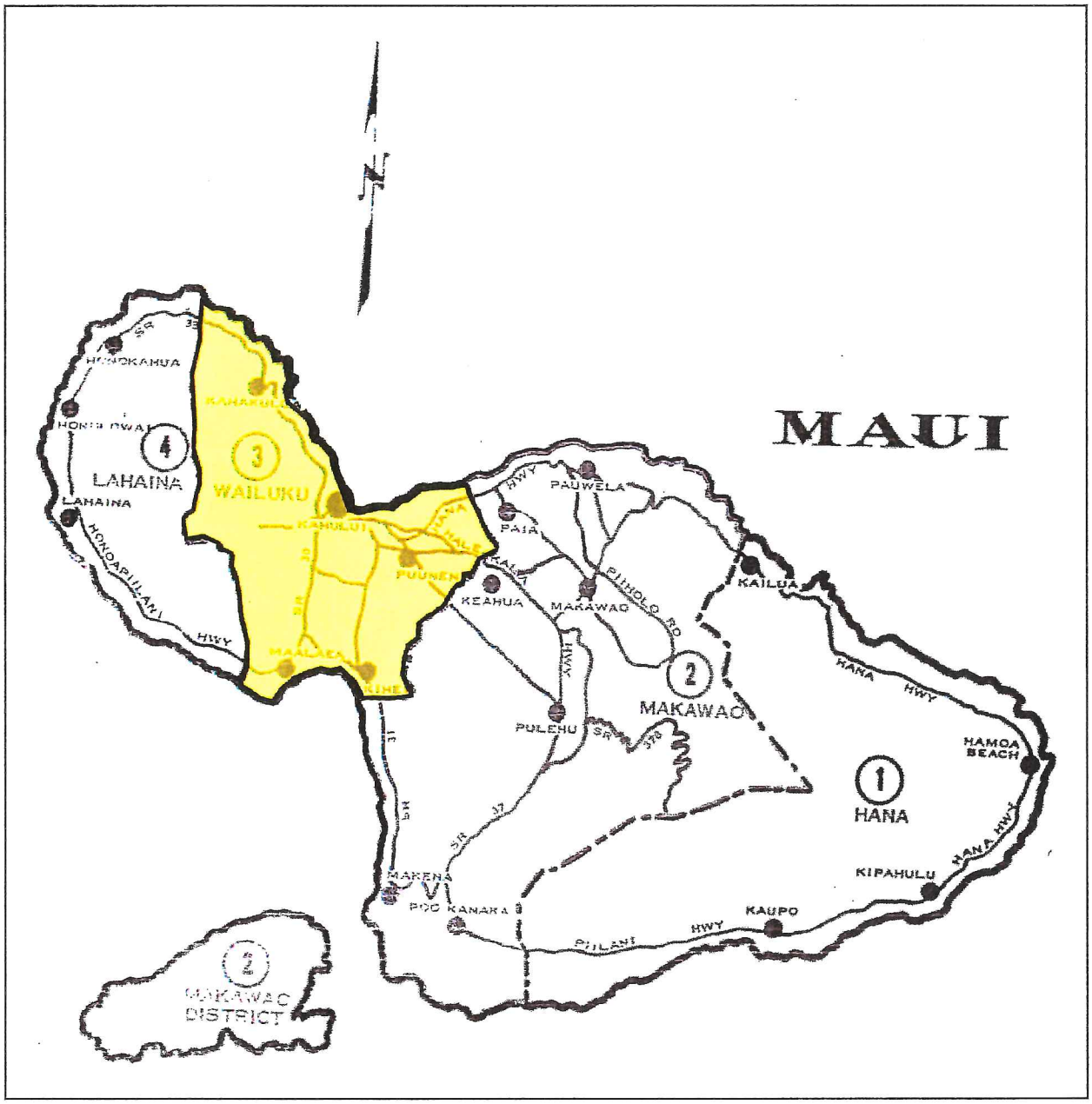

Figure 3: Wailuku District Boundaries.

extends *mauka* from a point 183 m (600 feet) south of the Kuihelani Highway's intersection with Honoapiilani Highway. The long, narrow project area runs 2.7 kilometers (1.7 miles) along the Honoapiilani Highway (Figure 4), and at it widest is 579 m (1900 feet).

PROJECT AREA LANDFORM

The sharp transition from valley floor to mountain slope is the most distinct visual feature of the nearby terrain. This dramatic elevation increase, however, occurs just *mauka* of the relatively flat project area (Figure 5). With the southeastern end of the project area having an elevation of 12 m (40 feet), and the northwestern perimeter high point of 61 m (200 feet), the maximum elevation difference throughout the project area is only 49 m (160 feet). The average *makai* to *mauka* elevation gained from walking the width of the project area (about half a kilometer) is only 24m (80 feet). The average elevation gained from climbing the next half kilometer beyond the project area's *mauka* border is 146 m (480 feet).

The gently-sloping terrain of the project area has been made more flatly uniform through decades of agricultural activity. Few distinct naturally-occurring landmarks remain within the project area's topography. Certain points within the project area afford an uninterrupted view of its entire expanse. The four perennial *mauka-makai* running drainages that cross the project area remained dry at the time of survey. It is likely that these narrow water courses that span the parcel's width only flow in times of heavy rains. Two of the four drainages are fairly shallow and narrow, and do not originate much farther upslope than the base of the mountains. The two more significant drainages appear on the USGS topographical map (see Figure 1), and are currently diverted under Honoapiilani Highway, eventually emptying into Ma`alaea Bay. Of these two, the southern drainage originates at an elevation of 335 m (1100 feet), and the northern drainage (Figure 6) originates near Puu Moe at 640 m (2100 feet). However, at a maximum width of less than four meters, it is likely that even these two more significant water sources served to irrigate the project area only in times of heavy rainfall.

CLIMATE AND VEGETATION

The project area receives 25 to 38 centimeters (10 to 15 inches) of rainfall annually (Armstrong 1983). This area is much drier than higher elevations to the west that receive as much as twenty times the level of precipitation. Air temperatures are consistently slightly warmer here than the Maui seasonal high and low averages, mostly due to the lower, coastal elevation.

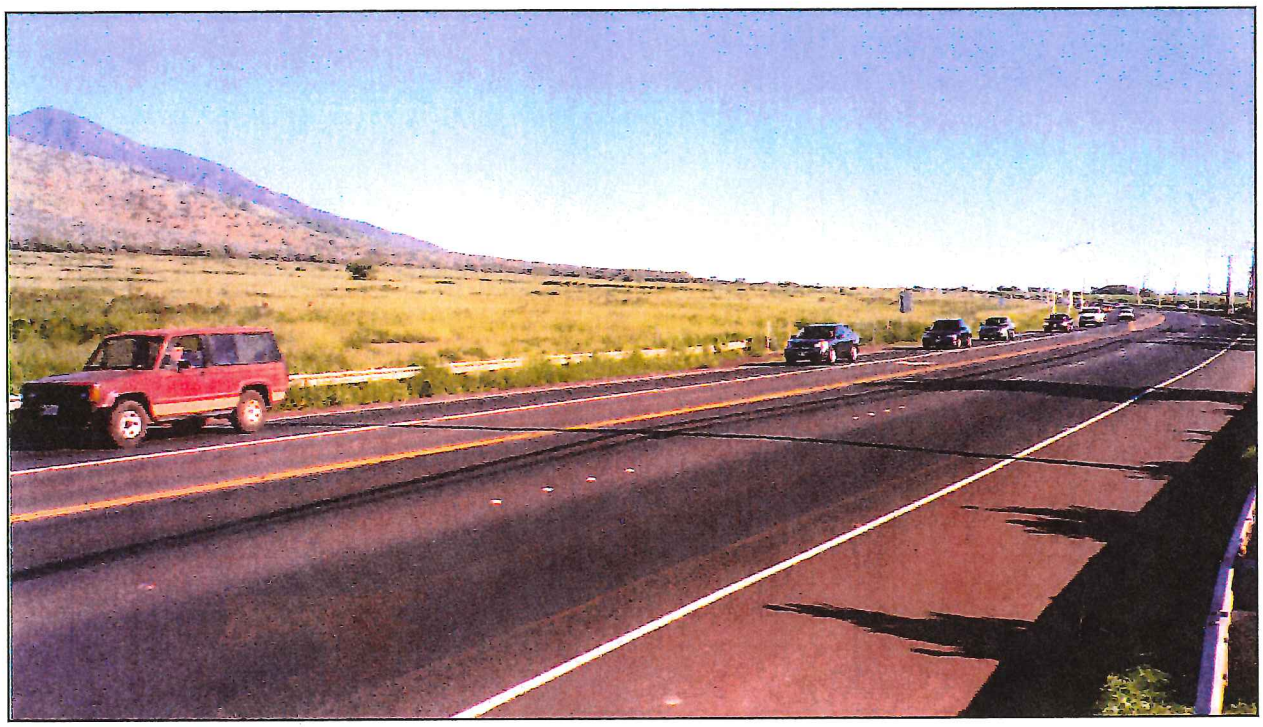

Figure 4: Project Area Overview. View to North, Across Honoapiilani Highway.

Figure 5: Project Area Overview. View to North, from Southern Quadrant.

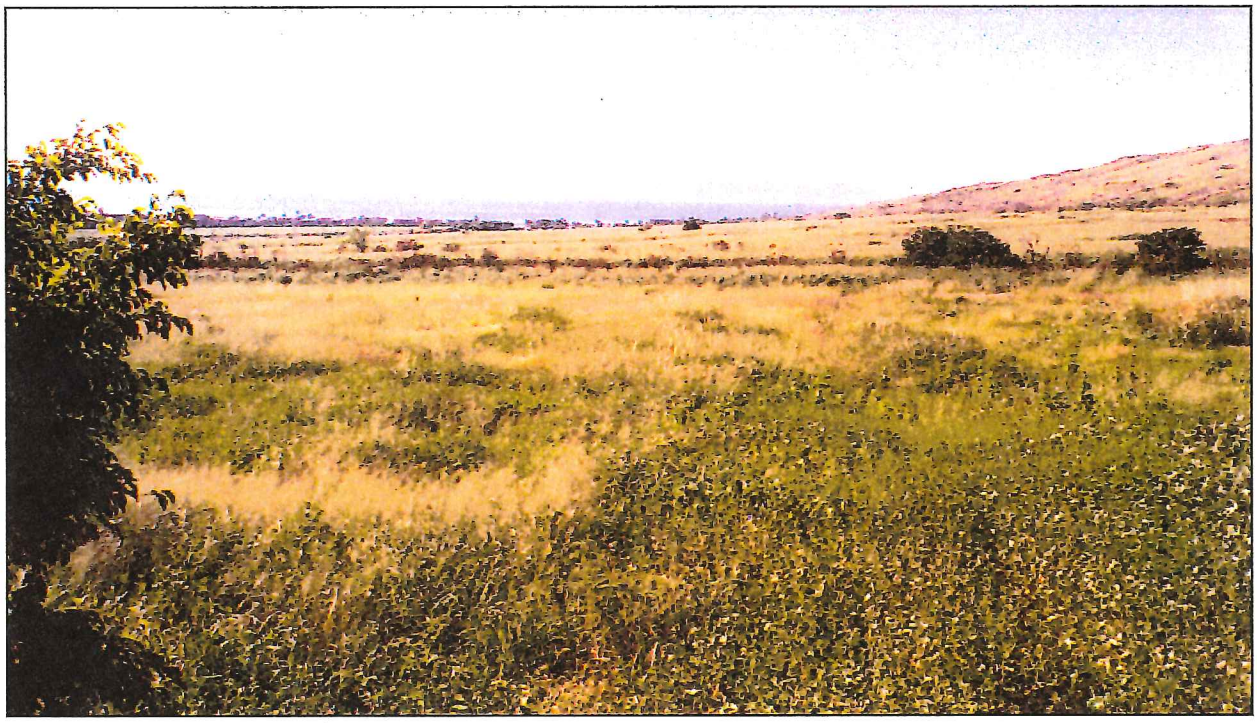

Figure 6: *Mauka-Makai* Vegetation Line Marks the Northern Drainage Appearing on the USGS Map. Northern Half of Project Area, View to South.

At the time of survey, project area vegetation consisted of a mix of introduced grasses and trees, few native species, and a variety of small garden plots with a mix of planted crop species. The only areas not covered by vegetation were the multiple dirt road segments that transect the property. Introduced grasses, ranging from 0.5 to 1.0 m tall, covered roughly 85 percent of the project area. Few *kiawe* trees (*Prosopis pallida*) were found outside of drainage perimeters, but along and within the drainages these introduced trees were abundant. *Kiawe* also lines the *mauka* side of the *mauka* perimeter road, and grows very dense within the State-owned lands at the base of the mountains. Overall, few trees exist within the former agriculture fields. Recent *koa haole* (*Leucaena leucocephala*) trees have grown to a height of no more than 1.5 m within the fields, but grow to a height of over 3.0 m along the *mauka* perimeter roads. Other species include lantana (*Lantana camarara*), sparse sisal (*Agave sisalana*), and the native *`ilima* (*Sida* sp.).

Over twenty different patches of recently abandoned garden crops are scattered throughout the southern 80 percent of the project area. None are larger than one acre, and none of these patches exist within the rockier northern soils. Two local informants spoke of "renting" land for small-scale farming within the "past couple of years," be it through a formal contract

with the previous land owner or not. Rows of banana trees occur in at least five different areas. One banana patch also includes gourds; papaya trees are interspersed throughout. At the center of the property, surface plastic irrigation pipes appear to be recently constructed and lead to a square sod field. The most elaborate small-scale farming remnant is what appears to be a *Ficus* sp. nursery at the center of the project area's northern half. Here, three rows of identically-sized trees are paralleled by what appear to be recently constructed concrete walkways and irrigation piping (Figure 7).

SOILS

As the project area extends north, its soils contain a greater concentration of basalt cobble and boulder. According to Foote *et al.* (1972:101), soils in the project area fall into mainly two categories: the Ewa Series (80 percent of the project area) and the Pulehu Series (most of the northern 20 percent). The Ewa Series consists of well-drained soils occurring on alluvial fans within Oahu and Maui. They are derived from igneous rock, moderately sloping, and best suited for sugar cane, truck crops, and pasture. The southern third of the project area consists entirely of Ewa Silty Clay (EsB), ideal for sugarcane. Bordering EsB soil to the north is a large contiguous section of Ewa Cobbly Silty Clay (EtB), covering roughly 50 percent of the project area. Foote *et al.* note that the removal of a surface layer of cobble renders this soil equally suitable to sugarcane cultivation as the less rocky soil to the south (1972:29–30, 115–116).

Figure 7: Possible Tree Nursery at Center of Project Area.

Roughly 20 percent of the project area, entirely concentrated at the northern end, consists of a Pulehu Series soil—specifically, Pulehu Cobbly Clay Loam (PtB). This soil is very similar to the Ewa Series in almost every aspect except its greater surface rock concentration. Thus, a direct correlation can be seen between the location of PtB soil and the 13 large, agricultural clearing mounds (State Site 50-50-09-5657) concentrated in the northern end of the project area (Figures 8 and 9). In an effort to create sugarcane fields equally productive as lands to the south, decades of tilling have deposited these enormous mounds of concentrated boulders. (See "RESULTS" section, below, for further discussion of the historic origin of the Site -5657 mounds).

TRADITIONAL AND HISTORIC SETTING

PRE-CONTACT TO EARLY HISTORIC ERA

Wailuku District, is frequently mentioned in historical texts and oral tradition as being politically, ceremonially, and geographically important during traditional times (Cordy 1981, 1996; Kirch 1985). Wailuku was considered a "chiefly center" (Sterling 1998:90) with many of the chiefs and much of the area's population residing near or within portions of `Īao Valley and lower Wailuku. The importance of the district is reflected by the relatively large number of *heiau* that were reportedly present in pre-Contact times. Oral tradition accounts surrounding these *heiau* provide examples of how religion tied into political power in the traditional Wailuku setting. Indeed, the period immediately preceding contact with the Europeans was one of considerable upheaval and conflict. *Wailuku*, meaning 'water of destruction,' succinctly describes the area in the late 1700s. Political power emanating from Moloka`i was an active element during the mid-eighteenth century. The resulting battle at Kalae`ili`ili (A.D. 1765) led to the expulsion of Keeaumoku and the Moloka`i *ali`i* and the beginning of Kahekili's reign (Kamakau 1992). Kahekili successfully defended his capital in Wailuku throughout the 1770s, until his defeat at the hands of Kamehameha's forces.

Closer to the current project area, in the southwest corner of Wailuku District, prehistoric settlement was not as dense as concentrations to the north. Climate had much to do with that trend, as the Ma`alaea area is a more arid environment than the rain-soaked fields to the north. According to Tomonari-Tuggle and Tuggle (1991), the majority of the pre-Contact population was located southwest of the project area, near what is now Ukumehame Beach State Park. Settlement was also probable north of Kealia Pond in Waikapu Ahupua`a. Handy and Handy report that before the historic sugarcane plantations in this region, water from Waikapu Stream ". . . was diverted into lo`i and its overflow was dissipated on the dry plains of the broad isthmus between West and East Maui" (1972:496).

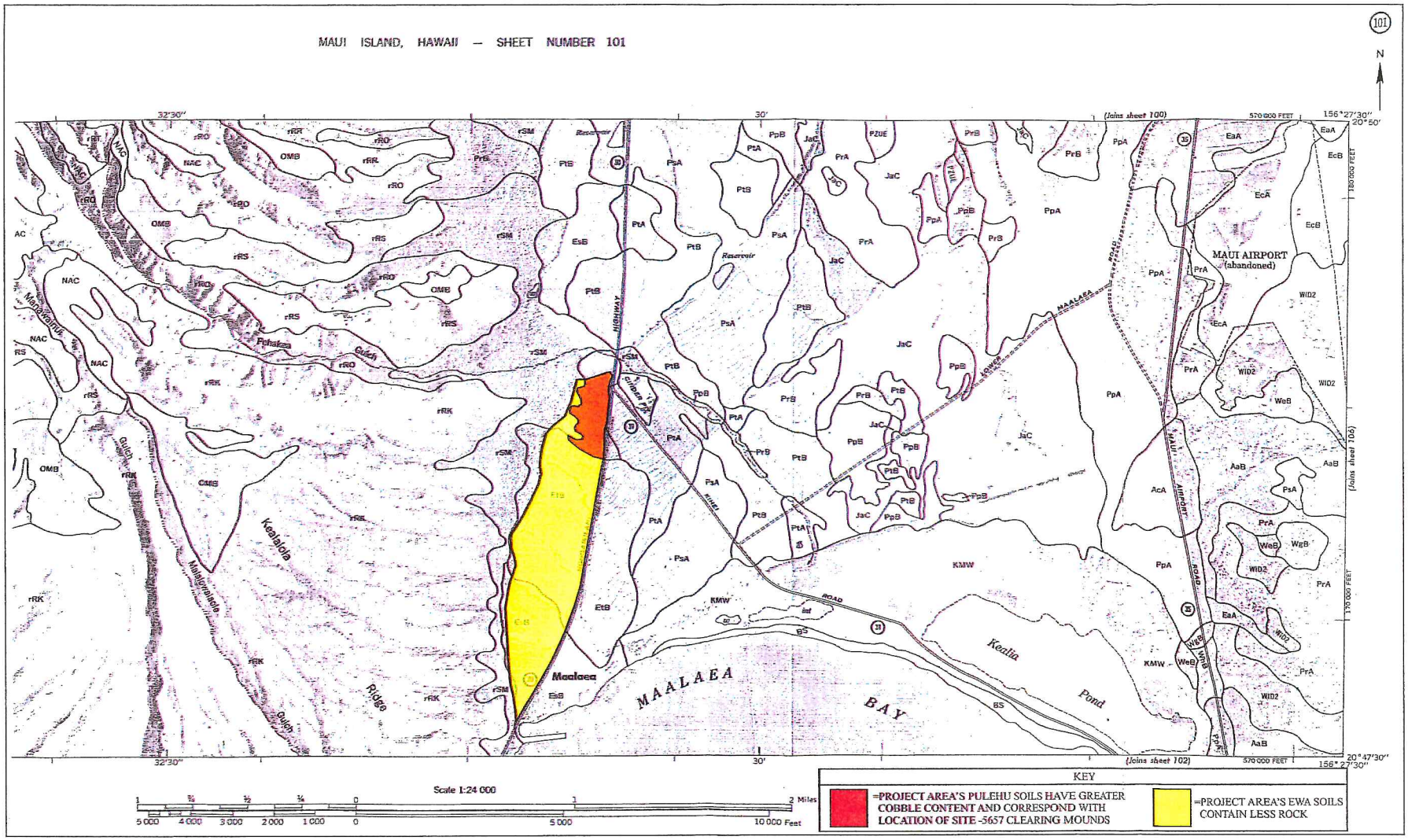

Figure 8: Project Area Soil Type Distribution (adapted from Foote *et al.* [1972:101]).

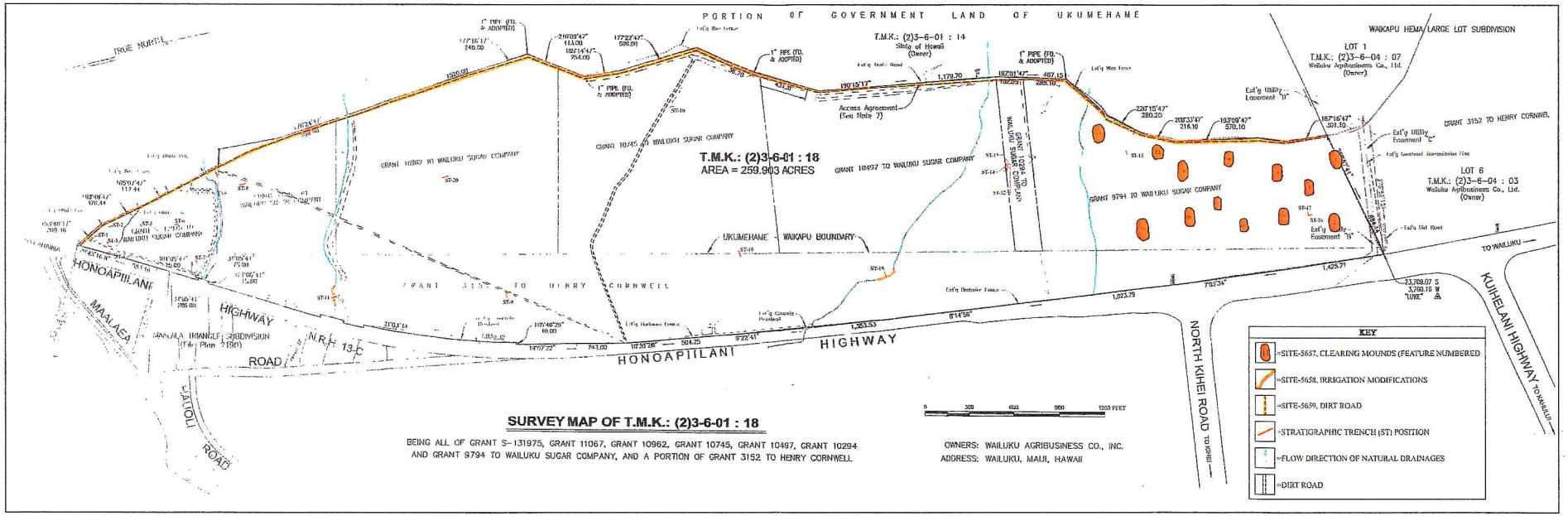

Figure 9: Project Area Site Map.

Wailuku District would see drastic change after Captain James Cook's 1778 arrival in Kahului Bay. The reign of Kamehameha I was intertwined with the increasing presence of Europeans within the Hawaiian Islands. By 1821, American missionaries had established a foothold in Lahaina and first arrived in Wailuku a year later. The religion of the Hawaiian people began to wane under the influence of Christianity. Fredericksen and Fredericksen (2002:4) point to a girls' seminary (Central Female Boarding School), established in Wailuku in 1836, as one of the initial steps in the conversion of Hawaiian language and customs in Maui.

THE GREAT MĀHELE

In 1848, commissioners of the Great Māhele instigated an extreme modification to traditional land tenure on all islands that resulted in a division of lands and a system of private ownership. The Māhele was based upon the principles of Western law. While a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was forced to establish laws changing the traditional Hawaiian society into that of a market economy (Kuykendall Vol. I 1938:145, footnote 47, *et passim*; Daws 1968:111; Kame`eleihiwa 1992:169–170, 176). The dramatic shift from a redistributive economy to a market economy resulted in drastic changes to land tenure, among other things. As a result, foreigners demanded private ownership of land to ensure their investments (Kuykendall Vol. I, 1938:145, *et passim*; Kame`eleihiwa 1992:178; Kelly 1998:4).

Once lands were made available and private ownership was instituted, native Hawaiians, including the *maka`āinana* (commoners), were able to claim land plots upon which they had been cultivating and living. Oftentimes, foreigners were simply just given lands by the *ali`i*. However, commoners would often only make claims if they had first been made aware of the foreign procedures (*kuleana* lands, or land commission awards). These claims could not include any previously cultivated or currently fallow land, *okipu*, stream fisheries, or many other natural resources necessary for traditional survival (Kame`eleihiwa 1992:295; Kirch and Sahlins 1992). Awarded parcels were labeled as Land Commission Awards (LCAs). If occupation could be established through the testimony of witnesses, the petitioners were issued a Royal Patent number and could then take possession of the property. Commoners claiming house lots in Honolulu, Hilo, and Lāhainā were required to pay commutation to the government before obtaining a Royal Patent for their awards (Chinen 1961:16).

During the Māhele, Wailuku District was declared Crown Land and numerous Land Commission Awards, approximately 180, were awarded within Wailuku Ahupua`a alone (Creed 1993). A handful of foreigners (*i.e.*, Anthony Catalena, James Louzada, E. Bailey) gained

control of large parcels of lands that would later be used for mass cultivation of sugar. Significantly, the majority of LCAs were awarded to Hawaiians, a gauge that can be used to measure pre-Contact settlement, since there was little overall change in traditional land use among Hawaiians prior to 1853 (Creed 1993:38).

During the Māhele, there were no land claims within the current project area. This fact may be attributed to the sparse pre-1848 Hawaiian population within the parcel, a result of settlement conditions within these *ahupua`a* favoring the coastal area.

THE LATE HISTORIC PERIOD AND GROWTH OF THE SUGAR INDUSTRY

Another influence that brought change to Maui was foreign commercialism. Two Chinese brothers, Ahung and Atai, of Honolulu's Hungtai Company arrived in Wailuku to explore the possibility of setting up one of its earliest sugar mills in 1828. Atai soon created a plant that processed sugar cane cultivated by Hawaiians, named the Hungtai Sugar Works (Dorrance and Morgan 2000:15–16). Ahung later joined Kamehameha III's sugar producing enterprise, although by 1844 both operations had ceased. The Wailuku Sugar Company was the next to follow, in 1862, and would expand sugar production over the next 126 years of its existence—4,450 acres by 1939, still more than three decades before its maximum production levels.

As it expanded its territory, the Wailuku Sugar Company first appeared on maps of the project area in the in the 1920s (Bureau of Conveyances, Grant 9794), although their acquisition of the project area land may have been as early as the turn of the century (Kennedy and Trimble 1992:4). Successive grants (Grant 10294 through to Grant S-13975) would follow in decades following and fully encompass the Ukumehame Ahupua`a side of the project area in Wailuku Sugar land. Kennedy and Trimble (1992:4) summarize the history of the Waikapu Ahupua`a (*makai*) portion of the project area by detailing its acquisition from the state government on November 18, 1875 by Henry Cornwell (Grant 3152). Cornwell subsequently sold to Claus Spreckels, and by the turn of the century the entire project area was under sugarcane cultivation.

Wailuku Sugar Company ended production in 1988, having averaged over 30,000 tons of sugar produced annually at its pinnacle in the 1970s (Dorrance and Morgan 2000:66). Owner C. Brewer & Company, Ltd. shut down sugar cultivation on the project area, which was then used almost entirely for pineapple cultivation starting no later than 1992 (Kennedy and Trimble 1992:1). The lands were under pineapple for at least the next three years (Tomonari-Tuggle 1995:11)—probably slightly longer—before transitioning to smaller-scale "garden" plots.

PREVIOUS ARCHAEOLOGY

Six studies on file within the SHPD-Kapolei archives summarize the most relevant previous archaeology within the vicinity of the current project area. Figure 10 exhibits the locations of these studies in relation to the current project area. Examination of the archaeological record helped to form the expected findings and, consequently, the subsurface testing pattern charted on Figure 9.

Most relevant to the current study is the only other previous archaeological study that took place within the current project area. Kennedy and Trimble (1992) surveyed an area that overlaps State Site 50-50-09-5659 (historic dirt road), first recorded in the present study (see Figure 10). While Kennedy and Trimble also note the lack of archaeological features in their project area due to the obvious history of intense agriculture, their 1992 report does not consider the road upon which their survey takes place to be a potential historic agricultural feature (as discussed below under "RESULTS"). The project area detailed in their study is no more than 5 meters wider than the dirt road itself, and concludes that "No artifacts, midden, or structures of historic or prehistoric significance were identified on the subject property" (1992:11).

An earlier Kennedy report (1986) entitled *Letter Report: Walk-Through Examination of the Proposed Maalaea Triangle, Maui (TMK: 3-6-01:1)* also concluded with negative results. This project area is located on the *makai* side of Honoapiilani Highway and extends to the coastline (see Figure 10). This was the first archaeological study performed on this parcel and Kennedy does mention (1986:2) nearby sites that are detailed in later studies.

Monitoring within a smaller section of the same project area described by Kennedy (1986) resulted in a single site—a previously disturbed historic burial: State Site 50-50-09-4480 (McGerty, Burgett, and Spear 1998). McGerty *et. al*'s report, entitled *Draft: Monitoring Report on Earth Moving and Construction Excavations, Maui Ocean Center Site, Maui, Hawaii, (TMK: 3-6-01:001 and 019)* describes a pearl shell button found with the burial. The location of Site -4480 is of interest to the current study as its position is approximately 200 m *makai* of the current project area's southern corner. As subsequent subsurface testing would prove, however, the sandy matrix McGerty *et. al* experienced in the Maui Ocean Center monitoring contrasted the reddish clay of the current project area, rendering the likelihood of encountering burials much less. Nonetheless, the McGerty *et. al* (1998) study also mentions two more burials found not far to the north from Site -4480. While these (Sites -3553 and -3554) are even less spatially related

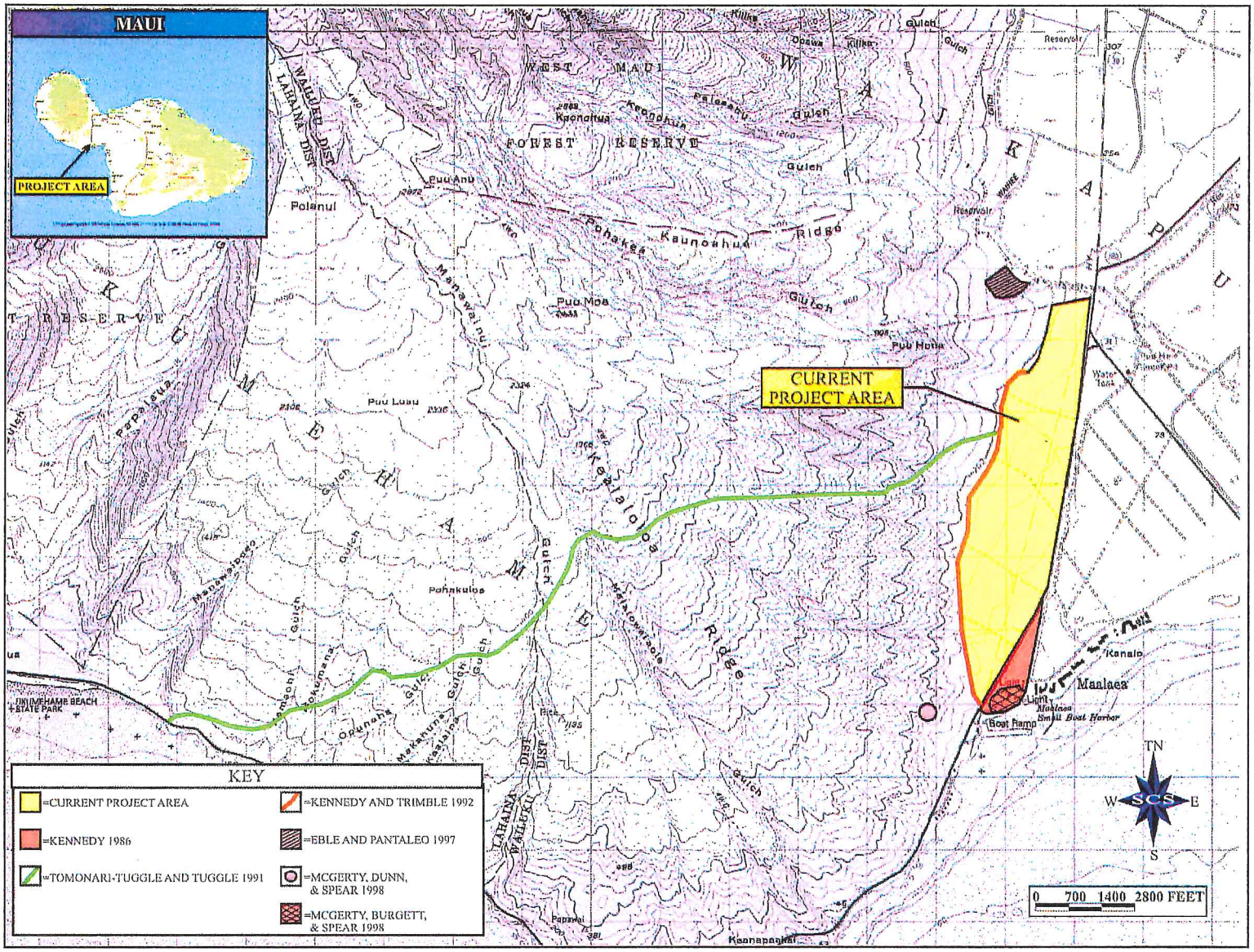

Figure 10: Locations of Selected Previous Archaeological Studies Near Current Project Area.

to the current project area, their presence will later call for increased testing in the southern portion of the current project area (closest to the sandy coastal matrices).

McGerty, Dunn, and Spear (1998) conducted Data Recovery in an area of five traditional sites documented by Moore and Kennedy (1995). These sites (50-50-09-3555, -4022, -4137, -4138, -4139) consisted of 28 features, including petroglyphs, subsurface firepits, agricultural terracing, rock mounds, and a C-shape. McGerty et. al's testing at Sites -4138, and -4139 did not produce any significant artifacts, however, radiocarbon analysis of a charcoal sample produced a date of A.D. 1390 to 1650. This sample was recovered from the C-shape (Site 4139, Feature C) which was determined to be a prehistoric temporary habitation. This site is less than 300 m *mauka* of the current project area's southern point.

There is no doubt that the current project area was utilized as a segment of an important trail system in the early 1800s, and probably prehistorically as well. The Lahaina Pali Trail is five miles long and crosses the southern slopes of the West Maui Mountains between Olowalu and Ma`alaea. The start of this trail, now a demonstration trail as part of the Na Ala Hele Trail System, borders the current project area near the center of the *mauka* border. By the historic period in which the trail's significance as a probable prehistoric route was realized, the portion *makai* of the current trail head (*i.e.* the portion transecting the width of the current project area) was already destroyed by sugarcane cultivation. Thus, the trail starts immediately outside the project area, within the State-owned lands. A 1991 study by Tomonari-Tuggle and Tuggle documented 18 sites upon the trail, the majority of historic origin (Figure 11).

SETTLEMENT PATTERN

Archaeological settlement data indicates that initial colonization and occupation of the Hawaiian Islands first occurred on the windward sides of the main islands, with populations eventually settling into drier leeward areas at later periods (Kirch 1985). Archaeological dates for initial occupation of the Hawaiian Islands far pre-date accepted ranges gathered from palynological data. A more conservative estimate for initial occupation of the islands is the A.D. 9th century (Athens 1997), if one is to lay more credibility with the pollen record than the archaeological record. In the Waihe`e and Wai`ehu areas of Wailuku, Kirch (1985:87) notes that "a number of coastal dune midden sites have been reported, and at least one of these contained pearl-shell fishhooks similar to those from the Bellows Site, eroding from the wave-cut midden." (The Bellows site, located on the windward coast of O`ahu, has yielded the controversial data of occupation dates from A.D. 300 to 600 [Pearson *et al.* 1971], one of the earliest dated sites in the

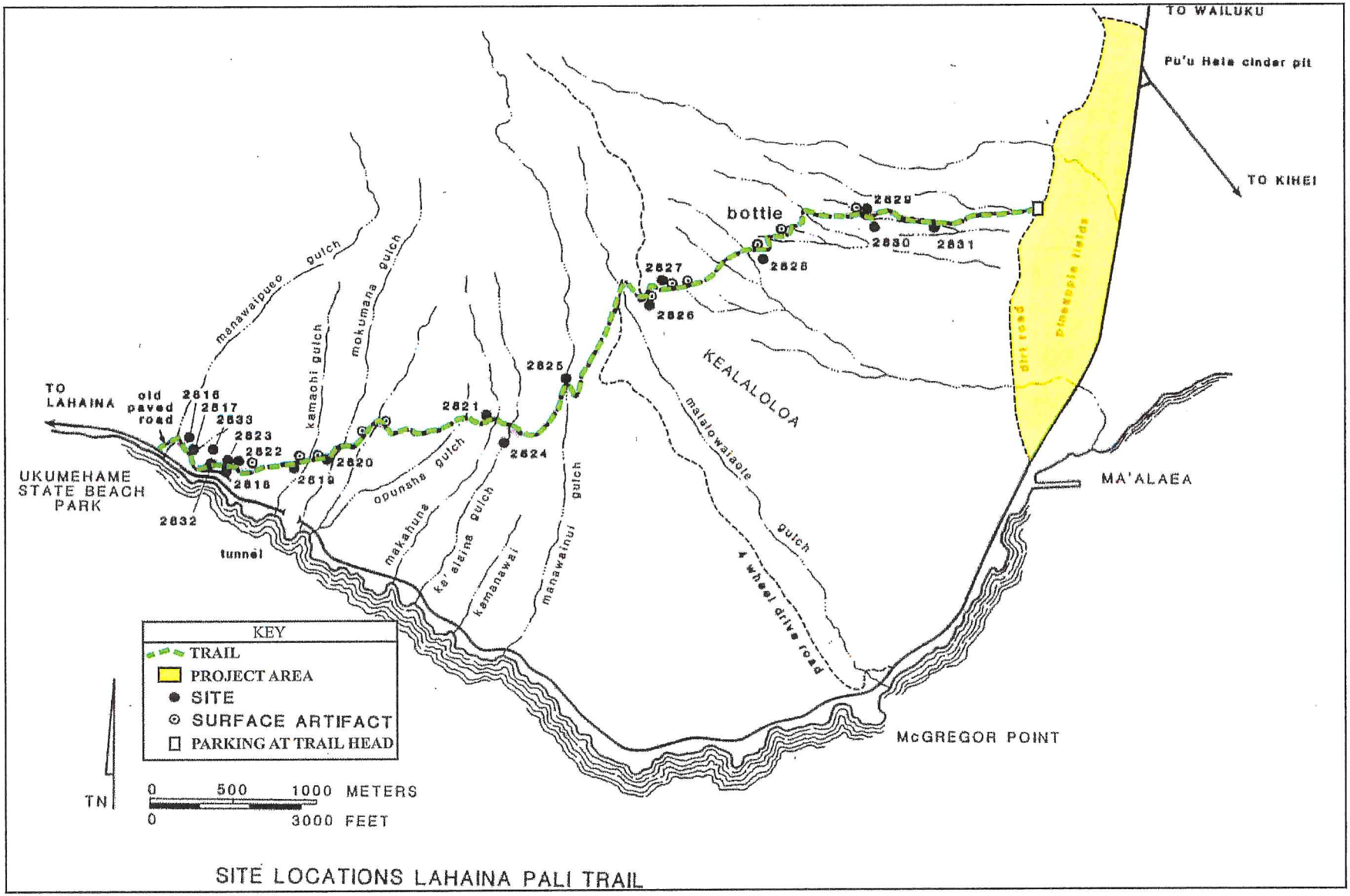

Figure 11: Project Area in Relation to Lahaina Pali Trail (Adapted from Tomonari-Tuggle and Tuggle 1991).

Hawaiian Islands. For the most part, these dates have now been diagnosed as problematic and are no longer considered valid.)

More recent research within Wailuku District indicates that Wailuku Ahupua`a was likely settled between *c.* A.D. 1100 (Kirch 1985:142) and A.D. 1200 (Fredericksen and Fredericksen 1996), whereas *ahupua`a* to the northeast have produced slightly earlier date ranges and *ahupua`a* to the southwest have later settlement dates. The earliest populations purportedly used local resources and seldom ventured into upland valleys. Cordy (in Creed 1993) suggests, however, that upper valley areas on windward coasts were likely populated before the A.D. 1100s. Coastal settlement was still dominant, but populations began exploiting and living in more upland *kula* zones. Population expansion to inland areas did not occur until the *c.* A.D. 12th century but continued through the 16th century. Large scale or intensive agricultural endeavors were implemented in association with habitation. Coastal lands were used for settlement and taro was cultivated in near-coastal reaches and in the uplands. Upland areas of Maui such as the Waiohuli-Kula area contained large garden enclosures, ceremonial structures, and permanent habitation sites by *c.* A.D. 1600.

Nearer the coast in lands like the current project area (*c.* 40–85 meters amsl), taro was cultivated along stream courses, dryland taro was grown on *kula* lands, and populations settled there as well. In the current parcel, however, no LCA records exist that might link prehistoric agriculture to historically documented practice.

EXPECTED FINDINGS

Based on all available physiographic, archaeological, and historical evidence, the following expectations guided this study:

- Historically-significant surface features were expected, particularly those pertaining to historic period sugarcane agriculture. SCS staff conducted a brief reconnaissance (prior to AIS) which reported the presence of the large clearing mounds. The reconnaissance did not report any other historic or prehistoric surface features, however, the probability of documenting additional historic agricultural features during AIS was considered high.

- A variety of traditional Hawaiian sites have been documented at locations within 500 meters outside of all three borders of the project area. While the probability of

encountering prehistoric archaeological surface features within the project area was considered low, there remained a moderate possibility of encountering subsurface cultural layers from a prehistoric period. The latter would depend largely on the existence of a previously undisturbed matrix stratigraphically lower (*i.e.*, older) than historically tilled soils.

- The probability of discovery of historic or prehistoric unmarked burials, or marked burials, was considered low. A slightly higher, yet still low, probability existed in regards to the discovery of scattered human remains during subsurface testing. While burials have been located within the sandy matrix of the adjacent parcels *makai* of Honoapiilani Highway (*i.e.*, during construction activities at the Maui Ocean Center; see McGerty, Burgett, and Spear 1998), SHPD records contain no documented burials *mauka* of Honoapiilani Highway (including on, or within a kilometer, of the current project area). The lack of burial sites immediately *mauka* of the highway can be attributed to two main factors: (1) the types of soils found here were generally less favored in prehistoric burial practices, and (2) the lands have been subject to continual agricultural activity for nearly a century, and in some cases, longer.

METHODOLOGY

In addition to analysis, interpretation, and preparation of this document, the work described in this Archaeological Inventory Survey report consisted of archival research, fieldwork, consultation (both professional and informal— *i.e.* talks with local residents and workers). No laboratory work was necessary. Specifics on all of these research activities are described in detail below.

ARCHIVAL RESEARCH

In addition to referencing available resources at SCS, archival research was conducted at the SHPD library facility (Kapolei, HI) and on the SHPD website before, during, and after the fieldwork described in this report. Archival work consisted of general research on the history and archaeology of the project area, as well as specific searches of previous archaeological studies in and around the subject parcel. Historic land use data, maps, and narrative information were obtained from the Hawaii Bureau of Conveyances as well as the Waihona `Aina Corporation.

FIELD METHODS

Fieldwork was conducted on January 31–February 11, 2005 by Jon Wilson, B.A. and Eric Pope, B.A. under the supervision of Principal Investigator Michael F. Dega, Ph.D. All aspects of the work were photographed and archived on the SCS computer database. Likewise, all fieldnotes, sketches, planviews, profiles, and maps are archived in SCS's Honolulu office.

Fieldwork resulted in a thorough, 100% pedestrian survey project area. The pedestrian survey was conducted via hundreds of east-west transects spanning the width of the project area, starting at the northern border and ending at the southern point. The method of pedestrian survey varied in relation to terrain. In areas of shorter grass and greater surface visibility (*i.e.*, among the Site –5657 clearing mounds) fieldworkers were spaced a maximum of 15 meters apart. In areas of denser vegetation and less surface visibility (*i.e.*, within and bordering the natural drainages) the distance between transect paths was reduced to 5 meters. A total of four temporary sites were plotted on a recently drafted (January 7, 2005) surveyor's map by calculating exact position via tape, compass, and pre-existing survey markers.

SUBSURFACE TESTING

Twenty stratigraphic trenches (ST-1 through ST-20) were excavated in the project area via backhoe, exposing a total of 293.4 linear meters (962.6 feet) of subsurface matrix. A standard 60-cm wide backhoe bucket was used, and the average width of trenches was 64 cm throughout the volume. Sixteen hours of intermittent excavation was conducted over the course of two days: February 9 and 10, 2005.

Methodology regarding excavation was as follows: first, the desired location was flagged by a field archaeologist. Excavation followed with an archaeologist monitoring at all times. Post excavation, three photographs were taken (overall position of the ST within the immediate vicinity of the project area, the length of the entire trench, and a close-up of the selected profiled wall). Also, a sketch stratigraphic profile was recorded on graph paper. All measurements, including detailed soil descriptions, were recorded in fieldnotes, and potential cultural material was screened from *in situ* matrix, or backfill, and thoroughly examined. Finally, the backhoe filled-in the trench.

Three main factors played a role in trench positioning: (1) the desire to excavate at the locations of the four temporary sites found during pedestrian survey, (2) the desire to gain an understanding of subsurface stratigraphy at locations evenly distributed throughout the project area, and (3) the desire to place a higher number of trenches in an area deemed slightly likelier to

contain subsurface prehistoric cultural material (the southern "triangle" *mauka* of the Ma`alaea Small Boat Harbor). This section of the project area lies in between multiple prehistoric sites already registered within the State Index of Historic Places (SIHP). Areas roughly 200 meters *mauka* and *makai* of the project area's southern point have contained traditional features. Therefore, 40 percent (8 STs) of the total individual excavations were placed within this triangle. Trench excavation locations were recorded using tape and compass, and were documented on a project area map (see Figure 9). Trench numbers indicate the chronological order in which they were excavated. Table 1 (in SUBSURFACE STRATIGRAPHY section) details the factors involved in trench positioning.

Maximum depth of individual trench excavation ranged from 96–247 centimeters below surface (cmbs), and averaged 156 cmbs. Bedrock (and/or extremely consolidated clays with decomposing gray basalt directly overlying bedrock) was reached in 16 of the 20 units. Of the units in which bedrock was reached, the shallowest depth was 72 cmbs and the deepest was 151 cmbs; average depth bedrock was first encountered was 114 cmbs. The four STs in which bedrock was not reached were either positioned in an area of convexed surface topography (*i.e.*, the surrounding field had been tilled so that it was higher at the center where the trench was located), or where extra soil had been likely imported for increased crop productivity. Total excavated area was roughly 187.8 square meters; total excavated volume was 292.9 cubic meters.

RESULTS

This section describes: (1) the three archaeological sites documented in the project area; and, (2) the subsurface testing, sediments, and stratigraphy throughout the project area. No significant artifacts or features were exposed in any the trenches. Excavation resulted in relatively homogenous soil stratification—what might be expected in an area subjected to decades of similar agricultural practice. The only relevant change in soil stratigraphy corresponded to the (previously discussed) shift in soil type from north to south. Some matrices had inclusions of modern debris, evidencing agricultural activity (likely small-scale) as recently as 2003.

SITE DESCRIPTION: 50-50-09-5657

Site 50-50-09-5657 consists of 13 historic clearing mounds located throughout the northern twenty percent of the project area (see Figure 9). The average feature measures approximately 40 by 30 m and is piled over 11 m high (Figure 12). Mega-boulders form at least

Figure 12: A Typical Boulder Mound Feature of Site -5657. View to Northeast.

the exterior layer of these features, with the average boulder measuring approximately 0.9 by 0.7 by 0.6 m. The majority of these features have a 4.0 m bulldozer blade track forming a ramp from the base to the summit (Figure 13). Heavy machinery scars are visible on the majority of surface boulders. Plastic irrigation tubing—both the ubiquitous black plastic (2 cm diameter) variety, and a larger-diameter white plastic tubing—can be found among surface crevices.

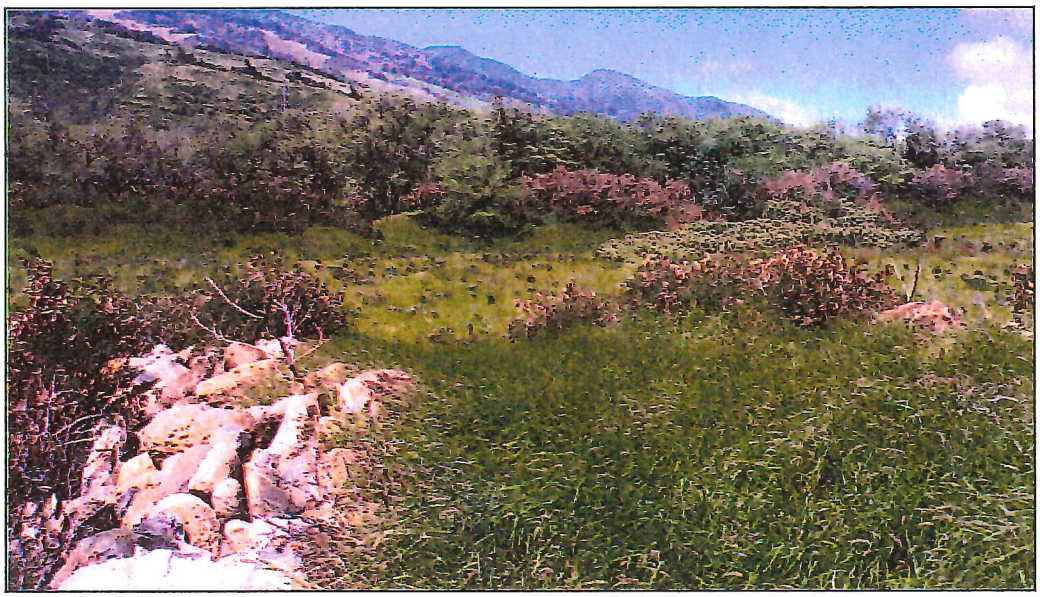

Figure 13: A Pushed "Ramp" on Top of a Site -5657 Mound Feature. Indicates Large Clearing Machinery in the Most Recent Layer of Mound Formation. View to Northwest.

Despite evidence of modern deposit on the exterior of Site -5657, the interior and/or base of these features are very likely historic. Rocky soil type, coupled with land-use records, indicates the necessity of boulder clearing prior to initial sugarcane cultivation. The even distribution of the clearing mounds within the northern portion of the project area may also point to historic agricultural technique. Whereas early 20th century clearing technology and methodology may have been limited to creating sporadic piles (to be gradually added on to throughout later decades), modern technology from the outset would have been likelier to clear the whole field level. Finally, enhancement of a 1965 aerial photo [Awai *et al.* (1967:map 30)] (Figure 14) shows the mounds in their same positions as present—a likely indicator of their locations at least a decade prior to 1965 as well.

While excavation or "testing" of Site -5657 clearing mounds could be accomplished only via highly specialized, very heavy machinery, SCS did perform representative subsurface testing in areas in between mounds (see "Subsurface Testing", below, specifically ST-15, ST-16, ST-17). Nothing of historic or prehistoric archaeological significance was found on the exterior of, or in between, the mounds. Confirmation of the historic origin of Site 50-50-09-5657 may be gained through archaeological observation of their deconstruction (see "RECOMMENDATIONS" section, below).

SITE DESCRIPTION: 50-50-09-5658

Site 50-50-09-5658 consists of dozens of likely historic sugarcane field irrigation modifications. All of these features are modifications within, or stemming out from, the two most significant perennial water courses. These drainages are the two interior drainages within the project area (see Figure 9). The northern of these drainages is approximately 730 m long, and the one directly south is approximately 460 m long. At intervals throughout their length, these two natural drainages have been widened by hand tools to increase and disperse water flow.

This widening modification involves two types: stream bank alterations (collectively recorded as Feature 1) and two narrow ditches (Feature 2 and Feature 3). Dozens of bank alterations are evidenced by shovel cuts and deposits. These modifications were not readily noticeable prior to pedestrian survey within the drainages themselves. When walking the two to four meter deep drainages, it becomes apparent that water flow was manipulated by removing parts of the soil stream bank in certain areas, and fortifying it by soil deposits in other areas. While this sort of alteration can be found within any 50 m stretch of these two drainages, only two isolated areas contain narrow channels extending from the streams. The southern interior stream has an 8 m shallow channel (Feature 2: 30 cm wide and 25 cm deep) that extends from

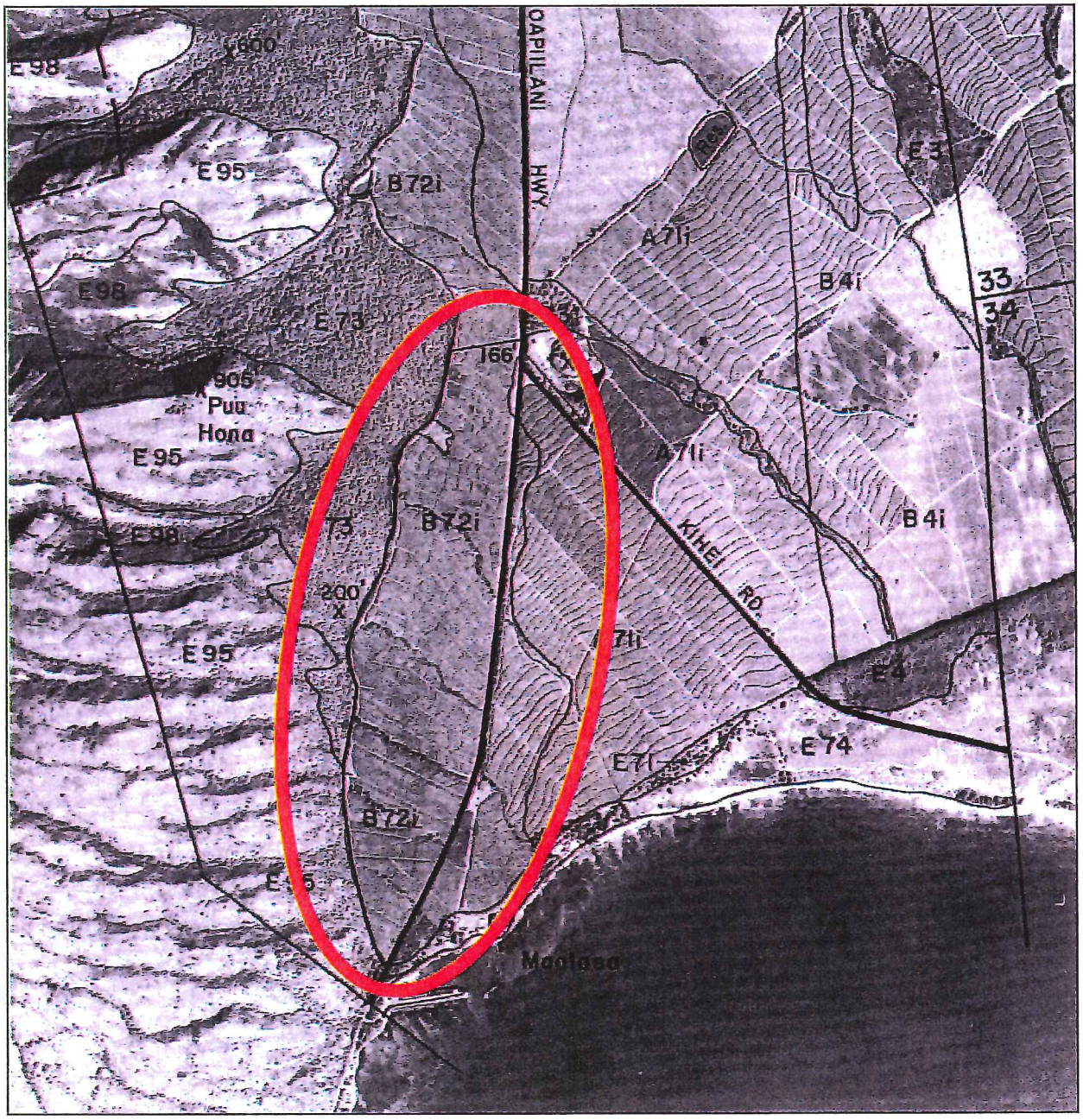

Figure 14: Aerial Photo of Project Area (Adapted from Awai *et al.* [1967:map 30]).

the southern bank to the southwest (see location of ST-11, Figure 9). The northern interior stream has an almost identical 7 m channel (Feature 3) extending eastward from its eastern bank (see location of ST-18, Figure 9).

It is likely that many more of these irrigation channels existed prior to the advent of more efficient irrigation methods (*i.e.*, imported water via tubing networks). Subsurface testing within and around these two channels produced none of the black irrigation tubing found at a depth of approximately 15 cmbs in the majority of all excavation. Surface observations also point to the historic origin of the subtle channel modifications. The channels extend outward from the stream and disappear under more recent deposits of tilled soil. This soil contains fragments of irrigation tubing (Figure 15), whereas no surface or subsurface matrix near the channel contains traces of modern disturbance. It is probable, that these two channels mark small areas that have remained undisturbed since historic use.

Nonetheless, ST-11 and ST-18, at a combined linear 19.1 m, excavated nearly 40 percent of this area. No historic material was observed, other than the depth of the soil-lined channels themselves.

SITE DESCRIPTION: 50-50-09-5659

Site 50-50-09-5659 consists of a historic dirt road that parallels the *mauka* perimeter of the entire project area (Figure 16). At some locations, the project area boundary extends several meters beyond (west of) this road—always including the entire width of the road within its boundaries. Thus, the length of the road is roughly equal to the length of the *mauka* perimeter of the project area (approximately three kilometers); the width of the road averages 4.0 m.

The Site -5659 road originates at the southern terminus of the project area and extends beyond the northern boundary where it forms a right angle with another dirt road segment that connects to Honoapiilani Highway. No less than seven other dirt road segments also connect Site -5659 to Honoapiilani Highway by transecting the width of the project area at various *mauka-makai* angles (see Figure 9). Site -5659's condition suggests that it is frequently traveled by Lahaina Pali trail hikers' vehicles. The parking area for the trail head is a turn out just two meters *mauka* of Site -5659, near the center of the project area's western border. The road is passable via car here. Other, less frequented sections of the road are only passable via four-wheel drive vehicles. One section near the southern point of the project area is washed out, and impassable.

Figure 15: Example of Abundant Irrigation Tubing Found on Surface to 60 cmbs throughout Project Area.

Figure 16: A Segment of Site -5659, Historic Dirt Road.

It is highly probable that this road, along with others that no longer exist, was an original access and cane transport route within the project area. Whereas the predecessor to Honoapiilani Highway offered access along the *makai* border of the original cane fields, a similar *mauka* access (Site -5659) would have been required if the fields were to be worked at all. Awai *et al.*'s aerial photo (see Figure 14) proves that the project area's internal roads are modern (as locations have shifted since) but Site -5659 was in an identical position in 1965, and likely at least a decade earlier as well.

While modern trash was found throughout all sections of Site -5659, no cultural material of archaeological interest was found on the surface of the road. Likewise, the few stratigraphic trenches that were positioned near the road revealed no subsurface cultural material or differing soil stratigraphy (ST-1 and ST-2).

SUBSURFACE STRATIGRAPHY

As stated above, 20 stratigraphic trenches (ST-1 through ST-20) were excavated in the project area (see Table 1), exposing a total of 293.4 linear meters (962.6 ft.) of subsurface matrix. Total excavated area was roughly 187.8 square meters; total excavated volume was approximately 292.9 cubic meters. Depth of excavation ranged from 96–247 cmbs, and averaged 156cmbs. Bedrock, and/or extremely consolidated clays with decomposing gray basalt that directly overlying bedrock, was reached in 16 of the 20 units. Of the units in which bedrock was reached, the shallowest depth was 72 cmbs and the deepest was 151 cmbs; average depth bedrock was first encountered was 114 cmbs. The four STs in which bedrock was not reached were either positioned in an area of convexed surface topography (*i.e.*, the surrounding field had been tilled so that it was higher at the center where the trench was located), or where extra soil had been likely imported for increased crop productivity.

Table 1 presents a summary of all relevant quantitative and qualitative stratigraphic and cultural material observations for each trench. Following, each stratigraphic trench is documented with photograph(s) and post-excavation profile drawing. (Photos and profiles documenting trenches that are very similar to previously described trenches have not been included due to redundancy.) Indeed, the first stratigraphic trench excavated proved to be the standard for nearly every succeeding trench. Only slight variation followed, in both stratigraphy and cultural make-up.

Table 1: Summary of Stratigraphic Trenches within TMK: (2) 3-6-01:18.

Stratigraphic Trench Number	Reason for ST Position*	Trench Length (m)	Maximum Depth (in centimeters)	Average Bedrock Depth (in centimeters)	Cultual Material within ST	ST Orientation (Magnetic)
ST-1	HP*	7.0	154	116	Modern agriculture remnant	North / South
ST-2	HP	7.0	165	125	—	North / South
ST -3	HP	7.0	190	151	—	East / West
ST -4	HP	7.0	153	92	—	North / South
ST -5	HP	7.0	173	112	—	East / West
ST -6	HP, R*	7.0	242	Bedrock not reached	—	North / South
ST -7	HP	7.0	122	106	—	East / West
ST -8	HP	39.1	219	112	Modern agriculture remnant	North / South
ST -9	TS*	21.3	145	104	Modern agriculture remnant	East / West
ST-10	TS, R	17.7	142	112	Modern agriculture remnant	North / South
ST-11	TS	7.1	96	72	Historic agriculture feature (surface)	North / South
ST-12	TS	10.2	247	Bedrock not reached	Modern midden	310 degrees
ST-13	TS	13.7	141	Bedrock not reached	Modern agriculture remnant	240 degrees
ST-14	TS	32.0	153	Bedrock not reached	Modern agriculture remnant	290 degrees
ST-15	R, TS	21.4	110	103	Modern agriculture remnant	290 degrees
ST-16	R, TS	17.3	136	119	—	North / South
ST-17	R, TS	20.6	116	101	—	East / West
ST-18	TS	12.0	160	151	Historic agriculture feature (surface)	East / West
ST-19	R	17.0	125	118	—	East / West
ST-20	R	15.0	133	124	Modern agriculture remnant	North / South

Excavation Intent: (**TS**) = trenches tested a specific Temporary Site; (**R**) = trenches dispersed throughout project area for Representative testing of stratigraphy; (**HP**) = trenches tested the southern "triangle" of project area, which lies in an area between concentrated traditional sites, thus a slightly Higher Probability of encountering prehistoric subsurface features.

TRENCH SUMMARIES

STRATIGRAPHIC TRENCH 1 (ST-1)

ST-1 was positioned at the far southern corner of the project area (see Figure 9) with the intent to test the section of the parcel with the highest probability of containing traditional features. This probability was calculated based on the position of the "southern triangle" of the project area (Figure 17) in relation to previously documented traditional sites not far outside its *mauka* and *makai* borders. ST-1 measured 7.00 by 0.64 m (Figure 18).

Layer I was a 116 cm thick, dark reddish-brown (2.5YR 3/3) clay loam (Figure 19). The matrix was of a medium-sized, blocky ped structure, and was firm. Rock content was less than

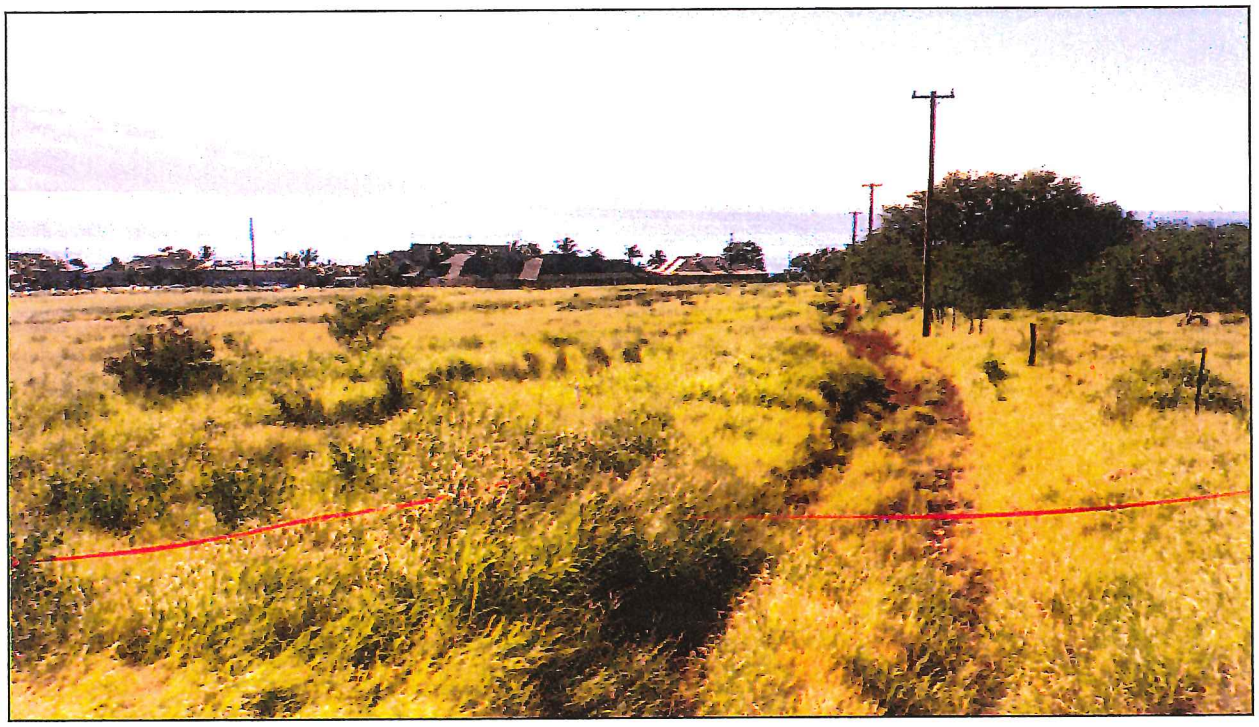

Figure 17: Southern "Triangle" of Project Area, with Site -5659 (Road) at Right. View to Southeast.

Figure 18: ST-1, Post-excavation. View to North.

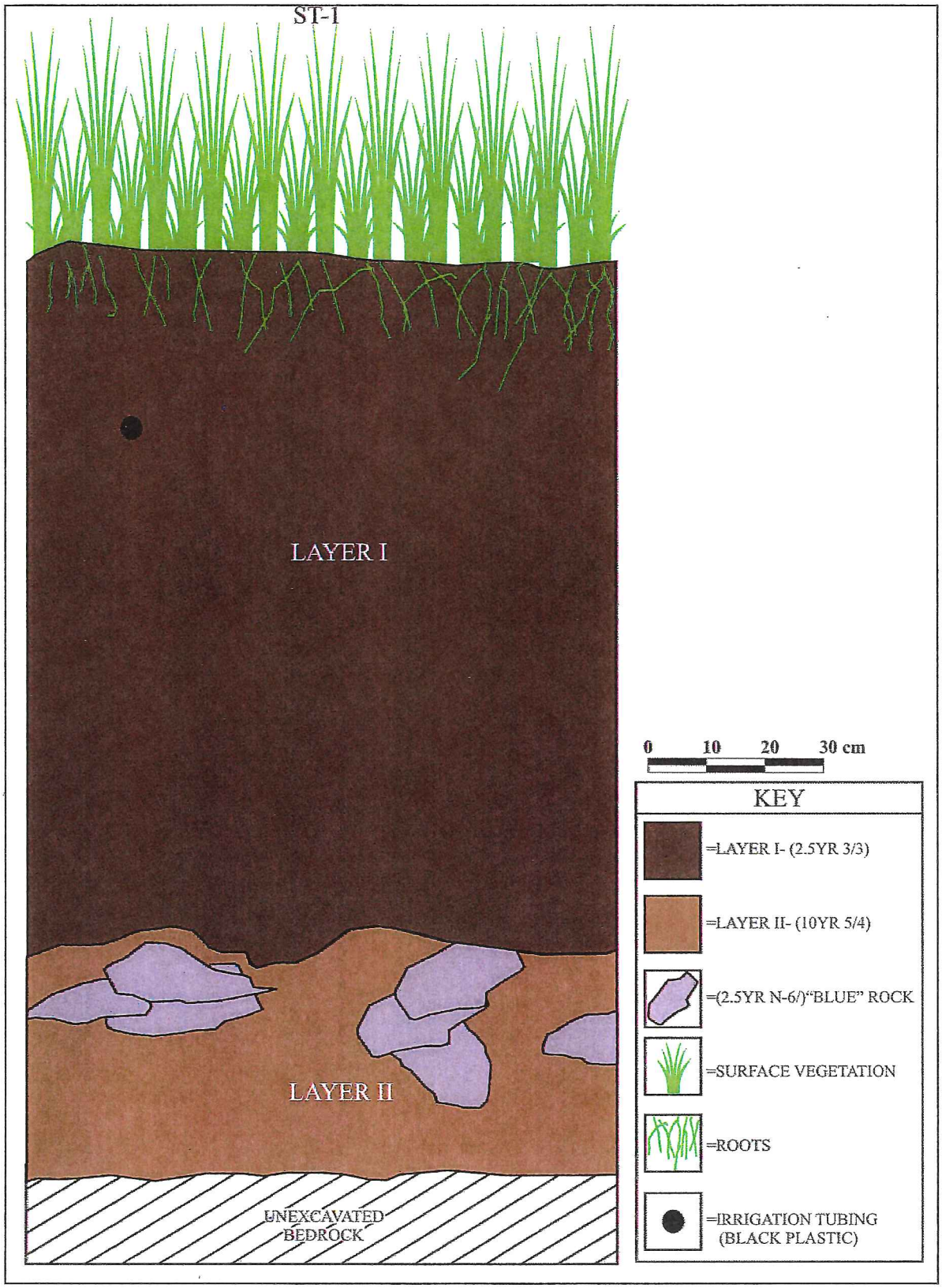

Figure 19: ST-1, Post-excavation. East Wall Stratigraphic Profile (Representative Section).

10 percent. Forty centimeter-tall grass grew dense on the surface and the fine roots extended over 15 cmbs. A 2-cm thick black plastic irrigation pipe had been severed by the backhoe bucket during excavation. The pipe was visible in the east wall profile at 27 cmbs (Figure 20). This was the only cultural material to be observed within ST-1. The base of Layer I likely indicates the subsurface extent of agricultural activity within the project area's southern triangle.

Layer II averaged 38 cm thick and was a yellowish-brown (10YR 5/4) culturally sterile matrix. The soil was a fine, granular ped structure, and was very hard. Twenty percent of Layer II was composed of "blue rock", and a harder, darker bedrock was exposed at the base. Excavation was then terminated at a maximum depth of 154 cmbs.

STRATIGRAPHIC TRENCH 2 (ST-2)

ST-2, like ST-1, intended to test the southern triangle for a cultural deposit. The stratigraphy of ST-2 was very similar to that of ST-1 in every respect, and the recorded profiles appeared nearly identical. No cultural material was observed within ST-2.

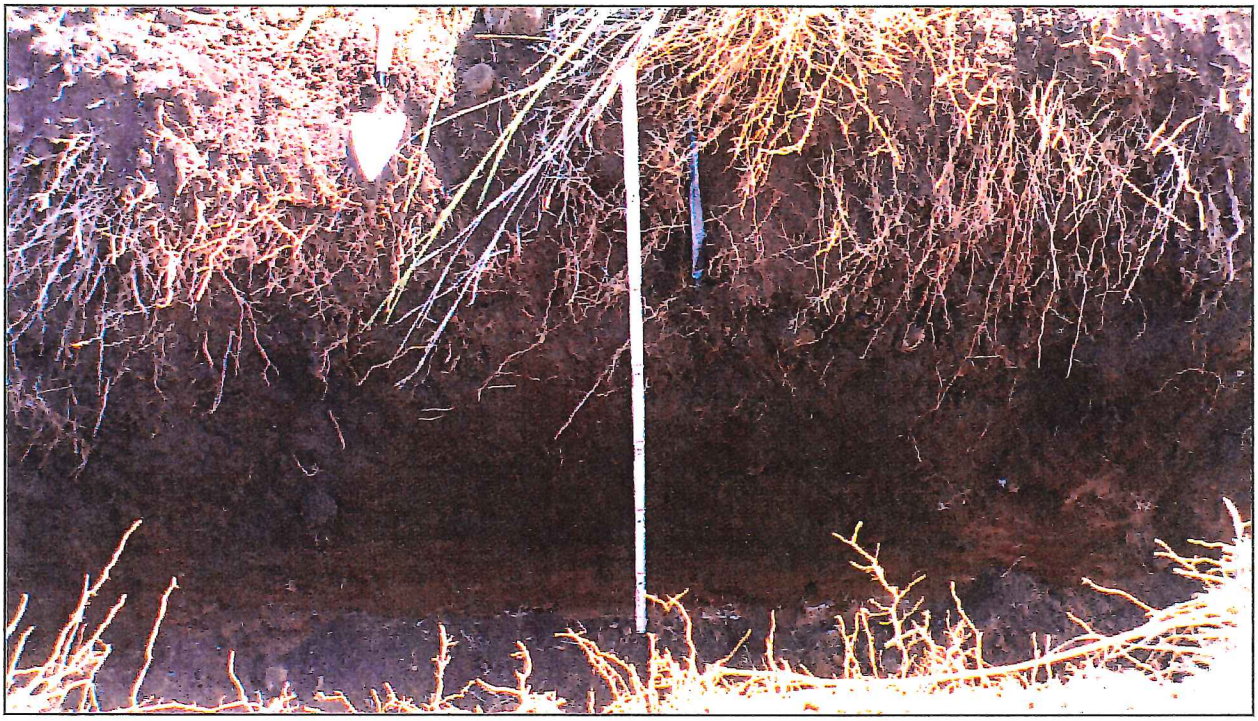

Figure 20: ST-1, Post-excavation. East Wall Photograph.

STRATIGRAPHIC TRENCH 3 (ST-3)

ST-3 was also placed in the "higher probability" zone of subsurface cultural deposit. This trench was the first that was oriented east-west, with the intent of possibly observing a change in the stratigraphy from ST-1 and ST-2. No change was observed and no cultural material was revealed.

STRATIGRAPHIC TRENCH 4 (ST-4)

ST-4 continued the trend of similar profiles (see Figure 19). However, this trench revealed bedrock at a slightly shallower depth (92 cmbs) than previously encountered. It is probable that ST-4's position near a graded, modern dirt road caused a portion of surface soil to erode downslope toward the highway. No cultural material observed.

STRATIGRAPHIC TRENCH 5 (ST-5)

ST-5 repeated the results of STs 2–4.

STRATIGRAPHIC TRENCH 6 (ST-6)

ST-6 was the first trench to be positioned farther north within the southern triangle. There remained the increased probability of encountering subsurface traditional features, however, the archaeological record shows that this chance would grow smaller as trench positions extended north. ST-6 also sought to gain a better understanding of overall project area stratigraphy outside of the southern triangle.

Excavation ceased after more than 200 cm of culturally sterile, homogenous soil. Bedrock was not encountered. This single, homogenous stratigraphic layer would also be observed in three more trenches to come. The likely explanation involves the subtle shape of the field immediately surrounding the trench. Tilling has left the surface within 75 m *mauka* and *makai* sloping down and away from the trench, which was positioned on a minor "crest." Thus, the piled soil here is not a true indicator of typical Layer I thickness. No cultural material was observed in this trench.

STRATIGRAPHIC TRENCH 7 (ST-7)

ST-7 resulted in a profile that matched the majority of previously excavated trenches. No cultural material was observed in this trench.

STRATIGRAPHIC TRENCH 8 (ST-8)

ST-8 resulted in a profile that matched the majority of previously excavated trenches. A black, plastic irrigation tube (identical to the one found in ST-1) extended from the east wall to

the west wall of the trench. This was the last trench to be positioned inside the southern triangle area—initially thought to have been a location of higher traditional site potential. However, no traditional subsurface features were observed within the southern triangle.

STRATIGRAPHIC TRENCH 9 (ST-9)

ST-9 was positioned with the intent to test an area near and within a Temporary Site. Pedestrian survey flagged the dirt road adjacent to ST-9's position as a possible historic road Figure 21). This trench revealed no difference in subsurface stratigraphy than previous excavation, nor did the trench produce any artifacts that may have been within the discard zone of historic traffic. The only cultural material observed was the usual irrigation tubing at 20 cmbs. Research unrelated to the subsurface testing later revealed this dirt road to be modern.

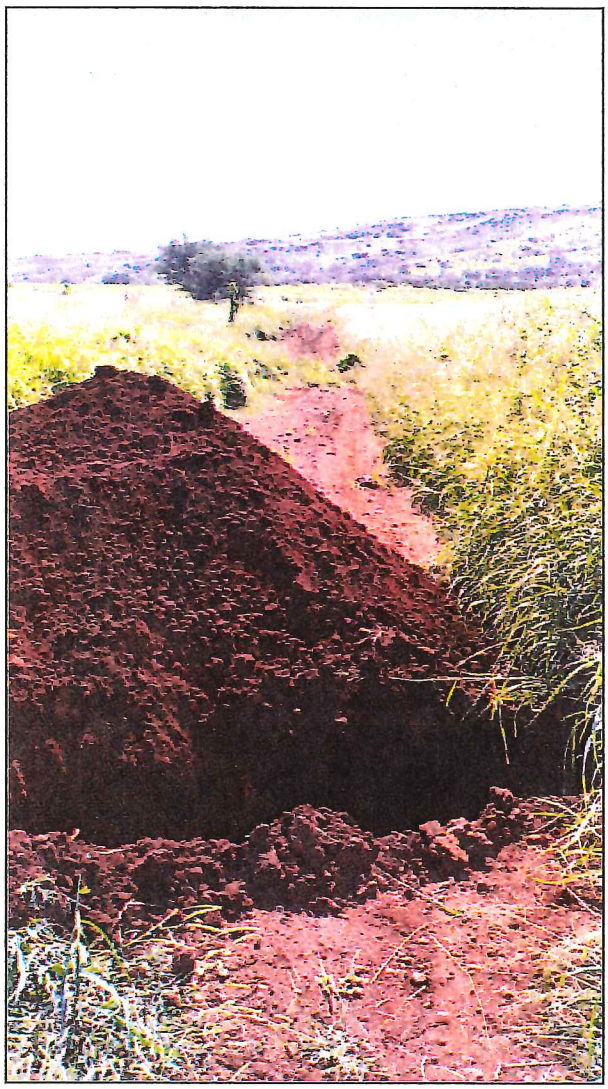

Figure 21: ST-9, Post-excavation. View to Southwest.

STRATIGRAPHIC TRENCH 10 (ST-10)

ST-10 also served to test a possible historic dirt road. The results were identical to ST-9, except that an *in situ* irrigation tube was observed at 58 cmbs. This depth increased known range of modern agricultural manipulation within the project area.

STRATIGRAPHIC TRENCH 11 (ST-11)

ST-11 was positioned to test a temporary site (ditch) that later became part of State Site 50-50-09-5658 (irrigation modification). Other than both the north and south wall profiles displaying the depth of the shallow ditch itself, no further cultural material was observed. (See ST-18 profile for a better subsurface representation of Site -5658.)

STRATIGRAPHIC TRENCH 12 (ST-12)

ST-12 also intended to test a temporary site, one which excavation proved to be modern. The "nursery" of Ficus sp. trees (Temporary Site 2) at the center of the project area was initially flagged as a temporary site. Although some surface features appeared modern (i.e., the relatively new appearance of the concrete walkways), the possibility existed that this temporary site could have been constructed at the location of historic cane workers' camp. A concrete building foundation was mapped in association with the tree rows (Figure 22).

ST-12 extended northwest from the foundation toward the concrete walkways of the nursery. A Coca Cola aluminum 12 ounce can was found *in situ* at a depth of 96 cmbs (Figure 23). The can's manufacture date was clearly decipherable: 2003. Other midden followed; a Dentine gum wrapper at 106 cmbs and a fragmented plastic fork head at 120 cmbs.

Excavation ceased after 247 cm of culturally sterile, homogenous soil. The matrix near the foundation pad had clearly been recently altered.

STRATIGRAPHIC TRENCH 13 (ST-13)

ST-13 sought to further explore what might lie beneath Temporary Site 2. The results of ST-13 also resulted in modern midden, and a single homogenous layer of "filled" soil. A 6-cm diameter, white PVC water pipe was uncovered 4 cmbs (Figure 24). The pipe ran perpendicular to the trench's length and was certainly part of a irrigation system involving the Ficus trees. The standard irrigation tubing appeared in the north wall profile at 19 cmbs. A shard of clear window glass was observed at 88 cmbs. Excavation ceased after 141 cm of culturally sterile, homogenous soil.

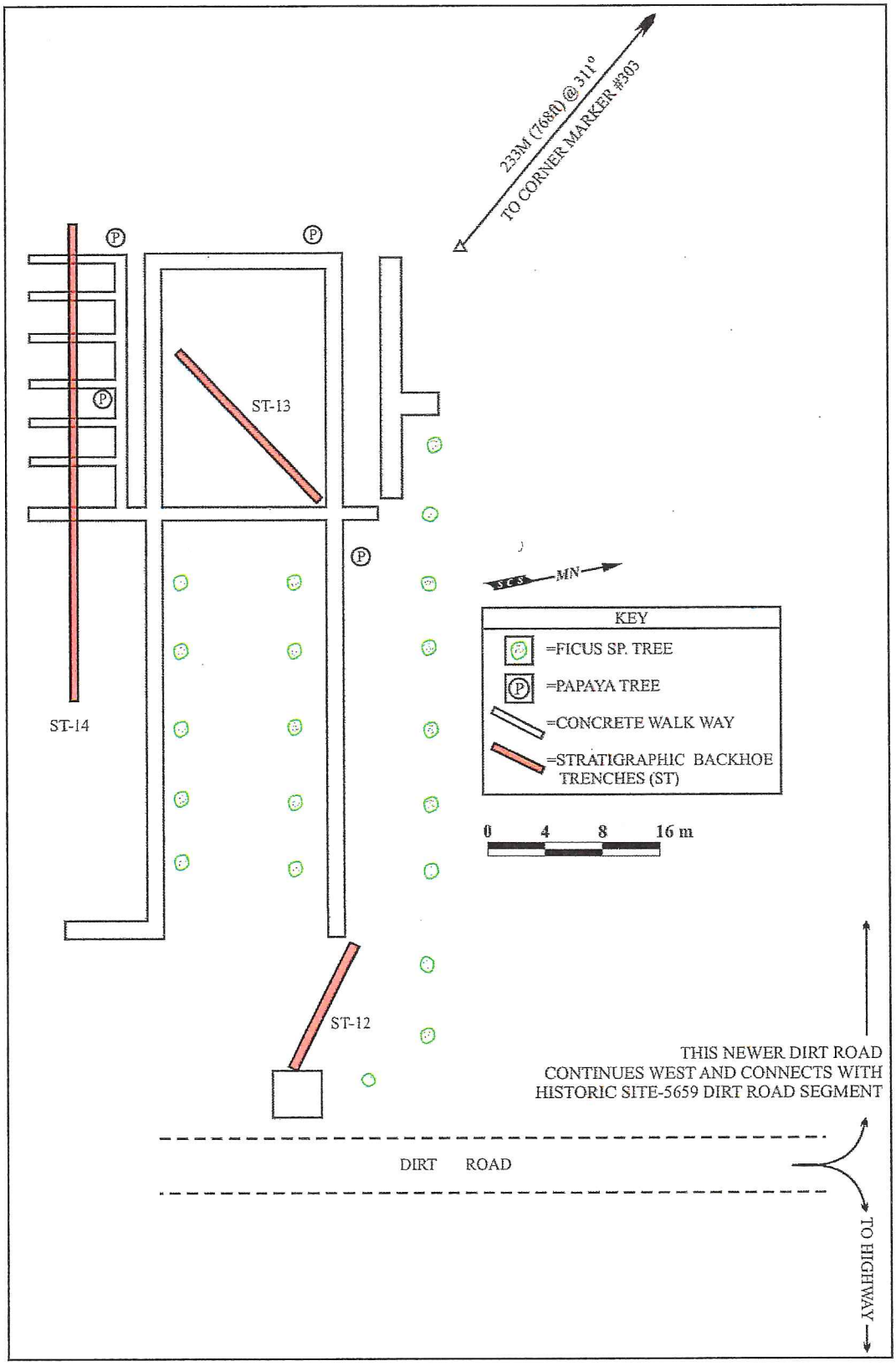

Figure 22: Plan View Map of Temporary Site 2, A Possible Modern *Ficus* sp. Nursery.

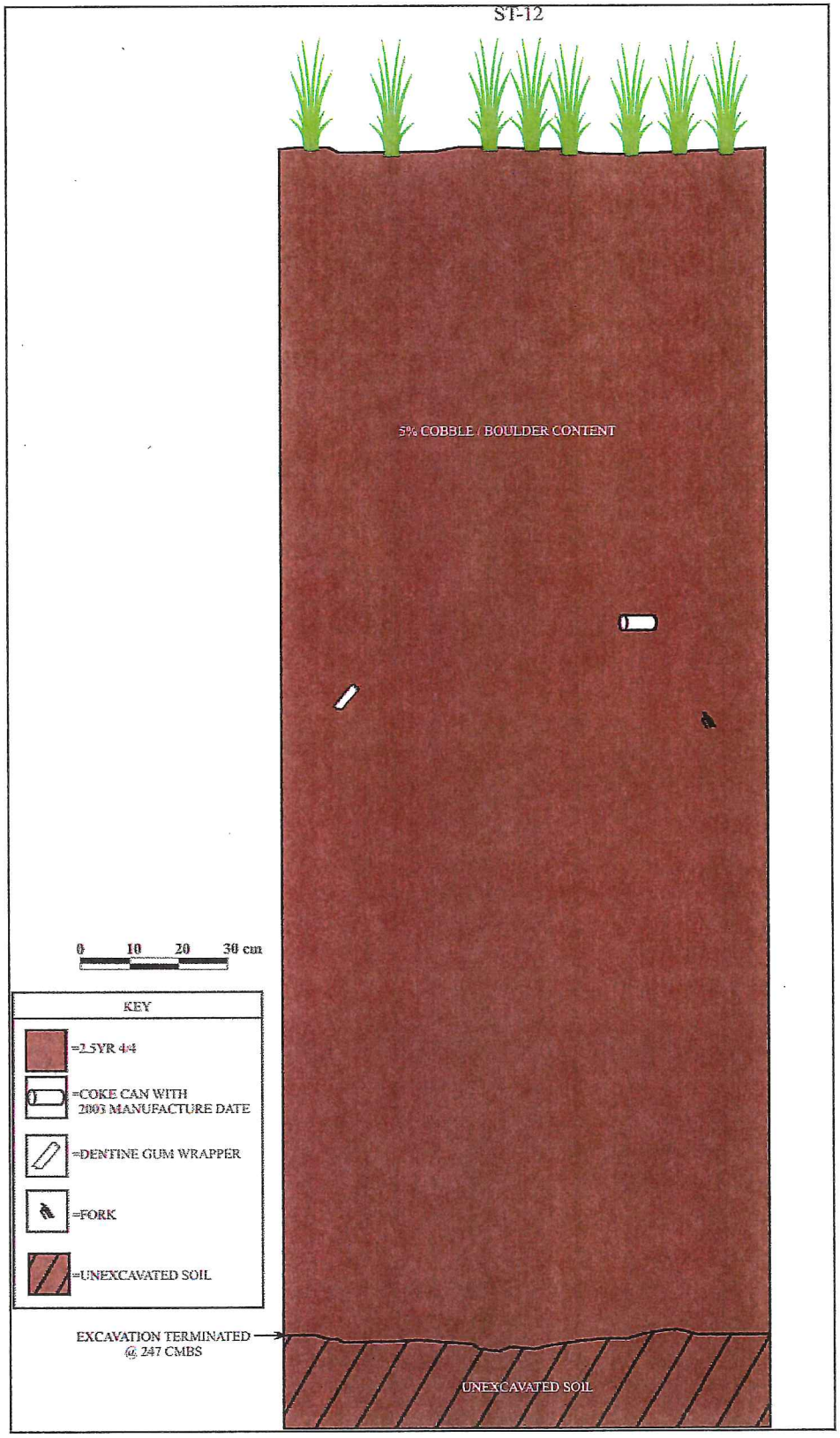

Figure 23: ST-12, Post-excavation. North Wall Stratigraphic Profile (Representative Section).

Figure 24: ST-13, Post-excavation. View to Southwest.

STRATIGRAPHIC TRENCH 14 (ST-14)

ST-14 provided another modern absolute date, albeit from a shallower provenience. A defunct electrical box (possibly used for lighting or irrigation system function) was attached to a series wires inside a PVC pipe at 39 cmbs (Figures 25 and 26). The manufacture date stamped on the pipe was "01/04/01". A section of the pipe was patched with an aluminum Coke can and adhesive. Once again, the manufacture date of the can was 2003. ST-14 also did not reach bedrock, although Layer I had a cobble content of 25 percent, higher than other areas tested previously (Figure 27).

No historic or traditional artifacts or features were observed at Temporary Site 2. Thus, the temporary designation was retracted, as this nursery is most likely a more elaborate example of the dozens of small-scale modern agriculture plots that are scattered throughout the project area. Extensive excavation did not reveal any evidence indication an older cultural layer beneath this area.

STRATIGRAPHIC TRENCH 15 (ST-15)

ST-15 sought to gain a representation of subsurface stratigraphy with the area of the (later-designated) Site -5657 clearing mounds. ST-15 was positioned in between two clearing mound features along the western border of the project area's north end (see Figure 9). Results

Figure 25: ST-14 Excavation. View to West.

Figure 26: ST-14 Excavation. View to West.

Figure 27: ST-14, Post-excavation. North Wall Photograph.

matched soil records that showed the area to have a greater rock concentration than areas to the south. ST-15 exhibited the first truly significant stratigraphy variation from the previous 14 trenches (Figures 28, 29, and 30).

Layer I was a 20 cm thick, dark brown (7.5YR 3/2) clay loam. The matrix was of a medium-sized, blocky ped structure, and was firm. It had a rock content of approximately five percent. Fifteen centimeter-tall grass grew dense on the surface and the fine roots extended 5 cmbs). No cultural material was observed within Layer I.

Figure 28: ST-15, Post-excavation. View to East.

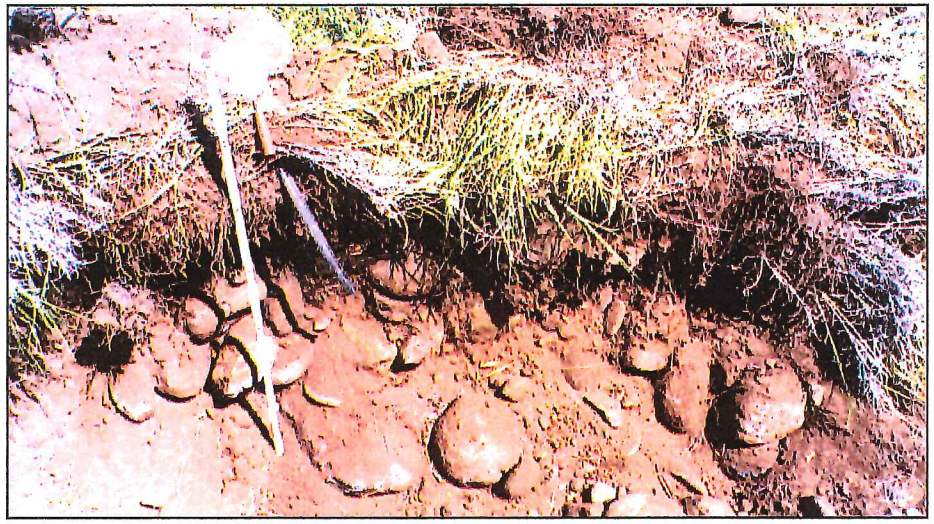

Figure 29: ST-15, Post-excavation. North Wall Photograph.

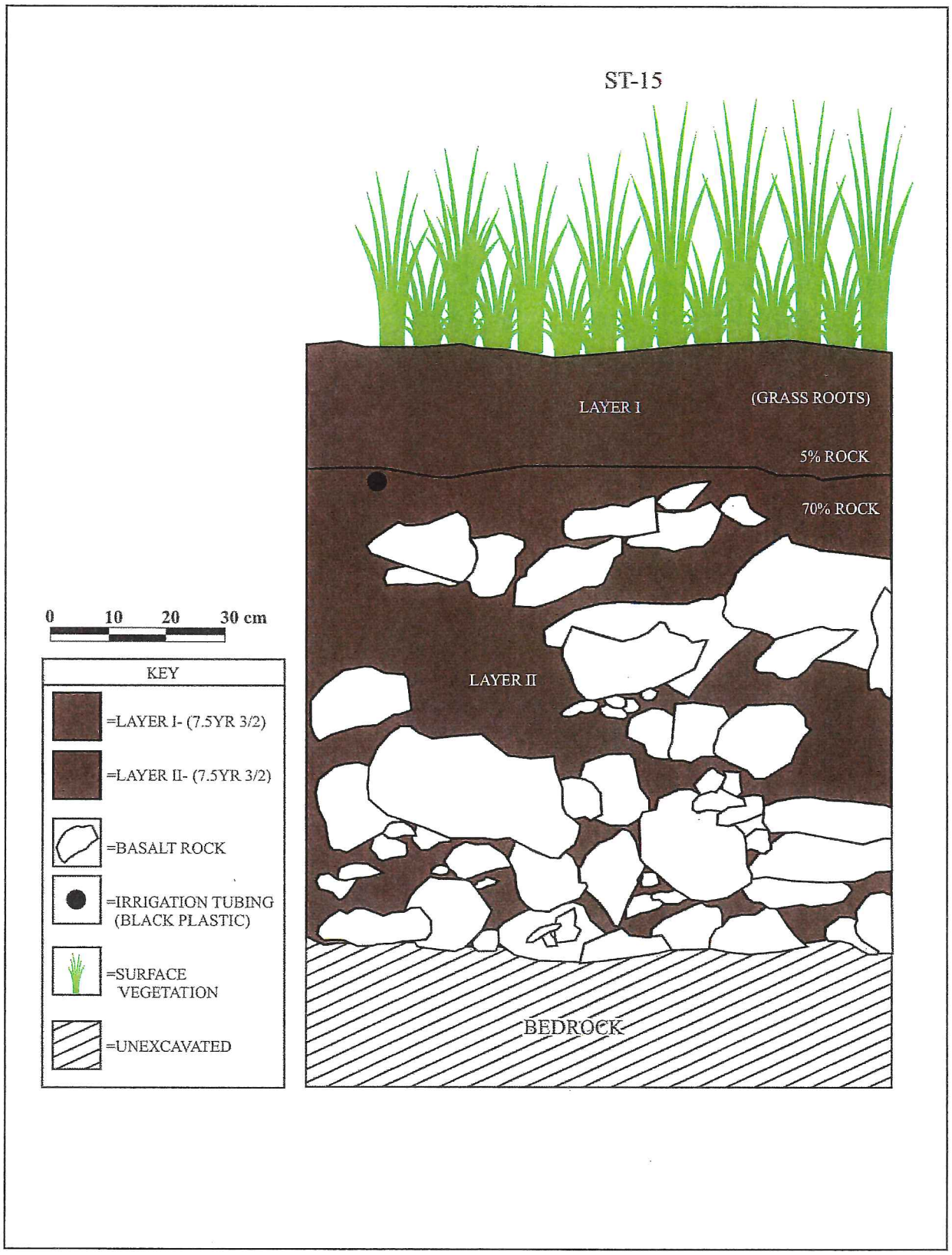

Figure 30: ST-15, Post-excavation. North Wall Stratigraphic Profile (Representative Section).

Layer II averaged 83 cm thick and was also a dark brown (7.5YR 3/2) clay loam. This matrix drastically changed in cobble and small boulder content—a concentration of 70 percent rock. Nonetheless, the common, black irrigation tubing was observed at 21 cmbs—the only cultural material. Whereas Layer I had been stripped of its rock (which then formed the piles of Site -5657), Layer II was beneath the planting soil.

STRATIGRAPHIC TRENCH 16 AND 17 (ST-16 AND ST-17)

ST-16 and ST-17 were excavated perpendicular to each other along the *makai* border of the project area's northern end (Figure 31). The trenches created an "L-shape" with the intention to expose stratigraphy both east-west and north-south in an immediate area. No notable variation was observed between ST-15, ST-16, or ST-17. The latter two trenches contained no cultural material.

STRATIGRAPHIC TRENCH 18 (ST-18)

ST-18, like ST-11, sought to expose the profile of a Site -5658 irrigation modification (shallow ditch). The trench was positioned perpendicular to ditch (which extended from a natural drainage). Aside from exposing the depth and width of the subtle feature, no change in stratigraphy was observed when compared to profiles of southern trenches (Figure 32).

Figure 31: ST-16 Excavation. View to East.

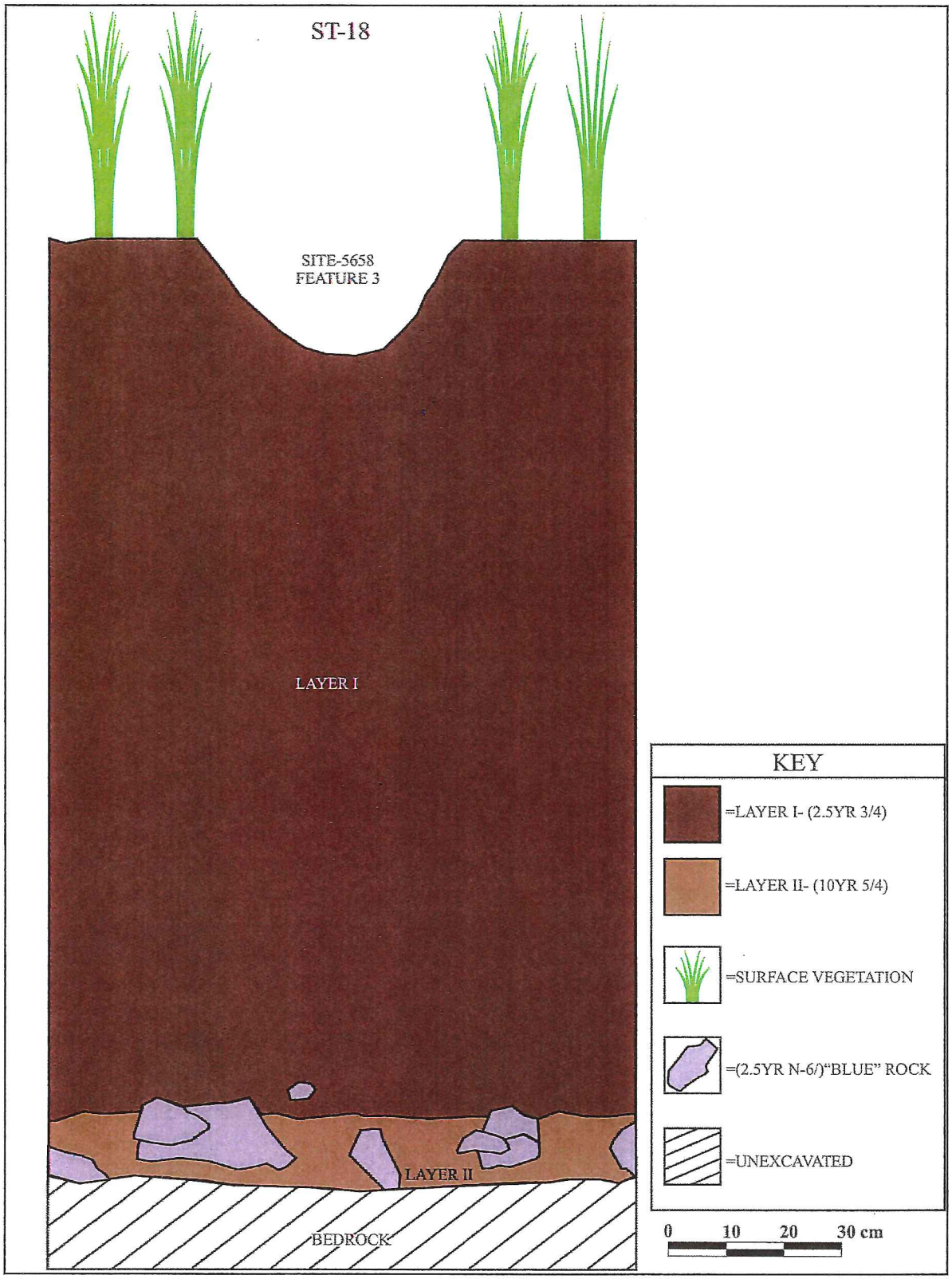

Figure 32: ST-18, Post-excavation. South Wall Stratigraphic Profile (Representative Section).

STRATIGRAPHIC TRENCH 19 (ST-19)

ST-19 sought to test a portion of the project area that remained relatively un-sampled toward the end of the subsurface testing period. Although this region was over 200 m away from any other trench, the stratigraphy was nearly identical to that of trenches to the south (Figure 33). No cultural material was observed within this trench.

STRATIGRAPHIC TRENCH 20 (ST-20)

ST-20 sought to test a portion of the project area that remained relatively un-sampled at the close of the subsurface testing period (Figure 34). Although this region was over 300 m away from any other trench, the stratigraphy was nearly identical to that of all trenches other than ST-14 through ST-17 (the higher rock concentrations). A west wall profile of ST-20 did reveal a black plastic "anti-weed" cover at 3 cmbs, along with irrigation tubing at 25 cmbs (Figure 35).

SUMMARY OF RESULTS

In summary, this Archaeological Inventory Survey resulted in the following findings:

- Three historic sites, all related to sugarcane agriculture, were identified, documented for the first time, and assigned SIHP numbers: Site 50-50-09-5657 (clearing mounds), Site 50-50-09-5658 (irrigation modifications), and Site 50-50-09-5659 (dirt road).

- A 100 percent pedestrian survey concluded that no prehistoric sites exist on the surface of the project area.

- Twently backhoe trenches (a volume of approximately 292 cubic meters) did not reveal any subsurface historic, or prehistoric, cultural material. Rather, excavation confirmed the extent, both in physical and temporal depth, of historic and modern agricultural activity within the project area.

- No burial features or human remains were observed during pedestrian survey or encountered during subsurface testing.

SIGNIFICANCE ASSESSMENTS

Three sites were documented in the project area [TMK: (2) 3-6-01:18] during Archaeological Inventory Survey. All three sites were of historic period construction and related to sugarcane agriculture. The sites have been evaluated for significance according to the criteria

Figure 33: Location of ST-19 within Central Project Area. View to East.

Figure 34: Location of ST-20 within Central Project Area. View to West.

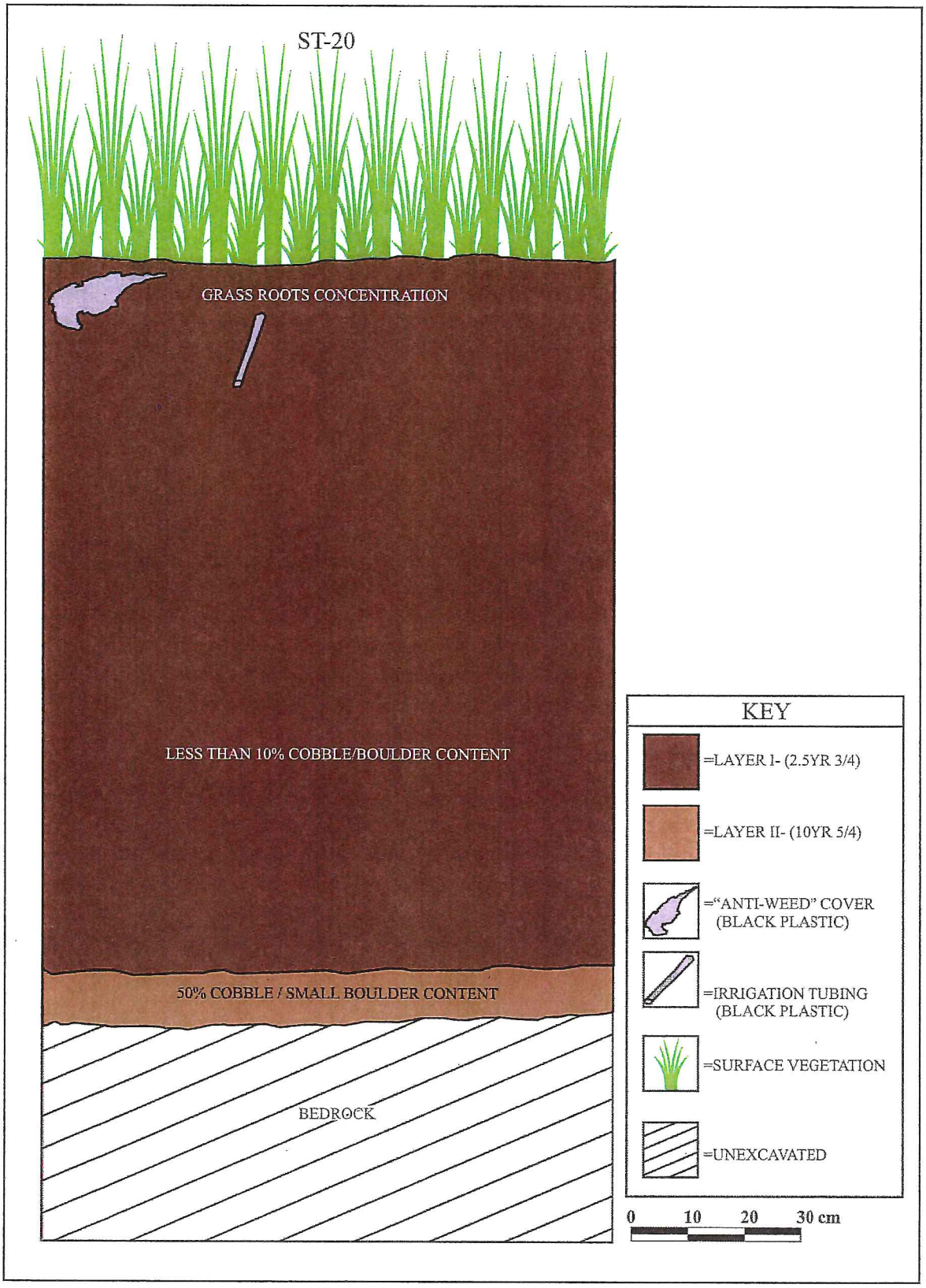

Figure 35: ST-20, Post-excavation. East Wall Stratigraphic Profile (Representative Section).

established for the State and National Register of Historic Places. Site 50-50-09-5657 (clearing mounds), Site 50-50-09-5658 (irrigation modifications), and Site 50-50-09-5659 (dirt road) are all considered significant under Criterion D. The five criteria are listed below:

Criterion A: Site is associated with events that have made a significant contribution to the broad patterns of our history;

Criterion B: Site is associated with the lives of persons significant to our past;

Criterion C: Site is an excellent site type; embodies distinctive characteristics of a type, period, or method of construction, or represents the work of a master, or possesses high artistic values, or represents a significant and distinguishable entity whose components may lack individual construction;

Criterion D: Site has yielded or has the potential to yield information important in prehistory or history;

Criterion E: Site has cultural significance; probable religious structures or burials present (State of Hawai`i criteria only).

RECOMMENDATIONS

Two of the three sites recorded during Inventory Survey require no further archaeological procedures. Criterion D sites 50-50-09-5658 (irrigation modifications) and 50-50-09-5659 (dirt road) have been listed in the SIHP. Identification, testing, analysis, and classification of the sites have been fully documented within this AIS report.

Site 50-50-09-5657 (clearing mounds), also classified under Criterion D, requires one additional archaeological procedure prior to the completion of its documentation (assuming no additional cultural material is located). Discussion between SCS and Dr. M. Kirkendall concluded that the internal construction of Site -5657's thirteen features is still unknown. It is possible that traditional Hawaiian features may be contained within these thirteen large piles of boulders.

Previous archaeological observations during construction activity on Maui have documented prehistoric architecture and artifacts under historic agriculture deposits. As sugarcane lands were originally cleared, it is possible that farmers deposited rubble on top of the nearest pre-existing "rock pile". As locally gathered rock was a staple for traditional Hawaiian

architecture, the pre-existing "rock piles" may have been a variety unidentified traditional features—constructions ranging from simple temporary shelters to elaborate religious platforms.

Due to this possibility, SCS recommends that an archaeologist observes—and directs the method of—the leveling of a sample portion of Site -5657's thirteen mound features. Those responsible for scheduling initial earth-moving procedures at the Ma`alaea Mauka project area will be required to coordinate the presence of an archaeological observer during Site -5657 deconstruction. An archaeologist must be on site prior to any earth-moving activity within the northern 20 percent of the project area, that is, any operation of heavy machinery that occurs within a 15.0 meter (50 feet) radius of a Site -5657 mound.

Deconstruction should incorporate machinery that slowly removes Site -5657 surface boulders in stages, rather than pushes any intact section of mound to a different location. The exact number of mound deconstructions to be witnessed by the archaeologist on site may be determined based on the contents of the first four mounds selected for leveling. Should additional historic and/or prehistoric cultural material be observed during Site -5657 leveling, archaeological procedures will follow SHPD's guidelines for an inadvertent discovery.

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Appendix G

Approval Letter of AIS From State Historic Preservation Division

(736)

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GOVERNOR OF HAWAII

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DEPARTMENT OF LAND AND NATURAL RESOURCES
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January 31, 2008

Dr. Michael F. Dega
Scientific Consultant Services, Inc.
711 Kapiolani Blvd., Suite 975
Honolulu, Hawaii 96793

LOG NO: 2007.1066
DOC NO: 0801TD20
Archaeology

Dear Dr. Dega:

Subject: Chapter 6E-42 Historic Preservation Review of an Archaeological Inventory Survey Report for the Proposed Ma'alaea Water Treatment Plant and Associated Infrastructure, Waikapu Ahupua'a, Wailuku District, Island of Maui TMK: (2) 3-6-04:03 (por.)

Thank you for submitting the subject archaeological inventory survey report for three disconnected land parcels comprising approximately 115 acres (*An Archaeological Inventory Survey of an Approximately 115 Acre Property for the Proposed Ma'alaea Water Treatment Plant Effluent Reuse Area Including the Potential Water Tank Location and Detention Ponds A and B, Waikapu Ahupua'a, Wailuku District, Island of Maui, Hawai'i*, M. F. Dega and C. A. Dagher March 2007). The report was submitted to the Kapolei office for review March 22, 2007. We apologize for the delay in responding to your submittal, and we recognize that the statutory review period has lapsed.

The project area includes a rectangular 85-acre effluent reuse area, located along the west side of Honoapiilani Highway; a 15-acre rectangular detention basin (Pond A) area, located to the northwest of the effluent reuse parcel; a 5-acre detention basin (Pond B) area, adjoining the south end of the effluent reuse area; a c. 5-acre potential tank site, located to the west of the Pond B area; and a water treatment facility, to be located at the southeast corner of the effluent reuse area, along Honoapiilani Highway.

The report contains the appropriate background information, maps, and discussion of methods, as specified in Hawaii Administrative Rule §13-276-5 regarding inventory survey reports. Seven newly identified historic properties were documented (SIHP 50-50-09-6251 through 6256). All of these sites are associated with historic/modern commercial agriculture and include three concrete ditches, three large mechanized clearing mounds/piles, and one stone-faced drainage feature. Subsurface testing was conducted in accessible portions of the project area, where 26 backhoe trenches were excavated. No subsurface findings are reported.

We note that surface visibility was severely limited in portions of the project area, particularly the Pond A area which was under sugar cane cultivation at the time of the survey. Subsurface testing was not conducted in the 15-acre area, due to the sugar cane. We concur with the recommendation made in the report (page 23) that, "...areas currently under sugar cane cultivation should be re-examined after the cane is harvested next year".

Dr. Michael F. Dega
Page 2

We concur with the preliminary significance assessments provided for the recorded commercial agricultural sites, which are determined to be significant under HRHP criterion "d", and we agree that no further work is needed to mitigate the project impacts to these sites.

Regarding the recommendations for further work, we agree that archaeological monitoring should occur during initial grubbing and grading, due to the poor visibility in general within the project area. If additional pedestrian survey work is conducted in cane fields after harvesting, while the ground surface is clear, the extent of subsequent monitoring can be limited to the fallow cane field areas only. We also recommend that removal of the stone clearing piles be monitored, due to the possibility that intact or remnant structural features could be present at the base of these piles. Such findings have been documented for other project areas on Maui. We also recommend that the monitoring plan include monitoring of subsurface excavation within the Pond A area, as this area was not subjected to subsurface testing. The Pond A area is closest to known pre-contact era agricultural and habitation complexes, and could contain remnant subsurface features beneath the plow zone.

If you have the opportunity to conduct additional pedestrian survey in harvested cane areas, please submit an addendum report of this activity and any findings. Otherwise, we look forward receiving to a monitoring plan that will include these cane field areas as well as the fallow fields for monitoring during grubbing and grading. The monitoring plan should also include measures as outline above, and should be consistent with specifications as listed in HAR §13-279-4 regarding monitoring plans.

Please direct any questions or comments regarding this review to Theresa K. Donham (808-281-4620) or Jenny L. Pickett (808-243-4641).

Aloha,

Nancy A. McMahon
Acting Archaeology Branch Chief

c: Bert Ratte, DPWEM, County of Maui
Jeffery Hunt, Director, Maui County Planning Dept., 250 S. High Street, Wailuku, HI 96793
Maui County Cultural Resources Commission, 250 S. High Street, Wailuku, HI 96793

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June 29, 2005

Michael Dega, Ph.D.
Scientific Consultant Services
711 Kapiolani Blvd. Suite 975
Honolulu, HI 96813

LOG NO: 2005.1191
DOC NO: 0506MK18

Dear Dr. Dega:

SUBJECT: Historic Preservation Review - 6E-42 - Archaeological Inventory Survey 259.903 Acres in Ma'alaea, prepared for AFK Development Ukumehame, and Waikapu Ahupua'a, Wailuku District, Maui Island TMK (2) 3-8-01:18

Thank you for the opportunity to review this report which our staff received on April 18, 2005 (Wilson and Dega 2005, *An Archaeological Inventory Survey Report on 259.903 Acres in Ma'alaea, Ukumehame and Waikapu Ahupua'a, Wailuku District, Maui Island, Hawaii (TMK (2) 3-6-01:18)*)...Scientific Consultant Services, Inc. ms.

The background section acceptably establishes the ahupua'a settlement pattern and predicts the likely site pattern in the project area. The historical information provided summarizes the history of the post-contact period land uses. The summary of previous archaeological work in the area provides a baseline for the current work. The project area has been utilized for commercial agriculture for probably over a century, and the report suggests that Henry Cornwell was in possession of the land in 1875, and subsequently sold it to Claus Spreckels. By the turn of the 19th century to the 20th, the parcel was under sugarcane production. The parcel was more recently used for commercial pineapple production followed by smaller scale truck garden plots.

The survey has adequately covered the project area documenting three historic properties. All three sites related to the historic use of the property for agriculture. SIHP 50-50-09-5657 consists of 13 "clearing mound", the ubiquitous piles of large boulders and cobbles scattered throughout the agriculturally used areas on Maui. The mounds on the subject parcel are confined to the area of the subject parcel comprised of the Pulehu Series Soil. SIHP 50-50-09-5658 consists of historic field irrigation modifications associated with sugarcane production. The features are modified drainages radiating from the perennial water courses. The drainages show alteration by hand tools. Finally, SIHP 50-50-09-5659 is an historic dirt road paralleling the *mauka* project area boundary. It is currently used by vehicles approaching the Ma'alaea terminus of the Lahaina Pali Trail. The trail ends at the project boundary, although it is assumed that the terminus formerly crossed or skirted portions of the subject parcel. Subsurface testing

(twenty backhoe trenches) were negative for evidence of cultural deposits. The stratigraphy within the trenches exhibited comparability within the two soil series evident on the parcel (Pulehu Series and Ewa Series). The site descriptions are acceptable.

We concur that all three sites are significant under Criterion "D" and have the potential to yield information important to understanding the history of the region. We also concur that the SIHP -5658 and -5659 have yielded adequate information and no further archaeological work is necessary. We also agree that SIHP -5657, the clearing mounds, warrant some additional work. It has been suggested that the mounds may contain historic/cultural materials that were placed there during initial clearance, or that the mounds utilized pre-existing "built" areas in the environment. As such, we concur with the mitigation recommendations detailed below.

We agree that some monitoring on the parcel is appropriate, especially in the vicinity of the rock mounds/piles. We also agree that an initial "sampling" of this area during initial earthmoving, will allow a better assessment of the probability for historic properties being identified beneath the piles. We concur with the general recommendation that during deconstruction, an archaeological monitor will be present. Based on the initial findings, and in consultation with the Maui SHPD office, a determination will be made regarding how many of the mounds merit such a monitoring program. We also believe that because of the proximity of the project area to the Ma'alaea coastal zone, any submitted monitoring plan should include a pre-consultation meeting between the construction crew and the SHPD office to alert the workers of the importance of halting work during construction in the event of inadvertent finds. This meeting will facilitate a relationship between our office, the construction crew, and your archaeologist, to ensure no historic properties are inadvertently impacted. We recog · e that this is a relatively unusual approach, but given the paucity of findings in an area in which we know prehistoric activity would have occurred merits a special approach.

We find this report to be acceptable. We will await a monitoring plan detailing the innovative measures suggested in your report and above. As always, if you disagree with our comments or have questions, please contact Dr. Melissa Kirkendall (Maui/Lana'i SHPD 243-5169) as soon as possible to resolve these concerns.

Aloha,

MELANIE A. CHINEN, Administrator
State Historic Preservation Division

MK: kf

c: Bert Ratte, DPWEM, County of Maui
Michael Foley, Director, Dept of Planning, 250 S. High Street, Wailuku, HI 96793
Maui Cultural Res Commission, Dept. of Plng, 250 S. High Street, Wailuku, HI 96793

(736)

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January 31, 2008

Dr. Michael F. Dega
Scientific Consultant Services, Inc.
711 Kapiolani Blvd., Suite 975
Honolulu, Hawaii 96793

LOG NO: 2007.1066
DOC NO: 0801TD20
Archaeology

Dear Dr. Dega:

Subject: **Chapter 6E-42 Historic Preservation Review of an Archaeological Inventory Survey Report for the Proposed Ma'alaea Water Treatment Plant and Associated Infrastructure, Waikapu Ahupua'a, Wailuku District, Island of Maui TMK: (2) 3-6-04:03 (por.)**

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The report contains the appropriate background information, maps, and discussion of methods, as specified in Hawaii Administrative Rule §13-276-5 regarding inventory survey reports. Seven newly identified historic properties were documented (SIHP 50-50-09-6251 through 6256). All of these sites are associated with historic/modern commercial agriculture and include three concrete ditches, three large mechanized clearing mounds/piles, and one stone-faced drainage feature. Subsurface testing was conducted in accessible portions of the project area, where 26 backhoe trenches were excavated. No subsurface findings are reported.

We note that surface visibility was severely limited in portions of the project area, particularly the Pond A area which was under sugar cane cultivation at the time of the survey. Subsurface testing was not conducted in the 15-acre area, due to the sugar cane. We concur with the recommendation made in the report (page 23) that, "...areas currently under sugar cane cultivation should be re-examined after the cane is harvested next year".

Dr. Michael F. Dega
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If you have the opportunity to conduct additional pedestrian survey in harvested cane areas, please submit an addendum report of this activity and any findings. Otherwise, we look forward receiving to a monitoring plan that will include these cane field areas as well as the fallow fields for monitoring during grubbing and grading. The monitoring plan should also include measures as outline above, and should be consistent with specifications as listed in HAR §13-279-4 regarding monitoring plans.

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Aloha,

Nancy A. McMahon
Acting Archaeology Branch Chief

c: Bert Ratte, DPWEM, County of Maui
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Appendix H

Archaeological Monitoring Plan

SCS Project Number 948-AMP-1

AN ARCHAEOLOGICAL MONITORING PLAN FOR 259.903 ACRES IN MĀ`ALAEA, UKUMEHAME, AND WAIKAPŪ AHUPUA`A, WAILUKU DISTRICT, MAUI ISLAND, HAWAI`I [TMK (2) 3-6-001:018]

Prepared by:
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April 2008

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INTRODUCTION

Scientific Consultant Services (SCS), Inc. has prepared this Archaeological Monitoring Plan (AMP) in advance of subsurface construction activities on a 259.903 acre lot in Mā`alaea, Ukumehame and Waikapū Ahupua`a, Wailuku District, Maui Island, Hawai`i [TMK: (2) 3-6-001:018] (Figures 1 and 2). An Archaeological Inventory Survey was conducted on this parcel (Wilson and Dega 2005), in which three historic archaeological sites were documented and catalogued under SIHP numbers 50-50-09-5657 (clearing mounds), -5658 (irrigation modifications) and -5659 (dirt road). Subsurface testing yielded negative results. The project area being former industrial farm land, Archaeological Monitoring was recommended for grubbing and grading activities on the property that extend beneath the plow-zone, as well as for the removal of Site -5657, where significant cultural deposits, including human remains, may be present within the lower levels of the rock mounds.

The present Monitoring program will ensure that any human remains found during this work are identified and appropriately mitigated, as deemed appropriate and lawful under Hawai`i State Law for the Inadertant Discovery of Human Remains (pursuent to 13-300-40a, b, c, HAR). Archaeological Monitoring will also ensure that significant cultural resources identified in the project area are adequately sampled, documented, and evaluated for their Historical significance.

This AMP will require the approval of the State Historic Preservation Division prior to the commencement of any ground altering activities. The following text provides more detailed information on the reasons for monitoring, previous archaeology both within and near the current project area, potential site types to be encountered during excavation, monitoring conventions and methodology for both field and laboratory work, as well as discusses curation and reporting.

ENVIRONMENTAL SETTING

PROJECT AREA DESCRIPTION AND LOCATION

Maui's Wailuku District encompasses an area from the eastern half of the West Maūi Mountains, north to Kahului Bay, south to Mā`alaea Bay, and includes the entire Kahului Isthmus. Near the southwestern corner of Wailuku District, the boundary separating Ukumehame Ahupua`a and Waikapū Ahupua`a runs from *mauka* to *makai* (roughly west to east). At an elevation of approximately 55 meters (180 feet) the *ahupua`a* boundary sharply angles south toward Mā`alaea Bay. This sharp angle between the two *ahupua`a* demarcates the northeastern boundary of the current project area. The *ahupua`a* boundary then divides the project area as it

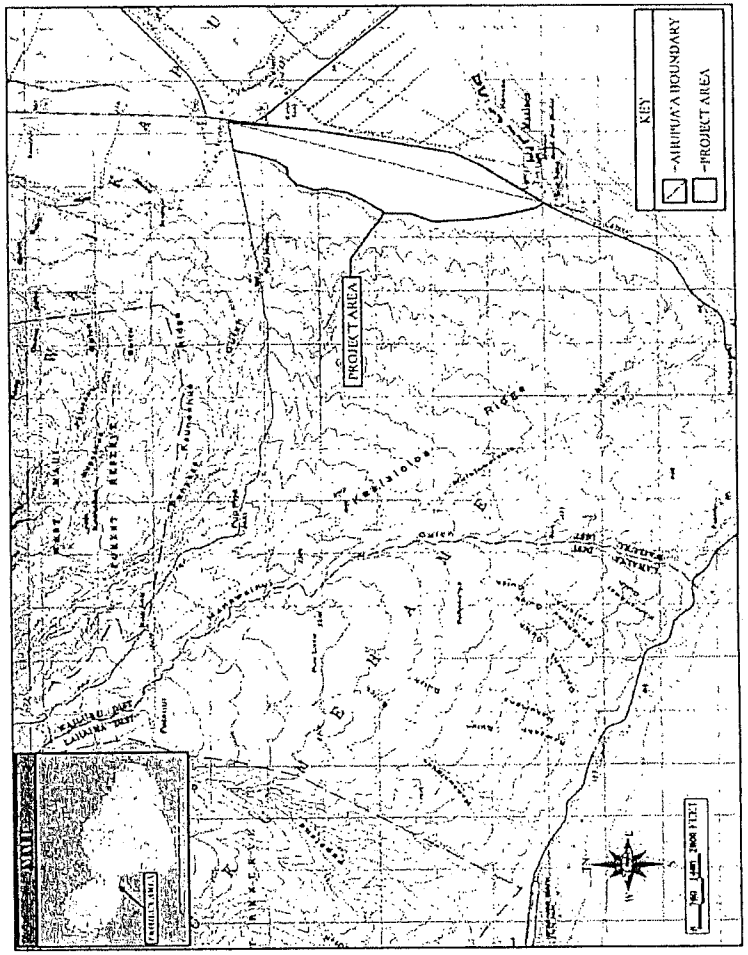

Figure 1: USGS Mā`alaea Quadrangle Showing the Project Area.

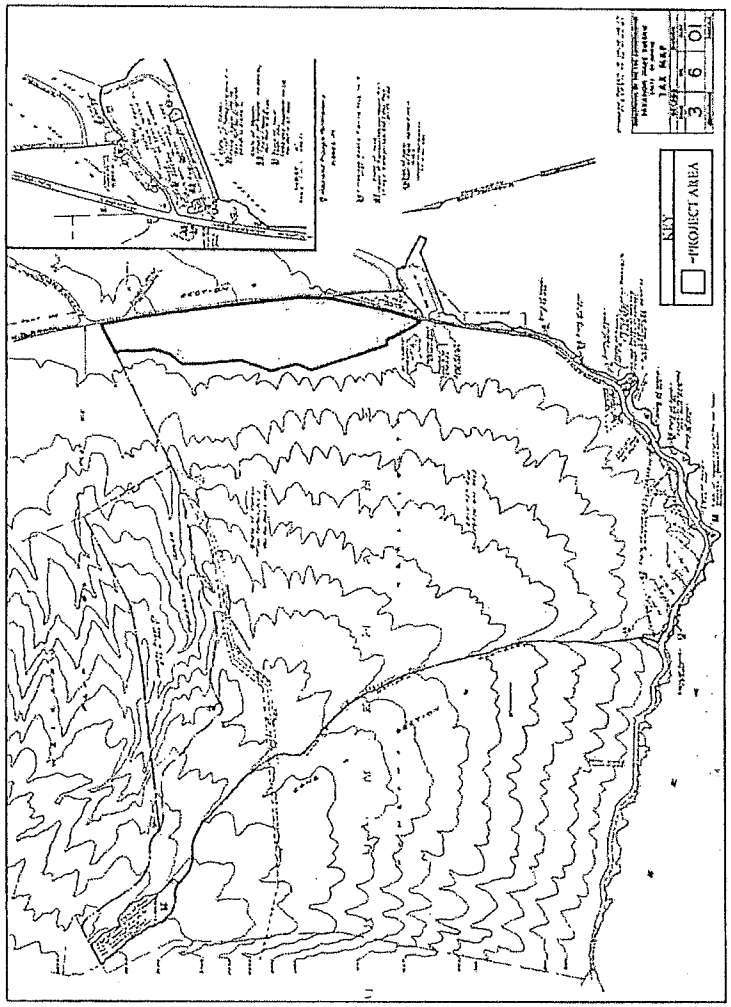

Figure 2: Tax Map Key [TMK] Showing the Project Area.

continues south, leaving roughly 65 percent of the parcel in Ukumehame Ahupua`a, and 35 percent of the parcel in Waikapū Ahupua`a.

The "Mā`alaea Mauka" project area consists of one contiguous 259.903-acre parcel that uses the Hono`api`ilani Highway as its *makai* border. The three-sided project area's southern terminus is a triangular point *mauka* of Mā`alaea Small Boat Harbor. The northern boundary line extends *mauka* from a point 183 m (600 feet) south of the Kuihelani Highway's intersection with Hono`api`ilani Highway. The long, narrow project area runs 2.7 kilometers (1.7 miles) along the Hono`api`ilani Highway, and at it widest is 579 m (1900 feet).

PROJECT AREA LANDFORM

The sharp transition from valley floor to mountain slope is the most distinct visual feature of the nearby terrain. This dramatic elevation increase, however, occurs just northwestof the relatively flat project area. With the southeastern end of the project area having an elevation of 12 m (40 feet), and the northwestern perimeter high point of 61 m (200 feet), the maximum elevation difference throughout the project area is only 49 m (160 feet). The average elevation gained from walking the width of the project area (about half a kilometer) is only 24m (80 feet). The average elevation gained from climbing the next half kilometer beyond the project area's northwest border is 146 m (480 feet).

The gently-sloping terrain of the project area has been made more flatly uniform through decades of agricultural activity. Few distinct naturally-occurring landmarks remain within the project area's topography. Certain points within the project area afford an uninterrupted view of its entire expanse. The four perennial east-west running drainages that cross the project area remained dry at the time of survey. It is likely that these narrow water courses that span the parcel's width only flow in times of heavy rains. Two of the four drainages are fairly shallow and narrow, and do not originate much farther upslope than the base of the mountains. The two more significant drainages appear on the USGS topographical map, and are currently diverted under Hono`api`ilani Highway, eventually emptying into Mā`alaea Bay. Of these two, the southern drainage originates at an elevation of 335 m (1100 feet), and the northern drainage originates near Pu`u Moe at 640 m (2100 feet). However, at a maximum width of less than four meters, it is likely that even these two more significant water sources served to irrigate the project area only in times of heavy rainfall.

CLIMATE AND VEGETATION

The project area receives 25 to 38 centimeters (10 to 15 inches) of rainfall annually (Armstrong 1983). This area is much drier than higher elevations to the west that receive as much as twenty times the level of precipitation. Air temperatures are consistently slightly warmer here than the Maui seasonal high and low averages, mostly due to the lower, coastal elevation. At the time of survey, project area vegetation consisted of a mix of introduced grasses and trees, few native species, and a variety of small garden plots with a mix of planted crop species. The only areas not covered by vegetation were the multiple dirt road segments that transect the property. Introduced grasses, ranging from 0.5 to 1.0 m tall, covered roughly 85 percent of the project area. Few *kiawe* trees (*Prosopis pallida*) were found outside of drainage perimeters, but along and within the drainages these introduced trees were abundant. *Kiawe* also lines the *mauka* side of the *mauka* perimeter road, and grows very dense within the State-owned lands at the base of the mountains. Overall, few trees exist within the former agriculture fields. Recent *koa haole* (*Leucaena leucocephala*) trees have grown to a height of no more than 1.5 m within the fields, but grow to a height of over 3.0 m along the *mauka* perimeter roads. Other species include lantana (*Lantana camarara*), sparse sisal (*Agave sisalana*), and the native *`ilima* (*Sida* sp.).

Over twenty different patches of recently abandoned garden crops are scattered throughout the southern 80 percent of the project area. None are larger than one acre, and none of these patches exist within the rockier northern soils. Two local informants spoke of "renting" land for small-scale farming within the "past couple of years," be it through a formal contract with the previous land owner or not. Rows of banana trees occur in at least five different areas. One banana patch also includes gourds; papaya trees are interspersed throughout. At the center of the property, surface plastic irrigation pipes appear to be recently constructed and lead to a square sod field. The most elaborate small-scale farming remnant is what appears to be a *Ficus* sp. nursery at the center of the project area's northern half. Here, three rows of identically-sized trees are paralleled by what appear to be recently constructed concrete walkways and irrigation piping.

SOILS

As the project area extends north, its soils contain a greater concentration of basalt cobble and boulder. According to Foote *et al.* (1972:101), soils in the project area fall into mainly two categories: the Ewa Series (80 percent of the project area) and the Pulehu Series (most of the northern 20 percent). The Ewa Series consists of well-drained soils occurring on alluvial fans within Oahu and Maui. They are derived from igneous rock, moderately sloping, and best suited

for sugar cane, truck crops, and pasture. The southern third of the project area consists entirely of Ewa Silty Clay (EsB), ideal for sugarcane. Bordering EsB soil to the north is a large contiguous section of Ewa Cobbly Silty Clay (EtB), covering roughly 50 percent of the project area. Foote *et al.* note that the removal of a surface layer of cobble renders this soil equally suitable to sugarcane cultivation as the less rocky soil to the south (1972:29–30, 115–116).

Roughly 20 percent of the project area, entirely concentrated at the northern end, consists of a Pulehu Series soil—specifically, Pulehu Cobbly Clay Loam (PtB). This soil is very similar to the Ewa Series in almost every aspect except its greater surface rock concentration. Thus, a direct correlation can be seen between the location of PtB soil and the 13 large, agricultural clearing mounds (State Site 50-50-09-5657) concentrated in the northern end of the project area. In an effort to create sugarcane fields equally productive as lands to the south, decades of tilling have deposited these enormous mounds of concentrated boulders.

REASON FOR MONITORING

Archaeological Monitoring is being conducted on this parcel due to the potential for discovery of significant cultural deposits, including human remains, in subsurface contexts below the plow-zone and within the lower levels of the rock mounds identified during Inventory Survey (Site 50-50-09-5657). There is a potential for discovery of buried cultural deposits throughout the project area. The subsurface contexts, though heavily disturbed by industrial farming practices, may contain *in situ* deposits below the plow line. While the mounds documented under Site -5657 were identified as clearing mounds associated with the Historic Period (Wilson and Dega 2005), there is also a chance that these mounds were traditional Hawaiian structures that were modified as clearing mounds in Historic times. Removal of these features from their present context may yield undocumented cultural deposits, especially in the lower levels of the features.

In preparation of the Environmental Impact Statement for this project, public testimony expressed concerns relevant to undocumented cultural deposits that may be revealed during the subsurface portion of the planned project. Archaeological Monitoring will mitigate the damage to any such deposits, and will ensure the appropriate and legal handling of such deposits, if any are identified.

TRADITIONAL AND HISTORIC SETTING

PRE-CONTACT TO EARLY HISTORIC ERA

Wailuku District, is frequently mentioned in historical texts and oral tradition as being politically, ceremonially, and geographically important during traditional times (Cordy 1981, 1996; Kirch 1985). Wailuku was considered a "chiefly center" (Sterling 1998:90) with many of the chiefs and much of the area's population residing near or within portions of `Iao Valley and lower Wailuku. The importance of the district is reflected by the relatively large number of *heiau* that were reportedly present in pre-Contact times. Oral tradition accounts surrounding these *heiau* provide examples of how religion tied into political power in the traditional Wailuku setting. Indeed, the period immediately preceding contact with the Europeans was one of considerable upheaval and conflict. *Wailuku*, meaning 'water of destruction,' succinctly describes the area in the late 1700s. Political power emanating from Moloka`i was an active element during the mid-eighteenth century. The resulting battle at Kalae`ili`ili (A.D. 1765) led to the expulsion of Keeaumoku and the Moloka`i *ali`i* and the beginning of Kahekili's reign (Kamakau 1992). Kahekili successfully defended his capital in Wailuku throughout the 1770s, until his defeat at the hands of Kamehameha's forces.

Closer to the current project area, in the southwest corner of Wailuku District, prehistoric settlement was not as dense as concentrations to the north. Climate had much to do with that trend, as the Mā`alaea area is a more arid environment than the rain-soaked fields to the north. According to Tomonari-Tuggle and Tuggle (1991), the majority of the pre-Contact population was located southwest of the project area, near what is now Ukumehame Beach State Park. Settlement was also probable north of Kealia Pond in Waikapū Ahupua`a. Handy and Handy report that before the historic sugarcane plantations in this region, water from Waikapū Stream ". . . was diverted into lo`i and its overflow was dissipated on the dry plains of the broad isthmus between West and East Maui" (1972:496).

Wailuku District would see drastic change after Captain James Cook's 1778 arrival in Kahului Bay. The reign of Kamehameha I was intertwined with the increasing presence of Europeans within the Hawaiian Islands. By 1821, American missionaries had established a foothold in Lahaina and first arrived in Wailuku a year later. The religion of the Hawaiian people began to wane under the influence of Christianity. Fredericksen and Fredericksen (2002:4) point to a girls' seminary (Central Female Boarding School), established in Wailuku in 1836, as one of the initial steps in the conversion of Hawaiian language and customs in Maui.

THE MĀHELE

In 1848, commissioners of the Mahele instigated an extreme modification to traditional land tenure on all islands that resulted in a division of lands and a system of private ownership. The Mahele was based upon the principles of Western law. While a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was forced to establish laws changing the traditional Hawaiian society into that of a market economy (Kuykendall Vol. I 1938:145, footnote 47, *et passim*; Daws 1968:111; Kame`eleihiwa 1992:169–170, 176). The dramatic shift from a redistributive economy to a market economy resulted in drastic changes to land tenure, among other things. As a result, foreigners demanded private ownership of land to ensure their investments (Kuykendall Vol. I, 1938:145, *et passim*; Kame`eleihiwa 1992:178; Kelly 1998:4).

Once lands were made available and private ownership was instituted, native Hawaiians, including the *Maka `ainana*(commoners), were able to claim land plots upon which they had been cultivating and living. Oftentimes, foreigners were simply just given lands by the *ali`i*. However, commoners would often only make claims if they had first been made aware of the foreign procedures (*kuleana* lands, or land commission awards). These claims could not include any previously cultivated or currently fallow land, *okipu*, stream fisheries, or many other natural resources necessary for traditional survival (Kame`eleihiwa 1992:295; Kirch and Sahlins 1992). Awarded parcels were labeled as Land Commission Awards (LCAs). If occupation could be established through the testimony of witnesses, the petitioners were issued a Royal Patent number and could then take possession of the property. Commoners claiming house lots in Honolulu, Hilo, and Lahaina were required to pay commutation to the government before obtaining a Royal Patent for their awards (Chinen 1961:16).

During the Māhele, Wailuku District was declared Crown Land and numerous Land Commission Awards, approximately 180, were awarded within Wailuku Ahupua`a alone (Creed 1993). A handful of foreigners (*i.e.*, Anthony Catalena, James Louzada, E. Bailey) gained control of large parcels of lands that would later be used for mass cultivation of sugar. Significantly, the majority of LCAs were awarded to Hawaiians, a gauge that can be used to measure pre-Contact settlement, since there was little overall change in traditional land use among Hawaiians prior to 1853 (Creed 1993:38).

During the Mahele, there were no land claims within the current project area. This fact may be attributed to the sparse pre-1848 Hawaiian population within the parcel, a result of settlement conditions within these *ahupua`a* favoring the coastal area.

THE LATE HISTORIC PERIOD AND GROWTH OF THE SUGAR INDUSTRY

Another influence that brought change to Maui was foreign commercialism. Two Chinese brothers, Ahung and Atai, of Honolulu's Hungtai Company arrived in Wailuku to explore the possibility of setting up one of its earliest sugar mills in 1828. Atai soon created a plant that processed sugar cane cultivated by Hawaiians, named the Hungtai Sugar Works (Dorrance and Morgan 2000:15–16). Ahung later joined Kamehameha III's sugar producing enterprise, although by 1844 both operations had ceased. The Wailuku Sugar Company was the next to follow, in 1862, and would expand sugar production over the next 126 years of its existence—4,450 acres by 1939, still more than three decades before its maximum production levels.

As it expanded its territory, the Wailuku Sugar Company first appeared on maps of the project area in the in the 1920s (Bureau of Conveyances, Grant 9794), although their acquisition of the project area land may have been as early as the turn of the century (Kennedy and Trimble 1992:4). Successive grants (Grant 10294 through to Grant S-13975) would follow in decades following and fully encompass the Ukumehame Ahupua`a side of the project area in Wailuku Sugar land. Kennedy and Trimble (1992:4) summarize the history of the Waikapū Ahupua`a (*makai*) portion of the project area by detailing its acquisition from the state government on November 18, 1875 by Henry Cornwell (Grant 3152). Cornwell subsequently sold to Claus Spreckels, and by the turn of the century the entire project area was under sugarcane cultivation.

Wailuku Sugar Company ended production in 1988, having averaged over 30,000 tons of sugar produced annually at its pinnacle in the 1970s (Dorrance and Morgan 2000:66). Owner C. Brewer & Company, Ltd. shut down sugar cultivation on the project area, which was then used almost entirely for pineapple cultivation starting no later than 1992 (Kennedy and Trimble 1992:1). The lands were under pineapple for at least the next three years (Tomonari-Tuggle 1995:11)—probably slightly longer—before transitioning to smaller-scale "garden" plots.

PREVIOUS ARCHAEOLOGY

Seven studies on file within the State Historic Preservation Division (SHPD)- Kapolei archives summarize the most relevant previous archaeology within the vicinity of the current project area (Figure 3).

Wilson and Dega conducted Archaeological Inventory Survey of the present study parcel in 2005. Three historic sites, three historic archaeological sites were documented and catalogued under SIHP numbers 50-50-09-5657 (clearing mounds), -5658 (irrigation modifications) and -5659 (dirt road). Subsurface testing yielded negative results.

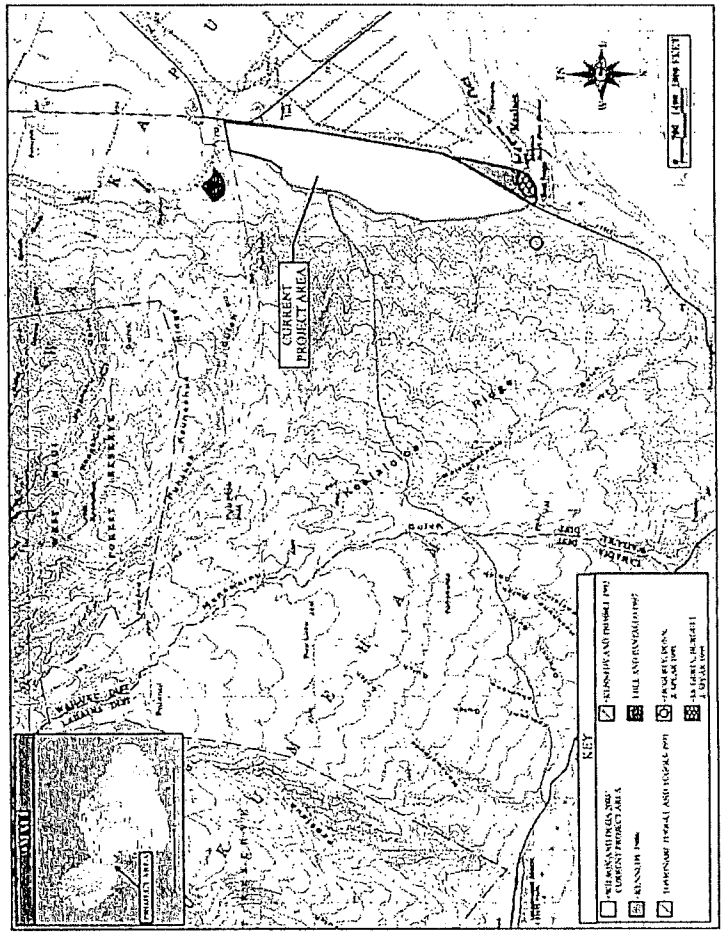

Figure 3: USGS Ma`alaea Quadrangle Showing the Previous Archaeology in the Vicinity of the Present Study Parcel.

Kennedy and Trimble (1992) surveyed an area that overlaps State Site 50-50-09-5659 (historic dirt road), first recorded in the present study. While Kennedy and Trimble also note the lack of archaeological features in their project area due to the obvious history of intense agriculture, their 1992 report does not consider the road upon which their survey takes place to be a potential historic agricultural feature (as discussed below under "RESULTS"). The project area detailed in their study is no more than 5 meters wider than the dirt road itself, and concludes that "No artifacts, midden, or structures of historic or prehistoric significance were identified on the subject property" (1992:11).

Seven historic sites, consisting of 23 features, were documented in a 60-acre parcel just north of the present study parcel (Dagher and Dega 2007: *in review*). These features included walls, enclosures, C-shape, and modified outcrops. All these sites were assessed as significant under Criterion D, and Archaeological Monitoring was recommended for the project area.

An earlier Kennedy report (1986) entitled *Letter Report: Walk-Through Examination of the Proposed Mā`alaea Triangle, Maui (TMK: 3-6-01:1)* also concluded with negative results. This project area is located on the *makai* side of Hono`api`ilani Highway and extends to the coastline. This was the first archaeological study performed on this parcel and Kennedy does mention (1986:2) nearby sites that are detailed in later studies.

Monitoring within a smaller section of the same project area described by Kennedy (1986) resulted in a single site—a previously disturbed historic burial: State Site 50-50-09-4480 (McGerty, Burgett, and Spear 1998). McGerty *et. al*'s report, entitled *Draft: Monitoring Report on Earth Moving and Construction Excavations, Maui Ocean Center Site, Maui, Hawaii, (TMK: 3-6-01:001 and 019)* describes a pearl shell button found with the burial. The location of Site -4480 is of interest to the current study as its position is approximately 200 m *makai* of the current project area's southern corner. As subsequent subsurface testing would prove, however, the sandy matrix McGerty *et. al* experienced in the Maui Ocean Center monitoring contrasted the reddish clay of the current project area, rendering the likelihood of encountering burials much less. Nonetheless, the McGerty *et. al* (1998) study also mentions two more burials found not far to the north from Site -4480. While these (Sites -3553 and -3554) are even less spatially related to the current project area, their presence will later call for increased testing in the southern portion of the current project area (closest to the sandy coastal matrices).

McGerty, Dunn, and Spear (1998) conducted Data Recovery in an area of five traditional sites documented by Moore and Kennedy (1995). These sites (50-50-09-3555, -4022, -4137, -

4138, -4139) consisted of 28 features, including petroglyphs, subsurface fire pits, agricultural terracing, rock mounds, and a C-shape. McGerty et. al's testing at Sites -4138, and -4139 did not produce any significant artifacts, however, radiocarbon analysis of a charcoal sample produced a date of A.D. 1390 to 1650. This sample was recovered from the C-shape (Site 4139, Feature C) which was determined to be a prehistoric temporary habitation. This site is less than 300 m *mauka* of the current project area's southern point.

There is no doubt that the current project area was utilized as a segment of an important trail system in the early 1800s, and probably prehistorically as well. The Lahaina Pali Trail is five miles long and crosses the southern slopes of the West Maui Mountains between Olowalu and Mā`alaea. The start of this trail, now a demonstration trail as part of the Na Ala Hele Trail System, borders the current project area near the center of the *mauka* border. By the historic period in which the trail's significance as a probable prehistoric route was realized, the portion *makai* of the current trail head (*i.e.* the portion transecting the width of the current project area) was already destroyed by sugarcane cultivation. Thus, the trail starts immediately outside the project area, within the State-owned lands. A 1991 study by Tomonari-Tuggle and Tuggle documented 18 sites upon the trail, the majority of historic origin.

In an Inventory Survey of the present study parcel (Wilson and Dega 2005), three historic sites, all related to sugarcane agriculture, were identified. These sites were designated under SIHP numbers 50-50-09-5657 (clearing mounds), -5658 (irrigation modifications), and Site -5659 (dirt road). These three sites were the only archaeological sites found within the project area, and all three are considered significant under Criterion D of the Hawaii State and National Register of Historic Places.

SETTLEMENT PATTERN

Archaeological settlement data indicates that initial colonization and occupation of the Hawaiian Islands first occurred on the windward sides of the main islands, with populations eventually settling into drier leeward areas at later periods (Kirch 1985). Archaeological dates for initial occupation of the Hawaiian Islands far pre-date accepted ranges gathered from palynological data. A more conservative estimate for initial occupation of the islands is the A.D. 9th century (Athens 1997), if one is to lay more credibility with the pollen record than the archaeological record. In the Waihe`e and Wai`ehu areas of Wailuku, Kirch (1985:87) notes that "a number of coastal dune midden sites have been reported, and at least one of these contained pearl-shell fishhooks similar to those from the Bellows Site, eroding from the wave-cut midden." (The Bellows site, located on the windward coast of O`ahu, has yielded the controversial data of

occupation dates from A.D. 300 to 600 [Pearson *et al.* 1971], one of the earliest dated sites in the Hawaiian Islands. For the most part, these dates have now been diagnosed as problematic and are no longer considered valid.)

More recent research within Wailuku District indicates that Wailuku Ahupua`a was likely settled between *c.* A.D. 1100 (Kirch 1985:142) and A.D. 1200 (Fredericksen and Fredericksen 1996), whereas *ahupua`a* to the northeast have produced slightly earlier date ranges and *ahupua`a* to the southwest have later settlement dates. The earliest populations purportedly used local resources and seldom ventured into upland valleys. Cordy (in Creed 1993) suggests, however, that upper valley areas on windward coasts were likely populated before the A.D. 1100s. Coastal settlement was still dominant, but populations began exploiting and living in more upland *kula* zones. Population expansion to inland areas did not occur until the *c.* A.D. 12th century but continued through the 16th century. Large scale or intensive agricultural endeavors were implemented in association with habitation. Coastal lands were used for settlement and taro was cultivated in near-coastal reaches and in the uplands. Upland areas of Maui such as the Waiohuli-Kula area contained large garden enclosures, ceremonial structures, and permanent habitation sites by *c.* A.D. 1600.

Nearer the coast in lands like the current project area (*c.* 40–85 meters amsl), taro was cultivated along stream courses, dry land taro was grown on *kula* lands, and populations settled there as well. In the current parcel, however, no LCA records exist that might link prehistoric agriculture to historically documented practice.

EXPECTED FINDINGS

Based on all available physiographic, archaeological, and historical evidence, the following expectations guided this study:

- Historically-significant surface features were expected, particularly those pertaining to historic period commercial sugarcane production. SCS conducted a brief reconnaissance (prior to AIS) which reported the presence of the large clearing mounds. The reconnaissance did not report any other historic or pre-Contact surface features, however, the probability of documenting additional historic agricultural features during Monitoring is considered high.

- A variety of traditional Hawaiian sites have been documented at several adjacent properties. While the probability of encountering pre-Contact archaeological surface features within the project area was considered low, there remains a moderate possibility of encountering subsurface cultural layers from a prehistoric period. The latter would depend largely on the existence of a previously undisturbed matrix stratigraphically lower (*i.e.*, older) than historically tilled soils.

The probability of discovery of historic or prehistoric unmarked burials, or marked burials, is considered low. A slightly higher, yet still low, probability exists in regards to the discovery of scattered human remains during subsurface testing. While burials have been located within the sandy matrix of the adjacent parcels *makai* of Hono`api`ilani Highway (*i.e.*, during construction activities at the Maui Ocean Center; see McGerty, Burgett, and Spear 1998), SHPD records contain no documented burials *mauka* of Hono`api`ilani Highway (including on, or within a kilometer, of the current project area). The lack of burial sites immediately *mauka* of the highway can be attributed to two main factors: (1) the types of soils found here are generally less favored in prehistoric burial practices, and (2) the lands have been subject to continual agricultural activity for nearly a century, and in some cases, longer.

Based on all of the above background information expected findings during Monitoring include:

(1) A variable subsurface stratigraphy that could indicate agricultural horizons and/or long-term habitation use of the area through post holes, fire features, and even burials, the latter of which would show some permanency in occupation in this geographic area.

(2) Historic sites have been previously documented. Monitoring will allow for additional observation at these sites, which may lead to improved discussions of them, new portions not previously described, or even new features found. Monitoring the parcel will contribute to greater understanding of the areas history and prehistory.

MONITORING CONVENTIONS AND METHODOLOGY

This AMP has been outlined in accordance with DLNR/SHPD administrative rule ' 13-279. Archaeological monitors will adhere to the following guidelines during monitoring procedures:

1. A qualified archaeologist familiar with the project area and the results of previous archaeological work conducted in the general area, will monitor subsurface construction activities on the parcel. If significant deposits or features are identified and additional field personnel are required, the archaeologist will notify the contractor or representatives before additional personnel are brought to the site.

2. If features or cultural deposits are identified during Archaeological Monitoring, the on-site archaeologist will have the authority to temporarily suspend construction activities at the significant location so that the cultural feature(s) or deposit(s) may be fully evaluated

and appropriate treatment of the cultural deposit(s) is conducted. SHPD will be consulted to establish feature significance and potential mitigation procedures. Treatment activities primarily include documenting the feature/deposit through plotting its location on an overall site map, illustrating a plan view map of the feature/deposit, profiling the deposit in three dimensions, photographing the finds (with the exception of human burials), artifact and soil sample collection, and triangulation of the finds. Construction work will only continue in the significant location when all documentation has been completed.

3. Control stratigraphy in association with subsurface cultural deposits will be noted and photographed, particularly those containing significant quantities or qualities of cultural materials. If deemed significant by SHPD and the archaeologist, these deposits will be sampled.

4. In the event that human remains are encountered, all work in the immediate area of the find will cease; the area will be secured from further activity until burial protocol has been completed. The SHPD island archaeologist and SHPD Culture and History Branch will both be immediately notified about the inadvertent discovery of human remains on the property. Notification of the inadvertent discovery will also be made to the Maui/Lanai Islands Burial Council by either SHPD or by the contracting archaeologist. A determination of minimum number of individuals (MNI), age(s), and ethnicity of the burial(s) will be ascertained in the field, following standard osteological procedures (*e.g.*, White 2000). Rules outlined in Chapter 6E, Section 43 shall be followed. Profiles, plan view maps, and illustrative documentation of skeletal parts will be recorded to document the burial(s). The burial location will be identified and marked. If a burial is disturbed, materials excavated from the vicinity of the burial(s) will be manually screened through 1/8-inch wire mesh screens in order to recover any displaced skeletal material. If the remains are to be removed, the work will be in compliance with HRS 6.E-43.6, Procedures Relating to Inadvertent Discoveries after approval from all parties (SHPD, Burial Council). All remains recovered from the site will be temporarily stored in a secure, on-site location until final disposition is determined and completed.

5. To ensure that contractors and the construction crew are aware of this AMP and possible site types to be encountered on the parcel, a brief coordination meeting will be held between the construction personnel and monitoring archaeologist prior to initiation of the project. The construction crew will also be informed as to the possibility that human burials could be encountered and how they should proceed if they observe such remains.

6. The archaeologist will provide all coordination with the contractor, SHPD, and any other group involved in the project. The archaeologist will coordinate all monitoring and sampling activities with the safety officers for the contractors to ensure that proper safety regulations and protective measures meet compliance. Close coordination will also be maintained with construction representatives in order to adequately inform personnel of the possibility that open archaeological units or trenches may occur in the project area.

7. As necessary, verbal reports will be made to SHPD and any other agencies as requested.

LABORATORY ANALYSIS

All samples collected during the project, except human remains, will undergo analysis at the SCS laboratory in Honolulu. In the event that human remains are identified and the SHPD authorizes their removal, these remains and all associated cultural materials will be curated at an appropriate location on Maui. Photographs, illustrations, and all notes accumulated during the project will be curated at the Honolulu laboratory of SCS. All retrieved artifact and midden samples will be sent to the SCS laboratory in Honolulu to be cleaned, sorted, and analyzed. Significant artifacts will be photographed, sketched, and classified (qualitative analysis). All metric measurements and weights will be recorded (quantitative analysis). This data will be presented in tabular form within the final monitoring report. Midden samples will be minimally identified to major 'class' (e.g., bivalve, gastropod mollusk, echinoderm, fish, bird, and mammal). All data will be clearly recorded on standard laboratory forms which also include number and weight (as appropriate) of each constituent category. These counts will also be included in the final report.

Should any samples amenable to dating be collected from a significant cultural deposit, they will be prepared in the SCS laboratory and submitted for specialized radiocarbon analysis. While primary emphasis for dating is placed on charcoal samples, we do not preclude the use of other materials such as marine shell or nonhuman bone materials. SCS will consult with SHPD and the client if radiocarbon dates are deemed necessary.

All stratigraphic profiles will be drafted for presentation in the final report. Representative plan view sketches showing the location and morphology of identified sites/features/deposits will be compiled and illustrated.

CURATION

If requested by the landowner, SCS will curate all recovered materials in Honolulu (except human remains, which would remain on-island) until a permanent, more suitable curation locale is identified. The land owner(s) may request to curate all recovered materials once analysis has been completed.

REPORTING

An Archaeological Monitoring report documenting the project findings and interpretation, following SHPD guidelines for Archaeological Monitoring reports, will be

submitted within 180 days of the completion of fieldwork. This time line is requested to account for any radiocarbon age determinations (typically 60 days), if necessary.

If cultural features or deposits are identified during fieldwork, the sites will be evaluated for historical significance and assessed under State and Federal Significance Criteria. The Archaeological Monitoring report will be drafted until accepted by SHPD and will be submitted to both SHPD and to the client.

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SCS Project Number 736-AMP-1

AN ARCHAEOLOGICAL MONITORING PLAN FOR THE PROPOSED MĀ`ALAEA WASTEWATER TREATMENT PLANT, EFFLUENT REUSE AREA, INCLUDING THE POTENTIAL WATER TANK LOCATION AND DETENTION PONDS A AND B, WAIKAPŪ AHUPUA`A, WAILUKU DISTRICT, ISLAND OF MAUI, HAWAI`I [TMK: (2) 3-6-004: 003 (por.)]

Prepared By:
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and
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February 2008

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INTRODUCTION

Scientific Consultant Services, Inc. (SCS) has prepared this Archaeological Monitoring Plan (AMP) in advance of construction work for the proposed Wastewater Treatment Facility, effluent reuse area, water tank site, and two detention basins. The project area is located in Mā`alaea, Waikapū Ahupua`a, Wailuku District, Maui Island, Hawai`i [TMK: (2) 3-6-004: 003 (por.)] at an elevation ranging from approximately 190 to 400 feet above mean sea level (amsl) (Figures 1 and 2).

Based on State Historic Preservation Division (SHPD) recommendations, Archaeological Monitoring is neccesary on the parcel due to the potential for the possible inadvertent discovery of traditional or historic cultural deposits and because multiple known historic sites are present in the vicinity of the parcel. The subject parcel itself does not represent a Land Commission Award (LCA).

Archaeological Monitoring will be conducted to ensure that if significant cultural resources are identified during subsurface work, they will be sampled, adequately documented, and evaluated for their historical significance, per SHPD recommendations. If human remains are identified, appropriate and lawful protocol concerning the Inadvertant Discovery of Human Remains (pursuent to 13-300-40a, b, c, HAR) will be followed.

Prior to the initiation of any subsuface construction activity, this AMP will require approval from the SHPD (Jenny Pickett, SHPD-Maui). Details on the reasons for monitoring, potential site types that may be encontered during excavation, monitoring conventions and methodologies for both fieldwork and laboratory work, and curation and reporting follow in the text below.

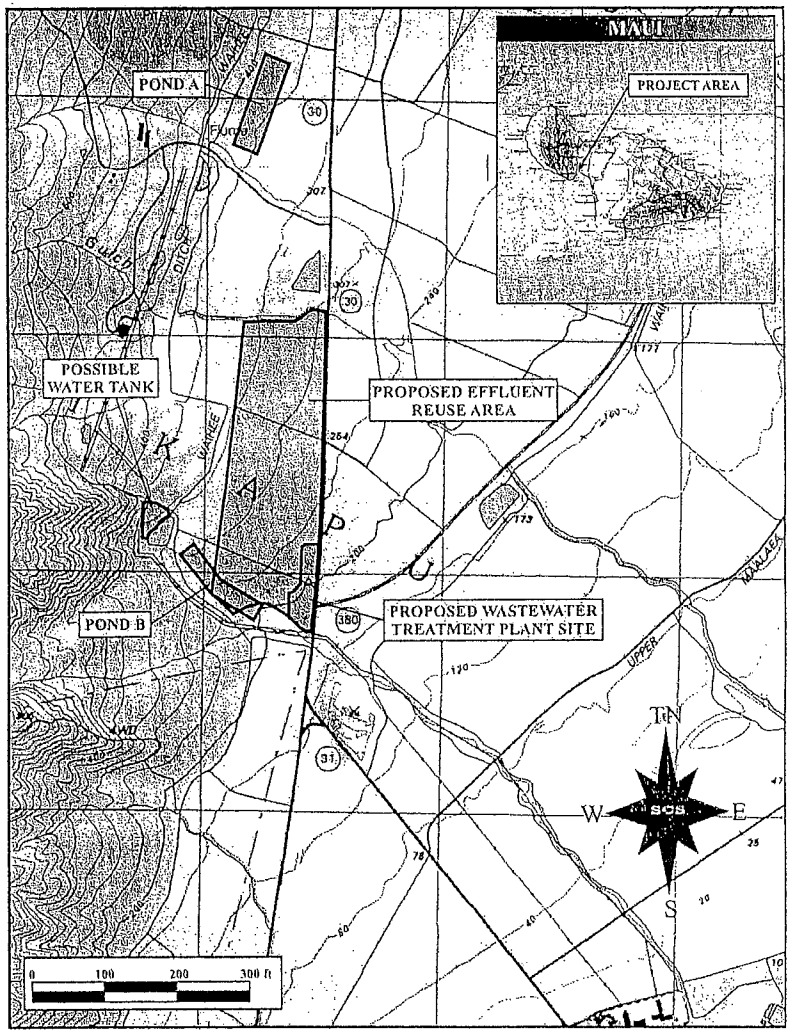

Figure 1: USGS Quadrangle (Ma`alaea and Wailuku) Map Showing Project Areas.

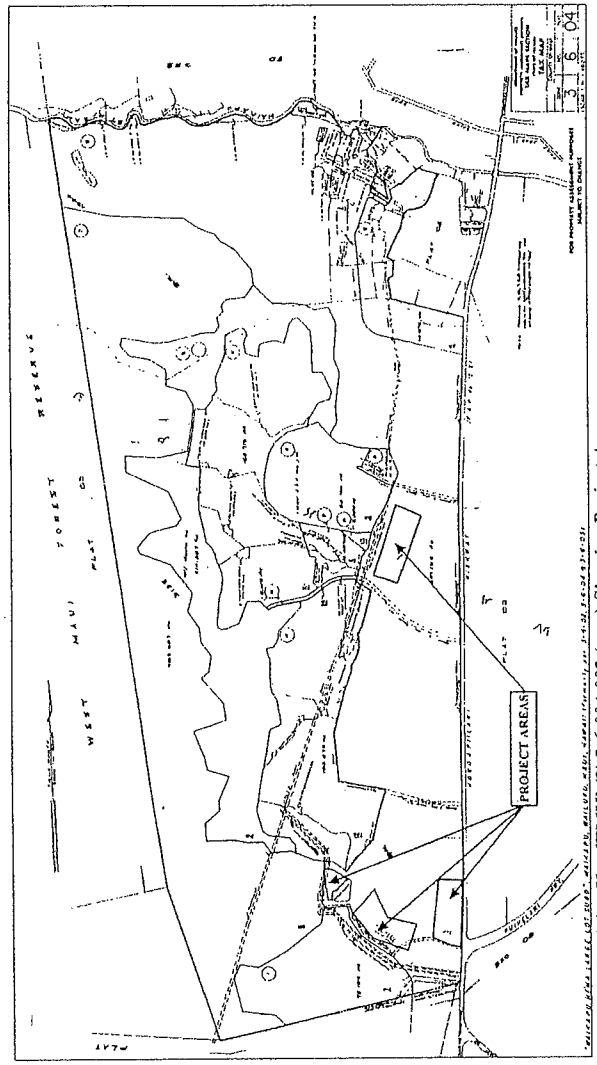

Figure 2: Tax Map Key [TMK] (2) 3-6-004:003 (por.) Showing Project Area.

REASONS FOR MONITORING

The present project area is situated entirely within a coastal environmental zone, an area subject to many traditional and historic activities. It is these coastal areas that were first thought to have been settled and also subject to sustained settlement (see Cordy 1981).

Based on all available physiographic, archaeological, and historical evidence, the following expectations guided this study:

- Historically-significant surface features were expected, particularly those pertaining to historic period sugarcane agriculture. SCS staff conducted an Archaeological Inventory Survey of the property to the south of the current project area (Wilson and Dega 2005) which reported the presence of the large clearing mounds and other features related to historic sugarcane cultivation. Thus, the probability of documenting additional historic agricultural features during Archaeological Inventory Survey was considered high.

- A variety of traditional Hawaiian sites have been documented at locations within nearby studies. Although the probability of encountering prehistoric archaeological surface features within the project area was considered low, a moderate possibility of encountering subsurface cultural layers from the prehistoric period remained. The latter would depend largely on the existence of a previously undisturbed matrix stratigraphically lower (*i.e.*, older) than historically tilled soils.

- The probability of discovery of historic or prehistoric unmarked burials, or marked burials, was considered low. A slightly higher, yet still low, probability existed in regards to the discovery of scattered human remains during subsurface testing. While burials have been located within the sandy matrix of the adjacent parcels *makai* of Honoapi'ilani Highway (*i.e.*, during construction activities at the Maui Ocean Center; see McGerty, Burgett, and Spear 1998), SHPD records contain no documented burials *mauka* of Honoapi'ilani Highway (including on, or within one kilometer of the current project area). The lack of burial sites immediately *mauka* of the highway can be attributed to two main factors: (1) the types of soils found here were generally less favored in prehistoric burial practices, and (2) the lands have been subject to continual agricultural activity for nearly a century, and in some cases, longer.

PREVIOUS ARCHAEOLOGY AND POTENTIAL SITE TYPES TO BE ENCOUNTERED

A number of studies on file at the State Historic Preservation Division, Kapolei archives summarize the most relevant previous archaeology within the vicinity of the current project area.

In a recent Archaeological Inventory Survey (Dega and Dagher 2007) conducted by SCS Inc. on the approximately 115 acres of the current project area, seven sites were newly identified and documented during the survey. All of the identified sites (50-50-09-6251 through 50-50-09-6257 related to historic commercial agriculture. These sites consisted of three historic irrigation ditches (Sites 50-50-09-6251, T-1; 50-50-09-6254, T-4; and 50-50-09-6257, T-7), three clearing mounds (Sites 50-50-09-6252, T-2; 50-50-09-6253, T-3; and 50-50-09-6256, T-6), and one modified stream drainage (Site 50-50-09-6255, T-5). A single additional clearing pile feature lies to the northwest of the project area; however, as this was located outside the project area boundaries this feature was not recorded.

In 1989, PHRI conducted an Archaeological Inventory Survey of over 600 acres within the Waikapū Mauka Partners Golf Resort located to the north of the current project area (Brisbin, *et al.*1991). The report documenting the findings of this survey (Haun 1989 in Brisbin, *et al.* 1991) does not appear to be available to the public at this time. Based on the findings and recommendations of Haun's Inventory Survey, Archaeological Data Recovery was subsequently conducted at the nine sites (comprised of over 46 features) newly identified during the initial survey report (Haun in Brisbin, *et al.* 1991). These nine sites indicated that this area was utilized for extensive traditional dryland agriculture with limited habitation and some historic ranching activities. The findings of this survey indicate that only a few habitation sites were located below 500 feet amsl and that the agricultural sites were "continuously distributed" throughout the project area.

Fifteen radiocarbon samples collected from data recovery excavations conducted at several of the features yielded sufficient amounts of charcoal suitable for providing reliable dates. The range of the radiocarbon dates suggests initial occupation of the project area occurred during the early 1500s and continued through the historic period (Brisbin *et al.* 1991).

During 1989 and 1990, Archaeological Consultants of Hawaii (ACH) conducted an Archaeological Inventory Survey of the lands immediately adjacent and *mauka* (west) of the above-mentioned PHRI project area (Kennedy 1994). During this survey a total of 18 sites, comprised of 74 features, were newly identified. These sites also indicated that the area was primarily utilized for traditional agriculture, although there was some evidence of limited habitation, including burials and ceremonial use. Kennedy (1994) concluded that these sites can only be a continuation of the occupation described by Brisbin, *et al.* (1991). Five charcoal samples collected from test excavations of several of the features were submitted for radiocarbon dating. These samples yielded dates ranging from A.D. 1040 through 1950.

In 1997, Aki Sinoto Consulting (ASC), in association with Garcia and Associates (GANDA), conducted an Archaeological Inventory Survey of 15 acres of land north of Pōhākea Gulch. One structural feature was documented during this survey. Given the description of this feature and the site location map this may be in association with Site 50-50-09-6062 (PHRI T-6) or 50-50-09-6063 (PHRI T-11) which were initially documented by PHRI in 1988 (Eble and Pantaleo 1997). This site is believed to have been subsequently destroyed during the construction of Pohakea Quarry (Dagher and Dega 2007).

Kennedy and Trimble (1992) surveyed an area to the south of the current project area. This survey overlaps State Site 50-50-09-5659 (historic dirt road), first recorded in the Wilson and Dega (2005) study. While Kennedy and Trimble also note the lack of archaeological features in their project area, due to the obvious history of intense agriculture, their 1992 report does not consider the road upon which their survey takes place to be a potential historic agricultural feature. The project area detailed in their study is no more than 5.0 meters wider than the dirt road itself, and concludes that "No artifacts, midden, or structures of historic or prehistoric significance were identified on the subject property" (1992:11).

An earlier Kennedy report entitled *Letter Report: Walk-Through Examination of the Proposed Ma'alaea Triangle, Maui (TMK: 3-6-01:1)* (1986) also concluded with negative results. This was the first archaeological study done on this parcel and Kennedy does mention (1986:2) nearby sites that are detailed in later studies. This project area is located on the *makai* (southeast) side of Honoapi'ilani Highway and extends to the coastline.

Monitoring within a smaller section of the same project area described by Kennedy (1986) resulted in a single site (a previously disturbed historic burial; State Site 50-50-09-4480) (McGerty, Burgett, and Spear 1998). The McGerty, *et. al* report, entitled *Draft: Monitoring Report on Earth Moving and Construction Excavations, Maui Ocean Center Site, Maui, Hawaii, (TMK: 3-6-01:001 and 019)*, describes a pearl shell button found with the burial. As subsequent subsurface testing would prove, however, the sandy matrix McGerty, *et. al* experienced in the Maui Ocean Center monitoring contrasted the reddish clay of the Wilson and Dega (2005) project area, rendering the likelihood of encountering burials much less. Nonetheless, the McGerty *et. al* (1998) study also mentions two more burials found not far to the north from Site -4480.

McGerty, Dunn, and Spear (1998) conducted Data Recovery in an area of five traditional sites documented by Moore and Kennedy (1995). These sites (50-50-09-3555, -4022, -4137, -

4138, -4139) consisted of 28 features, including petroglyphs, subsurface firepits, agricultural terracing, rock mounds, and a C-shape. Testing done by McGerty *et. al* at Sites -4138 and -4139 did not produce any significant artifacts; however, radiocarbon analysis of a charcoal sample produced a date of A.D. 1390 to 1650. This sample was recovered from the C-shape (Site -4139, Feature C), which was determined to be a prehistoric temporary habitation.

In 2005, SCS (Wilson and Dega 2005) conducted an Archaeological Inventory Survey of the 259.903-acre property immediately adjacent to the south of the current project area. Three historic sites, all related to sugarcane cultivation were newly identified and documented: Site 50-50-09-5657 (clearing mounds), Site 50-50-09-5658 (irrigation modifications), and Site 50-50-09-5659 (dirt road). These three sites were the only archaeological sites found within the project area. Subsurface testing consisting of 20 stratigraphic trenches (a volume of approximately 292.0 cubic meters) was conducted, but did not reveal any subsurface historic, or prehistoric, cultural material. Rather, excavation confirmed the extent, both in physical and temporal depth, of historic and modern agricultural activity within the project area.

However, there is no doubt that the area discussed in Wilson and Dega (2005) was utilized as a segment of an important trail system in the early 1800s, and probably prehistorically as well. The Lahaina Pāli Trail is five miles long and crosses the southern slopes of the West Maui Mountains between Olowalu and Mā'alaea. The start of this trail, now a demonstration trail as part of the Na Ala Hele Trail System, borders the Wilson and Dega 2005 project area near the center of the *mauka* border. By the Historic Period, in which the trail's significance as a probable prehistoric route was realized, the portion *makai* of the current trail head had already been destroyed by sugarcane cultivation. Thus, the trail starts immediately outside the project area, within the State-owned lands. A 1991 study by Tomonari-Tuggle and Tuggle documented 18 sites upon the trail, the majority of historic origin.

In 2000, SCS (Dega and Dagher 2007) conducted an Archaeological Inventory Survey of approximately 60 acres of land for the proposed Pōhākea Quarry expansion project. A total of seven sites comprised of 23 features were recorded and documented during this study. Five of these sites (Sites 50-50-09-6061 through 50-50-09-6065) were previously identified by PHRI in 1988, and two of these sites were newly identified (50-50-09-6066 and 50-50-09-6067). An additional segment of Site 50-50-09-6065 (PHRI T-13) was also identified and documented during the survey. All of these sites were interpreted as historic ranching sites.

MONITORING CONVENTIONS AND METHODOLOGY

This Archaeological Monitoring Plan has been prepared in accordance with the DLNR-SHPD Hawai'i Administrative Rules "Governing Standards for Archaeological Monitoring Studies and Reports" (§13-279). Archaeological monitors will adhere to the following guidelines during monitoring procedures:

1. A qualified archaeologist familiar with the project area and familiar with the results of previous archaeological work conducted in the general area will monitor subsurface construction activities on the parcel. If significant deposits or features are identified and additional field personnel are required, the archaeologist will notify the contractor or representatives before additional personnel are brought to the site. One Monitor will be required for each piece of ground altering equipment in operation during this project.

2. If features or cultural deposits are identified during Archaeological Monitoring, the on-site archaeologist will have the authority to temporarily suspend construction activities at the significant location so that the cultural feature(s) or deposit(s) may be fully evaluated and appropriate treatment of the cultural deposit(s) is conducted. SHPD will be contacted to establish feature significance and potential mitigation procedures. Treatment activities primarily include documenting the feature/deposit through plotting its location on an overall site map, illustrating a plan view map of the feature/deposit, profiling the deposit in three dimensions, photographing the finds (with the exception of human burials), artifact and soil sample collection, and triangulation of the finds. Construction work will only continue in the significant location when all documentation has been completed.

3. Control stratigraphy in association with subsurface cultural deposits will be noted and photographed, particularly those containing significant quantities or qualities of cultural materials. If deemed significant by SHPD and the archaeologist, these deposits will be sampled.

4. In the event that human remains are encountered, all work in the immediate area of the find will cease; the area will be secured from further activity until burial protocol has been completed. The SHPD island archaeologist and SHPD Culture and History Branch will both be immediately notified about the inadvertent discovery of human remains on the property. Notification of the inadvertent discovery will also be made to the Maui/Lanai Islands Burial Council by either SHPD or by the contracting archaeologist. A determination of minimum number of individuals (MNI), age(s), and ethnicity of the burial(s) will be ascertained in the field, following standard osteological procedures (*e.g.*, White 2000). Rules outlined in Chapter 6E, Section 43 shall be followed. Profiles, plan view maps, and illustrative documentation of skeletal parts will be recorded to document the burial(s). The burial location will be identified and marked. If a burial is disturbed, materials excavated from the vicinity of the burial(s) will be manually screened through 1/8-inch wire mesh screens to recover

any displaced skeletal material. If the remains are to be removed, the work will be in compliance with HRS 6.E-43.6, Procedures Relating to Inadvertent Discoveries after approval from all parties (SHPD, Burial Council). All remains recovered from the site will be temporarily stored in a secure, on-site location until final disposition is determined and completed

5. To ensure that contractors and the construction crew are aware of this Archaeological Monitoring Plan and possible site types to be encountered on the parcel, a brief coordination meeting will be held between the construction personnel and monitoring archaeologist prior to initiation of the project. The construction crew will also be informed as to the possibility that human burials could be encountered and how they should proceed if they observe such remains.

6. The archaeologist will provide all coordination with the contractor, SHPD, and any other group involved in the project. The archaeologist will coordinate all monitoring and sampling activities with the safety officers for the contractors to ensure that proper safety regulations and protective measures meet compliance. Close coordination will also be maintained with construction representatives in order to adequately inform personnel of the possibility that open archaeological units or trenches may occur in the project area.

7. As necessary, verbal reports will be made to SHPD and any other agencies as requested.

LABORATORY ANALYSIS

All samples collected during the project, except human remains, will undergo analysis at the SCS laboratory in Honolulu. In the event that human remains are identified and their removal authorized, they will be curated on Maui. Photographs, illustrations, and all notes accumulated during the project will be curated at the Honolulu laboratory. All retrieved artifact and midden samples will be thoroughly cleaned, sorted, and analyzed. Significant artifacts will be photographed, sketched, and classified (qualitative analysis). All metric measurements and weights will be recorded (quantitative analysis). These data will be presented in tabular form within the final monitoring report. Midden samples will be minimally identified to major class (*e.g.*, bivalve, gastropod mollusk, echinoderm, fish, bird, mammal). All data will be clearly recorded on standard laboratory forms which also include number and weight (as appropriate) of each constituent category. These counts will also be included in the final report.

Should any samples amenable to dating be collected from a significant cultural deposit, they will be prepared in the SCS laboratory and submitted for specialized radiocarbon analysis. While primary emphasis for dating is placed on charcoal samples, we do not preclude the use of

other material such as marine shell or nonhuman bone materials. SCS will consult with SHPD and the client if radiocarbon dates are deemed necessary.

All stratigraphic profiles will be drafted for presentation in the final report. Representative plan view sketches showing the location and morphology of identified sites/features/deposits will be compiled and illustrated.

CURATION

If requested by the landowner, SCS will curate all recovered materials in Honolulu (except human remains, which would remain on-island) until a permanent, more suitable curation center is identified. The landowner may request to curate all recovered cultural materials once analysis has been completed.

REPORTING

An Archaeological Monitoring Report documenting the project findings and interpretation, following SHPD guidelines for Archaeological Monitoring reports, will be prepared and submitted 45 days after the completion of fieldwork. This time line is requested to account for any radiocarbon age determinations (typically 30–45 days), if necessary.

If cultural features or deposits are identified during fieldwork, the sites will be evaluated for historical significance and assessed under State and Federal Significance Criteria. The Archaeological Monitoring report will be drafted until accepted by SHPD and will be submitted to both SHPD and the client.

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Appendix I

State Historic Preservation's Approval of AIS Monitoring Plan

(9481)

LINDA LINGLE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
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LAURA H. THIELEN
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BOARD OF LAND AND NATURAL RESOURCES
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DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
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COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND RESOURCES ENFORCEMENT
CONSERVATION AND RESOURCES PROTECTION AND RESTORATION
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

May 22, 2008

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LOG NO: 2008.1558
DOC NO: 0805PC40
Archaeology

Dear Dr. Dega:

SUBJECT: Chapter 6E-42 Historic Preservation Review of an Archaeological Monitoring Plan for ca. 260 Acres (104 Hectare) of Wailuku Agribusiness Property, Ma'alaea/Ukumehame/Waikapu Ahupua'a, Wailuku District, Maui Island, Hawai'i TMK: (2) 3-6-001: 018

Thank you for the opportunity to review this plan, which our staff received on April 22, 2008 (Shefcheck and Dega 2008): *Archaeological Monitoring Plan for 259.903 Acres in Ma'alaea, Ukumehame and Waikapu*...Scientific Consultant Services, Inc.

The plan was prepared upon review of a 2005 archaeological inventory survey conducted by your firm and concurrence from this office that precautionary archaeological monitoring is warranted during future ground altering disturbance associated with development of the subject parcel (SHPD LOG: 2005.1191; DOC NO: 0506MK18). Precautionary monitoring was recommended for ground altering disturbance associated with the destruction of the 13 large clearing mounds which comprise SIHP #50-50-09-5657, because of the possibility that they may contain historically significant cultural materials displaced during previous large scale field clearing activities related to commercial agriculture. It is also possible that culturally significant subsurface deposits may be identified below the plow zone at the base of the clearing piles once the piles have been removed.

As specified in the plan, an archaeologist will be on-site for all ground altering disturbance within the parcel. *However, we wish to recommend that given the size of the clearing piles, if more than one pile is dismantled at the same time, there should be one archaeologist on site at each location.* The plan also states that 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. Further, if human remains are inadvertently exposed, both the SHPD and Maui/Lana'i Islands Burial Council (MLIBC) will be notified and appropriate protocol followed. A report detailing the findings of the monitoring will be prepared and submitted to our office for review within the required 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, Deputy SHPO/State Archaeologist
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

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

April 25, 2008

Michael F. Dega, Ph.D.
Scientific Consultant Services, Inc.
711 Kapiolani Boulevard, Suite 975
Honolulu, Hawai'i 96813

LOG NO: 2008.0423
DOC NO: 0804PC24
Archaeology

Dear Dr. Dega:

SUBJECT: **Chapter 6E-8 Historic Preservation Review of an Archaeological Monitoring Plan for the Proposed Ma'alaea Water Treatment Plant, Effulent Refuse Area, Potential Water Tank Location and Detention Ponds A and B**
Waikapu Ahupua'a, Wailuku District, Island of Maui, Hawai'i
TMK: (2) 3-6-004: 003 por.

Thank you for the opportunity to review this plan, which our staff received on February 19, 2008 (Pestana and Dega 2008): *An Archaeological Monitoring Plan for the Proposed Maalaea Water Treatment Plant, Effluent Refuse Area*...Scientific Consultant Services, Inc. Please accept our apologies for the lengthy delay in commenting.

The plan was prepared as a result of a recommendation from our office that precautionary monitoring be undertaken during ground altering disturbance related to the subject parcel. The recommendation for precautionary monitoring within affected portions (115 of 657.195 acres) of the subject parcel was made primarily because of its location within a coastal environmental zone and the belief that these were the areas settled upon initial colonization of the Hawaiian Islands, greatly increasing the chance that remnant subsurface cultural deposits from the traditional period will be found. Previously identified sites known in the current project area include SIHP #50-50-09-6251 through -6257, all of which are related to post-Contact era commercial agricultural activities. Results of other inventory survey level work in the vicinity also establishes the surrounding area's use during the traditional period for agricultural, habitation and ceremonial activity.

As specified in the plan, there will be one archaeological monitor on site for each piece of ground disturbing equipment in use, 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. The plan also states that in the event culturally significant finds are made, the SHPD will be consulted for mitigation recommendations and further, that if human remains are inadvertently exposed, both the SHPD and Maui/Lana'i Islands Burial Council (MLIBC) will be notified and appropriate 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.

Michael F. Dega, Ph.D.
Page 2

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 Acting Archaeology Branch Chief
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
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April 25, 2008

Michael F. Dega, Ph.D.
Scientific Consultant Services, Inc.
711 Kapiolani Boulevard, Suite 975
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LOG NO: 2008.0423
DOC NO: 0804PC24
Archaeology

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As specified in the plan, there will be one archaeological monitor on site for each piece of ground disturbing equipment in use, 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. The plan also states that in the event culturally significant finds are made, the SHPD will be consulted for mitigation recommendations and further, that if human remains are inadvertently exposed, both the SHPD and Maui/Lana'i Islands Burial Council (MLIBC) will be notified and appropriate 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.

Michael F. Dega, Ph.D.
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Appendix J

Cultural Impact Assessment Report

SCS Project 535-CIA-1

A CULTURAL IMPACT ASSESSMENT REPORT ON APPROXIMATELY 260 ACRES OF LAND IN UKUMEHAME AND WAIKAPŪ AHUPUA`A, WAILUKU DISTRICT, MAUI ISLAND, HAWAI`I [TMK: 3-6-01:18]

Prepared by:

Leann McGerty, B.A.

and

Robert L. Spear, Ph.D.

June 2005

Prepared for:

AKF Development

1132 Norman Drive

Manteca, California 95336

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INTRODUCTION

Scientific Consultant Services (SCS), Inc. has been contracted by AKF Development to conduct a Cultural Impact Assessment on approximately 260 acres of land in Ukumehame and Waikapū Ahupua'a, Wailuku District, Maui Island, Hawai'i [TMK: 3-6-01:18] (Figure 1). According to information provided by the developers, a residential project that includes a mix of single-family and multi-family housing types. Amenities also include an open-space buffer along the highway and a 15-acre community oriented park connected to the neighborhoods by a pedestrian/bicycle path.

The Constitution of the State of Hawai'i clearly states the duty of the State and its agencies is to preserve, protect, and prevent interference with the traditional and customary rights of native Hawaiians. Article XII, Section 7 requires the State to "protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupua'a tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778" (2000). Beginning in 1850 with establishment of Hawai'i Revised Statutes (HRS) 7-1, native Hawaiians were given access rights to undeveloped private property and waterways in order to gather specific natural resources for customary uses. In 1992, the State of Hawai'i Supreme Court, reaffirmed HRS 7-1 and expanded it to include, "native Hawaiian rights...may extend beyond the ahupua'a in which a native Hawaiian resides where such rights have been customarily and traditionally exercised in this manner" (Pele Defense Fund v. Paty, 73 Haw.578, 1992).

Act 50, enacted by the Legislature of the State of Hawaii (2000) with House Bill 2895, relating to Environmental Impact Statements, proposes that:

> ...there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawaii's culture, and traditional and customary rights...[H.B. No. 2895].

Act 50 requires state agencies and other developers to assess the effects of proposed land use or shoreline developments on the "cultural practices of the community and State" as part of the HRS Chapter 343 environmental review process (2001). Its purpose has broadened, "to promote and protect cultural beliefs, practices and resources of native Hawaiians [and] other

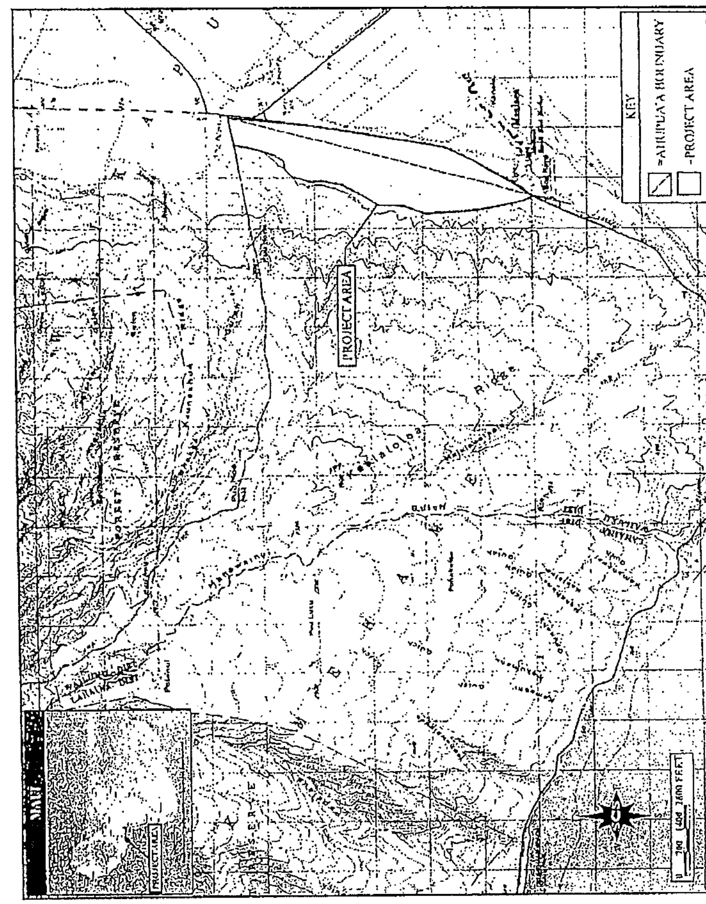

Figure 1: USGS Quadrangle Map Showing the Project Area.

ethnic groups, and it also amends the definition of 'significant effect' to be re-defined as "the sum of effects on the quality of the environment including actions that are...contrary to the State's environmental policies...or adversely affect the economic welfare, social welfare, or cultural practices of the community and State" (H.B. 2895, Act 50, 2000). Thus, not only are properties evaluated for impact to Native Hawaiians, but also for other ethnic groups as well.

Act 50 requires an assessment of cultural practices to be included in the Environmental Assessments and the Environmental Impact Statements, and to be taken into consideration during the planning process. The concept of geographical expansion is recognized by using, as an example, "the broad geographical area, e.g. district or *ahupua'a*" (OEQC 1997). It was decided that the process should identify 'anthropological' cultural practices, rather than 'social' cultural practices. For example, *limu* (edible seaweed) gathering would be considered an anthropological cultural practice, while a modern-day marathon would be considered a social cultural practice.

According to the Guidelines for Assessing Cultural Impacts established by the Hawaii State Office of Environmental Quality Control (OEQC 1997):

> The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religions and spiritual customs. The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both manmade and natural which support such cultural beliefs.

This Cultural Impact Assessment involves evaluating the probability of impacts on cultural values and rights within the project area and its vicinity.

METHODOLOGY

This Cultural Impact Assessment was prepared in accordance with the methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 1997). In outlining the "Cultural Impact Assessment Meodology", the OEQC state:

> ...information may be obtained through scooping, community meetings, ethnographic interviews and oral histories...[1997].

This report contains archival and documentary research, as well as communication with organizations having knowledge of the project area, its cultural resources, and its practices and beliefs. This Cultural Impact Assessment was prepared in accordance with the methodology and content protocol provided in the Guidelines for Assessing Cultural Impacts (OEQC 1997). The assessment concerning cultural impacts should address, but not be limited to, the following matters:

(1) a discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints of limitations with might have affected the quality of the information obtained;

(2) a description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken;

(3) ethnographic and oral history interview procedures, including the circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained;

(4) biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area;

(5) a discussion concerning historical and cultural source materials consulted, the institutions and repositories searched, and the level of effort undertaken, as well as the particular perspective of the authors, if appropriate, any opposing views, and any other relevant constraints, limitations or biases;

(6) a discussion concerning the cultural resources, practices and beliefs identified, and for the resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site;

(7) a discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area, affected directly or indirectly by the proposed project;

(8) an explanation of confidential information that has been withheld from public disclosure in the assessment;

(9) a discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs;

(10) an analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place, and;

(11) the inclusion of bibliography of references, and attached records of interviews which were allowed to be disclosed.

Based on the inclusion of the above information, assessments of the potential effects on cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

ARCHIVAL RESEARCH

Archival research focused on a historical documentary study involving both published and unpublished sources. These included legendary accounts of native and early foreign writers; early historical journals and narratives; historic maps and land records such as Land Commission Awards, Royal Patent Grants, and Boundary Commission records; historic accounts, and previous archaeological project reports.

INTERVIEW METHODOLOGY

When appropriate, interviews are conducted in accordance with Federal and State laws and guidelines. Individuals and/or groups who have knowledge of traditional practices and beliefs associated with a project area or who know of historical properties within a project area are sought for consultation. Individuals who have particular knowledge of traditions passed down from preceding generations and a personal familiarity with the project area are invited to share their relevant information. Often people are recommended for their expertise or can be located by visiting the area. Organizations, such as Hawaiian Civic Clubs, the Island Branch of Office of Hawaiian Affairs, historical societies, Island Trail clubs, and Planning Commissions are invited to contribute their input and suggest further avenues of inquiry, as well as specific individuals to interview.

When interviewees are identified, a standard procedure follows. Personal interviews are taped and then transcribed. These draft transcripts are returned to each of the participants for their review and comments. After corrections are made, each individual signs a release form, making the information available for this study. Key topics discussed with the interviewees vary from project to project, but usually include: personal association to the *ahupua`a*, land use in the project's vicinity; knowledge of traditional trails, gathering areas, water sources, religious sites;

place names and their meanings; stories that were handed down concerning special places or events in the vicinity of the project area; evidence of previous activities identified while in the project vicinity.

In this case, the project area had been used for ranching and agriculture for over 100 years. Letters, briefly outlining the development plans along with maps of the project area, were sent to organizations whose jurisdiction includes knowledge of the area with an invitation for consultation. Consultation was sought from the Maui Office of Hawaiian Affairs, Community Resource Coordinator, Maui; the Office of Hawaiian Affairs, O`ahu; Cultural Resource Planner for the Maui Planning Department; and the Central Maui Civic Club. Based on this research, an assessment of the potential effects on cultural resources in the project area and recommendations for mitigation of these effects can be proposed.

PROJECT AREA AND VICINITY

The project area comprises approximately 260 acres of land situated *mauka* of Honoapi`iland Highway from Ma`alaea Harbor to near the Kuihelani Highway on the lower eastern slope of Pu`ū Kukui in the *ahupua`a* of Ukumehame, with its eastern most section in the *ahupua`a* of Waikapū, West Maui (Figure 2). Ukumehame is bounded on the west by Olowalu Ahupua`a and on the east by Waikapū Ahupua`a. The *makai* portion of the project area is bounded on the east by Ma`alaea Harbor, on the west by rocky, uncultivated abandoned ranch land, and to the south by more abandoned ranch land.

CULTURAL HISTORICAL CONTEXT

The island of Maui ranks second in size of the eight main islands in the Hawaiian Archipelago. Pu`u Kukui, forming the west end of the island (1,215 m above mean sea level), is composed of large, heavily eroded amphitheater valleys that contain well-developed permanent stream systems that watered fertile agricultural lands extending to the coast. The deep valleys of West Maui and their associated coastal regions have been witness to many battles in ancient times and were coveted productive landscapes. Waikapū was the most southwestern valley of the Na Wai Eha (The Four Streams), a region that was famous as the largest continuous area of wet taro cultivation in the islands (Handy 1940:107).

PAST POLITICAL BOUNDARIES

Traditionally, the division of Maui's lands into districts (*moku*) and sub-districts was performed by a *kahuna* (priest, expert) named Kalaiha`ōhia, during the time of the *ali`i* Kaka`alaneo (Beckwith 1940:383; Fornander places Kaka`alaneo at the end of the 15th century or

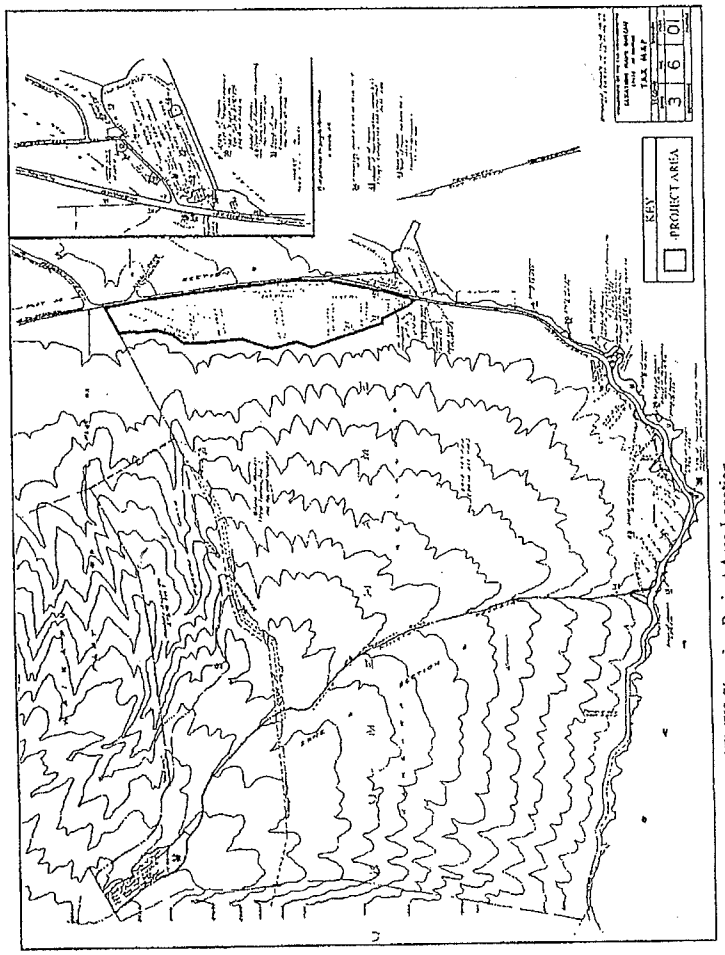

Figure 2: Tax Map Key [TMK] Showing Project Area Location.

the beginning of the 16th century [Fornander 1919–20, Vol. 6:248]). Land was considered the property of the king or *ali`i `ai moku* (the *ali`i* who eats the island/district), which he held in trust for the gods. The title of *ali`i `ai moku* ensured rights and responsibilities to the land, but did not confer absolute ownership. The king kept the parcels he wanted, his higher chiefs received large parcels from him and, in turn, they distributed smaller parcels to lesser chiefs. The *maka`āinana* (commoners) worked the individual plots of land.

In general, several terms, such as *moku*, *ahupua`a*, *`ili* or *`ili`āina* were used to delineate various land sections. A district (*moku*) contained smaller land divisions (*ahupua`a*) that customarily continued inland from the ocean and upland into the mountains. Extended household groups living within the *ahupua`a* were therefore able to harvest from both the land and the sea. Ideally, this situation allowed each *ahupua`a* to be self-sufficient by supplying needed resources from different environmental zones (Lyons 1875:111). The *`ili `āina* or *`ili* were smaller land divisions next in importance to the *ahupua`a* and were administered by the chief who controlled the *ahupua`a* in which it was located (Lyons 1875:33; Lucas 1995:40). The *mo`o`āina* were narrow strips of land within an *`ili*. The land holding of a tenant or *hoa `āina* residing in an *ahupua`a* was called a *kuleana* (Lucas 1995:61). The project area is located in the *ahupua`a* of Ukumehame, meaning literally *paid mehame wood* (most likely referring to the prevalence of the *mehame* [*Antidesma Platyphyllum*] tree prized in ancient times for anvils on which to pound *olonā* [*Touchardia* sp.] and for the red dye made from its fruits), and Waikapū, or *water of the conch* (referring to a special conch shell in the legend of Puapua-lenalena; Pukui *et al.*:214, 223, Rock 1974).

TRADITIONAL SETTLEMENT PATTERNS

The Hawaiian economy was based on agricultural production and marine exploitation, as well as raising livestock and collecting wild plants and birds. Extended household groups settled in various *ahupua`a*. During pre-Contact times, there were primarily two types of agriculture, wetland and dry land, both of which were dependent upon geography and physiography. River valleys, like those present in the western portion of Ukumehame, provided ideal conditions for wetland *kalo* (*Colocasia esculenta*) agriculture, which included pond fields and irrigation canals. Other cultigens, such as *kō* (sugar cane, *Saccharum officinaruma*) and *mai`a* (banana, *Musa* sp.), were also grown and, where appropriate, such crops as *`uala* (sweet potato, *Ipomoea batatas*) were produced. This was the typical agricultural pattern seen during traditional times on all the Hawaiian Islands (Kirch and Sahlins 1992, Vol. 1:5, 119; Kirch 1985). Agricultural development on the leeward side of Maui was likely to have begun early in what is known as the Expansion Period (A.D. 1200–1400 [Kirch 1985]).

WAHI PANI (LEGENDARY PLACES)

Scattered amongst the agricultural and habitation sites were other places of cultural significance to the *kama`āina* of the district. At least three *heiau* were recorded in Ukumehame Ahupua`a. Fishing *ko`a* (shrine) were present at Pā Ko`a beach (presently known as Ukumehame Beach Park) and petroglyphs were inscribed on mountain boulders, the meanings of which have yet to be fully understood (Thrum 1908, 1916, 1917; Walker 1930).

Trails extended from the coast to the mountains, linking the two for both economic and social reasons. A trail known as the *alanui* (or, *King's Trail*), which was built by Kihapi`ilani, extended along the coast passing through all the major communities between Lāhainā and Mākena. A path along Kealaloa ridge leads to the summit of Pu`u Kukui, the headwaters of the Pohakea and Ukumehame streams, and beyond. The Lahaina Pali Trail, constructed in 1841, provided access to other parts of the island.

Most of the *ahupua`a* on the coast have been overshadowed by the famous roadstead and village of Lāhainā, which served as the capitol of the Hawaiian Kingdom after the conquest of Kamehameha until 1855. The ethnographic and historic literature, often our only link to the past, reveals that the lands around Lāhainā were rich agricultural areas irrigated by aqueducts originating in well-watered valleys with permanent occupation predominately on the coast. Handy and Handy have stated the space cultivated by the natives of Lāhainā (district) at about "...three leagues [9 miles] in length, and one in its greatest breadth. Beyond this all is dry and barren; everything recalls the image of desolation" (1972:593). Crops cultivated included coconut, breadfruit, paper mulberry, banana, taro, sweet potato, sugar cane, and gourds.

Ukumehame Valley, with its permanent stream was one of the sources along with Olowalu, Launiupoko, and Kaua`ula, providing agricultural opportunities for the growing leeward population. Handy and Handy reported:

> Southeastward along the coast from the *ali`i* settlement were a number of areas where dispersed populations grew taro, sweet potato, breadfruit and coconut on the slopes below and in the sides of valleys which had streams with constant flow. All this area, like that around and above Lahaina, is now sugar-cane land. Ukumehame had extensive terraces below its canyon, some of which were still planted with taro in 1934; these terrace systems used to extend well down below the canyon...[1972].

The western portion of Ukumehame Ahupua`a offered beach and mountain habitation, as well as agricultural areas along the stream banks and in the southern marshy section close to the coast. Land was valuable in this section and 44 claims for land were made during the Great Māhele (Waihona `Aina 2004). Claimants for some parcels included several illustrious individuals who, although living in Lāhainā, claimed Ukumehame resources (David Malo, Charles Kanaina, etc.; McGerty and Spear 2005). Unlike the typical settlement, reflecting patterns of upland agriculture and coastal house sites, Ukumehame appears to have no distinct activity zones. House lots are found throughout the *ahupua`a* and *lo`i* are not only found along the stream, but continue into the plains fed by *`auwai* that is still extant (Devereux *et al* 1999).

However, the slope where the present project area is located faces east and is much drier than higher elevations to the west that receive as much as twenty times the level of precipitation. Air temperatures are consistently slightly warmer here than the Maui seasonal high and low averages, mostly due to the lower, coastal elevation. Four *mauka-makai* drainages cross the project area. In traditional times, it is likely that these narrow watercourses only flowed in times of heavy rains providing some moisture for marginal agriculture.

Closer to the current project area, in the southwest corner of Wailuku District, prehistoric settlement was not as dense as concentrations to the north. Climate had much to do with that trend, as the Ma`alaea area is a more arid environment than the rain-soaked fields to the north. According to Tomonari-Tuggle and Tuggle (1991), the majority of the pre-Contact population was located southwest of the project area, near what is now Ukumehame Beach State Park. Settlement was also probable north of Kealia Pond in Waikapu Ahupua`a. Handy and Handy report that before the historic sugar cane plantations were established in this region, water from Waikapu Stream "was diverted into lo`i and its overflow was dissipated on the dry plains of the broad isthmus between West and East Maui" (1972:496).

THE GREAT MĀHELE

In the 1840s, traditional land tenure shifted drastically with the introduction of private land ownership based on Western law. While it is a complex issue, many scholars believe that in order to protect Hawaiian sovereignty from foreign powers, Kauikeaouli (Kamehameha III) was forced to establish laws changing the traditional Hawaiian economy to that of a market economy (Kame`eleihiwa 1992:169–70, 176; Kelly 1983:45, 1998:4; Daws 1962:111; Kuykendall 1938 Vol. I:145). The Great Māhele of 1848 divided Hawaiian lands between the king, the chiefs, the government, and began the process of private ownership of lands. The subsequently awarded parcels were called Land Commission Awards (LCAs). Once lands were thus made available

and private ownership was instituted, the *maka'āinana* (commoners), if they had been made aware of the procedures, were able to claim the plots on which they had been cultivating and living. These claims did not include any previously cultivated but presently fallow land, *'okipū* (on O'ahu), stream fisheries, or many other resources necessary for traditional survival (Kelly 1983; Kame'eleihiwa 1992:295; Kirch and Sahlins 1992). If occupation could be established through the testimony of two witnesses, the petitioners were awarded the claimed LCA and issued a Royal Patent, after which they could take possession of the property (Chinen 1961:16). There were 44 claims for land in Ukumehame during the Māhele, but none were in or near the project area (Waihona 'Aina 2004). Seventeen *'ili* were also named and some of the *ahupua'a* became government land to sell as they saw fit.

Sugar was to be the economic future of Hawai'i and as early as 1828, two Chinese brothers, Ahung and Atai, of Honolulu's Hungtai Company, arrived in Wailuku to explore the possibility of setting up one of its earliest sugar mills. Atai soon created a plant that processed sugar cane cultivated by Hawaiians, named the Hungtai Sugar Works (Dorrance and Morgan 2000:15–16). Ahung then joined Kamehameha III's sugar producing enterprise, although by 1844 both operations had ceased. The Wailuku Sugar Company was the next to follow, in 1862, and would expand sugar production over the next 126 years of its existence—4,450 acres by 1939, still more than three decades before its maximum production levels.

As it expanded its territory, the Wailuku Sugar Company first appeared on maps of the project area in the in the 1920s (Bureau of Conveyances, Grant 9794), although their acquisition of the project area land may have been as early as the turn of the century (Kennedy and Trimble 1992:4). Successive grants (Grant 10294 through to Grant S-13975) would follow in decades following and fully encompass the Ukumehame Ahupua'a side of the project area to Wailuku sugar land. Kennedy and Trimble (1992:4) summarize the history of the Waikapu Ahupua'a (*makai*) portion of the project area by detailing its acquisition from the state government on November 18, 1875 by Henry Cornwell (Grant 3152). Cornwell subsequently sold to Claus Spreckels, and by the turn of the century, the entire project area was under sugar cane cultivation.

Wailuku Sugar Company ended production in 1988, having averaged over 30,000 tons of sugar produced annually at its pinnacle in the 1970s (Dorrance and Morgan 2000:66). Owner C. Brewer and Company, Ltd. shut down sugar cultivation on the project area, which was then used almost entirely for pineapple cultivation starting no later than 1992 (Kennedy and Trimble 1992:1). The lands were under pineapple for at least the next three years (Tomonari-Tuggle

1995:11)—probably slightly longer—before shifting to smaller-scale 'garden' plots. Recently, a few plots of land in the southern portion of the project area were leased. These agricultural ventures have included banana trees, gourds, and papaya. Portions of the upper valley of Ukumehame have been used for cattle grazing and, from the 1970s to the present time, there have been a number of families cultivating plants along the stream gulch. The traditional Hawaiian *'auwai* has been repaired and is now utilized for *lo'i kalo* irrigation. Now that sugar is longer an issue, the stream has found its way to the coast, reviving the stream's ecosystem.

The current project area was utilized as a segment of an important trail system in the early 1800s, and probably prehistorically as well. The Lahaina Pali Trail is five miles long and crosses the southern slopes of the West Maui Mountains between Olowalu and Ma'alaea. The start of this trail, now a demonstration trail as part of the Na Ala Hele Trail System, borders the current project area near the center of the *mauka* border. By the historic period in which the trail's significance as a probable prehistoric route was realized, the portion *makai* of the current trail head (*i.e.*, the portion transecting the width of the current project area) was already destroyed by sugarcane cultivation. Thus, the trail starts immediately outside the project area, within the state-owned lands. A 1991 study by Tomonari-Tuggle and Tuggle documented 18 archaeological sites upon the trail, the majority of historic origin (Figure 3).

SUMMARY ANDCULTURAL ASSESSMEMNT

As suggested in the "Guidelines for Accessing Cultural Impacts" (OEQC 1997), CIAs incorporating personal interviews should include ethnographic and oral history interview procedures, circumstances attending the interviews, as well as the results of this consultation. It is also permissible to include organizations with individuals familiar with cultural practices and features associated with the project area.

The "level of effort undertaken" (OEQC 1997) has not been officially defined and is left up to the investigator. To SCS, a good faith effort means contacting agencies by letter, interviewing people who may be affected by the project or who know its history, researching sensitive areas and previous land use, holding meetings in which the public is invited to testify, notifying the community through the media, and other appropriate strategies based on the type of project being proposed and its impact potential. In the case of the present parcel that has been agricultural for over 100 years, letters of inquiry were sent to organizations whose expertise would include the project area. Consultation was sought from the Maui Office of Hawaiian Affairs, Community Resource Coordinator, Maui; the Office of Hawaiian Affairs, O'ahu;

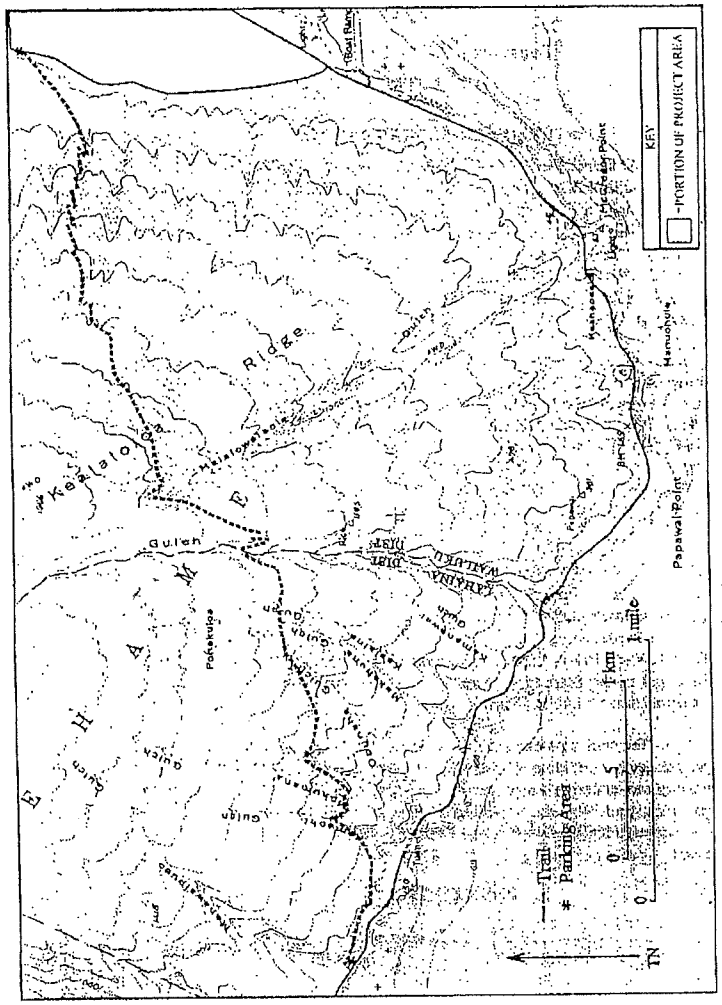

Figure 3: Map Showing Trail and Portion of Project Area.

Cultural Resource Planner for the Maui Planning Department; and the Central Maui Civic Club. Archival research included historical and cultural resources.

Additionally, historical and cultural source materials were also consulted were extensively used and can be found listed in the References Cited portion of the report. Such scholars as Thrum (1908, 1916 1917), Fornander (1919, 1969), Walker (1930), Kuykendall (1938), Beckwith (1940), Chinen (1961), Handy and Handy (1972), Puku`i *et al.* (1974), Kelly (1983, 1998), and Kame`eleihiwa (1992) have contributed, and continue to contribute, to our knowledge and understanding of Hawai`i, past and present. The works of these and other authors were consulted and incorporated in the report where appropriate. Land use document research was supplied by the Waihona `Aina Data base (2004).

Analysis of the potential effect of the project on cultural resources, practices or beliefs, the potential to isolate cultural resources, maintain practices or beliefs in their original setting, and the potential of the project to introduce elements that may alter the setting in which cultural practices take place is a requirement of the OEQC (No. 10, 1997). The project area has not been used for traditional cultural purposes within recent times. Based on historical research and the responses of the Maui Office of Hawaiian Affairs; Community Resource Coordinator, Maui; the Office of Hawaiian Affairs, O`ahu; the Cultural Resource Planner for the Maui Planning Department; and the Central Maui Civic Club, it is reasonable to conclude that Hawaiian rights related to gathering, access or other customary activities will not be affected and there will be no direct adverse effect upon cultural practices or beliefs.

However, the visual impact of the project from surrounding vantage points, for example, the highway, mountain trails, and the ocean is intrinsically more difficult to evaluate. Indirectly, each development may not seem to necessarily impose a negative cultural impact, especially when located on parcels that had been in agriculture for a century. But it is important to recognize that native Hawaiian cultural beliefs and practices are continually affected by the loss of land to development that intrudes into the natural setting and alters the landscape. These changes may affect certain cultural practices outside the project area. The custom of fishermen using certain landforms to triangulate secret, family fishing *ko`a* at sea, is an example of this affect. Maui has seen the development process intensify dramatically in the last 30 years, a trend that suggests the eventual permanent loss of traditional landscapes.

Documents submitted to SCS by AKF Development propose a residential project that will include a mix of single-family and multi-family housing types. Amenities also include an

open-space buffer along the highway and a 15-acre community-oriented park linked to the neighborhoods with a pedestrian/bicycle path. Based on the response from various organizations and through archival research, it is reasonable to conclude that, pursuant to Act 50, the exercise of native Hawaiian rights, or any ethnic group, related to gathering, access or other customary activities will not be affected by development activities on Parcel 18. It is recommended that Cultural Advisors be consulted during the planning process. In this way, appropriate mitigation measures, if needed, can be put in place before development occurs. However, because there were no activities identified, there are likely no adverse effects.

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Appendix K

Biological Resources Survey Report

BIOLOGICAL RESOURCES SURVEY

for the

MA'ALAEA PLANTATION PROJECT

MA'ALAEA, MAUI, HAWAII

by

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March 2014

Prepared for: JES LLC
dba Spencer Development

BIOLOGICAL RESOURCES SURVEY
MA'ALAEA PLANTATION PROJECT
MA'ALAEA , MAUI

INTRODUCTION

The Ma'alaea Plantation project lies on approximately 260 acres of undeveloped land north of Ma'alaea Town. The project area is located above the Honoapi'ilani Highway between Ma'alaea and to just beyond the North Kihei Road junction (see Figure 1). This study of the biological resources on this property was initiated by the owners in compliance with environmental requirements of the planning process.

SITE DESCRIPTION

The project area lies on gently sloping land, extending from the highway up to the edge of the foothills of the West Maui Mountains. Elevations range from 30 feet up to 200 feet above sea level. Four small unnamed gullies pass through the project and drain to the east of Ma'alaea. Vegetation consists primarily of open grasslands with a few scattered trees. Soils are characterized as Pulehu cobbly clay loam, Ewa cobbly silty clay and Ewa silty clay which are all well drained alluvial soils (Foote et al, 1972). Annual rainfall averages between 14 inches and 16 inches with the bulk occurring during the winter months (Armstrong, 1983).

BIOLOGICAL HISTORY

The entire project area was once a dry native shrubland with scattered trees such as wiliwili (*Erythrina sandwicensis*). It was cleared for agricultural use in the late 1800's and was cultivated for sugar cane for over 100 years. During the 1990's pineapple was cultivated for a few years, after which the area was leased out for small scale agriculture until 2003. For the past eleven years the land has been used for grazing. Little of the original vegetation remains except in the some of the small gullies.

SURVEY OBJECTIVES

This report summarizes the findings of a flora and fauna survey of the proposed Ma'alaea Plantation project which was conducted during February, 2014.

The objectives of the survey were to:

1. Document what plant and animal 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. Make recommendations to the landowner with respect to any sensitive species or habitats found in the project area.

BOTANICAL SURVEY REPORT

SURVEY METHODS

A walk-through botanical survey method was used following a route to ensure complete coverage of the area. Areas most likely to harbor native or rare plants such as gullies were more intensively examined. Notes were made on plant species, distribution and abundance as well as terrain and substrate.

DESCRIPTION OF THE VEGETATION

The vegetation throughout the entire area is an open grassland consisting primarily of two abundant grasses, Guinea grass (*Megathyrsus maximus*) and buffelgrass (*Cenchrus ciliaris*) along with a variety of other herbaceous species and a few shrubs and trees. A total of 67 plant species were recorded during two site visits. Also common were Carolina lovegrass (*Eragrostis pectinacea*), bristly foxtail (*Setaria verticillata*), spiny amaranth (*Amaranthus spinosus*), aheahea (*Chenopodium murale*), hairy merremia (*Merremia aegyptia*), lion's ear (*Leonotis nepetifolia*), cheese weed (*Malva parviflora*) and apple-of-Peru (*Nicandra physalodes*). Just four native plant species were recorded, the endemic wiliwili tree (*Erythrina sandwicensis*) and three shrubs, 'ilima (*Sida fallax*), 'uhaloa (*Waltheria indica*) and popolo (*Solanum americanum*). Ten small wiliwili trees were found growing in the larger gully running through the center of the project area.

DISCUSSION

The vegetation throughout the project area is dominated by non-native species. This is a result of over a century of intensive agricultural activity. Only four widespread dryland native species occur here. No officially listed Threatened or Endangered plants (U.S. Fish and Wildlife Service 2014) are found on the site, nor do any plants proposed as candidates for such status occur on the property. No special habitats were found on the property either.

Because the vegetation on the site is dominated primarily by non-native plants and because there are no rare or protected native species within the project area, there is little of botanical concern and the proposed project is not expected to have a significant negative impact on the botanical resources in this part of Maui.

RECOMMENDATIONS

It is recommended that the native wiliwili trees growing in one of the gullies be left to provide a native accent to the project development. These hardy trees are a signature species of Hawaii's dryland forests and flourish in this habitat with no care required.

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. Taxonomy and nomenclature of the flowering plants (Monocots and Dicots) are in accordance with Wagner et al. (1999).

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			
CYPERACEAE (Sedge Family)			
Cyperus rotundus L.	nut sedge	non-native	rare
POACEAE (Grass Family)			
Cenchrus ciliaris L.	buffelgrass	non-native	abundant
Chloris barbata (L.) Sw.	swollen fingergrass	non-native	uncommon
Chloris virgata Sw.	feather fingergrass	non-native	uncommon
Cynodon dactylon (L.) Pers.	Bermuda grass	non-native	uncommon
Digitaria insularis (L.) Mez ex Ekman	sourgrass	non-native	rare
Digitaria violascens Link	*kukae pua'a*	non-native	rare
Eragrostis pectinacea (Michx.) Nees	Carolina lovegrass	non-native	common
Megathyrsus maximus (Jacq.) Simon & Jacobs	Guinea grass	non-native	abundant
Melinis repens (Willd.) Zizka	Natal redtop	non-native	rare
Setaria verticillata (L.) P. Beauv.	bristly foxtail	non-native	common
Tragus berteronianus Schult.	bur grass	non-native	uncommon
XANTHORRHOEACEAE (Grass Tree Family)			
Aloe vera (L.) Burm. f.	aloe	non-native	rare
DICOTS			
AMARANTHACEAE (Amaranth Family)			
Alternanthera pungens Kunth	khaki weed	non-native	rare
Amaranthus hybridus L.	green amaranth	non-native	rare
Amaranthus spinosus L.	spiny amaranth	non-native	common
Atriplex subereta Verd.	saltbush	non-native	rare
Chenopodium murale L.	*āheahea*	non-native	common
APOCYNACEAE (Dogbane Family)			
Asclepias physocarpa (E.Mey.) Schlect.	baloon plant	non-native	rare
Calotropis procera (Aiton) W.T. Aiton	small crown flower	non-native	rare
ASTERACEAE (Sunflower Family)			
Bidens pilosa L.	Spanish needle	non-native	rare
Emilia fosbergii Nicolson	red pualele	non-native	rare
Galinsoga parviflora Cav.	----------	non-native	rare
Flaveria trinervia (Spreng.) C. Mohr	clustered yellowtops	non-native	rare
Pluchea carolinensis (Jacq.) G. Don	sourbush	non-native	rare
Senecio madagascariensis Poir.	fireweed	non-native	rare
Sonchus oleraceus L.	pualele	non-native	uncommon
Tridax procumbens L.	coat buttons	non-native	uncommon
Verbesina encelioides (Cav.) Benth. & Hook.	golden crown-beard	non-native	uncommon
Xanthium strumarium L.	kīkania	non-native	rare
BRASSICACEAE (Mustard Family)			
Sisymbrium altissimum L.	tumble mustard	non-native	uncommon
CONVOLVULACEAE (Morning Glory Family)			
Ipomoea triloba L.	little bell	non-native	rare
*Merremia aegypti*a (L.) Urb.	hairy merremia	non-native	common

SCIENTIFIC NAME	COMMON NAME	STATUS	ABUNDANCE
CUCURBITACEAE (Gourd Family)			
Cucumis dipsaceus Ehrenb. ex Spach	hedgehog gourd	non-native	uncommon
EUPHORBIACEAE (Spurge Family)			
Euphorbia hirta L.	hairy spurge	non-native	rare
Euphorbia hypericifolia L.	graceful spurge	non-native	rare
Ricinus communis L.	Castor bean	non-native	rare
FABACEAE (Pea Family)			
Acacia farnesiana (L.) Willd.	klu	non-native	rare
Chamaecrista nictitans (L.) Moench	partridge pea	non-native	uncommon
Crotalaria incana L.	fuzzy rattlepod	non-native	uncommon
Crotalaria pallida Aiton	smooth rattlepod	non-native	rare
Crotalaria retusa L.	rattlepod	non-native	rare
Desmanthus pernambucanus (L.) Thellung	slender mimosa	non-native	uncommon
Desmodium tortuosum (Sw.) DC.	Florida beggarweed	non-native	rare
Erythrina sandwicensis Degener	*wiliwili*	endemic	rare
Indigofera hendecaphylla Jacq.	creeping indigo	non-native	rare
Indigofera suffruticosa Mill.	*inikō*	non-native	uncommon
Leucaena leucocephala (Lamarck) de Wit	*koa haole*	non-native	uncommon
Macroptilium atropurpureum (DC.) Urb.	siratro	non-native	uncommon
Macroptilium lathyroides (L.) Urb.	wild bean	non-native	uncommon
Prosopis pallida (Humb. & Bonpl. ex Willd.)	*kiawe*	non-native	uncommon
LAMIACEAE (Mint Family)			
Leonotis nepetifolia (L.) R. Br.	lion's ear	non-native	common
MALVACEAE (Mallow Family)			
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	non-native	rare
Malva parviflora L.	cheese weed	non-native	common
Malvastrum cormandelianum (L.) Garcke	false mallow	non-native	uncommon
Sida fallax Walp.	*'ilima*	indigenous	uncommon
Sida rhombifolia L.	Cuban jute	non-native	rare
Sida spinosa L.	prickly sida	non-native	uncommon
Waltheria indica L.	*'uhaloa*	indigenous	uncommon
MORACEAE (Mulberry Family)			
Ficus microcarpa L. f.	Chinese banyan	non-native	rare
NYCTAGINACEAE (Four-o'clock Family)			
Boerhavia coccinea Mill.	scarlet spiderling	non-native	rare
PLANTAGINACEAE (Plantain Family)			
Misopates orontium (L.) Raf.	lesser snapdragon	non-native	rare
SOLANACEAE (Nighshade Family)			
Datura stramonium L.	jimson weed	non-native	uncommon
Nicandra physalodes (L.) Gaertn.	apple of Peru	non-native	common
Nicotiana glauca R.C. Graham	tree tobacco	non-native	uncommon
Solanum americanum Mill.	pōpolo	indigenous	rare
Solanum lycospersicum L.	cherry tomato	non-native	uncommon

FAUNA SURVEY REPORT

SURVEY METHODS

A walk-through fauna 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

A total of five mammal species or their signs were observed on the project area during two site visits. Taxonomy and nomenclature follow Tomich (1986). Several horses (*Equus caballus*) were pastured in the southern part of the property. Tracks of axis deer (*Axis axis*) were seen on the dirt road at the top of the property. Dog (*Canis familiaris*) tracks were seen in the same area. A mouse (*Mus domesticus*) was seen scurrying through underbrush.

During the evening two area were surveyed to determine if the native ōpe'ape'a or Hawaiian hoary bat, an endemic and an Endangered species was present in the project area. A bat detector, Batbox IIID, was employed set to the frequency of 27,000 Hertz which is the frequency these bats are known to use for echolocation when pursuing flying insect prey. Bat activity was detected at one of the sites near the middle of the project area. An abundance of flying insects was observed, the result and response to a proliferation of fresh plant growth from winter rains. Bats are drawn to areas with such abundance of insect life.

BIRDS

There was substantial birdlife diversity in this project area. An ample supply of grass and herbaceous plant seeds were available following a good winter wet season. Thirteen species of non-native birds and one endemic species were observed, most taking advantage of this seasonal food supply. Taxonomy and nomenclature follow American Ornithologists' Union (2012).

Two species were common throughout the project area, the zebra dove (*Geopelia striata*) and the chestnut mannikin (*Lonchura malacca*). The remaining species were all uncommon or rare in occurrence. One pair of the endemic and Endangered nēnē or Hawaiian goose (*Branta sandvicensis*) were seen during the early evening flying north, high above the project area toward the Waikapu golf courses where they are known to feed on grasses and bed down near water features.

INSECTS

Insect life was diverse and abundant throughout the project area. Lush plant growth triggered a seasonal explosion of insect activity. Taxonomy and nomenclature follow Nishida et al (1992). A total of 28 insect species were recorded during two site visits. One species, the beet webworm moth (*Spoladea recurvalis*) was abundant throughout the project area. Also common were the three-lined potato beetle (*Lema trilineata daturaphila*) and the cabbage butterfly (*Pieris rapae*). The remaining 25 species were uncommon or rare in occurrence.

Three native insect species were recorded. These included the endemic and Endangered Blackburn's sphinx moth (*Manduca blackburni*), an unidentified endemic yellow-faced bee (*Hylaeus* sp.) and the indigenous globe skimmer dragonfly (*Pantala flavescens*).

DISCUSSION AND RECOMMENDATIONS

The fauna species observed within the project area were primarily non-native and of little conservation concern. There were, however, five native species that were recorded, and three of these are of special focus and concern and require consultation with the U.S. Fish and Wildlife Service.

Ōpe'ape'a or Hawaiian hoary bats were detected in the center of the project area. These bats are on the Endangered Species List. They are highly mobile and move around seasonally following changing food availabilities and climates. Their use of the project area is thus probably incidental, but provisions need to be made that will protect them during the breeding and pupping season.

The nēnē or Hawaiian goose is also an Endangered species. The two birds that were seen flying over the project area are powerful fliers and wide-ranging in search of food. They did not land on the property but are likely to occasionally do so to forage on tender young grasses and herbaceous vegetation. When present, these nēnē need to be given enough space to prevent harassment or injury. The U.S. Fish and Wildlife Service can provide guidance on this.

The Blackburn's sphinx moth is another Endangered species that requires consideration and guidance. This large moth lays its eggs exclusively on toxic plants in the nightshade family. When the eggs hatch they feed on the leaves of these plants, ingesting the toxins to which they have come immune, and they use these toxins to ward off would be predators. Two species of the nightshade family, the tree tobacco (*Nicotiana glauca*) and the jimson weed (*Datura stramonium*), that these Endangered moths feed on were found in the project area during the flora survey. Both of these species thrive on disturbance and are often spread around by equipment and the soil and gravel materials they move. Four populations of tree tobacco plants were found in the northern part of the project area in highly disturbed areas, one along a road shoulder and three on stockpiled gravel mounds. All of these populations of tree tobacco were examined and all of them showed signs of Blackburn's sphinx moth activity. Leaf feeding damage was found at all sites as well as one egg and two mature larvae. The jimson weed plants were more widely dispersed across the property. No Blackburn's sphinx moth activity was found on these scattered jimson weed plants.

The U.S. Fish and Wildlife Service has guidelines for the removal of these host plants, the timing of which will avoid the undue disturbance or destruction of these Endangered moths. They need to be consulted for guidance on this matter.

The last of the native fauna were two insects that are not Endangered species, an unidentified Hylaeus bee (*Hylaeus* sp.) and the globe skimmer dragonfly (*Pantala flavescens*). There are many species of Hylaeus in Hawaii, a few of which are of wide distribution on Maui. The globe skimmer has a nearly worldwide distribution and is of no conservation concern.

There are no further recommendations regarding fauna species in the project area beyond the initiation of consultation with the U.S. Fish & Wildlife Service regarding the three Endangered species discussed above.

ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged in descending abundance within three groups: Mammals, Birds and Insects. 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
MAMMALS			
Axis axis Erxleben	axis deer	non-native	uncommon
Equus caballus L.	domestic horse	non-native	uncommon
Canis familiaris L.	domestic dog	non-native	rare
Mus domesticus Rutty	house mouse	non-native	rare
Lasiurus cinereus semotus H. Allen	Hawaiian hoary bat	endemic	rare
BIRDS			
Geopelia striata L.	zebra dove	non-native	common
Lonchura mallaca L.	chestnut mannikin	non-native	common
Francolinus pondicerianus Gmelin	gray francolin	non-native	uncommon
Bubulcus ibis L.	cattle egret	non-native	uncommon
Lonchura cantans Gmelin	African silverbill	non-native	uncommon
Acridotheres tristis L.	common myna	non-native	uncommon
Lonchura punctulata L.	nutmeg mannikin	non-native	uncommon
Streptopelia chinensis Scopoli	spotted dove	non-native	rare
Francolinus francolinus L.	black francolin	non-native	rare
Passer domesticus L.	house sparrow	non-native	rare
Alauda arvensis L.	sky lark	non-native	rare
Branta sandvicensis Vigors	nēnē, Hawaiian goose	endemic	rare
Mimus polyglottos L.	northern mockingbird	non-native	rare
Gallus gallus L.	chicken	non-native	rare

COMMON NAME	SCIENTIFIC NAME	STATUS	ABUNDANCE
INSECTS			
Order ARANAE - true spiders			
ARANEIDAE (Orb Weaver Family)			
Araneus diadematus Clerck	European garden spider	non-native	uncommon
Order COLEOPTERA - beetles			
CHRYSOMELIDAE (Leaf Beetle Family)			
Lema trilineata daturaphila Kogan & Goeden	three-lined potato beetle	non-native	common
Order DERMAPTERA - earwigs			
LABIIDAE (Little Earwig Family)			
Spirolabia dubronyi Hebard	little earwig	non-native	rare
Order DIPTERA - flies			
MUSCIDAE (Housefly Family)			
Musca domestica L.	housefly	non-native	rare
Musca sorbens Wiedemann	dung fly	non-native	uncommon
SYRPHIDAE (Hoverfly Family)			
Simosyrphus grandicornis Macquart	Australian hoverfly	non-native	uncommon
Order HETEROPTERA - true bugs			
PENTATOMIDAE (Stink Bug Family)			
Nezara viridula L.	green stink bug	non-native	rare
RHOPALIDAE (Scentless Plant Bug Family)			
Liorhyssus hyalinus Fabricius	no common name	non-native	rare
Order HYMENOPTERA - bees, wasps			
APIDAE (Honey Bee Family)			
Apis mellifera L.	honey bee	non-native	rare
Xylocopa sonorina Smith	Sonoran carpenter bee	non-native	uncommon
COLLETIDAE (Yellowface Bee Family)			
Hylaeus sp. undet.	yellowface bee	endemic	rare
FORMICIDAE (Ant Family)			
Pheidole megacephala Fabricius	big-headed ant	non-native	uncommon
MEGACHILIDAE (Leaf Cutter Family)			
Megachile gentilis Cresson	leaf cutter bee	non-native	rare
VESPIDAE (Vespid Wasp Family)			
Polistes aurifer Saussure	golden paper wasp	non-native	uncommon
Order LEPIDOPTERA - butterflies, moths			
CRAMBIDAE (Grass Moth Family)			
Spoladea recurvalis Fabricius	beet webworm moth	non-native	abundant

COMMON NAME	SCIENTIFIC NAME	STATUS	ABUNDANCE
HESPERIIDAE (Skipper Butterfly Family)			
Hylephila phyleus Drury	fiery skipper	non-native	uncommon
LYCAENIDAE (Gossamer-winged Butterfly Family)			
Lampides boeticus L.	long tail blue butterfly	non-native	uncommon
NOCTUIDAE (Owlet Moth Family)			
Achaea janata L.	Castor semi-looper	non-native	uncommon
Eudocima fullonia clerck	fruit piercing moth	non-native	rare
NYMPHALIDAE (Brush-footed Butterfly Family)			
Agraulis vanillae L.	passion flower butterfly	non-native	rare
Danaus plexippus L.	monarch butterfly	non-native	uncommon
Vanessa cardui L.	painted lady butterfly	non-native	rare
PIERIDAE (Small White and Sulphur Butterfly Family)			
Phoebis agarithe Boisduval	large orange sulphur butterfly	non-native	uncommon
Pieris rapae L.	cabbage butterfly	non-native	common
SPHINGIDAE (Sphinx Moth Family)			
Manduca blackburni Butler	Blackburn's sphinx moth	endemic	uncommon
Order ODONATA - dragonflies, damselflies			
LIBELLULIDAE (Skimmer Dragonfly Family)			
Pantala flavescens Fabricius	globe skimmer	indigenous	rare
Order ORTHOPTERA - grasshoppers, crickets			
ACRIDIDAE (Grasshopper Family)			
Oedaleus abruptus Thunberg	short-horned grasshopper	non-native	uncommon
Schistocerca nitens Thunberg	gray bird grasshopper	non-native	uncommon

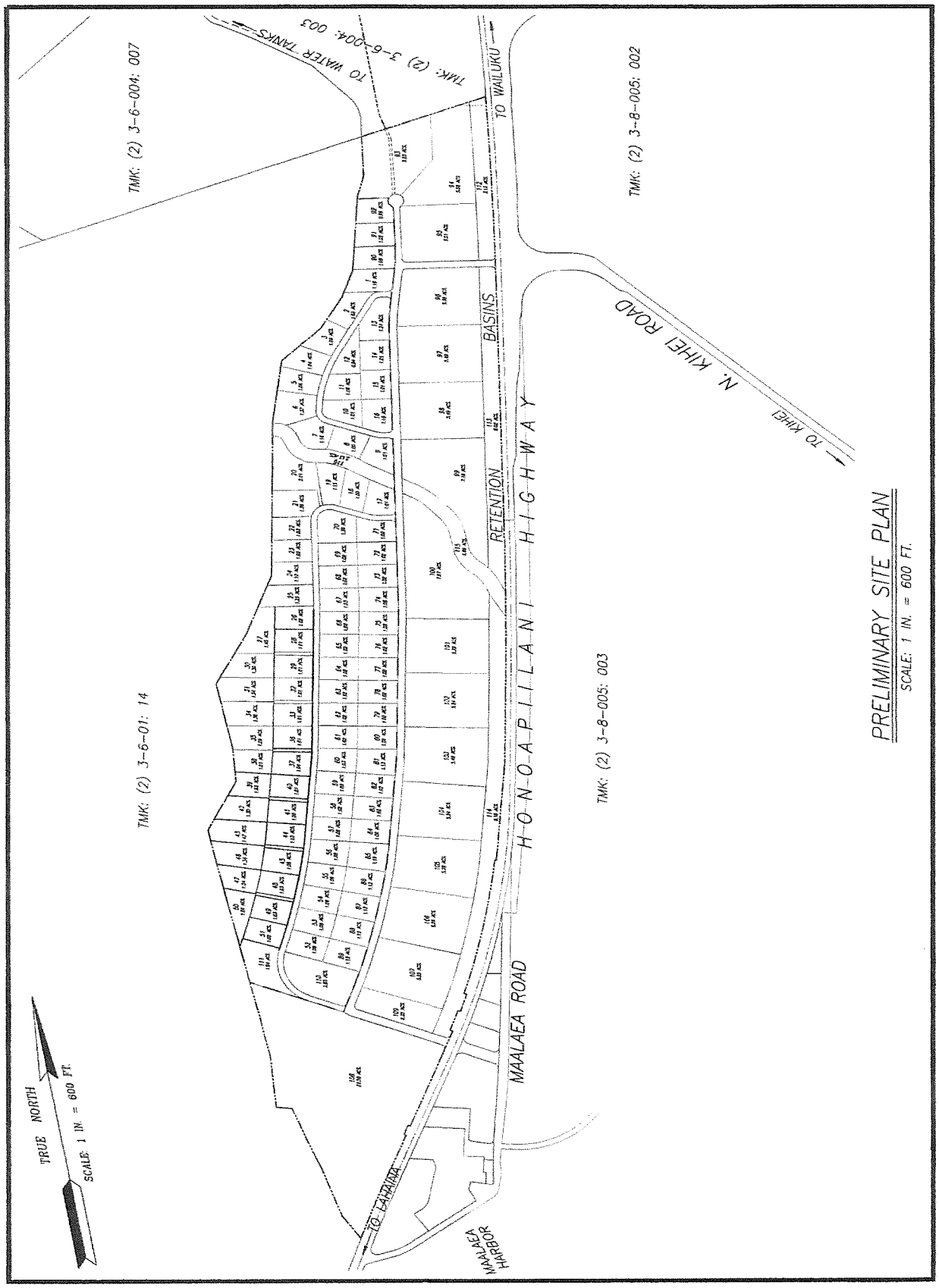

Figure 1. Project Area – Ma'alaea, Maui.

Figure 2. Project Area – view northeast from the center of the area.
Gently sloping grassland with a shallow gully with small trees in the distance.

Figure 3. Project Area – View southeast toward Ma'alaea.
Gently sloping grassland with Honoapi'ilani Highway in the distance.

Figure 4. A small gully in the center of the project area with wiliwili trees (*Erythrina sandwicensis*).

Figure 5. A tree tobacco plant (*Nicotiana glauca*) growing in the project area.

Figure 6. A 3.5 inch long submature larva of the Blackburn's sphinx moth (*Manduca blackburni*) on a tree tobacco plant on one of the gravel mounds.

Figure 7. A tree tobacco plant with Blackburn's sphinx moth larva feeding damage (missing leaves).

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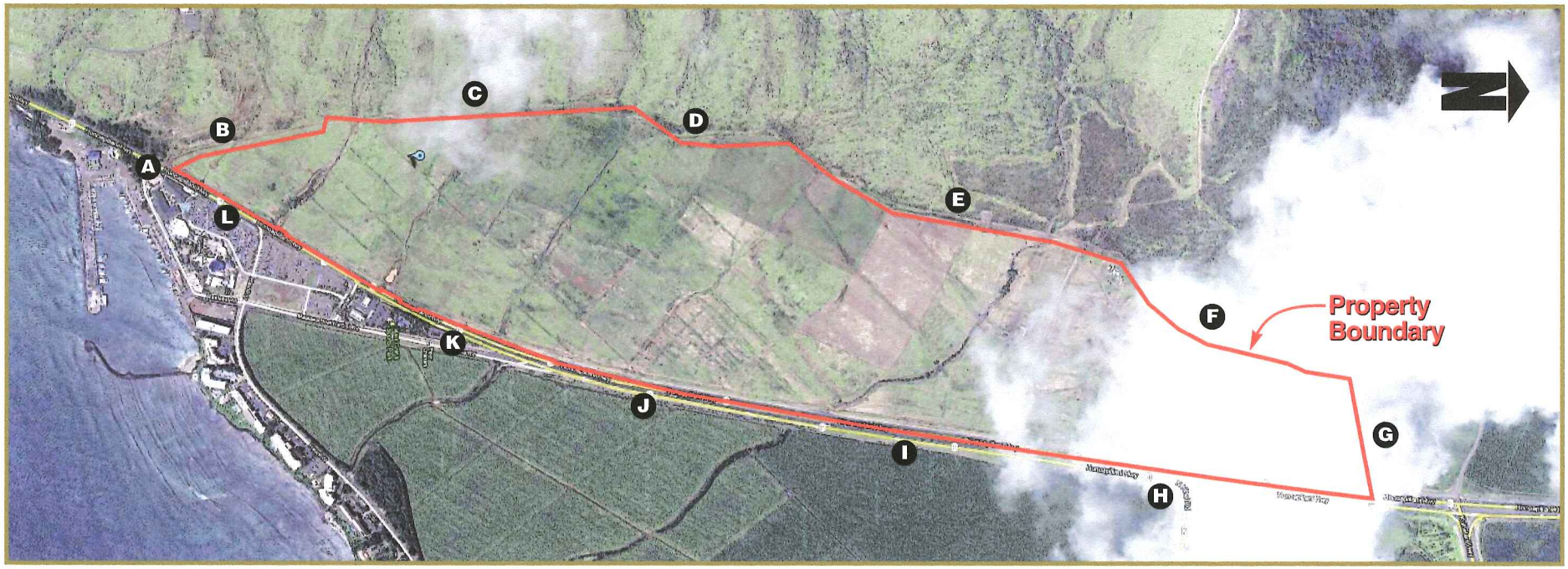
Appendix L

View Photos

Of Project Site

Aerial Photo of Project Site



Ⓐ View facing North from South corner of proposed property

Ⓑ View facing East from West adjoining property

Ⓒ View facing East from West adjoining property

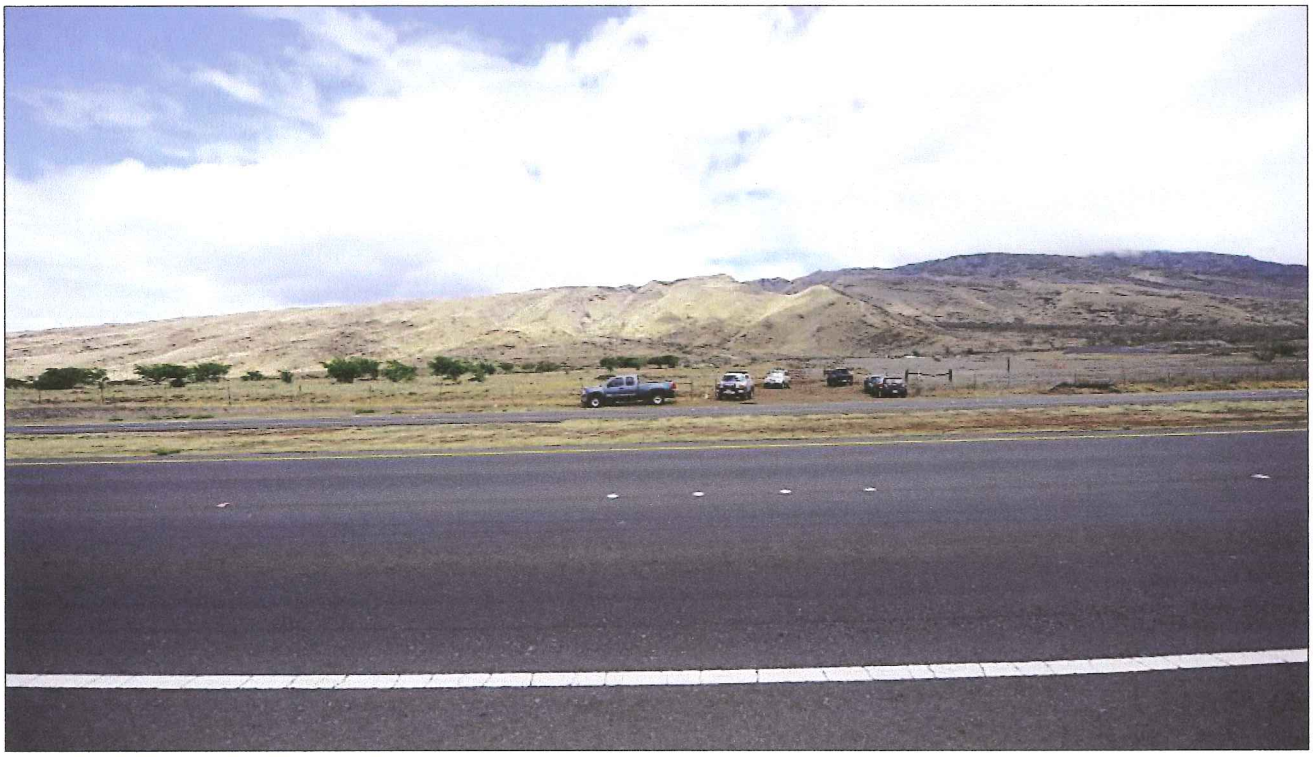
Ⓓ View facing East from West adjoining property

E View facing East from West adjoining property

F View facing East from West adjoining property

Ⓖ View facing South from Northern boundary of property

Ⓗ View facing West from Eastern adjoining property across Honapiʻilani Highway and corner of North Kīhei Road



I View facing West from Eastern adjoining property across Honapi'ilani Highway

J View facing West from Eastern boundary of property

K View facing West from Eastern boundary of property

L View facing West from Eastern boundary of property

Appendix M

Adequacy of Water Supply Report By Tom Nance Water Resource Engineering

TNWRE
Tom Nance Water
Resource Engineering

No. of pages: 13
Email: vbagoyo-devgroup@hawaii.rr.com
greg@tnwre.com
todd@tnwre.com

Original ☐ will ☑ will not be mailed to you.

December 19, 2014
14-074.r3 | 12-36

MEMORANDUM

To: Vince Bagoyo, Jr.

From: Tom Nance

Subject: Adequacy of Water Supply for the Proposed Maalaea Plantation Rural Subdivision in Maalaea, Maui

INTRODUCTION

This memo and its attachments address the adequacy of water supply for the proposed Maalaea Plantation rural subdivision in Maalaea, Maui. Exhibit 1 is a site plan of the proposed subdivision. The development would consist of: 74 rural residential lots of about one acre each; one 27.5 acre rural lot; 37 single family residential lots; 32.8 acres in parks and drainage facilities; and 91.7 acres in agriculture. The Maui County Department of Water Supply (DWS) is unable to serve this project. Because of this, the project would have a privately owned and operated system supplied by three wells that have been constructed for this purpose.

REQUIRED SUPPLY FOR THE PROJECT

Table 1 lists the water supply requirements for the project. It amounts to a year-round average of 0.398 million gallons per day (MGD). It should be noted that the water uses for Agriculture (lots 75, 76, 80, and 81), which amount to 46 percent of the total, may never actually be required in the quantities, estimated (refer to Exhibit 2 for the development intended for these lots). However, for the purposes of this report, the project's required supply is assumed to be as detailed in Table 1. The sources of supply must be capable of providing the maximum day supply, defined as 1.5 times the year-round average. For Maalaea Plantation, this amounts to 0.597 MGD. Three wells have already been developed for the project. They must be able to provide this supply with two wells operating and the third as standby.

WELLS DEVELOPED TO SUPPLY THE MAALAEA PLANTATION PROJECT

The three wells developed to supply Maalaea Plantation are known as Pohakea Wells 1, 2, and 3 and are also identified by State No. 4930-01, -02, and -03, respectively. Pohakea 1 was constructed and

initially pump tested in 2004. Pohakea 2 and 3 were completed and initially pump tested in 2007. At issue with all three wells is their long term salinity levels, particularly when they are operated concurrently as would periodically be required for the Maalaea Plantation Project.

Table 2 is a summary of the pump tests which were done after each well was constructed (May 2004 for Well 1 and December 2007 for Wells 2 and 3). The only salinity testing was done by the drilling contractor and that testing was limited to chloride determinations of questionable accuracy. Reported "stable" chloride levels were 160 milligrams per liter (MG/L) for Well 1 and 180 MG/L for Wells 2 and 3. Although these levels are less than the 250 MG/L secondary drinking water standard for chlorides of the EPA and State Department of Health (DOH), they are right at the informal "palatability" criterion of 160 to 180 MG/L for chlorides that have been informally adopted by municipal departments of water supply in Hawaii.

Prior to the involvement of TNWRE, Wells 1 and 2 had been tested twice and Well 3 once for all drinking water contaminants regulated for drinking water use. Table 3 summarizes the results for all constituents greater than the laboratory's detection limits. Points to note from this data summary are:

- No organic contaminants were detected in any of the samples;
- None of the concentrations of detected constituents exceeded the regulatory maximum allowable contaminant level (MCL);
- Nitrate-nitrogen levels, while well under the MCL, may reflect input from past agricultural practice; and
- All chloride levels were higher than reported by the drilling contractor during initial well testing.

The last of these results suggests that long-term salinity, particularly when the wells are operated concurrently, may be an issue.

WELL TESTING PROGRAM CONDUCTED BY TNWRE

To quantify potential long term salinity issues with the wells, a concurrent pump testing program was undertaken by TNWRE over the January 14 to 21, 2013 period. During this period, all three combinations of two wells pumping and the third turned off were run. Exhibit 3 presents the operating times of the wells. Information obtained during this testing is summarized in the sections following.

Static Water Levels. The water levels reported by the drilling contractor were found to be not realistic (refer back to Table 1). Table 4 presents the measurements made by TNWRE. These levels are lower than reported by the drilling contractor and are consistent with each other.

Pumping Rates. Well 1 averaged 273 GPM. Wells 2 and 3 averaged 470 to 475 GPM. As evidenced by the rising salinity that the pumping rates of Wells 2 and 3 produced (next section), these rates are far higher than appropriate hydrologically and also far greater than the Maalaea Plantation project will require.

Pumped Water Salinity Measured as Specific Conductance and Chlorides. Table 5 lists measurements of specific conductance and chlorides made throughout the test period. Chlorides of Well 1 were from 166 to 169 milligrams per liter (MG/L) and reasonably stable. Chlorides of Well 2 started at 175 MG/L and rose to 195 MG/L without stabilizing. Chlorides of Well 3 started at 191 MG/L and rose to 227 MG/L, also without stabilizing.

Testing for Regulated Drinking Water Constituents. Testing for all regulated drinking water constituents was undertaken for all three wells. Exhibit 4 lists detected constituents for Well 1. Exhibit 5 lists detected constituents for Wells 2 and 3. The wells meet all drinking water allowable levels for primary contaminants. However, the total dissolved solids (TDS) for all three wells exceed the secondary (recommended) standard of 500 MG/L.

Testing of Constituents for Reverse Osmosis (RO) Desalination Design. Given the pumped water salinity levels, reverse osmosis (RO) desalinization will be necessary. Table 6 lists results of water quality testing done to assist in the design of an RO system. Silica was unusually high and the TDS values exceeded 500 MG/L.

ADEQUACY OF SUPPLY AND RECOMMENDATIONS TO PRODUCE ACCEPTABLE DRINKING WATER

There is no question that the quantity of supply required for the project can be provided by two of the three Pohakea wells operating and the third as standby. However, to achieve acceptable drinking water quality, the following should be undertaken:

1. Change the capacities of the pumps in Wells 2 and 3 to 260 GPM. Their 470 to 475 GPM pumping rates are grossly oversized and, as a result, stable salinity levels were not achieved.

2. The 273 GPM pump in Well 1 can continue to be used until it needs to be replaced. At that time, downsize it to a 260 GPM capacity pump.
3. Well 1 will always produce the lowest salinity water. It should be the first well on and last off in any operating sequence.
4. Install a reverse osmosis (RO) treatment system to reduce the salinity of the water delivered to customers. Specifics of this proposal are described in the section following. The wastewater stream from the RO, referred to as the concentrate, would be reused to irrigate the 30 acres of drainage retention basins and other common area irrigation.

PROPOSED REVERSE OSMOSIS CONFIGURATION FOR MAALAEA PLANTATION

Assuming the well pump capacities for all three wells are reduced to 260 GPM as recommended above, the stable salinity levels of each of the three wells will approximately be as follows:

Well Number	Chlorides (MG/L)	Total Dissolved Solids (MG/L)
1	180	520
2	220	640
3	240	670

The objective of the treatment process is to produce a blend of RO product water and untreated well water which has chlorides of 100 MG/L or less and total dissolved solids (TDAS) of 300 MG/L or less. For this analysis, it is assumed that the RO product will have chlorides of 10 MG/L and TDS of 40 MG/L and the product recovery rate will be 70 percent. Exhibit 6 is a schematic of the proposed system. The mix of RO product water and untreated well water to produce the desired chloride and TDS levels will depend on which wells are operating. Three operating examples are given below which illustrate the range of mixing ratios: Well 1 alone; Wells 1 and 2 operating; and Wells 2 and 3 operating. The last of these is the worst case scenario which would only occur if Well 1 is down for maintenance or pump replacement.

Summary of Possible Operating Conditions

• Operating Wells	Well 1 Alone	Wells 1 & 2	Wells 2 & 3
• Raw Water Supply			
• Chlorides (MG/L)	180	200	235
• TDS (MG/L)	520	580	655
• Mix Ratio (RO Product: Well Water)	50:50	55:45	65:35
• Blended Water to Storage/Customers			
• Chlorides (MG/L)	95	95	90
• TDS (MG/L)	280	285	255
• Ro Concentrate for Irrigation Reuse			
• Chlorides (MG/L)	575	665	760
• TDS (MG/L)	1640	1840	2090

The mixing ratio of RO product to untreated well water would range from 50:50 (for Well 1 as the sole source) to 65:35 (when and if use of Wells 2 and 3 concurrently is required). In all cases, the salinity of the RO concentrate will be acceptable for irrigation reuse on grasses and other salt tolerant landscaping.

Attachments

ec: Greg Fukumitsu and Todd Yonamine – TNWRE, Inc.

ZONING AREAS:	
RURAL (ONE ACRE) - RU-1	82.5
RURAL (FIVE ACRES) - RU-5	27.5
AGRICULTURE - AG	91.7
RESIDENTIAL - R-3	10.0
PARK	2.8
ROADS	13.2
MISCELLANEOUS	30.0
	257.7

PRELIMINARY SITE PLAN
SCALE: 1 IN. = 300 FT.

Exhibit 1

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

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 16-115-3 OF THE HAWAII ADMINISTRATIVE RULES, PROFESSIONAL ENGINEERS, ARCHITECTS, SURVEYORS, AND LANDSCAPE ARCHITECTS.

SIGNATURE DATE
EXP. DATE: 4-30-16

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

MAALAEA PLANTATION SUBDIVISION

T.M.K.: (2) 3-8-001: 018
MAALAEA, MAUI, HAWAII
PRELIMINARY SITE PLAN

REVISION	DATE	NOTE

DESIGNED BY: M.M.M.
DRAWN BY: L.C.O.
PROJECT NO.: 2013-
DRAWING NAME: EXHIBITS/ P-SITE PLAN
DATE: 11-11-14

SHEET NO. 1 OF SHEETS

Exhibit 2

Ma'alaea Plantation

Project Summary

November 17, 2014

1. Ma'alaea Plantation will be developed into a project consisting of lots zoned Agricultural, Rural 5, Rural 1, R3 Residential, and related lots for parks, drainage reserves, and roads. The allocation of lots will be as follows:

RURAL 1 (Lots 1-74)	82.5 Acres
RURAL 5 (Lot 82)	27.5 Acres
Agricultural (Lots 75, 76, 80, 81)	91.7 Acres
R3 Residential – 38 lots (Lots 77 - 78)	10.0 Acres
Park (Lot 79)	2.8 Acres
Drainage (Lots 83 - 89)	30.0 Acres
Roads	13.2 Acres
Total Acreage:	257.7 Acres

2. The County of Maui will be given the right of first refusal to purchase Lots 80 and 81, consisting of approximately 80 acres, at a price to be agreed upon with the developer.

3. The lots zoned R3 Residential will be used by the developer to build 38 homes that will fulfill the developer's affordable housing requirements for the entire project No ohana dwelling units will be allowed on the 38 R3 zoned lots.

4. Lot 79 will be dedicated to the County of Maui or kept as a private park to fulfill the park requirements for the entire project

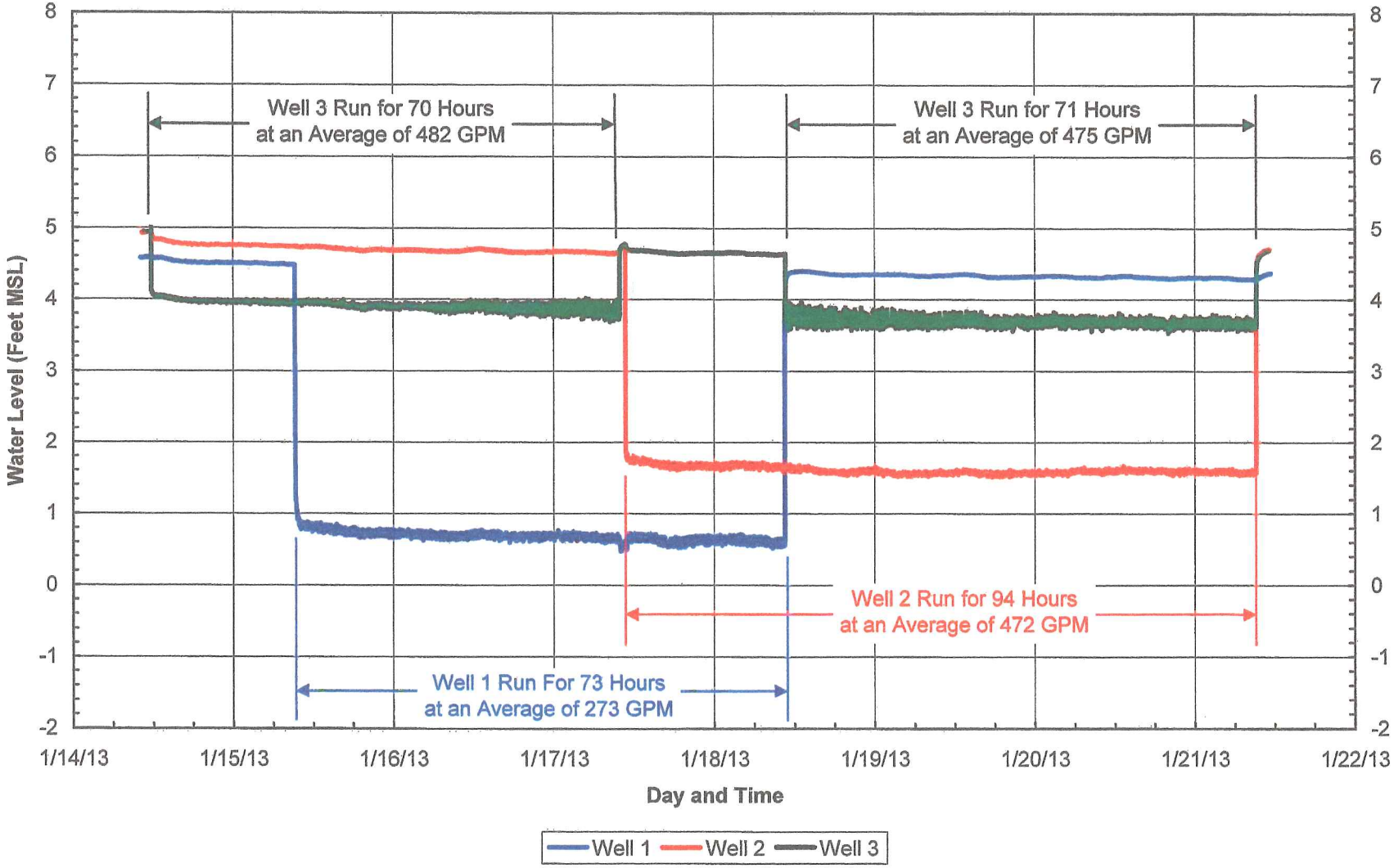
5. All lots will utilize separate septic systems locate on each lot There will be no large scale private sewage treatment plant

6. The total urbanized area (the Rural 1, Rural 5, and R3 Residential zoned lots) amounts to a total acreage of approximately 120 acres, which is less than half of the total parcel size of 257.7 acres.

7. It is the intention of the developer to utilize Lots 75 and 76 for alternative energy projects if such projects are economically feasible and the appropriate PUC and/or MECO approvals can be obtained.

Exhibit 3

Pumping Intervals and Rates During the January 14 to 21, 2013 Pump Tests



eurofins
Eaton Analytical
formerly MWH Laboratories

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel: (626) 386-1100
Fax: (626) 386-1101
1 800 566 LABS (1 800 566 5227)

Laboratory Hits
Report: 422555

Tom Nance Water Resource Engineering
Tom Nance
560 N. Nimitz Hwy. - Suite 213
Honolulu, HI 96817

Samples Received on:
01/21/2013

Analyzed	Analyte	Sample ID	Result	Federal MCL	Units	MRL
	201301210069	**Pohakea Well 1**				
01/24/2013 17:03	Alkalinity in CaCO3 units		100		mg/L	2
01/22/2013 16:43	Barium Total ICAP/MS		16	2000	ug/L	2
01/25/2013 17:54	Bicarb.Alkalinity as HCO3calc		130		mg/L	2
01/25/2013 17:54	Bicarbonate as CaCO3		100		mg/L	
01/23/2013 21:29	Boron Total ICAP		0.056		mg/L	0.05
01/23/2013 21:29	Calcium Total ICAP		38		mg/L	1
01/21/2013 15:38	Chloride		180	250	mg/L	5
01/28/2013 21:21	Fluoride		0.10	4	mg/L	0.05
01/23/2013 21:29	Magnesium Total ICAP		32		mg/L	0.1
01/21/2013 15:38	Nitrate as Nitrogen by IC		2.0	10	mg/L	0.5
01/24/2013 17:03	PH (H3=past HT not compliant)		7.6		Units	0.1
01/23/2013 21:29	Potassium Total ICAP		6.1		mg/L	1
01/23/2013 21:29	Silica		66		mg/L	0.5
01/23/2013 21:29	Sodium Total ICAP		84		mg/L	1
01/23/2013 21:29	Strontium Total ICAP		0.28		mg/L	0.01
01/21/2013 15:38	Sulfate		27	250	mg/L	2.5
01/24/2013 22:55	Total Dissolved Solids (TDS)		520	500	mg/L	10

Exhibit 4

SUMMARY OF POSITIVE DATA ONLY

eurofins | Eaton Analytical
formerly MWH Laboratories

750 Royal Oaks Drive, Suite 100
Monrovia, California 91016-3629
Tel: (626) 386-1100
Fax: (626) 386-1101
1 800 566 LABS (1 800 566 5227)

Laboratory Hits
Report: 422786

Tom Nance Water Resource Engineering
Tom Nance
560 N. Nimitz Hwy. - Suite 213
Honolulu, HI 96817

Samples Received on:
01/29/2013

Analyzed	Analyte	Sample ID	Result	Federal MCL	Units	MRL
	201301220014	**Pohakea Well 2**				
01/25/2013 18:45	Alkalinity in CaCO3 units		96		mg/L	2
01/23/2013 11:43	Barium Total ICAP/MS		20	2000	ug/L	2
01/26/2013 11:41	Bicarb.Alkalinity as HCO3calc		120		mg/L	2
01/26/2013 11:41	Bicarbonate as CaCO3		96		mg/L	
01/23/2013 21:47	Boron Total ICAP		0.052		mg/L	0.05
01/23/2013 21:47	Calcium Total ICAP		44		mg/L	1
01/25/2013 21:43	Chloride		210	250	mg/L	5
01/28/2013 23:06	Fluoride		0.090	4	mg/L	0.05
01/23/2013 21:47	Magnesium Total ICAP		34		mg/L	0.1
01/22/2013 12:08	Nitrate as Nitrogen by IC		2.0	10	mg/L	0.2
01/25/2013 18:45	PH (H3=past HT not compliant)		7.4		Units	0.1
01/23/2013 21:47	Potassium Total ICAP		6.5		mg/L	1
01/23/2013 21:47	Silica		65		mg/L	0.5
01/23/2013 21:47	Sodium Total ICAP		91		mg/L	1
01/23/2013 21:47	Strontium Total ICAP		0.32		mg/L	0.01
01/22/2013 12:08	Sulfate		32	250	mg/L	1
01/27/2013 16:39	Total Dissolved Solids (TDS)		610	500	mg/L	10
	201301220015	**Pohakea Well 3**				
01/25/2013 19:00	Alkalinity in CaCO3 units		95		mg/L	2
01/22/2013 16:55	Barium Total ICAP/MS		22	2000	ug/L	2
01/26/2013 11:41	Bicarb.Alkalinity as HCO3calc		120		mg/L	2
01/26/2013 11:41	Bicarbonate as CaCO3		95		mg/L	
01/23/2013 21:52	Boron Total ICAP		0.051		mg/L	0.05
01/23/2013 21:52	Calcium Total ICAP		47		mg/L	1
01/22/2013 12:21	Chloride		230	250	mg/L	5
01/28/2013 23:11	Fluoride		0.090	4	mg/L	0.05
01/23/2013 21:52	Magnesium Total ICAP		35		mg/L	0.1
01/22/2013 12:21	Nitrate as Nitrogen by IC		2.0	10	mg/L	0.5
01/25/2013 19:00	PH (H3=past HT not compliant)		7.5		Units	0.1
01/23/2013 21:52	Potassium Total ICAP		7.0		mg/L	1
01/23/2013 21:52	Silica		65		mg/L	0.5
01/23/2013 21:52	Sodium Total ICAP		100		mg/L	1
01/23/2013 21:52	Strontium Total ICAP		0.34		mg/L	0.01
01/22/2013 12:21	Sulfate		34	250	mg/L	2.5
01/27/2013 16:40	Total Dissolved Solids (TDS)		640	500	mg/L	10

SUMMARY OF POSITIVE DATA ONLY

Exhibit 5

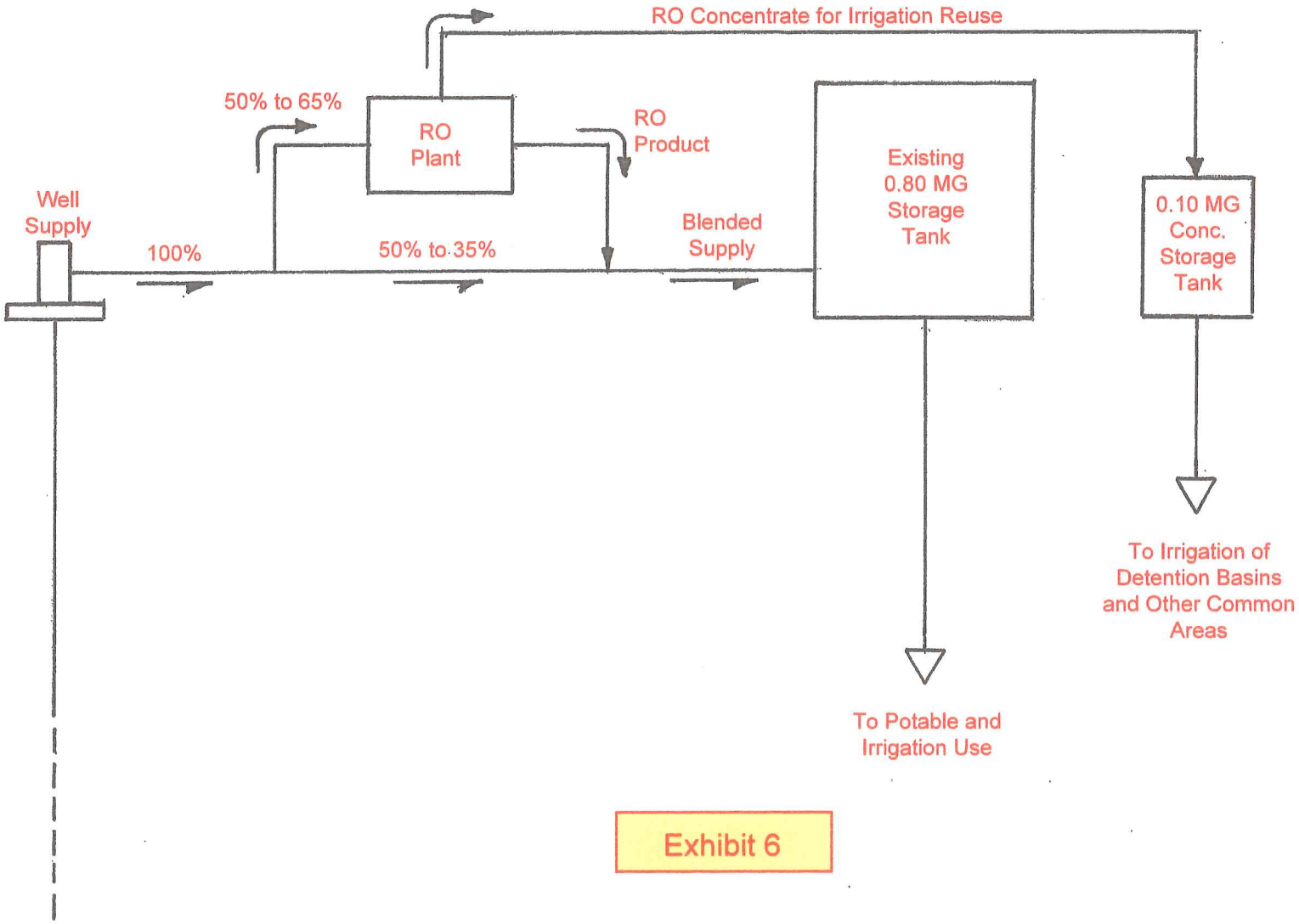


Exhibit 6

Schematic of the Maalaea Plantation
Well Supply and Reverse Osmosis (RO)
Treatment System

Table 1

Projected Water Supply Requirements for
the Maalaea Plantation Project

Type of Development	No. of Units	Average Demand		Maximum Day Amount (GPD)
		Unit Use Rate (GPD/Unit)	Amount (GPD)	
Rual 1 (Lots 1 to 74)	74	1,500	111,000	166,500
Rual 5 (Lot 82)	27.5 Ac	2500/Ac	68,750	103,125
Agricultural (Lots 75, 76, 80, and 81)	91.7 Ac	2000/Ac	183,400	275,100
R3 Residential (38 Lots)	38	600	22,800	34,200
Park (Lot 79)	2.8 Ac	2500/Ac	7,000	10,500
Roads	13.2 Ac	400/Ac	5,280	7,920
Drianage Retention Basin (Lots 83 to 89)	30.0 Ac	- -	- -	- -
Totals			398,230	597,345

Table 2

Summary of Individual Pump Test Results Following Each Well's Construction

Well No.	Test Date	Static Water Level (Feet MSL)	Pumping Rate (GPM)	Drawdown (Feet)	Chlorides (MG/L)
4930-01	May 2004	7.4	330	3.7	160
4930-02	Dec 2007	5.3	450	3.3	180
4930-03	Dec 2007	6.8	435	0.9	180

Notes:
1. All data as reported by the Wailani Drilling Company, drilling Contractor
2. Static water level in Well 4930-01 appears to be based on an incorrect benchmark elevation.
3. Testing of Wells 2 and 3 was done several days apart. The wells were not pumped concurrently.
4. Chlorides reported to be stable during all three individual tests.

Table 3

Summary of Detected Constituents During Testing for Regulated Drinking Water Contaminants

Constituent	Unit	Regulatory MCL	Well 1		Well 2		Well 3 1/23/08
			8/23/07	11/10/01	1/23/08	4/21/10	
Alkalinity	mg/l	None	103	110	88	99	100
Barium	mg/l	2000	15	15	17	17	19
Calcium	mg/l	None	36	35	39	41	42
Chromium	mg/l	100	4.0	4.4	5.0	7.0	5.4
Fluoride	mg/l	2	0.15	0.11	0.12	0.09	0.12
Nitrate as N	mg/l	10	2.23	2.1	1.88	2.2	1.93
Chlorides	mg/l	250	180	Not Tested	190	Not Tested	220

Notes:
1. Sampling on 8/23/07 and 1/23/08 was by AECOS for M&E Pacific as its client.
2. Sampling on 4/21/10 and 11/10/10 was by Pural Water Specialty Company for its client, Spencer House.
3. The 250 mg/l chloride limit is a secondary (non-mandatory) requirement.
4. All analyses by MWH Laboratories

Table 4

Concurrent Water Level Measurements of the Pohakea Wells

Measurement Day and Time	Pohakea 1 (Feet MSL)	Pohakea 2 (Feet MSL)	Pohakea 3 (Feet MSL)
9/12/12 @ 9:00	4.43	4.82	4.85
1/14/13 @ 10:00	4.57	4.93	4.94
1/21/13 @ 11:30	4.37	4.68	4.69

Notes:

1. All measurements by Tom Nance.
2. Re Benchmark is the top of sounding tube nipple on each pump's base plate:

   Pohakea 1 : 319.32
   Pohakea 2 : 338.07
   Pohakea 3 : 340.78

Table 5

Pumped Water Specific Conductance and Chlorides
During the January 14 to 21, 2013 Pump Testing

Well	Sample Day and Time	Specific Conductance (µS/cm at 25° C)	Chlorides (MG/L)
1	1/15/13 @ 09:18	866	168
	1/15/13 @ 16:20	870	168
	1/16/13 @ 08:07	862	169
	1/16/13 @ 17:30	864	167
	1/17/13 @ 07:56	861	166
	1/17/13 @ 15:30	862	167
	1/18/13 @ 08:00	855	166
2	1/17/13 @ 10:52	895	175
	1/17/13 @ 15:35	904	180
	1/18/13 @ 08:06	926	185
	1/18/13 @ 17:55	931	188
	1/19/13 @ 06:40	936	190
	1/19/13 @ 14:10	937	190
	1/20/13 @ 06:40	943	192
	1/20/13 @ 16:15	944	192
	1/21/13 @ 08:52	945	195
3 (1st Pumping Period)	1/14/13 @ 11:48	946	191
	1/14/13 @ 18:24	965	196
	1/15/13 @ 09:30	973	199
	1/15/13 @ 16:24	978	203
	1/16/13 @ 08:30	981	204
	1/16/13 @ 17:36	981	204
	1/17/13 @ 09:50	987	205
3 (2nd Pumping Period)	1/18/13 @ 17:58	1009	210
	1/19/13 @ 06:43	1014	214
	1/19/13 @ 14:13	1018	215
	1/20/13 @ 06:44	1023	217
	1/20/13 @ 16:18	1025	223
	1/21/13 @ 08:54	1029	227

Notes:
1. Specific conductance measured with a HACH Sension5 meter calibrated to a 1413 µS/cm standard.
2. Chlorides determined by mercuric nitrate titration.

Table 6

Results of Sampling for Reverse Osmosis System Design

Constituent	Units	Pohakea 1 (4930-01)	Pohakea 2 (4930-02)	Pohakea 3 (4930-03)
Alkalinity in CaCO3 units	mg/L	100	96	95
Barium Total ICAP/MS	ug/L	16	20	22
Bicarb.Alkalinity as HCO3calc	mg/L	130	120	120
Bicarbonate as CaCO3	mg/L	100	96	95
Boron Total ICAP	mg/L	0.056	0.052	0.051
Calcium Total ICAP	mg/L	38	44	47
Chloride	mg/L	180	210	230
Fluoride	mg/L	0.10	0.090	0.090
Magnesium Total ICAP	mg/L	32	34	35
Nitrate as Nitrogen by IC	mg/L	2.0	2.0	2.0
PH (H3=past HT not compliant)	Units	7.6	7.4	7.5
Potassium Total ICAP	mg/L	6.1	6.5	7.0
Silica	mg/L	66	65	65
Sodium Total ICAP	mg/L	84	91	100
Strontium Total ICAP	mg/L	0.28	0.32	0.34
Sulfate	mg/L	27	32	34
Total Dissolved Solids (TDS)	mg/L	520	610	640

Notes:
1. Well 1 was sampled on January 18, 2013 and Wells 2 and 3 on January 21, 2013, all by Tom Nance.
2. All analyses by Eurofins Eaton Analytical (formerly MWH Laboratories).

Appendix N

Reverse Osmosis Report For Proposed Project By Tom Nance Water Resource Engineering

TNWRE
Tom Nance Water
Resource Engineering

No. of pages: 3
Email: vbagoyo-devgroup@hawaii.rr.com
mark@otomoengineering.com
greg@tnwre.com

Original ☐ will ☑ will not be mailed to you.

May 13, 2014
14-079.r2 | 12-36

MEMORANDUM

To: Vince Bagoyo
Mark Matsuda – Otomo Engineering, Inc.

From: Tom Nance

Subject: Reverse Osmosis for Maalaea Plantation

As a follow up to my memo of April 9th, I've made a series of calculations to estimate the quantity and quality of the RO concentrate that could be used for irrigation of salt tolerant grass in the retention basins and possibly other common areas. The following assumptions are incorporated into the calculations:

- The recommended reduced well pumping capacities in my April 9th memo to produce stable salinity levels from all three wells are implemented.
- The stable chloride levels achieved by the reduced pump capacities are as follows:

Well	Chlorides (MG/L)
1	180
2	210
3	230

- The wells are operated to produce the freshest supply possible: Well 1 is first on and last off; Well 2 comes on to supplement Well 1; and Well 3 is exclusively standby.
- The objective of the RO process is to treat a portion of the raw well water supply and mix the product water back with the remaining untreated well water to produce a supply to the consumer with chlorides of about 100 MG/L and total dissolved solids (TDS) of about 330 MG/L.
- Product water from the RO will have chlorides of 20 MG/L. About 70 percent of water to the RO will be product; the remaining 30 percent would be concentrate for irrigation reuse.

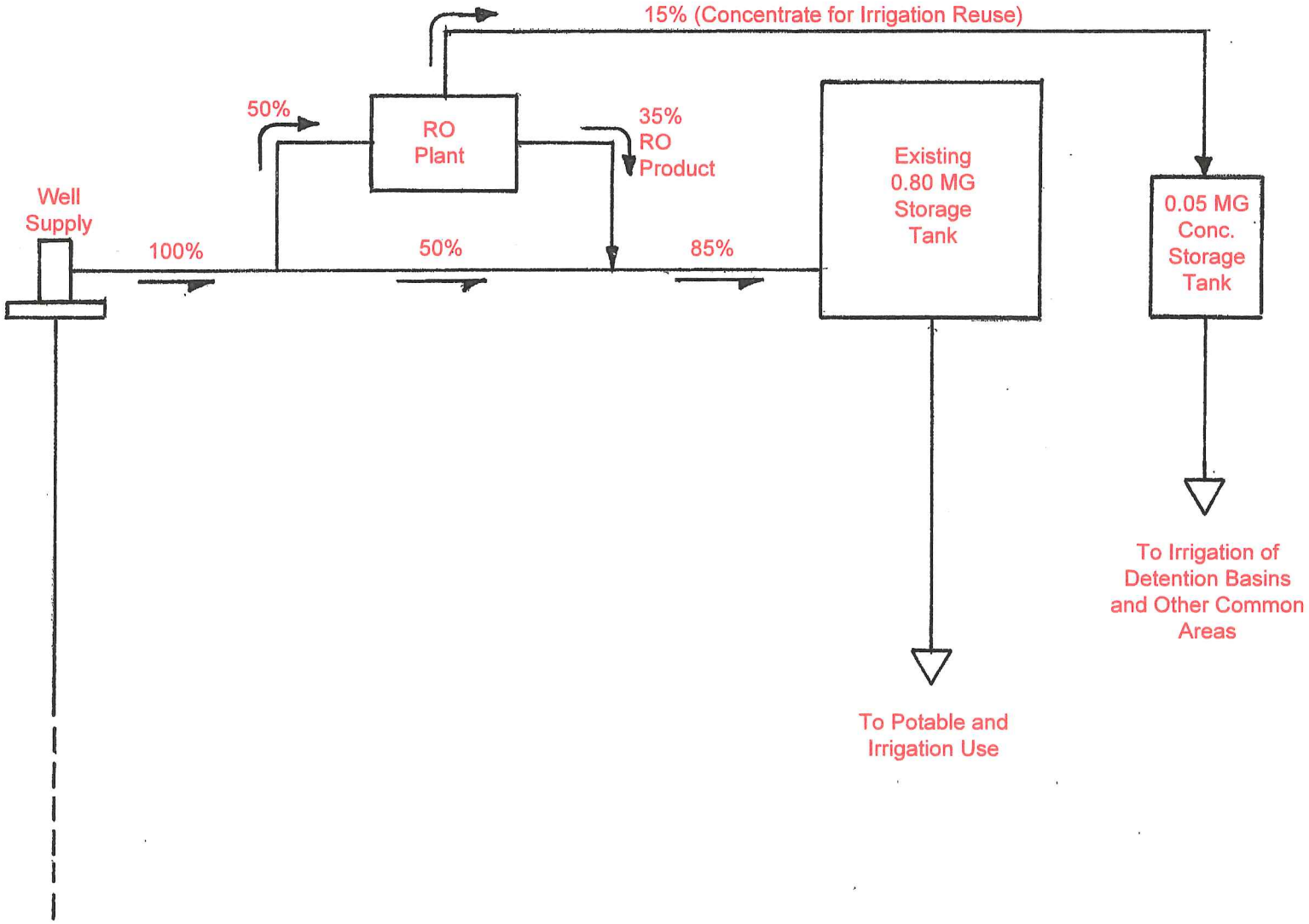
Refer to the attached schematic. Fifty percent of the well water would go directly to the storage tank and the other 50 percent would go through the RO. The RO product would be blended with the

untreated well water to produce the project's potable and irrigation supply. Concentrate from the RO would be directed into a small 50,000 gallon storage tank and would be used to irrigate stormwater detention basins and other common areas. Resulting qualities and quantities would be as listed below. The RO concentrate would be usable for irrigation.

• Flow Condition	Average	Max Day
• Chlorides of Raw Water Supply from Wells 1 & 2 (MG/L)	187	195
• Chlorides of Blended Product Water (MG/L)	104	108
• Amount of Concentrate for Reuse/Disposal (GPD)	56,000	84,200
• Chlorides of Concentrate (MG/L)	576	603
• TDS of Concentrate (MG/L)	1495	1560

Attachment

ec: Greg Fukumitsu – TNWRE, Inc.



Schematic of the Maalaea Plantation
Well Supply and Reverse Osmosis (RO)
Treatment System

Appendix O

Phases I & II Environmental Assessment Reports

PHASE I
ENVIRONMENTAL SITE ASSESSMENT

MAALAEA MAUKA
WAILUKU, MAUI, HAWAII
TMK: (2) 3-6-001: PARCEL 018

November 15, 2006

Prepared for:

M&E Pacific, Inc.
841 Bishop Street, Suite 1900
Honolulu, Hawaii 96813

Prepared by:

element environmental llc
environmental · engineering · water resources
62-180 Emerson Road
Haleiwa, Hawaii 96712
Phone (808) 637-1200 • Fax (808) 637-0001

Job No. 060050

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EXECUTIVE SUMMARY

Element Environmental LLC (E2) conducted a Phase I Environmental Site Assessment (ESA) on approximately 259.885 acres of land designated as Tax Map Key (TMK): (2) 3-6-001 parcel 018 (the property). The property is located in West Maui between Waikapu and Maalaea along the western side of Honoapiilani Highway. The property is currently used as a pasture for cattle ranching.

The Phase I ESA was performed in accordance with the scope and limitations of the American Society of Testing and Materials Practice E 1527-05 to identify the presence of recognized environmental conditions associated with the property and included a review of environmental regulatory records in the site vicinity, a review of the site history, a review of the site geology and hydrogeology, a site reconnaissance, and interviews.

This assessment has revealed no significant evidence of recognized environmental conditions in connection with the property with the exception of fourteen (14) unmarked 55-gallon high density polyethylene (HDPE) drums located along the dirt road bordering the southwestern end of the property. Twelve (12) of the drums were partially full with an unknown liquid at the time of the field inspection. Two of the drums were damaged and empty indicating a potential release. In an interview with Mr. Alex Franco, Manager of Maui Cattle Company, Mr. Franco noted that the drums were present prior to their use of the property over a year ago. Mr. Franco believes that the drums may have been left by one of the farmers that were previously utilizing the property. In a follow-up request for additional information, Mr. Chumbley of Wailuku Agribusiness, indicated that the drums must have been left by a former licensee. As of the date of this report, Mr. Chumbley is planning to have the drums removed by November 17, 2006.

E2 recommends that the contents of the drums be determined and that drums and contents be properly disposed and/or recycled in accordance with all Federal, State and local regulations. Upon removal of the drums, the soil and vegetation beneath the drums should be inspected for indications of a release by an environmental professional. If a significant release is suspected, appropriate sampling and cleanup should be conducted.

E2 has also identified that the property has been historically used for sugarcane cultivation. In an interview, Mr. Chumbley of Wailuku Agribusiness (former user of the property) indicated that pesticides and herbicides were applied to the property as part of the normal agricultural operations. Therefore, residual levels of pesticides and herbicides are probably present on the property. Although proper applications of pesticides and herbicides does not constitute a release of hazardous chemicals, E2 recommends that limited composite soil sampling be conducted on the property should the intended land use of the property change from agricultural to residential. The purpose of the limited sampling would be to determine if residual levels of pesticides/herbicides are present in site soils. The sample analyses selected should be based on the list of potential pesticides and herbicides that may have been applied to the property as provided by Mr. Chumbley.

PHASE I ENVIRONMENTAL SITE ASSESSMENT

Maalaea Mauka
Wailuku, Maui, Hawaii
TMK: (2) 3-6-001: Parcel 018

November 15, 2006

1.0 INTRODUCTION

1.1 OVERVIEW

This report presents the results of Element Environmental LLC's (E2's) Phase I Environmental Site Assessment (ESA) of the subject property. The general location of the property is shown on Figure 1 (Site Vicinity Map) in Appendix A.

This report details the work performed to identify the presence of recognized environmental conditions associated with this property. Throughout this ESA the property of interest is referred to as *the subject property, the property, the site, or the facility.*

1.2 PURPOSE

E2 conducted this Phase I ESA to identify recognized environmental conditions associated with the property. American Society for Testing and Materials (ASTM) guidance defines *recognized environmental conditions* as the "presence or likely presence of any hazardous substances 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, groundwater, or surface water of the property" (ASTM, 2005). Recognized environmental conditions do not include *de minimis* conditions that generally do not present a threat to human 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 (ASTM, 2005).

This Phase I ESA constitutes all appropriate inquiry into the previous ownership and uses of the property consistent with good commercial or customary practice and is intended to permit the Phase I ESA user to satisfy one of the requirements to qualify for the innocent landowner, contiguous property owner, or bona fide prospective purchaser limitations on Comprehensive Environmental Response Compensation and Liability Act (CERCLA) liability, hereinafter, the "landowner liability protections" or "LLPs".

1.3 DETAILED SCOPE OF SERVICES

Our Phase I ESA was performed in accordance with the ASTM "Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process" (ASTM Designation E 1527-05). The ASTM standard defines good commercial and customary practice in the United States of America for conducting an environmental site assessment of a parcel of commercial real estate with respect to the range of contaminants within the scope of Comprehensive Environmental Response, Compensation and

Liability Act (CERCLA) (42 U.S.C. §9601) and petroleum products (ASTM, 2005). Adherence to the ASTM standard is intended to limit liability of property owners from inherited environmental contamination.

We performed the following tasks in completion of the Phase I ESA:

- **Review of regulatory records.** We reviewed standard environmental record sources including the U.S. Environmental Protection Agency's (EPA's) Comprehensive Environmental Response Compensation and Liability Information System (CERCLIS) database, EPA's Resource Conservation and Recovery Act (RCRA) database, U.S. Institutional Controls database, U.S. Engineering Controls database, EPA's Emergency Response Notification System (ERNS) database, State of Hawaii Department of Health (DOH) Office of Hazard Evaluation and Emergency Response (HEER) site list, DOH Underground Storage Tank (UST) lists, DOH list of landfills and other solid waste facilities, DOH Voluntary Response Program (VRP) sites list, and DOH Brownfield sites list.
- **Review of site history.** We reviewed reasonably ascertainable standard historical sources including historical maps; aerial photographs; building permits, zoning records and property tax records available online; various printed publications as well as publications posted on the internet; and information from the interview with the owner's representative.
- **Review of site geology and hydrogeology.** We reviewed reasonably ascertainable published information on surface and subsurface conditions at the site and surrounding area. We used this information to assess topography, drainage, surface water bodies, anticipated subsurface geology, and groundwater occurrence and usage in the area.
- **Site reconnaissance.** We performed a site reconnaissance of the property to note visual signs of contamination, and we conducted a limited assessment of portions of the neighboring properties visible from the subject property boundaries. During our site reconnaissance we specifically looked for stained soil, dead or stressed vegetation, hazardous substances, petroleum products, electrical and hydraulic equipment, aboveground and underground storage tanks, disposal areas, maintenance areas, wells, sumps, drains, and cesspools/sewers.
- **Interviews.** We interviewed the user of the Phase I ESA and owner's representative, Mr. Steven Kikuchi, Partner of Maalaea Properties; current site user, Mr. Alex Franco, of Maui Cattle Company; and former owner's representative, Mr. Avery Chumbley, President of Wailuku Agribusiness regarding past and current use and activities on the property and adjoining properties.
- **Data evaluation and report preparation.** We evaluated the information collected and prepared this report that documents our assessment and presents our findings, opinions, and conclusions.

1.4 SIGNIFICANT ASSUMPTIONS

Significant assumptions include the following:

1) The information provided during the interview with the owner's representative is complete and accurate and
2) The information provided by the regulatory database search service is complete and accurate.

1.5 LIMITATIONS AND EXCEPTIONS

Phase I ESAs, by their very nature, are limited. E2 has endeavored to meet what it believes is the applicable standard of care and, in so doing is obliged to advise M&E Pacific, Inc. and Maalaea Properties LLC of Phase I ESA limitations. This ESA did not assess environmental issues or conditions at the property that are outside the scope of ASTM Practice 1527-05, including asbestos-containing materials (ACMs), radon, lead-based paint, lead in drinking water, wetlands, regulatory compliance, cultural and historic resources, industrial hygiene, health and safety, ecological resources, endangered species, indoor air quality, biological agents and mold, and site geotechnical concerns, nor did it include any sampling or testing for biological agents and mold, radon, methane, ACMs, lead-based paint, or other environmental contaminants. Our investigation was limited to the procedures described in the Phase I ESA Standard Practice (ASTM, 2005).

The conclusions presented in this report are professional opinions based solely upon visual observations of the site and vicinity and our interpretation of the available historical and regulatory information and documents reviewed. They are intended exclusively for the purpose outlined herein and apply only to the site location and project indicated.

Our findings and opinions are based on information that we obtained on given dates through records review, site reconnaissance, interviews, and related activities. It is possible that other information exists or subsequently has become known, just as it is possible for conditions we observed to have changed after our observation. For these and associated reasons, E2 and many of its peers routinely advise clients for ESA services that it would be a mistake to place unmerited faith in findings and opinions conveyed via ESA reports. E2 cannot under any circumstances warrant or guarantee that not finding indicators of hazardous substances or petroleum products means that hazardous substances or petroleum products do not exist on the site.

1.6 SPECIAL TERMS AND CONDITIONS

E2's services are performed, within the limits prescribed by our Clients, with the usual thoroughness and competence of the consulting profession in accordance with the standard for professional services at the time those services are rendered. No warranty or representation, either expressed or implied, is included or intended in our proposals, contracts, or reports.

Findings and opinions presented herein apply to site conditions existing at the time of our investigation and those reasonably foreseeable; they cannot necessarily apply to site changes of which we are not aware and have not had the opportunity to evaluate.

1.7 USER RELIANCE

This report is intended for the sole use of M&E Pacific Inc. and Maalaea Properties LLC. The scope of services performed in execution of this investigation may not be appropriate to satisfy the needs of other users, and any use or re-use of this document or the findings, conclusions, or recommendations presented herein is at the sole risk of said user.

2.0 SITE DESCRIPTION

2.1 LOCATION AND LEGAL DESCRIPTION

The subject property consists of one parcel of developed land located in West Maui between Waikapu and Maalaea along the western side of Honoapiilani Highway. Figure 1 (Site Vicinity Map) and Figure 2 (Site Location Map) in Appendix A show the site location. The property consists of approximately 259.885 acres of land designated as Tax Map Key (TMK): (2) 3-6-001: parcel 018.

2.2 SITE AND VICINITY GENERAL CHARACTERISTICS

The subject property is located along the western side of Honoapiilani Highway (Route 30) between Kuihelani Highway (Route 380) and Kapoli Street on the Island of Maui. The western portion of the property is bounded by the eastern side of Kealaloloa Ridge.

The state land use designation for the property is Agricultural (County of Maui, 2006). The southern end of the property is located in a State Special Management Area (County of Maui, 2006). A portion of the southern end of the property is also located within the Federal Emergency Management Agency 500 year flood plain (County of Maui, 2006).

Maui is moderately warm with mean monthly temperatures ranging from 70° to 84° Fahrenheit. The average annual rainfall at the site is approximately 20 inches per year (Giambelluca et al., 1986).

2.3 CURRENT USE OF THE PROPERTY

The property is currently used as pasture land for cattle. The pasture is operated by Maui Cattle Company.

2.4 DESCRIPTIONS OF STRUCTURES, ROADS, AND OTHER IMPROVEMENTS ON THE SITE

The site is currently occupied by cattle and pasture land throughout most of the site. Maui Cattle Company has installed wire fences throughout the property to control grazing patterns of the cattle. Maui Cattle Company also has a cattle pen and storage area near the center of the property. Entrance to the cattle pen can be made via a dirt road and locked gate located along Honoapiilani Highway.

Honoapiilani Highway runs along the eastern and southern boundary of the site. A dirt road off of Honoapiilani Highway runs along the northern and western perimeter of the site. There is also a weather station along the perimeter, however, it could not be determined if the station was located within or outside of the property boundary. Photographs of the site showing some of the site improvements are included in Appendix A.

2.5 CURRENT USES OF THE ADJOINING PROPERTIES

Current uses of adjoining properties include the open lands and pineapple agricultural land to the north, a Hawaiian Cement quarry to the northwest, Maalaea Construction and Demolition Landfill to the northeast open lands and sugar cane agricultural land to the east, a gas station and aquarium to the southeast, Maalaea Small Boat Harbor to the south, and Kealaloloa Ridge to the west.

3.0 USER PROVIDED INFORMATION

3.1 ENVIRONMENTAL LIENS OR ACTIVITY AND USE LIMITATIONS

Mr. Steven Kikuchi, of Maalaea Properties LLC, is not aware of any environmental cleanup liens against the property. A copy of the User Questionnaire completed by Mr. Kikuchi is included in Appendix C.

3.2 SPECIALIZED KNOWLEDGE

Mr. Kikuchi has no specialized knowledge or experience related to the property or nearby properties.

3.3 COMMONLY KNOWN OR REASONABLE ASCERTAINABLE INFORMATION

Mr. Kikuchi is not aware of commonly known or reasonably ascertainable information about the property that would help identify conditions indicative of releases or threatened releases of hazardous substances or petroleum products.

3.4 VALUATION REDUCTION FOR ENVIRONMENTAL ISSUES

Mr. Kikuchi did not indicate any valuation reduction of the subject property due to environmental issues.

3.5 OWNER, PROPERTY MANAGER, AND OCCUPANT INFORMATION

Maalaea Properties LLC owns the property and Maui Cattle Company currently uses the site for cattle grazing. Mr. Steven Kikuchi is a Partner of Maalaea Properties and Mr. Alex Franco is a representative of Maui Cattle Company. According to Mr. Kikuchi and Mr. Franco, no employees or tenants reside on the subject property.

3.6 REASON FOR PERFORMING THE PHASE I ESA

The Phase I ESA was conducted at the request of Maalaea Properties LLC as part of the due diligence process prior to developing the subject property for residential use.

3.7 OTHER INFORMATION

No other information was provided by the user.

4.0 RECORDS REVIEW

4.1 STANDARD ENVIRONMENTAL RECORD SOURCES

4.1.1 Overview

To identify the presence of adverse environmental conditions at the subject property, several published sources of environmental records were reviewed. This section lists the records that were searched and the results of each search.

ASTM E 1527-05 specifies a search distance for specific environmental record sources. The following record sources were searched for incidents or sites within the listed search distances of the subject property:

Standard Environmental Record Sources	Search Distance (miles)
Federal NPL (National Priorities List) site list	1.0
Federal Delisted NPL site list	0.5
Federal CERCLIS (Comprehensive Environmental Response, Compensation and Liability Information System) list	0.5
Federal CERCLIS NFRAP (No Further Remedial Action Planned) site list	0.5
Federal RCRA (Resource Conservation and Recovery Act) CORRACTS facilities list (facilities subject to Corrective Action under RCRA)	1.0
Federal RCRAInfo list for TSDF (treatment, storage, and disposal facilities)	0.5
Federal RCRAInfo list for generators	Site and adjoining properties
Federal institutional control/engineering control registries	Site only
Federal ERNS (Emergency Response Notification System) list	Site only
State list of hazardous waste sites identified for investigation or remediation (NPL or CERCLIS equivalents)	1.0
State landfill and/or solid waste disposal site list	0.5
State leaking UST (underground storage tank) list	0.5
State registered UST list	Site and adjoining properties
State institutional control/engineering control registries	Site only
State voluntary cleanup sites	0.5
State Brownfield sites	0.5

E2 used a regulatory database search service, provided by Environmental Data Resources, Inc. (EDR), to review the above Federal and State government databases. A copy of *The EDR Radius Map with GeoCheck®* is included in Appendix B. The following sections summarize the findings of the regulatory database search. In reviewing the environmental databases, it should be noted that such databases are not instantaneously updated by the specific regulatory agencies. Depending on the database and the agency, update frequency may be as infrequent as annually. The dates of the most recent updates for the searched environmental databases are listed in the EDR report in Appendix B.

4.1.2 U.S. EPA National Priorities Site List

The NPL is a subset of CERCLIS and identifies over 1,200 sites for priority cleanup under the Superfund Program. The ASTM designated search distance for the NPL is one mile. EDR did not locate NPL sites within one mile of the subject property.

4.1.3 U.S. EPA Delisted NPL Site List

The National Oil and Hazardous Substances Pollution Contingency Plan (NCP) establishes the criteria that the EPA uses to delete sites from the NPL. In accordance with 40 CFR 300.425(e), sites may be deleted from the NPL where no further response is appropriate. The ASTM designated search distance for delisted NPL sites is one-half mile. EDR did not locate delisted NPL sites within one-half mile of the subject property.

4.1.4 U.S. EPA CERCLIS List

The CERCLIS list contains data on potentially hazardous sites that have been reported to the EPA by states, municipalities, private companies, and private persons pursuant to Section 103 of CERCLA. CERCLIS contains sites which 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 ASTM designated search distance for CERCLIS sites is one-half mile. EDR did not identify CERCLIS sites within one-half mile of the subject property.

4.1.5 U.S. EPA CERCLIS NFRAP Site List

Archived sites are sites that have been removed and archived from the inventory of CERCLIS sites. Archived status indicates that, to the best of EPA's knowledge, assessment at a site has been completed and that EPA has determined no further steps will be taken to list this site on the NPL, unless information indicates this decision was not appropriate or other considerations require a recommendation for listing at a later time. This decision does not necessarily mean that there is no hazard associated with a given site; it only means that, based upon available information, the location is not judged to be a potential NPL site. The ASTM designated search distance for NFRAP sites is one-half mile. EDR did not locate CERCLIS NFRAP sites within one-half mile of the property.

4.1.6 U.S. EPA RCRA CORRACTS Facilities List

EPA's CORRACTS, or Corrective Action Sites database, identifies facilities that generate, treat, store, or dispose of hazardous wastes where RCRA corrective action activity has occurred. These sites have experienced spills or releases of hazardous chemicals prompting the need for corrective action. The ASTM designated search distance for the CORRACTS list is one mile. EDR did not identify any CORRACTS sites within one mile of the subject property.

4.1.7 U.S. EPA RCRAInfo List for TSD Facilities

The RCRAInfo list includes facilities that treat, store, dispose of, or incinerate hazardous waste (TSD facilities). The ASTM designated search distance for TSD facilities is one-half mile. EDR did not identify TSD facilities within one-half mile of the subject property.

4.1.8 U.S. EPA RCRA Generators List

RCRAInfo is EPA's comprehensive information system, providing access to data supporting the Resource Conservation and Recovery Act (RCRA) of 1976 and the Hazardous and Solid Waste Amendments (HSWA) of 1984. RCRAInfo replaces the data recording and reporting abilities of the Resource Conservation and Recovery Information System (RCRIS). The database includes selective information on sites which generate, transport, store, treat and/or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA). Conditionally exempt small quantity generators (CESQGs) generate less than 100 kilograms (kg) of hazardous waste, or less than one kg of acutely hazardous waste per month. Small quantity generators (SQGs) generate between 100 kg and 1,000 kg of hazardous waste per month. Large quantity generators (LQGs) generate over 1,000 kilograms (kg) of hazardous waste, or over one kg of acutely hazardous waste per month. Transporters are individuals or entities that move hazardous waste from the generator off-site to a facility that can recycle, treat, store, or dispose of the waste. TSDFs treat, store, or dispose of the waste. The ASTM designated search distance for RCRA generators is the subject property and adjoining properties. EDR located one orphan RCRA generators on an adjoining property.

RCRA Generator Name	Location Relative to the Subject Property	Site Status/Comments
Maalaea Store RR1 Box 374 Maalaea Road Wailuku, HI 96793	1/8 to ¼ miles southwest (lower elevation)	CESQG. No TSDF activities reported. No violations found.

It is unlikely that the CESQGs site has negatively impacted the subject property due to the relative elevation from the property (lower), and the "no violations found" status.

4.1.9 U.S. Institutional / Engineering Control Registries

U.S. Institutional / Engineering Control (IEC) registries are lists of sites that have institutional and/or engineering controls in place. Institutional controls include administrative measures, such as groundwater use restrictions, construction restrictions, property use restrictions, and post remediation care requirements intended to prevent exposure to contaminants remaining on site. Deed restrictions are generally required as part of the institutional controls. Engineering controls include various forms of caps, building foundations, liners, and treatment methods to create pathway elimination for regulated substances to enter environmental media or effect human health. The ASTM designated search distance for federal institutional / engineering control registries is the subject property only. EDR did not locate federal IEC sites on the subject property or within one mile of the subject property.

4.1.10 U.S. EPA ERNS List

ERNS is a national database of more than 365,000 records, which contains information on specific notification of releases of oil and hazardous substances to the environment. The ASTM designated search distance for ERNS incidents is the subject property only. No reported ERNS incidents have occurred on the subject property.

4.1.11 State of Hawaii Hazardous Waste Sites List

The State Hazardous Waste Sites records are the states' equivalent to NPL or CERCLIS. These sites may or may not already be listed on the federal NPL or CERCLIS list. Priority sites planned for cleanup using state funds (state equivalent of Superfund) are identified along with sites where cleanup will be paid for by potentially responsible parties. The DOH HEER office maintains a Sites of Interest Database, which includes sites that HEER has an interest in, has investigated, or may investigate under Hawaii Revised Statute 128D (the State Superfund law). The ASTM designated search distance for the State Hazardous Waste Sites List is one mile. EDR did not identify any State Hazardous Waste sites within one mile of the subject property.

4.1.12 State of Hawaii Landfill / Solid Waste Disposal Site List

The State DOH Solid and Hazardous Waste Branch has a list of permitted solid waste disposal facilities and landfills in the State of Hawaii. The ASTM designated search distance for permitted solid waste disposal sites / landfills is one-half mile. EDR did not locate permitted landfills or disposal sites within one-half mile of the subject property.

4.1.13 State of Hawaii LUST List

The leaking underground storage tank (LUST) database, compiled by the State DOH Solid and Hazardous Waste Branch (SHWB) UST Section, contains an inventory of reported leaking underground storage tank incidents. The ASTM designated search distance for LUST sites is one-half mile. EDR located three (one orphan) LUST sites within one-half mile of the subject property. The sites are listed below.

LUST Site Name	Location Relative to the Subject Property	Site Status/Comments
Hawaiian Cement - Waikapu Quarry Honoapiilani Highway Wailuku, HI 96793	1/8 to ¼ miles northwest (up gradient)	Site Cleanup Completed 5/16/95.
Maalaea 76 Station 15 Kapoli Street Wailuku, HI 96793	1/8 to ¼ miles southeast (down gradient)	Site Cleanup Initiated 10/25/04.
Maalaea Store RR1 Box 374 Maalaea Road Wailuku, HI 96793	1/8 to ¼ miles southeast (down gradient)	Site Cleanup Completed 8/23/05.

Note: Gradient direction refers to approximate groundwater flow direction.

It is unlikely that off-site LUST sites have negatively impacted the subject property due to the "Site Cleanup Completed" status for the up gradient site and the anticipated groundwater flow direction from the down gradient sites.

4.1.14 State of Hawaii Registered UST List

USTs are regulated under RCRA and must be registered with the state department responsible for administering the UST program. The list of registered UST sites is compiled by the State DOH SHWB UST Section. The ASTM designated search distance for UST sites is one-quarter mile. EDR located three (one orphan) UST sites within one-quarter mile of the subject property. The sites are listed below.

UST Site Name	Location Relative to the Subject Property	Site Status/Comments
Hawaiian Cement - Waikapu Quarry Honoapiilani Highway Wailuku, HI 96793	1/8 to ¼ miles northwest (up gradient)	6 USTs Permanently Out of Use.
Maalaea 76 Station 15 Kapoli Street Wailuku, HI 96793	1/8 to ¼ miles southeast (down gradient)	3 USTs Currently In Use: Tank ID: 2a-92 Capacity: 10,000 Gallons Substance: Gasoline Installed: 10/20/00 Tank ID: 87 Capacity: 15,000 Gallons Substance: Gasoline Installed: 10/20/00 Tank ID: 2b Capacity: 6,000 Gallons Substance: Diesel Installed: 10/20/00
Maalaea Store RR1 Box 374 Maalaea Road Wailuku, HI 96793	1/8 to ¼ miles southeast (down gradient)	2 USTs Permanently Out of Use.

Note: Gradient direction refers to approximate groundwater flow direction.

It is unlikely that off-site UST sites have negatively impacted the subject property due to the status of the closed USTS and groundwater flow direction (down gradient) of the USTs in service.

4.1.15 State of Hawaii Institutional Control Registry

Institutional controls on properties were obtained from the DOH VRP and Brownfield databases. The ASTM designated search distance for state institutional / engineering control registries is the subject property only. EDR did not identify the subject property on state institutional / engineering controls lists.

4.1.16 State of Hawaii Voluntary Response Program Sites

The ASTM designated search distance for VRP sites is one-half mile. EDR did not identify any VRP sites listed within one-half mile of the subject property.

4.1.17 State of Hawaii Brownfield Sites

The ASTM designated search distance for Brownfield sites is one-half mile. EDR did not list any state Brownfield sites within one-half mile of the subject property.

4.2 ADDITIONAL ENVIRONMENTAL RECORD SOURCES

Additional environmental record sources that were reviewed for this Phase I ESA included Maui County building permit and zoning records available online. The findings from review of these records are discussed in Section 4.4.2.

4.3 PHYSICAL SETTING SOURCES

4.3.1 USGS Topographic Map Coverage

According to the U.S. Geological Survey (USGS) topographic maps of the area (Maalaea Quadrangle), the property is located at approximately 20° 48' 14.4'' north latitude and 156° 30' 41.1'' west longitude. The elevation of the subject property ranges from approximately 40 feet above mean sea level at the southern end near Maalaea Small Boat Harbor to approximately 200 feet above mean sea level at the northern end near Kuihelani Highway. Topographic map coverage of the subject site is shown on Figure 1 in Appendix A.

4.3.2 Geologic and Hydrogeologic Setting

E2 reviewed published geologic and hydrogeologic reports and maps to obtain information regarding subsurface conditions in the general area of the site to evaluate potential migration of contaminants.

Geology and Soils

The subject property is located along the eastern base of the West Maui Mountains.

According to the U. S. Soil Conservation Service (Foote et al., 1972) the predominant soil types located in the site vicinity are:

> Pulelu cobbly loam – well drained and excessively drained, medium textured, moderately textured, and coarse-textured soils on alluvial fans and in basins on the island of Maui.
>
> Stony alluvial land – moderately well and well drained, moderately coarse textured soils with moderate infiltration rates.

Hydrogeology

The subject property is located within the Waikapu Aquifer System of the Wailuku Aquifer Sector (Mink and Lau, 1990). Two aquifers are located beneath the site, an upper aquifer that occurs in sedimentary (alluvial) deposits and a lower (deeper) aquifer that occurs in horizontally extensive lavas. Both aquifers are basal, where freshwater is in contact with seawater. The upper aquifer is unconfined, where the water table is the upper surface of the saturated aquifer; and the lower aquifer is confined by impermeable or poorly permeable formations (the sedimentary deposits) with the top of the saturated aquifer below the surface of the groundwater (Mink and Lau, 1990).

The upper aquifer has the potential to be used, is not a drinking water source or ecologically important, has a moderate salinity (1,000 to 5,000 milligrams per liter of chloride), is replaceable, and is moderately vulnerable to contamination. The lower aquifer has the potential to be used, is not a drinking water source or ecologically important, has a moderate salinity (1,000 to 5,000 milligrams per liter of chloride), is replaceable, and has a low vulnerability to contamination.

Based on regional topography, regional groundwater flow direction is expected to be south-southeast towards the ocean. The nearest drinking water supply wells are located over one mile from subject property to the northwest (EDR, 2006). There are five wells registered with the State Department of Land and Natural Resources within a one mile radius of the property. Three wells are being used for irrigation, one well may be used for drinking water for future residential development, and one well does not have a listed use.

Surface Water

The closest surface water body to the site is the Maalaea Small Boat Harbor, which is approximately 500 feet south of the southern end of the site, and is contiguous with the Pacific Ocean. The location of the Maalaea Small Boat Harbor in relation to the site is shown on Figure 1 in Appendix A. There is also an earthen reservoir located approximately 1,000 feet northwest of the site.

Storm water runoff appears that it would flow into swales and gullies to the south-southwest of the site towards Honoapiilani Highway and Maalaea Harbor.

4.4 HISTORICAL USE INFORMATION

4.4.1 Historical Review Sources

Past use of the subject property and adjoining properties was ascertained by reviewing the following standard historical sources: aerial photographs; building permits, zoning records, and property tax records available online; various printed publications; as well as publications posted on the internet; and information from the interview with the owner's representative. Appendix D contains copies of pertinent maps.

4.4.2 Past Uses of the Subject Property and Adjoining Properties

Past Uses of the Subject Property

Review of aerial photographs from 1950 through 1995 indicates that the property was used for agricultural purposes, specifically sugarcane cultivation, throughout the entire period.

Mr. Chumbley, of Wailuku Agribisuness, indicated that various pesticides and herbicides were properly applied to the property for sugarcane cultivation. Mr. Chumbley has provided a list of pesticides and herbicides, which is included in Appendix C.

Past Uses of Adjoining Properties

The earliest aerial photographs from 1950 indicate that a quarry was active at the location of the current Maalaea Construction and Demolition Landfill. The land to the north and east were being used for agriculture. There were many small structures, probably commercial, located to the south near Maalaea Harbor. The land to the west was undeveloped.

No changes are visible until the 1980s when larger structures were built near Maalaea Harbor. Quarry activities at the current Maalaea Construction and Demolition Landfill appear to be ongoing at this time.

The last aerial photograph in 1995 shows no changes, with the possible exception that quarry activity may have stopped.

From the site reconnaissance and interviews, also to be discussed in the following sections, we know that the quarry that had begun operations before 1950 is now being used as a demolition and construction debris landfill. Also, a new quarry began operations to the northwest of the site and is still in operation at this time.

5.0 SITE RECONNAISSANCE

5.1 METHODOLOGY AND LIMITING CONDITIONS

E2 personnel conducted the site reconnaissance November 1, 2006. The site reconnaissance consisted of a visual inspection of the property and the surrounding area.

The site reconnaissance was limited by the following condition:

1) The site had only a few dirt roads that were drivable. Overgrown grass in areas where the site was inaccessible by car may have obstructed the view of some surface or subsurface objects.

2) Drums containing liquids of unknown contents were found at the site. No sampling was performed to determine the contents.

5.2 GENERAL SITE SETTING

Site reconnaissance was conducted on November 1, 2006 by Mr. Roger Aoki and Mr. Ryan Yamauchi of E2. The reconnaissance included visual a survey of the property and a brief survey of the visible portions of the adjacent properties. Photographs are included in Appendix A.

The site is former sugar cane agricultural land that is currently being used as pasture land for cattle grazing. The cattle grazing is operated by the Maui Cattle Company. In addition to grazing fields, the Maui Cattle Company has a few pens and a feeding area near the center of the property. The Maui Cattle Company stores small quantities of gasoline and other petroleum products near the pen area to operate small tractors.

An active quarry facility is in operation to the northwest. Also, across Honoapiilani Highway to the northeast there is a former quarry that is currently being used as a demolition and construction debris landfill. The area to the west is undeveloped. The area to the east was used for sugar cane agriculture. Maalaea Small Boat Harbor and several commercial establishments are located to the south of the property.

5.3 HAZARDOUS SUBSTANCE AND PETROLEUM PRODUCTS IN CONNECTION WITH IDENTIFIED USES

E2 identified small quantities of petroleum products associated with the Maui Cattle Company operations during the site reconnaissance. There were five 5-gallon gasoline containers and seven 5-gallon containers of hydraulic and transmission oil stored near the pen area in the center of the property. Some of the containers were empty and none of the containers were completely full. One car battery was also observed in the pen area. No significant surface staining was observed in the petroleum product storage area.

5.4 HAZARDOUS SUBSTANCE AND PETROLEUM CONTAINERS *(NOT NECESSARILY IN CONNECTION WITH IDENTIFIED USES)*

E2 did not observe any hazardous substances or petroleum containers not necessarily associated with identified uses.

5.5 UNIDENTIFIED SUBSTANCE CONTAINERS

E2 observed fourteen (14) 55-gallon high density polyethylene (HDPE) drums along the southwestern perimeter of the property. Most of the drums were full with liquid. Two damaged drums were empty. The drums were not labeled and the contents of the drums are unknown at this time. Mr. Kikuchi was unaware of the drums being on-site. Mr. Franco indicated that the drums were on site before Maui Cattle Company began using the site about a year ago. As of the date of this report, Mr. Chumbley is planning to have the drums removed by November 17, 2006.

5.6 STORAGE TANKS

E2 did not observe the presence of storage tanks on the property during the site reconnaissance.

E2 observed two plastic storage containers (approximately 1 cubic yard in size) within the pen area. According to Mr. Franco, these containers are used to store molasses that is used in feed for the cattle.

5.7 INDICATIONS OF PCBS

E2 did not observe indications of the potential presence of PCBs on the property during the site reconnaissance.

5.8 INDICATIONS OF SOLID WASTE DISPOSAL

E2 observed one pile of solid waste, which appears to be discarded rain gauges, on the property. The pile was located near the southwestern end of the site. Also, the recent fire in September has exposed some illicit dumping of propane tanks along the western perimeter of the site.

5.9 MIGRATION OF OFF-SITE CONTAMINATION

E2 did not observe off-site contaminant migration onto the property.

5.10 OTHER CONDITIONS OF CONCERN

Odors
No strong, pungent, or noxious odors were identified at the property during the site reconnaissance.

Stressed Vegetation
No stressed vegetation was identified at the property during the site reconnaissance.

Wastewater and Septic Systems
No wastewater or septic systems were identified at the property during the site visit or from records reviewed.

Storm Water
Storm water run-on and/or run-off were not observed on the property during the site reconnaissance. Storm water runoff appears that it would flow into swales and gullies to the south-southwest of the site towards Honoapiilani Highway and Maalaea Harbor.

Drains and Sumps
No drains or sumps were identified at the property during the site reconnaissance.

Stained Soil or Pavement
No stained soil or pavement was identified at the property during the site reconnaissance.

Wells
No wells were identified at the property during the site reconnaissance. A well head located just adjacent to the property was observed along the western perimeter of the property. Wells are discussed in Section 4.3.2.

Pits, Ponds, or Lagoons
No pits, ponds, or lagoons were identified at the property during the site reconnaissance.

6.0 INTERVIEWS

6.1 INTERVIEW WITH CURRENT OWNER / FORMER OWNER / OCCUPANTS

E2 interviewed Mr. Steven Kikuchi, Partner of Maalaea Properties LLC; Mr. Avery Chumbley, President of Wailuku Agribusiness; and Alex Franco, Manager of Maui Cattle Company regarding the subject property. Information obtained during the interviews is included in pertinent sections of this report.

6.2 INTERVIEW WITH LOCAL GOVERNMENTAL OFFICIALS

Written requests for information were sent to the State of Hawaii Department of Health, the Maui County Department of Fire Control, and the Local Emergency Planning Committee. Copies of the information request and responses are included in Appendix D and Information obtained is included in pertinent sections of this report.

7.0 FINDINGS AND OPINIONS

Review of Standard Environmental Record Sources

A review of the environmental regulatory databases indicated that the subject property was not listed on any of the federal or state databases searched by EDR.

A review of the environmental regulatory databases identified one SQG site, located within the respective search radii. However, due to its location, relative elevation, and status, the site is unlikely to have a significant environmental impact on the subject property.

Three LUST sites are located within one-half mile of the subject property. These sites have completed cleanup or are located at such a distance down gradient of the subject property that they are unlikely to have an environmental impact on the subject property. Likewise, three registered UST sites, one UST site currently in use and 2 UST sites permanently out of use, were identified within ¼ mile of the subject property. The active UST site has three USTs, a 10,000 gallon gasoline, a 15,000 gallon gasoline and a 6,000 gallon diesel. This UST site is located down gradient of the subject property and is unlikely to have an environmental impact on the subject property.

Historical Review

E2 identified that the property was historically used for agriculture, specifically for sugar cane cultivation. In an interview, Mr. Chumbley of Wailuku Agribusiness (former user of the property) indicated that pesticides and herbicides were applied to the property as part of the normal agricultural operations. Mr. Chumbley provided a list of potential pesticides and herbicides that may have been applied to the property (Appendix C).

E2 also identified a construction and demolition debris landfill, and a gas station operating adjacent to the subject property. Gas stations are also known to have petroleum products that are harmful to and persistent in the environment. However, no records have been filed with the Department of Health regarding hazardous material or substance releases from either of these sites.

Site Reconnaissance

E2 identified five (5) 5-gallon containers of gasoline, seven (7) 5-gallon containers of hydraulic and transmission oil, and one car battery within the pen area operated by the Maui Cattle Company near the center of the property. Gasoline and other petroleum products, if released, may be harmful to and persistent in the environment. No staining was observed on the ground surface below or around the gasoline containers, transmission oil, or battery.

Fourteen (14) 55-gallon unmarked HDPE drums containing an unknown liquid were observed along the western perimeter of the property. Twelve of the drums were partially full with liquid and two drums were empty, possibly indicating a potential release. Mr. Franco indicated that the drums were on site before the Maui Cattle Company began using the site about a year ago. In a follow-up request for additional information, Mr. Chumbley of Wailuku Agribusiness, indicated that the drums must have been left by a former licensee. As of the date of this report, Mr. Chumbley is planning to have the drums removed by November 17, 2006.

E2 did not observe any other recognized environmental conditions during the site reconnaissance.

8.0 CONCLUSIONS

We have performed a Phase I Environmental Site Assessment in conformance with the scope and limitations of ASTM Practice E 1527-05 of the subject property, located in Maalaea Mauka, Wailuku, Hawaii, designated as TMK: (2) 3-6-001: parcel 018. Any exceptions to, or deletions from, this practice are described in Section 1.5 of this report. This assessment has revealed no significant evidence of recognized environmental conditions in connection with the property with the exception of the fourteen (14) unmarked 55-gallon HDPE drums located along the dirt road bordering the southwestern end of the property. Twelve (12) of the drums were partially full with an unknown liquid at the time of the field

inspection. Two of the drums were damaged and empty indicating a potential release. In an interview with Mr. Alex Franco, Manager of Maui Cattle Company, Mr. Franco noted that the drums were present prior to their use of the property over a year ago. Mr. Franco believes that the drums may have been left by one of the farmers that were previously utilizing the property. In a follow-up request for additional information, Mr. Chumbley of Wailuku Agribusiness, indicated that the drums must have been left by a former licensee. As of the date of this report, Mr. Chumbley is planning to have the drums removed by November 17, 2006.

E2 recommends that the contents of the drums be determined and that drums and contents be properly disposed and/or recycled in accordance with all Federal, State and local regulations. Upon removal of the drums, the soil and vegetation beneath the drums should be inspected for indications of a release by an environmental professional. If a significant release is suspected, appropriate sampling and cleanup should be conducted.

E2 has also identified that the property has been historically used for sugarcane cultivation. In an interview, Mr. Chumbley of Wailuku Agribusiness (former user of the property) indicated that pesticides and herbicides were applied to the property as part of the normal agricultural operations. Therefore, residual levels of pesticides and herbicides are probably present on the property. Although proper applications of pesticides and herbicides does not constitute a release of hazardous chemicals, E2 recommends that limited composite soil sampling be conducted on the property should the intended land use of the property change from agricultural to residential. The purpose of the limited sampling would be to determine if residual levels of pesticides/herbicides are present in site soils. The sample analyses selected should be based on the list of potential pesticides and herbicides that may have been applied to the property as provided by Mr. Chumbley.

9.0 DEVIATIONS

In conducting this Phase I ESA, there were no deletions from the standard practice (ASTM Designation E1527-05) and no client-imposed constraints. In addition, no data gaps were encountered, other than the limitations described in Section 5.1.

10.0 REFERENCES

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11.0 SIGNATURE OF ENVIRONMENTAL PROFESSIONALS

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.

Roger C. Aoki, P.E. Date: November 15, 2006

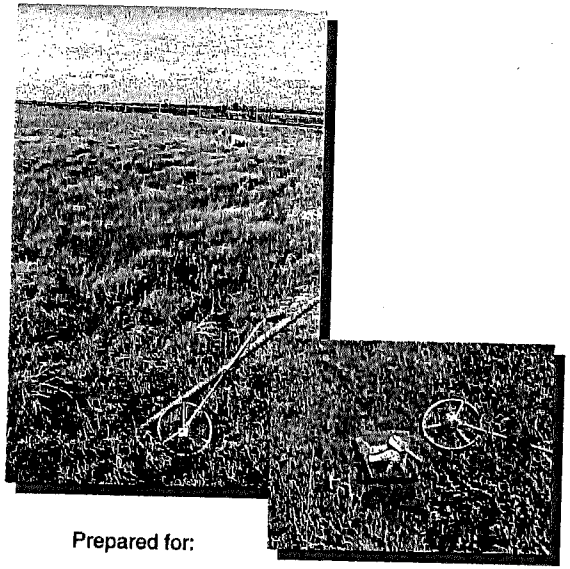
Ryan S. Yamauchi, P.E. Date: November 15, 2006

12.0 QUALIFICATIONS OF ENVIRONMENTAL PROFESSIONALS

Qualifications of the environmental professional are included in Appendix E.

Phase II Environmental Site Assessment Screening Report

Maalaea Mauka
TMK (2) 3-6-001:018
Maalaea, Maui, Hawaii



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August 2007

Executive Summary

Element Environmental, LLC completed a Screening Phase II Environmental Site Assessment (ESA) of the Maalaea Mauka property identified as TMK: (2) 3-6-001: parcel 018 located in Maui, Hawaii. A Phase I ESA prepared for the property in November 2006 identified historical agricultural use at the site. The purpose of this Screening Phase II ESA was to evaluate if residual levels of pesticides and herbicides resulting from historic agricultural use are present in surface soils. In addition, an area where fourteen 55-gallon unmarked drums were identified in the Phase I ESA was investigated to determine if a release from the drums had occurred. The results of this screening will be used to determine if additional characterization and remediation with regard to the planned future residential development is necessary to protect human health and the environment.

In line with current State of Hawaii Department of Health (HDOH) published guidance documents, the Screening Phase II ESA was completed on "neighborhood-size" decision units utilizing a multi-increment sampling approach. The 260-acre site was divided into eight decision units approximately 32.5 acres in size with one multi-increment surface soil sample collected from each unit. The multi-increment samples were analyzed for pesticide and herbicide constituents that may have been applied to the property.

The results of the multi-increment sampling analyses indicate that residual pesticides and herbicides are not present at significant levels in the surface soils at the site. The majority of the pesticide and herbicide analytes were not detected in the multi-increment samples. The heavy metal arsenic was detected in all of the multi-increment samples. The arsenic levels detected were within range of natural occurring levels (i.e. background levels) found in soils throughout Hawaii. According to HDOH guidance, residential sites that contain arsenic within background levels do not require further action or restrictions on land use.

Two discrete samples were also collected from beneath the area where fourteen 55-gallon drums were observed during the Phase I ESA. The two samples were analyzed for a full suite of analytes to determine if a significant release had occurred in the area. The analytical results did not indicate that a significant release had occurred from the drums. One of the two samples contained a low level of total petroleum hydrocarbons-residual range organics. The level detected was well below the HDOH Environmental Action Level (EAL). The majority of the remaining analytes were not detected with the exception of metals, which were detected at levels below the HDOH EALs and U.S. Environmental Protection Agency (EPA) Region 9 Preliminary Remediation Goals or within naturally occurring background levels. Based on these sample results and the fact that the drums were removed and disposed, no further action is recommended for the drum area at this time.

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Section 1 Introduction

This Phase II Environmental Site Assessment (ESA) Screening Report presents the work procedures, methods, and results from the Screening Phase II ESA conducted by Element Environmental, LLC (E2) for the Maalaea Mauka property located in Maui, Hawaii. A Phase I ESA prepared for the property in November 2006 identified historical agricultural use at the site. This Screening Phase II ESA was conducted to determine if residual levels of pesticides and herbicides are present in surface soils at the site.

This Phase II ESA Screening Report has been prepared for M&E Pacific, Inc. in accordance with E2's fee proposal dated February 20, 2007.

1.1 Purpose and Objectives

The purpose of this Screening Phase II ESA was to evaluate if residual levels of pesticides and herbicides resulting from historic agricultural use at the site are present in surface soils. In addition, an area where fourteen 55-gallon unmarked drums were identified in the Phase I ESA was investigated to determine if a release from the drums had occurred. The results of this screening will be used to determine if additional characterization and remediation with regard to the planned future development is necessary to protect human health and the environment.

1.2 Report Organization

Details of the investigation are presented in the following sections of this Phase II ESA Screening Report. The report is organized as follows:

Section 1:	Introduction
Section 2:	Site Description and Background
Section 3:	Field Investigation and Sample Collection
Section 4:	Sample Analytical Results
Section 5:	Summary and Recommendations
Appendix A:	Potentially Applied Pesticides and Herbicides
Appendix B:	Laboratory Analytical Results
Appendix C:	Project Photographs

Section 2 Site Background

2.1 Site Location and Description

The project site consists of one parcel of developed land located in West Maui between Waikapu and Maalaea along the western side of Honoapiilani Highway (Figure 2-1). The property consists of approximately 259.885 acres of land designated as Tax Map Key (TMK): (2) 3-6-001: parcel 018.

Honoapiilani Highway runs along the eastern and southern boundary of the site. A dirt road off of Honoapiilani Highway runs along the northern and western perimeter of the site. A weather station is also present along the southwestern perimeter; however, it could not be determined if the station is located within or outside of the property boundary.

The site is currently occupied by the Maui Cattle Company, which utilizes the site for cattle pastures. Maui Cattle Company has installed wire fences throughout the property to control grazing patterns of the cattle. Maui Cattle Company also has a cattle pen and storage area near the center of the property. Entrance to the cattle pen can be made via a dirt road and locked gate located along Honoapiilani Highway.

The state land use designation for the property is Agricultural (County of Maui, 2007). The southern end of the property is located in a State Special Management Area (County of Maui, 2007). A portion of the southern end of the property is also located within the Federal Emergency Management Agency 500 year flood plain (County of Maui, 2007).

2.2 Physiography

2.2.1 Climate

According to Giambelluca et al. (1986), the mean monthly temperatures in Maui range from 70° to 84° Fahrenheit. The average annual rainfall at the site is approximately 20 inches per year (Giambelluca et al., 1986).

2.2.2 Geology

The project site is located along the eastern base of the West Maui Mountains.

According to the U. S. Soil Conservation Service (Foote et al., 1972), the predominant soil types located in the site vicinity are:

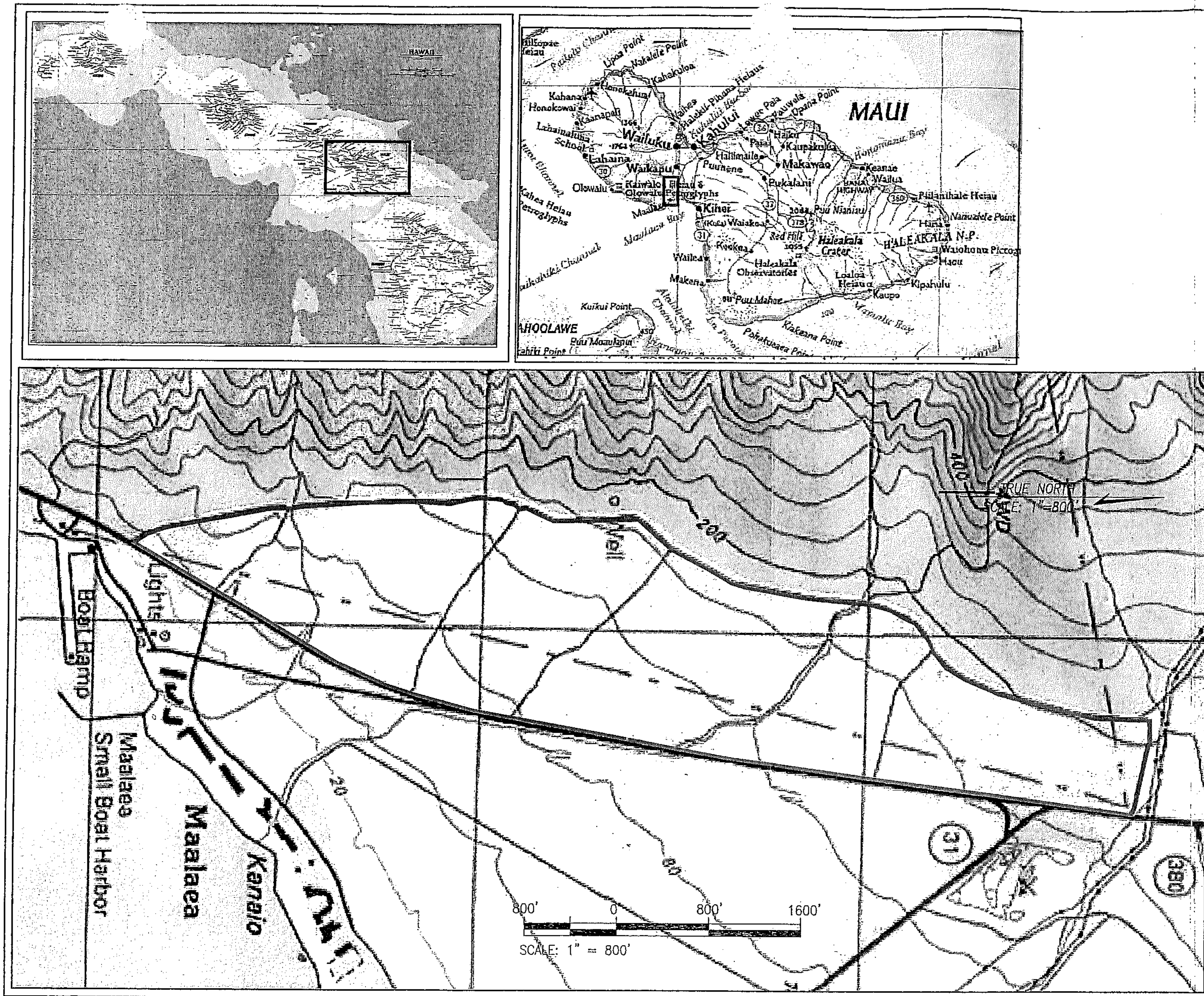
Pulelu cobbly loam – well drained and excessively drained, medium textured, moderately textured, and coarse-textured soils on alluvial fans and in basins on the island of Maui.

Stony alluvial land – moderately well drained, moderately coarse textured soils with moderate infiltration rates.

List of Acronyms

AL	Anatek Labs
AR	applicable requirements
bgs	below ground surface
BTEX	benzene, toluene, ethylbenzene, and xylene
C	Celsius
COC	Chain-of-Custody
COPC	Contaminants of Potential Concern
DQO	data quality objectives
E2	Element Environmental, LLC
EAL	Environmental Action Level
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
GPS	global positioning system
HDOH	State of Hawaii Department of Health
HDPE	High Density Polyethylene
HEER	Office of Hazard Evaluation and Emergency Response
LCS	laboratory control sample
MDL	method detection limit
mg/kg	milligrams per kilogram
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
msl	mean sea level
PCB	polychlorinated biphenyl
PPE	personal protective equipment
PQL	practical quantitation limit
PRG	Preliminary Remediation Goal
QA	quality assurance
QA/QC	quality assurance/quality control
RPD	relative percent difference
RSD	relative standard deviation
SOW	scope of work

STL	Severn Trent Laboratories
SVOC	semi-volatile organic compound
TA-Honolulu	Test America-Honolulu
TPH-diesel	total petroleum hydrocarbons-diesel range
TPH-gas	total petroleum hydrocarbons-gasoline range
TPR-rro	total petroleum hydrocarbons-residual range organics
USGS	U.S. Geological Survey
VOC	volatile organic compound



LEGEND:

SITE BOUNDARY

element environmental llc
environmental · engineering · water resources

PROJECT TITLE:
MAALAEA MAUKA PHASE II ESA SCREENING
MAALAEA , MAUI, HAWAII

FIGURE TITLE:
MAALAEA MAUKA
PROJECT LOCATION MAP

DATE: AUGUST 10, 2007

FIGURE NO.: 2-1

2.2.3 Hydrogeology

The project site is located within the Waikapu Aquifer System of the Wailuku Aquifer Sector (Mink and Lau, 1990). Two aquifers are located beneath the site, an upper aquifer that occurs in sedimentary (alluvial) deposits and a lower (deeper) aquifer that occurs in horizontally extensive lavas. Both aquifers are basal, where freshwater is in contact with seawater. The upper aquifer is unconfined, where the water table is the upper surface of the saturated aquifer; and the lower aquifer is confined by impermeable or poorly permeable formations (the sedimentary deposits) with the top of the saturated aquifer below the surface of the groundwater (Mink and Lau, 1990).

The upper aquifer has the potential to be used, is not a drinking water source or ecologically important, has a moderate salinity (1,000 to 5,000 milligrams per liter of chloride), is replaceable, and is moderately vulnerable to contamination. The lower aquifer has the potential to be used, is not a drinking water source or ecologically important, has a moderate salinity (1,000 to 5,000 milligrams per liter of chloride), is replaceable, and has a low vulnerability to contamination.

Based on regional topography, regional groundwater flow direction is expected to be south-southeast towards the ocean. The nearest drinking water supply wells are located over one mile from subject property to the northwest (Element, 2006). There are five wells registered with the State Department of Land and Natural Resources within a one mile radius of the property. Three wells are being used for irrigation, one well may be used for drinking water for future residential development, and one well does not have a listed use.

2.2.4 Surface Water

The closest surface water body to the site is the Maalaea Small Boat Harbor, which is approximately 500 feet south of the southern end of the site, and is contiguous with the Pacific Ocean. The location of the Maalaea Small Boat Harbor in relation to the site is shown on Figure 2-1. There is also an earthen reservoir located approximately 1,000 feet northwest of the site.

Storm water runoff appears that it would flow into swales and gullies to the south-southwest of the site towards Honoapiilani Highway and Maalaea Harbor.

2.3 Site History

The Phase I ESA completed in November 2006 identified that the property has been historically used for agricultural purposes, specifically sugarcane cultivation, from at least 1950 to the mid 1990s. In an interview conducted during the Phase I ESA, Mr. Avery Chumbley of Wailuku Agribusiness (former user of the property) indicated that pesticides and herbicides were applied to the property as part of the normal agricultural operations. A list of potential pesticides and herbicides that may have been applied to the site was provided by Mr. Chumbley and is included in Appendix A (Element, 2006).

The site is currently occupied by the Maui Cattle Company, which utilizes the site for cattle pastures. Maui Cattle Company has installed wire fences throughout the property to control grazing patterns of the cattle. Maui Cattle Company also has a cattle pen and storage area near the center of the property.

During the Phase I ESA site reconnaissance, fourteen unmarked 55-gallon High Density Polyethylene (HDPE) drums were observed along the dirt road bordering the southwestern

end of the property. Twelve (12) of the drums were partially full with an unknown liquid at the time of the field inspection. Two of the drums were damaged and empty, indicating a potential release. In an interview with Mr. Alex Franco, Manager of Maui Cattle Company, Mr. Franco noted that the drums were present prior to their use of the property over a year ago. Mr. Franco believes that the drums may have been left by one of the farmers that were previously utilizing the property. In a follow-up request for additional information, Mr. Chumbley of Wailuku Agribusiness, indicated that the drums must have been left by a former lessee. Mr. Chumbley planned to have the drums removed by November 17, 2006 (Element, 2006).

Section 3 Field Investigation and Sample Collection

3.1 Sampling Approach

3.1.1 Multi-Increment Sampling

The primary objective of this project was to resolve the following Decision Statement: Determine whether residual levels of pesticides and herbicides resulting from historic agricultural use at the site are present in surface soils, and if present, determine if additional characterization and remediation with regard to the planned future residential development is necessary to protect human health and the environment.

In order to resolve the Decision Statement, E2 determined that an appropriate amount of data would be required. Therefore, a multi-increment sampling strategy was designed to screen the entire 260 acre site. Multi-increment sampling is a method employed to obtain representative samples that exhibit average concentrations of the material being sampled and that account for the variability of concentrations within that particular material. Such a method was developed to provide accurate (closeness of the sample value to its actual value) and precise (closeness of repeated sample values, or repeatability) data.

The multi-increment sampling strategy follows the State of Hawaii Department of Health (HDOH) Hazard Evaluation and Emergency Response Office (HEER) technical report, entitled "Pesticides in Former Agricultural Lands and Related Areas – Updates on Investigation and Assessment" dated May 11, 2007. The sampling strategy employed for this project follows the "neighborhood-size" decision unit approach as outlined in the "Initial Screening of Agricultural Lands" section of the technical report.

The neighborhood size approach breaks down the project site into neighborhood-size decision units on the order of ten acres. The technical report recommends that the size and shape of individual decision units should be determined with respect to soil type, topography, past crop use, proposed redevelopment, etc. Areas suspected of higher levels of contamination (e.g. former pesticide mixing areas, storage areas, plantation camps, rail lines, etc.) are recommended to be investigated separately (HDOH, 2007). For the Maalaea Mauka project site, the site soils and past crop use across the site is relatively uniform and no areas suspected of higher levels of contamination were identified in the Phase I ESA, with the exception of the area with the 14 drums. Therefore, the 260 acre site was divided into eight neighborhood-size decision units on the order of 32.5 acres in area.

Per the technical report, one multi-increment sample was collected from each decision unit. For quality assurance purposes, one decision unit was sampled in triplicate. The field sampling methodology is described in the sections to follow.

3.1.2 Multi-Increment Sample Analyses

The technical report recommends that each multi-increment sample be tested for the full suite of pesticides that may have been used in the past. Based on the list of pesticides and herbicides provided by Mr. Chumbley, the multi-increment samples were analyzed for the following constituents:

- Arsenic and Lead (Method: SW 846);

- Semi-volatile Organic Compounds (Method: GC/MS and 8270C);
- Chlorinated Herbicides (Method: EPA 8151A);
- Organochlorine Pesticides (Method: EPA 8081A);
- Carbamates (Method: EPA 8321A);
- Volatile Organic Compounds (i.e. Fumigants) (Method: EPA 8260B); and
- Polychlorinated Biphenyls (Method: EPA 8082).

The technical report also recommends sampling for dioxins, which may remain in soils even though the parent pesticide has degraded below levels of concern (HDOH, 2007). However, due to the expense of the analysis and the screening nature of this investigation, dioxins were not analyzed as part of this investigation.

3.1.3 Discrete Sampling

During the Phase I ESA site reconnaissance, fourteen unmarked 55-gallon HDPE drums were identified along the dirt road bordering the southwestern end of the property. Twelve (12) of the drums were partially full with an unknown liquid at the time of the field inspection. Two of the drums were damaged and empty, indicating a potential release. In an interview with Mr. Alex Franco, Manager of Maui Cattle Company, Mr. Franco noted that the drums were present prior to their use of the property over a year ago. Mr. Franco believes that the drums may have been left by one of the farmers that were previously utilizing the property. In a follow-up request for additional information, Mr. Chumbley of Wailuku Agribusiness, indicated that the drums must have been left by a former lessee (Element, 2006). Based on the potential for a release from the drums, the area surrounding the drums was separated from the multi-increment decision units and sampled discretely. Two discrete samples were collected from the surface soil directly beneath the drums.

3.1.4 Discrete Sample Analyses

Due to the unknown nature of the drum contents, the discrete surface soil samples collected from the drum area were analyzed for the following complete suite of analytes:

- Total Petroleum Hydrocarbons – gasoline range (Method: EPA 8015M/8260B)
- Total Petroleum Hydrocarbons – diesel range and residual range organics (Method: EPA 8015M)
- RCRA 8 Metals (Method: SW 846)
- Volatile Organic Compounds (Method: EPA 8260B)
- Semi-volatile Organic Compounds (Method: GC/MS)
- Chlorinated Herbicides (Method: EPA 8151A)
- Organochlorine Pesticides (Method: EPA 8081A)
- Polychlorinated Biphenyls (Method: EPA 8082)

3.2 Sample Collection

3.2.1 Decision Unit Establishment

The eight neighborhood size decision units were established at the site utilizing a hand held global positioning system (GPS) unit. Latitude and longitude coordinates of the decision unit boundary corners were obtained from the United States Geological Survey (USGS) Topographic Quadrangle mapping program. The hand held GPS unit was used to locate the boundary corners of the decision units in the field and survey flagging was used to mark these corners. The eight decision units were numbered from 1 to 8 from south to north (Figure 3-1).

3.2.2 Multi-Increment Sample Collection

One multi-increment sample was collected from each of the decision units with one decision unit sampled in triplicate. Per the HDOH technical report, each multi-increment sample consisted of 30 to 50 increments of soil. Each increment was collected approximately 6 inches below the ground surface using dedicated plastic scoop(s) and consisted of approximately 50 grams of soil. The increments were placed into Ziploc bags for shipment to the laboratory and the bags were labeled with the project name, sample identification, and the date/time of sample collection. Prior to handling any soil, E2 personnel donned a new pair of disposable nitrile gloves. New plastic scoops were used to collect each multi-increment sample. Sieving of the samples was not conducted in the field, but rather at the laboratory.

Per the HDOH technical report, the increments were collected in a stratified-random manner by sampling up and down adjacent rows. The increments within a decision unit were physically combined into one sample. The adjacent sampling rows were spaced approximately 160 to 175 feet apart to provide coverage across the entire decision unit. The increment sample locations across several rows in each decision unit were recorded using a hand held GPS unit such that the spatial coverage could be verified by mapping the coordinate locations (Figure 3-2). No suspect areas (i.e. dumping sites, waste pits, etc.) were observed during the multi-increment sampling across the decision units.

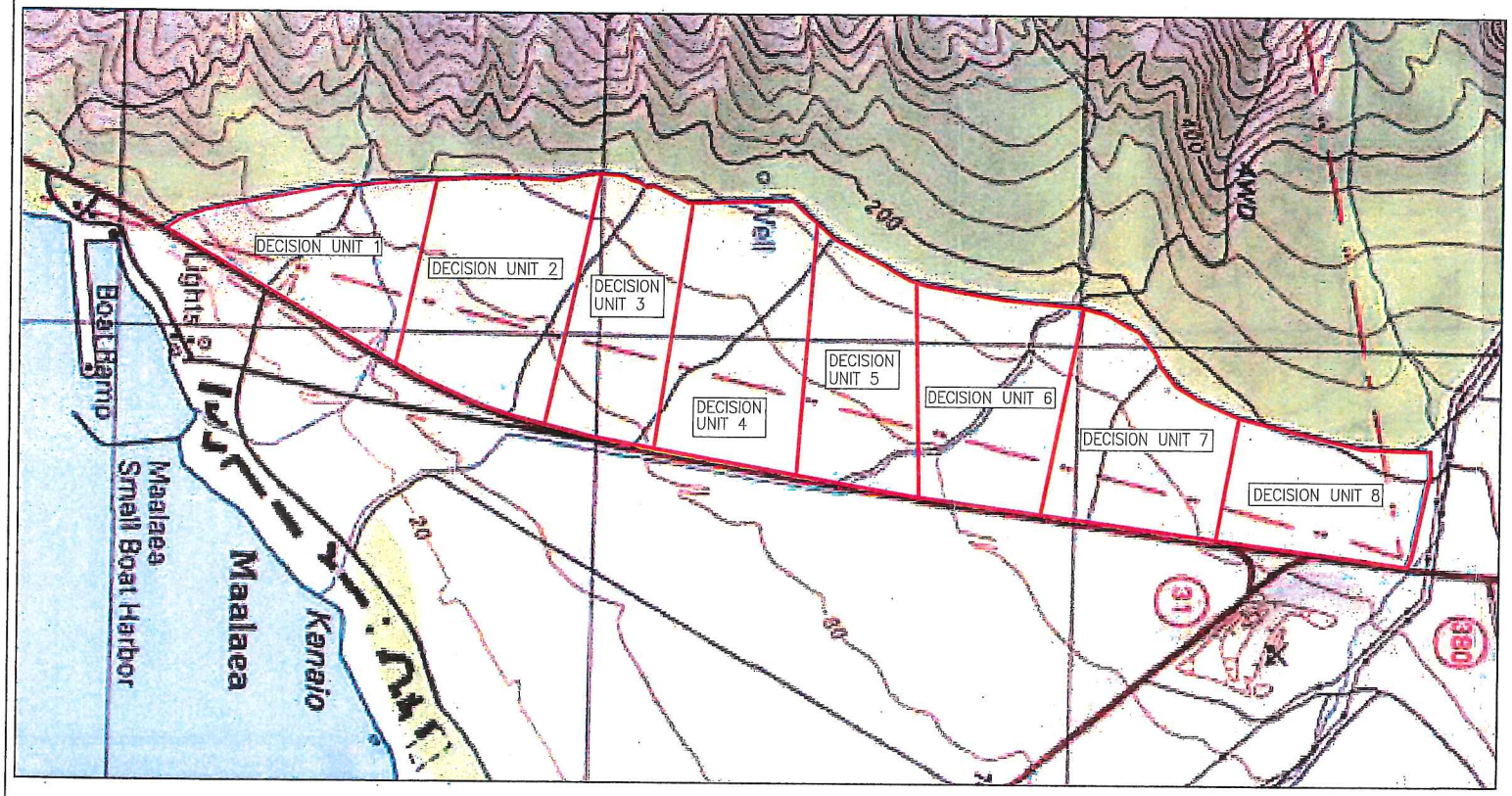
Based on consultation with HEER, discrete sampling for volatile organic compound (VOC) analysis was completed rather than utilizing multi-increment sampling techniques. Discrete VOC samples were collected in the middle of each decision unit at a depth of 18 inches below ground surface (bgs) (Figure 3-2).

A summary of the multi-increment samples collected is presented in Table 3-1 below.

TRUE NORTH
SCALE: 1"=800'

LEGEND:

DECISION UNIT BOUNDARY



800' 0' 800' 1600'
SCALE: 1" = 800'

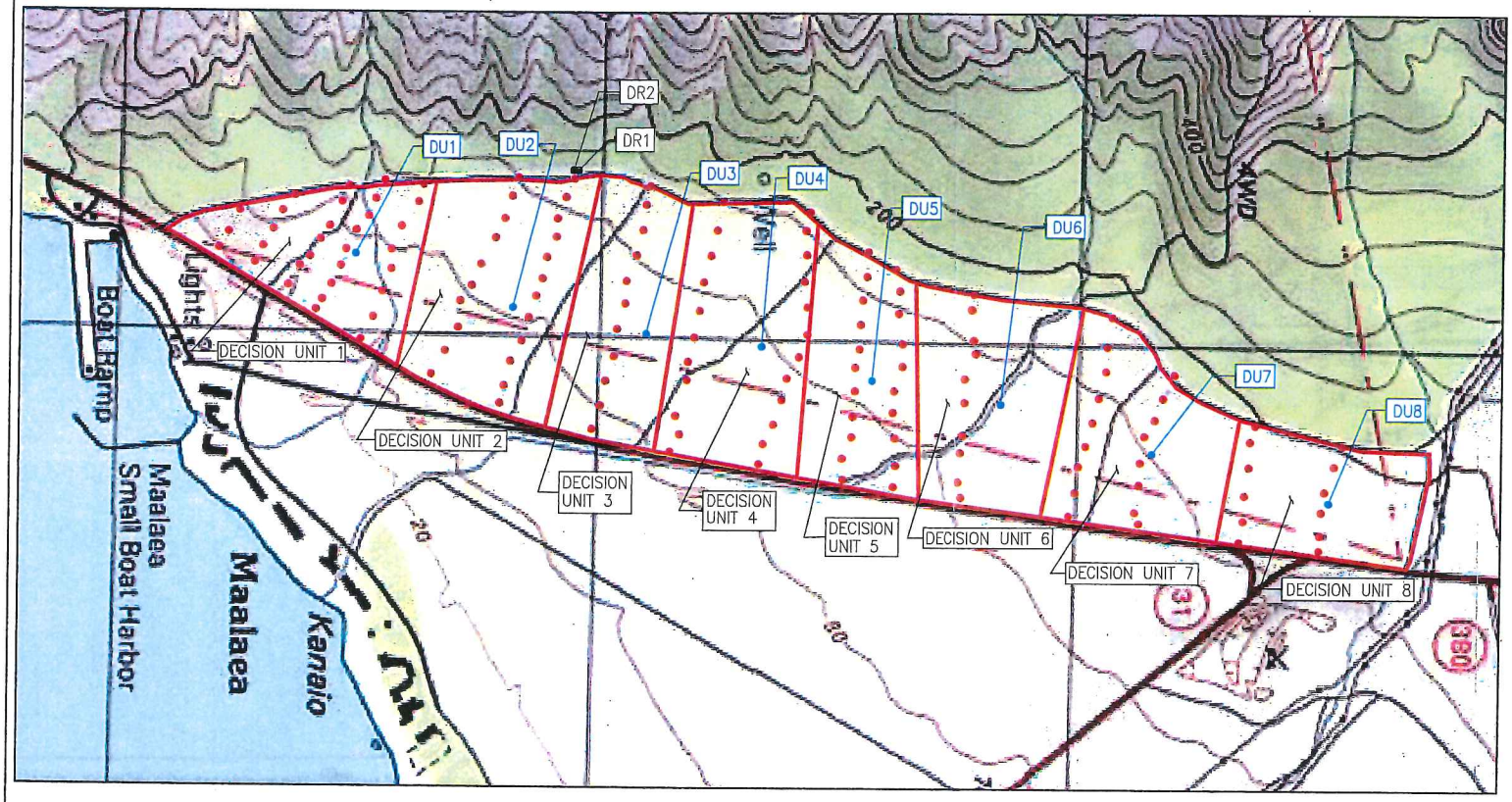
element environmental llc
environmental · engineering · water resources

PROJECT TITLE:
MAALAEA MAUKA PHASE II ESA SCREENING
MAALAEA, MAUI, HAWAII

FIGURE TITLE:
MAALAEA MAUKA
DECISION UNITS

DATE: AUGUST 10, 2007

FIGURE NO.: 3-1



LEGEND:

DECISION UNIT BOUNDARY

GPS SAMPLE LOCATIONS

MULTI–INCREMENTAL GPS SAMPLE LOCATION

DU1 VOC GPS SAMPLE LOCATION

DR1 FORMER DRUM GPS SAMPLE LOCATION

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PROJECT TITLE:
MAALAEA MAUKA PHASE II ESA SCREENING
MAALAEA, MAUI, HAWAII

FIGURE TITLE:
MAALAEA MAUKA
GPS SAMPLE LOCATIONS

DATE: AUGUST 10, 2007

FIGURE NO.: 3-2

Table 3-1
Multi-Increment Sample Summary

Sample Identification	Decision Unit	Number of Increments
DU1	1	34
DU2	2	51
DU3	3	55
DU4	4	57
DU5	5	54
DU6	6	48
DU7	7	49
DU8	8	40
DU9	1	32
DU10	1	31

3.2.3 Discrete Sample Collection

The 14 drums observed during the Phase I ESA had been properly removed from the site by Wailuku Agribusiness prior to commencement of this field investigation. The area where the drums were observed was located by hand held GPS and verified against photos taken during the Phase I ESA (Figure 3-2). Stressed vegetation and staining was not observed in the area. Two surface soil samples were collected from beneath the former drum locations. The two samples were collected using dedicated plastic scoops and placed into pre-cleaned laboratory jars. The samples were collected approximately 6 inches bgs (18 inches for VOC analysis). The sample jars were labeled with the project name, sample identification, and the date/time of sample collection.

3.2.4 Sample Shipment

All soil samples were chilled immediately upon sample collection. The samples were hand delivered to the analytical laboratory, Test America (TA-Honolulu), on Oahu under proper Chain of Custody procedures. TA-Honolulu processed the samples and completed the majority of the analyses. Sub-samples were sent to their sister laboratories, Severn Trent Laboratories (STL) in Seattle and Anatek Labs (AL) in Idaho, for certain analyses (Chlorinated Herbicides and Organochlorine Pesticides at STL and Carbamates and subset Semi-volatile Organic Compounds at AL).

Section 4 Soil Sampling Results

4.1 Data Evaluation Criteria

The primary objective of this Screening Phase II ESA is to determine if residual levels of pesticides and herbicides are present in site surface soils, and if present, whether the levels warrant further characterization and remediation when considering the planned future land use change from agricultural to residential. Therefore, the soil sample analytical results for this Screening Phase II ESA are compared to the current HDOH Environmental Action Levels (EALs) for sites where groundwater is a current or potential source of drinking water and a surface water body is less than 150 meters from the site (HDOH, 2006) and the U.S. Environmental Protection Agency (EPA) Region 9 Residential Preliminary Remediation Goals (PRGs) (EPA, 2004). In addition, arsenic levels are also compared to the soil action levels presented in the HDOH HEER technical report entitled "Soil Action Levels and Categories for Bioaccessible Arsenic" dated August 7, 2006.

4.2 Sample Results

4.2.1 Multi-increment Sample Results

A total of ten multi-increment samples were collected during this investigation: one from Decision Units 2 through 7 and three from Decision Unit 1. The laboratory analytical results are presented in Table 4-1. Some analytical results within the table are reported as "ND", which indicates that a specific analyte was "not detected" at or above the method reporting limits as shown on the laboratory reports. Concentrations detected above the reporting limit are shown in "bold" font. Detected concentrations that are below the HDOH EALs and EPA Region 9 Residential PRGs are highlighted in light blue. Detected concentrations that are above either the HDOH EALs or EPA Region 9 Residential PRGs are highlighted in orange. Several analytes do not have established EALs or PRGs and are identified on the tables by "NS", which indicates that "no standard" has been established. The complete laboratory reports are provided in Appendix B.

The analytical results indicate that VOCs, semi-volatile organic compounds (SVOCs), chlorinated herbicides, organochlorine pesticides, carbamates, and polychlorinated biphenyls (PCBs) were not detected in any of the multi-increment samples. Lead was detected in two of the ten multi-increment samples at concentrations much lower than the HDOH EAL and EPA Region 9 PRG.

Arsenic was detected in all ten multi-increment samples. The range of concentrations detected was 2.82 mg/kg to 3.98 mg/kg. These arsenic levels are below the HDOH EAL of 20 mg/kg, but above the EPA Region 9 Residential PRG of 0.39 mg/kg. Based on the HDOH HEER technical report for bioaccessible arsenic, concentrations of total arsenic less than or equal to 20 mg/kg are within range of natural occurring levels (i.e. background levels) found in soils throughout Hawaii (HDOH, 2006b). According to Table 1 in the HDOH HEER technical report, residential sites with concentrations of arsenic less than or equal to 20 mg/kg do not require further action or restrictions on land use.

Table 4-1
Laboratory Analytical Results
Multi-increment Samples

Analyte	Sample Number																				HDOH Residential EAL (mg/kg)	EPA Region 9 Residential PRG (mg/kg)
	DU1		DU2		DU3		DU4		DU5		DU6		DU7		DU8		DU9		DU10			
	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)		
TOTAL METALS (SW 846)																						
Arsenic	3.04	0.962	2.94	0.952	3.96	0.98	3.64	0.98	3.33	0.952	3.58	0.943	3.1	0.971	3.41	0.971	2.82	0.935	2.89	0.943	20	0.39
Lead	ND	1.92	5.19	1.9	1.97	1.96	ND	1.96	ND	1.9	ND	1.89	ND	1.94	ND	1.94	ND	1.87	ND	1.89	200	400
SEMIVOLATILE ORGANICS (GC/MS)																						
1,2,4,5-Tetrachlorobenzene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	18
1,2,4-Trichlorobenzene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	1.6	62
1,2-Dichlorobenzene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	1.1	600
1,3-Dichlorobenzene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	7.4	530
1,4-Dichlorobenzene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.065	34
1-Chloronaphthalene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
1-Naphthylamine	ND	0.617	ND	0.658	ND	0.658	ND	0.641	ND	0.635	ND	0.658	ND	0.637	ND	0.633	ND	0.641	ND	0.633	NS	NS
2,3,4,6-Tetrachlorophenol	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.4	1,800
2,4,5-Trichlorophenol	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.18	6,100
2,4,6-Trichlorophenol	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	1.2	6.1
2,4-Dichlorophenol	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.3	180
2,4-Dimethylphenol	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.73	1,200
2,4-Dinitrophenol	ND	1.59	ND	1.69	ND	1.69	ND	1.65	ND	1.63	ND	1.69	ND	1.64	ND	1.63	ND	1.65	ND	1.63	0.21	120
2,4-Dinitrotoluene	ND	0.617	ND	0.658	ND	0.658	ND	0.641	ND	0.635	ND	0.658	ND	0.637	ND	0.633	ND	0.641	ND	0.633	0.25	NS
2,6-Dichlorophenol	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.3	NS
2,6-Dinitrotoluene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.42	120
2-Chloronaphthalene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
2-Chlorophenol	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.012	63
2-Methylnaphthalene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.25	NS
2-Methylphenol (o-Cresol)	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	3,100
2-Naphthylamine	ND	0.617	ND	0.658	ND	0.658	ND	0.641	ND	0.635	ND	0.658	ND	0.637	ND	0.633	ND	0.641	ND	0.633	NS	NS
2-Nitroaniline	ND	1.59	ND	1.69	ND	1.69	ND	1.65	ND	1.63	ND	1.69	ND	1.64	ND	1.63	ND	1.65	ND	1.63	NS	180
2-Nitrophenol	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
2-Picoline	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
3,3-Dichlorobenzidine	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.04	1.1
3-Methylcholanthrene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
3-Nitroaniline	ND	1.59	ND	1.69	ND	1.69	ND	1.65	ND	1.63	ND	1.69	ND	1.64	ND	1.63	ND	1.65	ND	1.63	NS	18
4,6-Dinitro-2-methylphenol	ND	1.59	ND	1.69	ND	1.69	ND	1.65	ND	1.63	ND	1.69	ND	1.64	ND	1.63	ND	1.65	ND	1.63	NS	NS
4-Aminobiphenyl	ND	0.617	ND	0.658	ND	0.658	ND	0.641	ND	0.635	ND	0.658	ND	0.637	ND	0.633	ND	0.641	ND	0.633	NS	NS
4-Bromophenyl phenyl ether	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
4-Chloro-3-methylphenol	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
4-Chloroaniline	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.053	240
4-Chlorophenyl phenyl ether	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
4-Methylphenol (p-Cresol)	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	310
4-Nitroaniline	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	23
4-Nitrophenol	ND	1.59	ND	1.69	ND	1.69	ND	1.65	ND	1.63	ND	1.69	ND	1.64	ND	1.63	ND	1.65	ND	1.63	NS	NS
7,12-Dimethylbenz (a) anthracene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
a,a-Dimethylphenethylamine	ND	1.59	ND	1.69	ND	1.69	ND	1.65	ND	1.63	ND	1.69	ND	1.64	ND	1.63	ND	1.65	ND	1.63	0.035	61
Acenaphthene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	16	NS
Acenaphthylene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	13	NS
Acetophenone	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
Aniline	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	85
Anthracene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	2.8	22,000
Azobenzene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	4.4
Benzidine	ND	1.59	ND	1.69	ND	1.69	ND	1.65	ND	1.63	ND	1.69	ND	1.64	ND	1.63	ND	1.65	ND	1.63	NS	0.0021
Benzo (a) anthracene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	6.2	NS
Benzo (a) pyrene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.62	0.062
Benzo (b) fluoranthene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	6.2	0.61
Benzo (g,h,i) perylene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	27	NS

Table 4-1
Laboratory Analytical Results
Multi-Increment Samples

Analyte	Sample Number																				HDOH Residential EAL (mg/kg)	EPA Region 9 Residential PRG (mg/kg)
	DU1		DU2		DU3		DU4		DU5		DU6		DU7		DU8		DU9		DU10			
	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)		
Benzo (k) fluoranthene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	37	6.2
Benzoic acid	ND	1.59	ND	1.69	ND	1.69	ND	1.65	ND	1.63	ND	1.69	ND	1.64	ND	1.63	ND	1.65	ND	1.63	NS	100,000
Benzyl alcohol	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	18,000
Bis(2-chloroethoxy)methane	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
Bis(2-chloroethyl)ether	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.00012	0.22
Bis(2-chloroisopropyl) ether	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.003	2.9
Bis(2-ethylhexyl)phthalate (DEHP)	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	35	35
Butyl benzyl phthalate	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	12,000
Chrysene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	23	62
Dibenz (a,j) acridine	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
Dibenzo (a,h) anthtracene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.62	0.062
Dibenzofuran	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	150
Diethylphthalate	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.035	49,000
Dimethylphthalate	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.035	100,000
Dimethylaminoazobenzene	ND	0.617	ND	0.658	ND	0.658	ND	0.641	ND	0.635	ND	0.658	ND	0.637	ND	0.633	ND	0.641	ND	0.633	NS	NS
Di-n-butyl phthalate	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
Di-n-octyl phthalate	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	2,400
Ethyl Methanesulfonate	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
Fluoranthene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	40	2,300
Fluorene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	8.9	2,700
Hexachlorobenzene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.3	0.3
Hexachlorobutadiene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	4.3	6.2
Hexachlorocyclopentadiene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	370
Hexachloroethane	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	16	35
Indeno (1,2,3-cd) pyrene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	6.2	0.62
Isophorone	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.69	510
Methyl Methanesulfonate	ND	0.617	ND	0.658	ND	0.658	ND	0.641	ND	0.635	ND	0.658	ND	0.637	ND	0.633	ND	0.641	ND	0.633	NS	NS
Naphthalene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	1.2	56
Nitrobenzene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.037	20
N-Nitrosodimethylamine	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	0.022
N-Nitrosodi-n-butylamine	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	0.024
N-Nitrosodi-n-propylamine	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	0.069
N-Nitrosodiphenylamine	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	99
N-Nitrosopiperidine	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
Pentachloronitrobenzene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	1.9
Pentachlorophenol	ND	1.59	ND	1.69	ND	1.69	ND	1.65	ND	1.63	ND	1.69	ND	1.64	ND	1.63	ND	1.65	ND	1.63	3	NS
Phenacetin	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	NS
Phenanthrene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	11	NS
Phenol	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	0.076	18,000
Pronamide	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	4,600
Pyrene	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	85	2,300
Pyridine	ND	0.308	ND	0.329	ND	0.329	ND	0.320	ND	0.317	ND	0.329	ND	0.318	ND	0.316	ND	0.320	ND	0.316	NS	61
CHLORINATED HERBICIDES (EPA 8151A)																						
Dalapon	ND	0.0083	ND	0.0082	ND	0.0082	ND	0.0081	ND	0.0081	ND	0.0082	ND	0.0083	ND	0.0078	ND	0.0083	ND	0.0080	0.091	1,800
4-Nitrophenol	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0032	ND	0.0033	ND	0.0033	ND	0.0031	ND	0.0033	ND	0.0032	NS	NS
Dicamba	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0032	ND	0.0033	ND	0.0033	ND	0.0031	ND	0.0033	ND	0.0032	NS	1,800
MCPP	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0032	ND	0.0033	ND	0.0033	ND	0.0031	ND	0.0033	ND	0.0032	NS	NS
MCPA	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0032	ND	0.0033	ND	0.0033	ND	0.0031	ND	0.0033	ND	0.0032	NS	NS
Dichlorprop	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0032	ND	0.0033	ND	0.0033	ND	0.0031	ND	0.0033	ND	0.0032	NS	NS
2,4-D	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0032	ND	0.0033	ND	0.0033	ND	0.0031	ND	0.0033	ND	0.0032	2.7	690
Pentachlorophenol	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0032	ND	0.0033	ND	0.0033	ND	0.0031	ND	0.0033	ND	0.0032	3.0	3.0
Silvex (2,4,5-TP)	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0032	ND	0.0033	ND	0.0033	ND	0.0031	ND	0.0033	ND	0.0032	0.67	490
2,4,5-T	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0032	ND	0.0033	ND	0.0033	ND	0.0031	ND	0.0033	ND	0.0032	NS	610

Table 4-1
Laboratory Analytical Results
Multi-increment Samples

Analyte	Sample Number																				HDOH Residential EAL (mg/kg)	EPA Region 9 Residential PRG (mg/kg)
	DU1		DU2		DU3		DU4		DU5		DU6		DU7		DU8		DU9		DU10			
	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)		
Dinoseb	ND	0.0083	ND	0.0082	ND	0.0082	ND	0.0081	ND	0.0081	ND	0.0082	ND	0.0083	ND	0.0078	ND	0.0083	ND	0.0080	NS	61
2,4-DB	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0033	ND	0.0032	ND	0.0033	ND	0.0033	ND	0.0031	ND	0.0033	ND	0.0032	NS	490
ORGANOCHLORINE PESTICIDES (EPA 8081A)																						
Aldrin	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00064	ND	0.00067	ND	0.00065	ND	0.00065	ND	0.00066	0.029	0.029
alpha-BHC	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00064	ND	0.00067	ND	0.00065	ND	0.00065	ND	0.00066	NS	0.09
beta-BHC	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00064	ND	0.00067	ND	0.00065	ND	0.00065	ND	0.00066	NS	0.32
delta-BHC	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00064	ND	0.00067	ND	0.00065	ND	0.00065	ND	0.00066	NS	NS
gamma-BHC (Lindane)	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00064	ND	0.00067	ND	0.00065	ND	0.00065	ND	0.00066	0.049	0.44
4,4'-DDD	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	2.4	2.4
4,4'-DDE	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	2.4	1.7
4,4'-DDT	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	1.7	1.7
Dieldrin	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	0.0023	0.03
Endosulfan I	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00064	ND	0.00067	ND	0.00065	ND	0.00065	ND	0.00066	0.0046	370
Endosulfan II	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	NS	NS
Endosulfan sulfate	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	NS	NS
Endrin	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	0.00065	18
Endrin aldehyde	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	NS	NS
Heptachlor	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00064	ND	0.00067	ND	0.00065	ND	0.00065	ND	0.00066	0.013	0.11
Heptachlor epoxide	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00064	ND	0.00067	ND	0.00065	ND	0.00065	ND	0.00066	0.014	0.053
Methoxychlor	ND	0.0065	ND	0.0065	ND	0.0065	ND	0.0065	ND	0.0065	ND	0.0064	ND	0.0067	ND	0.0065	ND	0.0065	ND	0.0066	19	310
Endrin ketone	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	ND	0.0013	NS	NS
Toxaphene	ND	0.065	ND	0.065	ND	0.065	ND	0.065	ND	0.065	ND	0.064	ND	0.067	ND	0.065	ND	0.065	ND	0.066	0.00042	0.44
alpha-Chlordane	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00064	ND	0.00067	ND	0.00065	ND	0.00065	ND	0.00066	1.6	1.6
gamma-Chlordane	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00065	ND	0.00064	ND	0.00067	ND	0.00065	ND	0.00065	ND	0.00066	1.6	1.6
POLYCHLORINATED BIPHENYLS (EPA 8082)																						
Aroclor 1016	ND	0.0321	ND	0.0322	ND	0.0315	ND	0.0331	ND	0.0323	ND	0.0326	ND	0.0330	ND	0.0318	ND	0.0310	ND	0.0324	1.1	3.9
Aroclor 1221	ND	0.0641	ND	0.0643	ND	0.0631	ND	0.0662	ND	0.0645	ND	0.0651	ND	0.0660	ND	0.0637	ND	0.0619	ND	0.0647	1.1	NS
Aroclor 1232	ND	0.0321	ND	0.0322	ND	0.0315	ND	0.0331	ND	0.0323	ND	0.0326	ND	0.0330	ND	0.0318	ND	0.0310	ND	0.0324	1.1	NS
Aroclor 1242	ND	0.0321	ND	0.0322	ND	0.0315	ND	0.0331	ND	0.0323	ND	0.0326	ND	0.0330	ND	0.0318	ND	0.0310	ND	0.0324	1.1	NS
Aroclor 1248	ND	0.0321	ND	0.0322	ND	0.0315	ND	0.0331	ND	0.0323	ND	0.0326	ND	0.0330	ND	0.0318	ND	0.0310	ND	0.0324	1.1	NS
Aroclor 1254	ND	0.0321	ND	0.0322	ND	0.0315	ND	0.0331	ND	0.0323	ND	0.0326	ND	0.0330	ND	0.0318	ND	0.0310	ND	0.0324	1.1	0.22
Aroclor 1260	ND	0.0321	ND	0.0322	ND	0.0315	ND	0.0331	ND	0.0323	ND	0.0326	ND	0.0330	ND	0.0318	ND	0.0310	ND	0.0324	1.1	NS
VOLATILE ORGANIC COMPOUNDS (EPA 8260B)																						
1,1,1-Trichloroethane	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	7.8	1,200
1,1,2,2-Tetrachloroethane	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	0.00099	0.41
1,1,2-Trichloroethane	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	0.026	0.73
1,1-Dichloroethane	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	1.9	510
1,1-Dichloroethylene	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	1.2	120
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	0.0009	0.46
1,2-Dibromoethane (EDB)	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	0.000052	0.032
1,2-Dichlorobenzene	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	1.1	600
1,2-Dichloroethane (EDC)	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	0.0011	0.28
1,2-Dichloropropane	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	0.021	0.34
1,3-Dichlorobenzene	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	7.4	530
1,4-Dichlorobenzene	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	0.065	3.4
Bromodichloromethane	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	0.0034	0.82
Bromoform (tribromomethane)	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	2.2	62
Bromomethane (methyl bromide)	ND	0.0988	ND	0.0977	ND	0.0998	ND	0.100	ND	0.0998	ND	0.0998	ND	0.0992	ND	0.100	NA	-	NA	-	0.34	3.9
Carbon Tetrachloride	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	0.027	0.25
Chlorobenzene	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	1.5	150
Chlorodibromomethane	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	NS	340

Table 4-1
Laboratory Analytical Results
Multi-increment Samples

Analyte	Sample Number																				HDOH Residential EAL (mg/kg)	EPA Region 9 Residential PRG (mg/kg)
	DU1		DU2		DU3		DU4		DU5		DU6		DU7		DU8		DU9		DU10			
	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)		
Chloroethane	ND	0.0494	ND	0.0488	ND	0.0499	ND	0.0500	ND	0.0499	ND	0.0499	ND	0.0496	ND	0.0501	NA	-	NA	-	0.27	3.0
Chloroform	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	0.018	0.22
Chloromethane (methyl chloride)	ND	0.0494	ND	0.0488	ND	0.0499	ND	0.0500	ND	0.0499	ND	0.0499	ND	0.0496	ND	0.0501	NA	-	NA	-	16	47
cis-1,2-Dichloroethylene	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	2.2	43
cis-1,3-Dichloropropene	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	NS	NS
Dichlorodifluoromethane	ND	0.0494	ND	0.0488	ND	0.0499	ND	0.0500	ND	0.0499	ND	0.0499	ND	0.0496	ND	0.0501	NA	-	NA	-	NS	94
Methylene Chloride	ND	0.0494	ND	0.0488	ND	0.0499	ND	0.0500	ND	0.0499	ND	0.0499	ND	0.0496	ND	0.0501	NA	-	NA	-	0.067	9.1
Tetrachloroethylene (PCE)	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	0.069	0.48
trans-1,2-Dichloroethylene	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	6.7	69
1,3-Dichloropropene	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	0.046	0.78
Trichloroethylene (TCE)	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	0.036	0.053
Trichlorofluoromethane	ND	0.00988	ND	0.00977	ND	0.00998	ND	0.0100	ND	0.00998	ND	0.00998	ND	0.00992	ND	0.0100	NA	-	NA	-	NS	390
Vinyl chloride	ND	0.0494	ND	0.0488	ND	0.0499	ND	0.0500	ND	0.0499	ND	0.0499	ND	0.0496	ND	0.0501	NA	-	NA	-	0.02	0.079
SEMI-VOLATILE ORGANIC COMPOUNDS (EPA 8270C)																						
Ametryne	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	1.1	550
Atrazine	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	0.11	2.2
Diazinon	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	NS	55
Fenamiphos	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	NS	15
Hexazinone	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	120	2,000
Metribuzin	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	ND	0.05	NS	1,500
CARBAMATES (EPA 8321A)																						
Diuron	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	1.4	120
Oxamyl	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	ND	0.02	NS	1,500

Notes:
ND - Sample not dectected above laboratory reporting limit.
NS - No standard set for analyte.
NA - Sample not analyzed for that analyte.
Detected concentrations below EALs and PRGs are indicated in bold and highlighted light blue.
Detected concentrations above either EALs or PRGs are indicated in bold and highlighted orange.

4.2.2 Discrete Sample Results

Two discrete surface soil samples were collected from the area where 14 drums were identified in the Phase I ESA. The laboratory analytical results for these two samples are summarized in Table 4-2. The complete laboratory analytical reports are provided in Appendix B.

The analytical results indicate that total petroleum hydrocarbons-gasoline range (TPH-gas); total petroleum hydrocarbons-diesel range (TPH-diesel); benzene, toluene, ethylbenzene, and xylene (BTEX); VOCs; SVOCs; chlorinated herbicides; organochlorine pesticides; and PCBs were not detected in either sample. One sample, Drum-2, did contain total petroleum hydrocarbons-residual range organics (TPH-rro) at a concentration of 21.9 mg/kg, well below the HDOH EAL of 500 mg/kg.

The metals barium, cadmium, chromium, and lead were detected in both samples. Mercury was also detected in sample Drum-2. The detected metal concentrations were all below the HDOH EALs and EPA Region 9 PRGs except for chromium in sample Drum-1. Chromium was detected at a concentration of 240 mg/kg in sample Drum-1, slightly above the EAL and PRG of 210 mg/kg. However, this concentration of chromium represents a human health cancer risk of 1.1×10^{-6}, which is within EPA's acceptable human health cancer risk range of 1×10^{-6} to 1×10^{-4}.

4.2.3 Quality Control Samples

Decision Unit 1 was sampled in triplicate for quality assurance / quality control (QA/QC) purposes. Arsenic was the only analyte detected in these three multi-increment samples. The arsenic concentrations in these three samples, DU1, DU9, and DU10 were 3.04 mg/kg, 2.82 mg/kg, and 2.89 mg/kg, respectively. The relative percent difference (RPD) of these samples ranges from 5 to 7.5 percent. This low RPD range represents a high precision in the field sampling methodology.

Laboratory QA/QC procedures employed for this project were standard laboratory QA/QC procedures which included using standard EPA test methods, and analyzing one or more of the following: method blanks, laboratory control spikes, matrix spikes, matrix spike duplicates, laboratory control samples and sample duplicates. QA/QC results and QA/QC case narratives are included in the attached laboratory reports. According to TA-Honolulu, the laboratory QA/QC analysis met quality assurance objectives with the exceptions noted in the case narratives. Due to logistical issues regarding sample preparation and shipment to the mainland, the organochlorine pesticide analyses were extracted outside of recommended hold times and were flagged as estimated. Considering that organochlorine pesticides are semi-volatile and very persistent in the environment, the organochlorine pesticide sample results are considered useable for screening purposes.

Table 4-2
Laboratory Analytical Results
Discrete Samples from Drum Area

Analyte	Sample Number: Drum 1 Sample Result (mg/kg)	Drum 1 Reporting Limit (mg/kg)	Drum 2 Sample Result (mg/kg)	Drum 2 Reporting Limit (mg/kg)	HDOH Residential EAL (mg/kg)	EPA Region 9 Residential PRG (mg/kg)
EXTRACTABLE PETROLEUM HYDROCARBONS (EPA 8015M)						
DRO	ND	6.55	ND	6.66	500	NS
RRO	ND	19.7	**21.9**	20.0	500	NS
GASOLINE RANGE ORGANICS / BTEX (EPA 8015M/8260B)						
GRO	ND	0.495	ND	0.488	100	NS
Benzene	ND	0.00198	ND	0.00195	0.22	0.64
Ethylbenzene	ND	0.00198	ND	0.00195	3.3	400
m,p-xylene	ND	0.00396	ND	0.00391	2.3 (total)	270 (total)
o-Xylene	ND	0.00198	ND	0.00195	2.3 (total)	270 (total)
Toluene	ND	0.00198	ND	0.00195	2.9	520
TOTAL METALS (SW 846)						
Arsenic	ND	4.50	ND	4.55	20	0.39
Barium	**107**	9.01	**95.3**	9.09	750	5,400
Cadmium	**3.88**	1.8	**2.26**	1.82	12	37
Chromium	**240**	4.5	**171**	4.55	210	210
Lead	**60.8**	9.01	**124**	9.09	200	400
Mercury	ND	0.0192	**0.0511**	0.0181	10	23
Selenium	ND	9.01	ND	9.09	10	390
Silver	ND	4.50	ND	4.55	20	390
SEMIVOLATILE ORGANICS (GC/MS)						
1,2,4,5-Tetrachlorobenzene	ND	0.320	ND	0.322	NS	18
1,2,4-Trichlorobenzene	ND	0.320	ND	0.322	1.6	62
1,2-Dichlorobenzene	ND	0.320	ND	0.322	1.1	600
1,3-Dichlorobenzene	ND	0.320	ND	0.322	7.4	530
1,4-Dichlorobenzene	ND	0.320	ND	0.322	0.065	34
1-Chloronaphthalene	ND	0.320	ND	0.322	NS	NS
1-Naphthylamine	ND	0.641	ND	0.645	NS	NS
2,3,4,6-Tetrachlorophenol	ND	0.320	ND	0.322	0.4	1,800
2,4,5-Trichlorophenol	ND	0.320	ND	0.322	0.18	6,100
2,4,6-Trichlorophenol	ND	0.320	ND	0.322	1.2	6.1
2,4-Dichlorophenol	ND	0.320	ND	0.322	0.3	180
2,4-Dimethylphenol	ND	0.320	ND	0.322	0.73	1,200
2,4-Dinitrophenol	ND	1.65	ND	1.66	0.21	120
2,4-Dinitrotoluene	ND	0.641	ND	0.645	0.25	NS
2,6-Dichlorophenol	ND	0.320	ND	0.322	0.3	NS
2,6-Dinitrotoluene	ND	0.320	ND	0.322	0.42	120
2-Chloronaphthalene	ND	0.320	ND	0.322	NS	NS
2-Chlorophenol	ND	0.320	ND	0.322	0.012	63
2-Methylnaphthalene	ND	0.320	ND	0.322	0.25	NS
2-Methylphenol (o-Cresol)	ND	0.320	ND	0.322	NS	3,100
2-Naphthylamine	ND	0.641	ND	0.645	NS	NS
2-Nitroaniline	ND	1.65	ND	1.66	NS	180
2-Nitrophenol	ND	0.320	ND	0.322	NS	NS
2-Picoline	ND	0.320	ND	0.322	NS	NS
3,3-Dichlorobenzidine	ND	0.320	ND	0.322	0.04	1.1
3-Methylcholanthrene	ND	0.320	ND	0.322	NS	NS
3-Nitroaniline	ND	1.65	ND	1.66	NS	18
4,6-Dinitro-2-methylphenol	ND	1.65	ND	1.66	NS	NS
4-Aminobiphenyl	ND	0.641	ND	0.645	NS	NS

Table 4-2
Laboratory Analytical Results
Discrete Samples from Drum Area

Analyte	Sample Number				HDOH Residential EAL (mg/kg)	EPA Region 9 Residential PRG (mg/kg)
	Drum 1		Drum 2			
	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)		
4-Bromophenyl phenyl ether	ND	0.320	ND	0.322	NS	NS
4-Chloro-3-methylphenol	ND	0.320	ND	0.322	NS	NS
4-Chloroaniline	ND	0.320	ND	0.322	0.053	240
4-Chlorophenyl phenyl ether	ND	0.320	ND	0.322	NS	NS
4-Methylphenol (p-Cresol)	ND	0.320	ND	0.322	NS	310
4-Nitroaniline	ND	0.320	ND	0.322	NS	23
4-Nitrophenol	ND	1.65	ND	1.66	NS	NS
7,12-Dimethylbenz (a) anthracene	ND	0.320	ND	0.322	NS	NS
a,a-Dimethylphenethylamine	ND	1.65	ND	1.66	0.035	61
Acenaphthene	ND	0.320	ND	0.322	16	NS
Acenaphthylene	ND	0.320	ND	0.322	13	NS
Acetophenone	ND	0.320	ND	0.322	NS	NS
Aniline	ND	0.320	ND	0.322	NS	85
Anthracene	ND	0.320	ND	0.322	2.8	22,000
Azobenzene	ND	0.320	ND	0.322	NS	4.4
Benzidine	ND	1.65	ND	1.66	NS	0.0021
Benzo (a) anthracene	ND	0.320	ND	0.322	6.2	NS
Benzo (a) pyrene	ND	0.320	ND	0.322	0.62	0.062
Benzo (b) fluoranthene	ND	0.320	ND	0.322	6.2	0.61
Benzo (g,h,i) perylene	ND	0.320	ND	0.322	27	NS
Benzo (k) fluoranthene	ND	0.320	ND	0.322	37	6.2
Benzoic acid	ND	1.65	ND	1.66	NS	100,000
Benzyl alcohol	ND	0.320	ND	0.322	NS	18,000
Bis(2-chloroethoxy)methane	ND	0.320	ND	0.322	NS	NS
Bis(2-chloroethyl)ether	ND	0.320	ND	0.322	0.00012	0.22
Bis(2-chloroisopropyl) ether	ND	0.320	ND	0.322	0.003	2.9
Bis(2-ethylhexyl)phthalate (DEHP)	ND	0.320	ND	0.322	35	35
Butyl benzyl phthalate	ND	0.320	ND	0.322	NS	12,000
Chrysene	ND	0.320	ND	0.322	23	62
Dibenz (a,j) acridine	ND	0.320	ND	0.322	NS	NS
Dibenzo (a,h) anthracene	ND	0.320	ND	0.322	0.62	0.062
Dibenzofuran	ND	0.320	ND	0.322	NS	150
Diethylphthalate	ND	0.320	ND	0.322	0.035	49,000
Dimethylphthalate	ND	0.320	ND	0.322	0.035	100,000
Dimethylaminoazobenzene	ND	0.641	ND	0.645	NS	NS
Di-n-butyl phthalate	ND	0.320	ND	0.322	NS	NS
Di-n-octyl phthalate	ND	0.320	ND	0.322	NS	2,400
Ethyl Methanesulfonate	ND	0.320	ND	0.322	NS	NS
Fluoranthene	ND	0.320	ND	0.322	40	2,300
Fluorene	ND	0.320	ND	0.322	8.9	2,700
Hexachlorobenzene	ND	0.320	ND	0.322	0.3	0.3
Hexachlorobutadiene	ND	0.320	ND	0.322	4.3	6.2
Hexachlorocyclopentadiene	ND	0.320	ND	0.322	NS	370
Hexachloroethane	ND	0.320	ND	0.322	16	35
Indeno (1,2,3-cd) pyrene	ND	0.320	ND	0.322	6.2	0.62
Isophorone	ND	0.320	ND	0.322	0.69	510
Methyl Methanesulfonate	ND	0.641	ND	0.645	NS	NS
Naphthalene	ND	0.320	ND	0.322	1.2	56
Nitrobenzene	ND	0.320	ND	0.322	0.037	20
N-Nitrosodimethylamine	ND	0.320	ND	0.322	NS	0.022
N-Nitrosodi-n-butylamine	ND	0.320	ND	0.322	NS	0.024
N-Nitrosodi-n-propylamine	ND	0.320	ND	0.322	NS	0.069

Table 4-2
Laboratory Analytical Results
Discrete Samples from Drum Area

Analyte	Sample Number				HDOH Residential EAL (mg/kg)	EPA Region 9 Residential PRG (mg/kg)
	Drum 1		Drum 2			
	Sample Result (mg/kg)	Reporting Limit (mg/kg)	Sample Result (mg/kg)	Reporting Limit (mg/kg)		
N-Nitrosodiphenylamine	ND	0.320	ND	0.322	NS	99
N-Nitrosopiperidine	ND	0.320	ND	0.322	NS	NS
Pentachloronitrobenzene	ND	0.320	ND	0.322	NS	1.9
Pentachlorophenol	ND	1.65	ND	1.66	3	NS
Phenacetin	ND	0.320	ND	0.322	NS	NS
Phenanthrene	ND	0.320	ND	0.322	11	NS
Phenol	ND	0.320	ND	0.322	0.076	18,000
Pronamide	ND	0.320	ND	0.322	NS	4,600
Pyrene	ND	0.320	ND	0.322	85	2,300
Pyridine	ND	0.320	ND	0.322	NS	61
CHLORINATED HERBICIDES (EPA 8151A)						
Dalapon	ND	0.0083	ND	0.0083	0.091	1,800
4-Nitrophenol	ND	0.0033	ND	0.0033	NS	NS
Dicamba	ND	0.0033	ND	0.0033	NS	1,800
MCPP	ND	0.0033	ND	0.0033	NS	NS
MCPA	ND	0.0033	ND	0.0033	NS	NS
Dichlorprop	ND	0.0033	ND	0.0033	NS	NS
2,4-D	ND	0.0033	ND	0.0033	2.7	690
Pentachlorophenol	ND	0.0033	ND	0.0033	3.0	3.0
Silvex (2,4,5-TP)	ND	0.0033	ND	0.0033	0.67	490
2,4,5-T	ND	0.0033	ND	0.0033	NS	610
Dinoseb	ND	0.0083	ND	0.0083	NS	61
2,4-DB	ND	0.0033	ND	0.0033	NS	490
ORGANOCHLORINE PESTICIDES (EPA 8081A)						
Aldrin	ND	0.00066	ND	0.00064	0.029	0.029
alpha-BHC	ND	0.00066	ND	0.00064	NS	0.09
beta-BHC	ND	0.00066	ND	0.00064	NS	0.32
delta-BHC	ND	0.00066	ND	0.00064	NS	NS
gamma-BHC (Lindane)	ND	0.00066	ND	0.00064	0.049	0.44
4,4'-DDD	ND	0.0013	ND	0.0013	2.4	2.4
4,4'-DDE	ND	0.0013	ND	0.0013	2.4	1.7
4,4'-DDT	ND	0.0013	ND	0.0013	1.7	1.7
Dieldrin	ND	0.0013	ND	0.0013	0.0023	0.03
Endosulfan I	ND	0.00066	ND	0.00064	0.0046	370
Endosulfan II	ND	0.0013	ND	0.0013	NS	NS
Endosulfan sulfate	ND	0.0013	ND	0.0013	NS	NS
Endrin	ND	0.0013	ND	0.0013	0.00065	18
Endrin aldehyde	ND	0.0013	ND	0.0013	NS	NS
Heptachlor	ND	0.00066	ND	0.00064	0.013	0.11
Heptachlor epoxide	ND	0.00066	ND	0.00064	0.014	0.053
Methoxychlor	ND	0.0066	ND	0.0064	19	310
Endrin ketone	ND	0.0013	ND	0.0013	NS	NS
Toxaphene	ND	0.066	ND	0.064	0.00042	0.44
alpha-Chlordane	ND	0.00066	ND	0.00064	1.6	1.6
gamma-Chlordane	ND	0.00066	ND	0.00064	1.6	1.6

Table 4-2
Laboratory Analytical Results
Discrete Samples from Drum Area

Analyte	Sample Number: Drum 1 Sample Result (mg/kg)	Drum 1 Reporting Limit (mg/kg)	Drum 2 Sample Result (mg/kg)	Drum 2 Reporting Limit (mg/kg)	HDOH Residential EAL (mg/kg)	EPA Region 9 Residential PRG (mg/kg)
POLYCHLORINATED BIPHENYLS (EPA 8082)						
Aroclor 1016	ND	0.0330	ND	0.0333	1.1	3.9
Aroclor 1221	ND	0.0660	ND	0.0667	1.1	NS
Aroclor 1232	ND	0.0330	ND	0.0333	1.1	NS
Aroclor 1242	ND	0.0330	ND	0.0333	1.1	NS
Aroclor 1248	ND	0.0330	ND	0.0333	1.1	NS
Aroclor 1254	ND	0.0330	ND	0.0333	1.1	0.22
Aroclor 1260	ND	0.0330	ND	0.0333	1.1	NS
VOLATILE ORGANIC COMPOUNDS (EPA 8260B)						
1,1,1-Trichloroethane	ND	0.00990	ND	0.00977	7.8	1,200
1,1,2,2-Tetrachloroethane	ND	0.00990	ND	0.00977	0.00099	0.41
1,1,2-Trichloroethane	ND	0.00990	ND	0.00977	0.026	0.73
1,1-Dichloroethane	ND	0.00990	ND	0.00977	1.9	510
1,1-Dichloroethylene	ND	0.00990	ND	0.00977	1.2	120
1,2-Dibromo-3-chloropropane (DBCP)	ND	0.00990	ND	0.00977	0.0009	0.46
1,2-Dibromoethane (EDB)	ND	0.00990	ND	0.00977	0.000052	0.032
1,2-Dichlorobenzene	ND	0.00990	ND	0.00977	1.1	600
1,2-Dichloroethane (EDC)	ND	0.00990	ND	0.00977	0.0011	0.28
1,2-Dichloropropane	ND	0.00990	ND	0.00977	0.021	0.34
1,3-Dichlorobenzene	ND	0.00990	ND	0.00977	7.4	530
1,4-Dichlorobenzene	ND	0.00990	ND	0.00977	0.065	3.4
Bromodichloromethane	ND	0.00990	ND	0.00977	0.0034	0.82
Bromoform (tribromomethane)	ND	0.00990	ND	0.00977	2.2	62
Bromomethane (methyl bromide)	ND	0.0990	ND	0.0977	0.34	3.9
Carbon Tetrachloride	ND	0.00990	ND	0.00977	0.027	0.25
Chlorobenzene	ND	0.00990	ND	0.00977	1.5	150
Chlorodibromomethane	ND	0.00990	ND	0.00977	NS	340
Chloroethane	ND	0.0495	ND	0.0488	0.27	3.0
Chloroform	ND	0.00990	ND	0.00977	0.018	0.22
Chloromethane (methyl chloride)	ND	0.0495	ND	0.0488	16	47
cis-1,2-Dichloroethylene	ND	0.00990	ND	0.00977	2.2	43
cis-1,3-Dichloropropene	ND	0.00990	ND	0.00977	NS	NS
Dichlorodifluoromethane	ND	0.0495	ND	0.0488	NS	94
Methylene Chloride	ND	0.0495	ND	0.0488	0.067	9.1
Tetrachloroethylene (PCE)	ND	0.00990	ND	0.00977	0.069	0.48
trans-1,2-Dichloroethylene	ND	0.00990	ND	0.00977	6.7	69
1,3-Dichloropropene	ND	0.00990	ND	0.00977	0.046	0.78
Trichloroethylene (TCE)	ND	0.00990	ND	0.00977	0.036	0.053
Trichlorofluoromethane	ND	0.00990	ND	0.00977	NS	390
Vinyl chloride	ND	0.0495	ND	0.0488	0.02	0.079

Notes:
ND - Sample not dectected above laboratory reporting limit.
NS - No standard set for analyte.
NA - Sample not analyzed for that analyte.
Detected concentrations below EALs and PRGs are indicated in bold and highlighted light blue.
Detected concentrations above either EALs or PRGs are indicated in bold and highlighted orange.

Section 5 Summary of Findings

E2 completed a Screening Phase II ESA of the Maalaea Mauka property identified as TMK: (2) 3-6-001: parcel 018 located in Maui, Hawaii. The purpose of this Screening Phase II ESA was to evaluate if residual levels of pesticides and herbicides resulting from historic agricultural use at the site are present in surface soils. In addition, an area where fourteen 55-gallon unmarked drums were identified in the Phase I ESA was investigated to determine if a release from the drums had occurred.

Per the HDOH HEER technical report for investigation and assessment of former agricultural lands, the screening was completed on "neighborhood-size" decision units utilizing a multi-increment sampling approach. The 260-acre site was divided into eight decision units approximately 32.5 acres in size with one multi-increment surface soil sample collected from each unit. The multi-increment samples were analyzed for pesticide and herbicide constituents that may have been applied to the property.

The results of the multi-increment sampling analyses indicate that residual pesticides and herbicides are not present at significant levels in the surface soils at the site. Arsenic was detected in all of the multi-increment samples. The levels detected were within range of natural occurring levels (i.e. background levels) found in soils throughout Hawaii. According to HDOH guidance, residential sites that contain arsenic within background levels do not require further action or restrictions on land use.

Two discrete samples were also collected from beneath the area where fourteen 55-gallon drums were observed during the Phase I ESA. The two samples were analyzed for a full suite of analytes to determine if a significant release had occurred in the area. The analytical results did not indicate that a significant release had occurred from the drums. One of the two samples contained a low level of TPH-rro. The level detected was well below the HDOH EAL. The majority of the remaining analytes were not detected with the exception of metals, which were detected below the HDOH EALs and EPA Region 9 PRGs or within naturally occurring background levels. Based on these sample results and the fact that the drums were removed and disposed, no further action is recommended for the drum area at this time.

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WAILUKU WATER CO.
WAIKAPU ZIAO WAIEHU WAIHEE
Na Wai Eha

November 1, 2006

To: Avery Chumbley
From: Clayton Suzuki

Subject: Waikapu to Maalaea Fields

The following chemicals may have been used during the cultivation of sugarcane in the Waikapu to Maalaea Fields.

Active Ingredient:	Brand Name:
Atrazine	Aatrex Nine-O
Ametryn	Evik 80W
2, 4-D	Formula 40
Diuron	Karmex DF
Glyphosate	Roundup
Metribuzin	Sinbar
Hexazinone	Velpar
Glyphosate	Polado

The following fertilizers were used in the cultivation of sugarcane.

Nitrogen
Potassium
Phosphorus
Calcium carbonate

The following chemicals may have been used during the cultivation of pineapple in the Waikapu to Maalaea fields.

Aliette	Ethrel
Amdro	Evik
Diazinon	Hyvar X
Karmex (Diuron)	Velpar DF
Roundup (non crop area)	Atrazine
Fruitone	Nemcur 3

The following fertilizers were used in the cultivation of pineapple.

Nitrogen	Sulfate of Potash
Iron Sulfate	Magnesium Sulfate
Zinc Sulfate	Sulfate of Amonia
Phosic Acid	

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August 08, 2007

LABORATORY REPORT

Client:
Element Environmental LLC
62-180 Emerson Rd,
Haleiwa, HI 96712
Attn: Matt Neal

Work Order: HQG0016
Project Name: Maalea
Project Number: Maalaea Phase II ESA
Date Received: 07/02/07

The results listed within this Laboratory Report pertain only to the samples tested in the laboratory. The analyses contained in this report were performed in accordance with the applicable certifications as noted. All soil samples are reported on a wet weight basis unless otherwise noted in the report. This Laboratory Report is confidential and is intended for the sole use of TestAmerica and its client. This report shall not be reproduced, except in full, without written permission from TestAmerica.

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TestAmerica Analytical Testing Corporation certifies that the analytical results contained herein apply only to the specific sample(s) analyzed.

The Chain(s) of Custody, 2 pages, are included and are an integral part of this report. This entire report was reviewed and approved for release.

If you have any questions relating to this analytical report, please contact your Laboratory Project Manager at 1-(808)486-5227

CASE NARRATIVE:
This report has been revised to include BTEX for sample IDs Drum 1 and Drum 2.

Client Samples IDs DU1 through DU10 contained in this report were prepared by incremental subsampling in accordance with the EPA/600/R-03/027 Guidance Document.

8270C (Modified) and 8321A analyses were performed by Anatek Labs, Inc. Please find Anatek Labs, Inc. report attached.

8081A and 8151A analyses were performed by STL-Seattle. Please find STL-Seattle report attached.

Samples were received into laboratory at a temperature of 0 °C.

NELAC states that samples which require thermal preservation shall be considered acceptable if the arrival temperature is within 2 degrees C of the required temperature or the method specified range. For samples with a temperature requirement of 4 degrees C, an arrival temperature from 0 degrees C to 6 degrees C meets specifications. Samples that are delivered to the laboratory on the same day that they are collected may not meet these criteria. In these cases, the samples are considered acceptable if there is evidence that the chilling process has begun, such as arrival on ice.

The reported results were obtained in compliance with the 2003 NELAC standards unless otherwise noted.

Approved By:

Jamie L Slade
Project Manager

NELAC Certification # E87907

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Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

SAMPLE IDENTIFICATION	LAB NUMBER	COLLECTION DATE AND TIME
DU1	HQG0016-01	06/29/07 16:45
DU2	HQG0016-02	06/28/07 13:30
DU3	HQG0016-03	06/28/07 15:51
DU4	HQG0016-04	06/28/07 16:30
DU5	HQG0016-05	06/28/07 16:50
DU6	HQG0016-06	06/29/07 10:10
DU7	HQG0016-07	06/29/07 11:10
DU8	HQG0016-08	06/29/07 12:10
DU9	HQG0016-09	06/29/07 14:10
DU10	HQG0016-10	06/29/07 15:10
DU1-VOC	HQG0016-11	06/29/07 16:30
DU2-VOC	HQG0016-12	06/29/07 15:55
DU3-VOC	HQG0016-13	06/29/07 15:23
DU4-VOC	HQG0016-14	06/29/07 14:53
DU5-VOC	HQG0016-15	06/29/07 14:26
DU6-VOC	HQG0016-16	06/29/07 13:53
DU7-VOC	HQG0016-17	06/29/07 13:25
DU8-VOC	HQG0016-18	06/29/07 12:33
Drum1	HQG0016-19	06/29/07 19:07
Drum2	HQG0016-20	06/29/07 19:07

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-01 (DU1 - Solid/Soil)					Sampled: 06/29/07 16:45		Recvd: 07/02/07 12:35		
Polychlorinated Biphenyls by EPA Method 8082									
Aroclor 1016	ND	C-01	mg/kg	0.0321	1	07/07/07 02:22	07/05/07	7G05005	SW8082
Aroclor 1221	ND	C-01	"	0.0641	"	"	"	"	"
Aroclor 1232	ND	C-01	"	0.0321	"	"	"	"	"
Aroclor 1242	ND	C-01	"	0.0321	"	"	"	"	"
Aroclor 1248	ND	C-01	"	0.0321	"	"	"	"	"
Aroclor 1254	ND	C-01	"	0.0321	"	"	"	"	"
Aroclor 1260	ND	C-01	"	0.0321	"	"	"	"	"
Surr: Decachlorobiphenyl (24-154%)	*110 %*	*C-01*				"	"	"	"
Semivolatile Organics by GC/MS									
1,2,4,5-Tetrachlorobenzene	ND		mg/kg	0.308	1	07/27/07 01:00	07/11/07	7G11004	SW8270C
1,2,4-Trichlorobenzene	ND		"	0.308	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.308	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.308	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.308	"	"	"	"	"
1-Chloronaphthalene	ND		"	0.308	"	"	"	"	"
1-Naphthylamine	ND		"	0.617	"	"	"	"	"
2,3,4,6-Tetrachlorophenol	ND		"	0.308	"	"	"	"	"
2,4,5-Trichlorophenol	ND		"	0.308	"	"	"	"	"
2,4,6-Trichlorophenol	ND		"	0.308	"	"	"	"	"
2,4-Dichlorophenol	ND		"	0.308	"	"	"	"	"
2,4-Dimethylphenol	ND		"	0.308	"	"	"	"	"
2,4-Dinitrophenol	ND		"	1.59	"	"	"	"	"
2,4-Dinitrotoluene	ND		"	0.617	"	"	"	"	"
2,6-Dichlorophenol	ND		"	0.308	"	"	"	"	"
2,6-Dinitrotoluene	ND		"	0.308	"	"	"	"	"
2-Chloronaphthalene	ND		"	0.308	"	"	"	"	"
2-Chlorophenol	ND		"	0.308	"	"	"	"	"
2-Methylnaphthalene	ND		"	0.308	"	"	"	"	"
2-Methylphenol (o-Cresol)	ND		"	0.308	"	"	"	"	"
2-Naphthylamine	ND		"	0.617	"	"	"	"	"
2-Nitroaniline	ND		"	1.59	"	"	"	"	"
2-Nitrophenol	ND		"	0.308	"	"	"	"	"
2-Picoline	ND		"	0.308	"	"	"	"	"
3,3'-Dichlorobenzidine	ND		"	0.308	"	"	"	"	"
3-Methylcholanthrene	ND		"	0.308	"	"	"	"	"
3-Nitroaniline	ND		"	1.59	"	"	"	"	"
4,6-Dinitro-2-methylphenol	ND		"	1.59	"	"	"	"	"
4-Aminobiphenyl	ND		"	0.617	"	"	"	"	"
4-Bromophenyl phenyl ether	ND		"	0.308	"	"	"	"	"
4-Chloro-3-methylphenol	ND		"	0.308	"	"	"	"	"
4-Chloroaniline	ND		"	0.308	"	"	"	"	"
4-Chlorophenyl phenyl ether	ND		"	0.308	"	"	"	"	"
4-Methylphenol (p-Cresol)	ND		"	0.308	"	"	"	"	"
4-Nitroaniline	ND		"	0.308	"	"	"	"	"
4-Nitrophenol	ND		"	1.59	"	"	"	"	"
7,12-Dimethylbenz (a) anthracene	ND		"	0.308	"	"	"	"	"
a,a-Dimethylphenethylamine	ND		"	1.59	"	"	"	"	"

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-01 (DU1 - Solid/Soil) - cont.					Sampled: 06/29/07 16:45		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Acenaphthene	ND		"	0.308	"	"	"	"	"
Acenaphthylene	ND		"	0.308	"	"	"	"	"
Acetophenone	ND		"	0.308	"	"	"	"	"
Aniline	ND		"	0.308	"	"	"	"	"
Anthracene	ND		"	0.308	"	"	"	"	"
Azobenzene	ND		"	0.308	"	"	"	"	"
Benzidine	ND		"	1.59	"	"	"	"	"
Benzo (a) anthracene	ND		"	0.308	"	"	"	"	"
Benzo (a) pyrene	ND		"	0.308	"	"	"	"	"
Benzo (b) fluoranthene	ND		"	0.308	"	"	"	"	"
Benzo (g,h,i) perylene	ND		"	0.308	"	"	"	"	"
Benzo (k) fluoranthene	ND		"	0.308	"	"	"	"	"
Benzoic acid	ND		"	1.59	"	"	"	"	"
Benzyl alcohol	ND		"	0.308	"	"	"	"	"
Bis(2-chloroethoxy)methane	ND		"	0.308	"	"	"	"	"
Bis(2-chloroethyl)ether	ND		"	0.308	"	"	"	"	"
Bis(2-chloroisopropyl) ether	ND		"	0.308	"	"	"	"	"
Bis(2-ethylhexyl)phthalate	ND		"	0.308	"	"	"	"	"
Butyl benzyl phthalate	ND		"	0.308	"	"	"	"	"
Chrysene	ND		"	0.308	"	"	"	"	"
Dibenz (a,j) acridine	ND		"	0.308	"	"	"	"	"
Dibenz (a,h) anthracene	ND		"	0.308	"	"	"	"	"
Dibenzofuran	ND		"	0.308	"	"	"	"	"
Diethyl phthalate	ND		"	0.308	"	"	"	"	"
Dimethyl phthalate	ND		"	0.308	"	"	"	"	"
Dimethylaminoazobenzene	ND		"	0.617	"	"	"	"	"
Di-n-butyl phthalate	ND		"	0.308	"	"	"	"	"
Di-n-octyl phthalate	ND		"	0.308	"	"	"	"	"
Ethyl Methanesulfonate	ND		"	0.308	"	"	"	"	"
Fluoranthene	ND		"	0.308	"	"	"	"	"
Fluorene	ND		"	0.308	"	"	"	"	"
Hexachlorobenzene	ND		"	0.308	"	"	"	"	"
Hexachlorobutadiene	ND		"	0.308	"	"	"	"	"
Hexachlorocyclopentadiene	ND		"	0.308	"	"	"	"	"
Hexachloroethane	ND		"	0.308	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND		"	0.308	"	"	"	"	"
Isophorone	ND		"	0.308	"	"	"	"	"
Methyl Methanesulfonate	ND		"	0.617	"	"	"	"	"
Naphthalene	ND		"	0.308	"	"	"	"	"
Nitrobenzene	ND		"	0.308	"	"	"	"	"
N-Nitrosodimethylamine	ND		"	0.308	"	"	"	"	"
N-Nitrosodi-n-butylamine	ND		"	0.308	"	"	"	"	"
N-Nitrosodi-n-propylamine	ND		"	0.308	"	"	"	"	"
N-Nitrosodiphenylamine	ND		"	0.308	"	"	"	"	"
N-Nitrosopiperidine	ND		"	0.308	"	"	"	"	"
Pentachloronitrobenzene	ND		"	0.308	"	"	"	"	"
Pentachlorophenol	ND		"	1.59	"	"	"	"	"

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-01 (DU1 - Solid/Soil) - cont.					Sampled: 06/29/07 16:45		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Phenacetin	ND		"	0.308	"	"	"	"	"
Phenanthrene	ND		"	0.308	"	"	"	"	"
Phenol	ND		"	0.308	"	"	"	"	"
Pronamide	ND		"	0.308	"	"	"	"	"
Pyrene	ND		"	0.308	"	"	"	"	"
Pyridine	ND		"	0.308	"	"	"	"	"
Surr: 2,4,6-Tribromophenol (52.6-114%)	66 %					"	"	"	"
Surr: 2-Fluorobiphenyl (45.9-108%)	65 %					"	"	"	"
Surr: 2-Fluorophenol (39.4-103%)	44 %					"	"	"	"
Surr: Nitrobenzene-d5 (37.2-107%)	60 %					"	"	"	"
Surr: Phenol-d6 (49.6-103%)	47 %	Z				"	"	"	"
Surr: Terphenyl-d14 (45.7-133%)	83 %					"	"	"	"
Total Metals by SW 846 Series Methods									
Arsenic	3.04		mg/kg	0.962	1	07/20/07 12:54	07/10/07	7G10005	SW6010B
Lead	ND		"	1.92	"	"	"	"	"
Sample ID: HQG0016-02 (DU2 - Solid/Soil)					Sampled: 06/28/07 13:30		Recvd: 07/02/07 12:35		
Polychlorinated Biphenyls by EPA Method 8082									
Aroclor 1016	ND	C-01	mg/kg	0.0322	1	07/07/07 02:49	07/05/07	7G05005	SW8082
Aroclor 1221	ND	C-01	"	0.0643	"	"	"	"	"
Aroclor 1232	ND	C-01	"	0.0322	"	"	"	"	"
Aroclor 1242	ND	C-01	"	0.0322	"	"	"	"	"
Aroclor 1248	ND	C-01	"	0.0322	"	"	"	"	"
Aroclor 1254	ND	C-01	"	0.0322	"	"	"	"	"
Aroclor 1260	ND	C-01	"	0.0322	"	"	"	"	"
Surr: Decachlorobiphenyl (24-134%)	106 %	C-01				"	"	"	"
Semivolatile Organics by GC/MS									
1,2,4,5-Tetrachlorobenzene	ND		mg/kg	0.329	1	07/27/07 01:47	07/11/07	7G11004	SW8270C
1,2,4-Trichlorobenzene	ND		"	0.329	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.329	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.329	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.329	"	"	"	"	"
1-Chloronaphthalene	ND		"	0.329	"	"	"	"	"
1-Naphthylamine	ND		"	0.658	"	"	"	"	"
2,3,4,6-Tetrachlorophenol	ND		"	0.329	"	"	"	"	"
2,4,5-Trichlorophenol	ND		"	0.329	"	"	"	"	"
2,4,6-Trichlorophenol	ND		"	0.329	"	"	"	"	"
2,4-Dichlorophenol	ND		"	0.329	"	"	"	"	"
2,4-Dimethylphenol	ND		"	0.329	"	"	"	"	"
2,4-Dinitrophenol	ND		"	1.69	"	"	"	"	"
2,4-Dinitrotoluene	ND		"	0.658	"	"	"	"	"
2,6-Dichlorophenol	ND		"	0.329	"	"	"	"	"
2,6-Dinitrotoluene	ND		"	0.329	"	"	"	"	"
2-Chloronaphthalene	ND		"	0.329	"	"	"	"	"
2-Chlorophenol	ND		"	0.329	"	"	"	"	"
2-Methylnaphthalene	ND		"	0.329	"	"	"	"	"

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-02 (DU2 - Solid/Soil) - cont.					Sampled: 06/28/07 13:30		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
2-Methylphenol (o-Cresol)	ND		"	0.329	"	"	"	"	"
2-Naphthylamine	ND		"	0.658	"	"	"	"	"
2-Nitroaniline	ND		"	1.69	"	"	"	"	"
2-Nitrophenol	ND		"	0.329	"	"	"	"	"
2-Picoline	ND		"	0.329	"	"	"	"	"
3,3'-Dichlorobenzidine	ND		"	0.329	"	"	"	"	"
3-Methylcholanthrene	ND		"	0.329	"	"	"	"	"
3-Nitroaniline	ND		"	1.69	"	"	"	"	"
4,6-Dinitro-2-methylphenol	ND		"	1.69	"	"	"	"	"
4-Aminobiphenyl	ND		"	0.658	"	"	"	"	"
4-Bromophenyl phenyl ether	ND		"	0.329	"	"	"	"	"
4-Chloro-3-methylphenol	ND		"	0.329	"	"	"	"	"
4-Chloroaniline	ND		"	0.329	"	"	"	"	"
4-Chlorophenyl phenyl ether	ND		"	0.329	"	"	"	"	"
4-Methylphenol (p-Cresol)	ND		"	0.329	"	"	"	"	"
4-Nitroaniline	ND		"	0.329	"	"	"	"	"
4-Nitrophenol	ND		"	1.69	"	"	"	"	"
7,12-Dimethylbenz (a) anthracene	ND		"	0.329	"	"	"	"	"
a,a-Dimethylphenethylamine	ND		"	1.69	"	"	"	"	"
Acenaphthene	ND		"	0.329	"	"	"	"	"
Acenaphthylene	ND		"	0.329	"	"	"	"	"
Acetophenone	ND		"	0.329	"	"	"	"	"
Aniline	ND		"	0.329	"	"	"	"	"
Anthracene	ND		"	0.329	"	"	"	"	"
Azobenzene	ND		"	0.329	"	"	"	"	"
Benzidine	ND		"	1.69	"	"	"	"	"
Benzo (a) anthracene	ND		"	0.329	"	"	"	"	"
Benzo (a) pyrene	ND		"	0.329	"	"	"	"	"
Benzo (b) fluoranthene	ND		"	0.329	"	"	"	"	"
Benzo (g,h,i) perylene	ND		"	0.329	"	"	"	"	"
Benzo (k) fluoranthene	ND		"	0.329	"	"	"	"	"
Benzoic acid	ND		"	1.69	"	"	"	"	"
Benzyl alcohol	ND		"	0.329	"	"	"	"	"
Bis(2-chloroethoxy)methane	ND		"	0.329	"	"	"	"	"
Bis(2-chloroethyl)ether	ND		"	0.329	"	"	"	"	"
Bis(2-chloroisopropyl) ether	ND		"	0.329	"	"	"	"	"
Bis(2-ethylhexyl)phthalate	ND		"	0.329	"	"	"	"	"
Butyl benzyl phthalate	ND		"	0.329	"	"	"	"	"
Chrysene	ND		"	0.329	"	"	"	"	"
Dibenz (a,j) acridine	ND		"	0.329	"	"	"	"	"
Dibenzo (a,h) anthracene	ND		"	0.329	"	"	"	"	"
Dibenzofuran	ND		"	0.329	"	"	"	"	"
Diethyl phthalate	ND		"	0.329	"	"	"	"	"
Dimethyl phthalate	ND		"	0.329	"	"	"	"	"
Dimethylaminoazobenzene	ND		"	0.658	"	"	"	"	"
Di-n-butyl phthalate	ND		"	0.329	"	"	"	"	"
Di-n-octyl phthalate	ND		"	0.329	"	"	"	"	"

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-02 (DU2 - Solid/Soil) - cont.					Sampled: 06/28/07 13:30		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Ethyl Methanesulfonate	ND		"	0.329	"	"	"	"	"
Fluoranthene	ND		"	0.329	"	"	"	"	"
Fluorene	ND		"	0.329	"	"	"	"	"
Hexachlorobenzene	ND		"	0.329	"	"	"	"	"
Hexachlorobutadiene	ND		"	0.329	"	"	"	"	"
Hexachlorocyclopentadiene	ND		"	0.329	"	"	"	"	"
Hexachloroethane	ND		"	0.329	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND		"	0.329	"	"	"	"	"
Isophorone	ND		"	0.329	"	"	"	"	"
Methyl Methanesulfonate	ND		"	0.658	"	"	"	"	"
Naphthalene	ND		"	0.329	"	"	"	"	"
Nitrobenzene	ND		"	0.329	"	"	"	"	"
N-Nitrosodimethylamine	ND		"	0.329	"	"	"	"	"
N-Nitrosodi-n-butylamine	ND		"	0.329	"	"	"	"	"
N-Nitrosodi-n-propylamine	ND		"	0.329	"	"	"	"	"
N-Nitrosodiphenylamine	ND		"	0.329	"	"	"	"	"
N-Nitrosopiperidine	ND		"	0.329	"	"	"	"	"
Pentachloronitrobenzene	ND		"	0.329	"	"	"	"	"
Pentachlorophenol	ND		"	1.69	"	"	"	"	"
Phenacetin	ND		"	0.329	"	"	"	"	"
Phenanthrene	ND		"	0.329	"	"	"	"	"
Phenol	ND		"	0.329	"	"	"	"	"
Pronamide	ND		"	0.329	"	"	"	"	"
Pyrene	ND		"	0.329	"	"	"	"	"
Pyridine	ND		"	0.329	"	"	"	"	"
Surr: 2,4,6-Tribromophenol (32.6-114%)	*74 %*					"	"	"	"
Surr: 2-Fluorobiphenyl (45.9-108%)	*74 %*					"	"	"	"
Surr: 2-Fluorophenol (39.4-103%)	*56 %*					"	"	"	"
Surr: Nitrobenzene-d5 (37.2-107%)	*71 %*					"	"	"	"
Surr: Phenol-d6 (49.6-105%)	*55 %*					"	"	"	"
Surr: Terphenyl-d14 (45.7-133%)	*92 %*					"	"	"	"
Total Metals by SW 846 Series Methods									
Arsenic	2.94		mg/kg	0.952	1	07/20/07 12:58	07/10/07	7G10003	SW6010B
Lead	5.19		"	1.90	"	"	"	"	"

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-03 (DU3 - Solid/Soil)					Sampled: 06/28/07 15:51		Recvd: 07/02/07 12:35		
Polychlorinated Biphenyls by EPA Method 8082									
Aroclor 1016	ND	C-01	mg/kg	0.0315	1	07/07/07 03:17	07/05/07	7G05005	SW8082
Aroclor 1221	ND	C-01	"	0.0631	"	"	"	"	"
Aroclor 1232	ND	C-01	"	0.0315	"	"	"	"	"
Aroclor 1242	ND	C-01	"	0.0315	"	"	"	"	"
Aroclor 1248	ND	C-01	"	0.0315	"	"	"	"	"
Aroclor 1254	ND	C-01	"	0.0315	"	"	"	"	"
Aroclor 1260	ND	C-01	"	0.0315	"	"	"	"	"
Surr: Decachlorobiphenyl (24-154%)	*111 %*	*C-01*				"	"	"	"
Semivolatile Organics by GC/MS									
1,2,4,5-Tetrachlorobenzene	ND		mg/kg	0.329	1	07/27/07 02:33	07/11/07	7G11004	SW8270C
1,2,4-Trichlorobenzene	ND		"	0.329	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.329	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.329	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.329	"	"	"	"	"
1-Chloronaphthalene	ND		"	0.329	"	"	"	"	"
1-Naphthylamine	ND		"	0.658	"	"	"	"	"
2,3,4,6-Tetrachlorophenol	ND		"	0.329	"	"	"	"	"
2,4,5-Trichlorophenol	ND		"	0.329	"	"	"	"	"
2,4,6-Trichlorophenol	ND		"	0.329	"	"	"	"	"
2,4-Dichlorophenol	ND		"	0.329	"	"	"	"	"
2,4-Dimethylphenol	ND		"	0.329	"	"	"	"	"
2,4-Dinitrophenol	ND		"	1.69	"	"	"	"	"
2,4-Dinitrotoluene	ND		"	0.658	"	"	"	"	"
2,6-Dichlorophenol	ND		"	0.329	"	"	"	"	"
2,6-Dinitrotoluene	ND		"	0.329	"	"	"	"	"
2-Chloronaphthalene	ND		"	0.329	"	"	"	"	"
2-Chlorophenol	ND		"	0.329	"	"	"	"	"
2-Methylnaphthalene	ND		"	0.329	"	"	"	"	"
2-Methylphenol (o-Cresol)	ND		"	0.329	"	"	"	"	"
2-Naphthylamine	ND		"	0.658	"	"	"	"	"
2-Nitroaniline	ND		"	1.69	"	"	"	"	"
2-Nitrophenol	ND		"	0.329	"	"	"	"	"
2-Picoline	ND		"	0.329	"	"	"	"	"
3,3'-Dichlorobenzidine	ND		"	0.329	"	"	"	"	"
3-Methylcholanthrene	ND		"	0.329	"	"	"	"	"
3-Nitroaniline	ND		"	1.69	"	"	"	"	"
4,6-Dinitro-2-methylphenol	ND		"	1.69	"	"	"	"	"
4-Aminobiphenyl	ND		"	0.658	"	"	"	"	"
4-Bromophenyl phenyl ether	ND		"	0.329	"	"	"	"	"
4-Chloro-3-methylphenol	ND		"	0.329	"	"	"	"	"
4-Chloroaniline	ND		"	0.329	"	"	"	"	"
4-Chlorophenyl phenyl ether	ND		"	0.329	"	"	"	"	"
4-Methylphenol (p-Cresol)	ND		"	0.329	"	"	"	"	"
4-Nitroaniline	ND		"	0.329	"	"	"	"	"
4-Nitrophenol	ND		"	1.69	"	"	"	"	"
7,12-Dimethylbenz (a) anthracene	ND		"	0.329	"	"	"	"	"
a,a-Dimethylphenethylamine	ND		"	1.69	"	"	"	"	"

Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalaea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-03 (DU3 - Solid/Soil) - cont.					Sampled: 06/28/07 15:51		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Acenaphthene	ND		"	0.329	"	"	"	"	"
Acenaphthylene	ND		"	0.329	"	"	"	"	"
Acetophenone	ND		"	0.329	"	"	"	"	"
Aniline	ND		"	0.329	"	"	"	"	"
Anthracene	ND		"	0.329	"	"	"	"	"
Azobenzene	ND		"	0.329	"	"	"	"	"
Benzidine	ND		"	1.69	"	"	"	"	"
Benzo (a) anthracene	ND		"	0.329	"	"	"	"	"
Benzo (a) pyrene	ND		"	0.329	"	"	"	"	"
Benzo (b) fluoranthene	ND		"	0.329	"	"	"	"	"
Benzo (g,h,i) perylene	ND		"	0.329	"	"	"	"	"
Benzo (k) fluoranthene	ND		"	0.329	"	"	"	"	"
Benzoic acid	ND		"	1.69	"	"	"	"	"
Benzyl alcohol	ND		"	0.329	"	"	"	"	"
Bis(2-chloroethoxy)methane	ND		"	0.329	"	"	"	"	"
Bis(2-chloroethyl)ether	ND		"	0.329	"	"	"	"	"
Bis(2-chloroisopropyl) ether	ND		"	0.329	"	"	"	"	"
Bis(2-ethylhexyl)phthalate	ND		"	0.329	"	"	"	"	"
Butyl benzyl phthalate	ND		"	0.329	"	"	"	"	"
Chrysene	ND		"	0.329	"	"	"	"	"
Dibenz (a,j) acridine	ND		"	0.329	"	"	"	"	"
Dibenzo (a,h) anthracene	ND		"	0.329	"	"	"	"	"
Dibenzofuran	ND		"	0.329	"	"	"	"	"
Diethyl phthalate	ND		"	0.329	"	"	"	"	"
Dimethyl phthalate	ND		"	0.329	"	"	"	"	"
Dimethylaminoazobenzene	ND		"	0.658	"	"	"	"	"
Di-n-butyl phthalate	ND		"	0.329	"	"	"	"	"
Di-n-octyl phthalate	ND		"	0.329	"	"	"	"	"
Ethyl Methanesulfonate	ND		"	0.329	"	"	"	"	"
Fluoranthene	ND		"	0.329	"	"	"	"	"
Fluorene	ND		"	0.329	"	"	"	"	"
Hexachlorobenzene	ND		"	0.329	"	"	"	"	"
Hexachlorobutadiene	ND		"	0.329	"	"	"	"	"
Hexachlorocyclopentadiene	ND		"	0.329	"	"	"	"	"
Hexachloroethane	ND		"	0.329	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND		"	0.329	"	"	"	"	"
Isophorone	ND		"	0.329	"	"	"	"	"
Methyl Methanesulfonate	ND		"	0.658	"	"	"	"	"
Naphthalene	ND		"	0.329	"	"	"	"	"
Nitrobenzene	ND		"	0.329	"	"	"	"	"
N-Nitrosodimethylamine	ND		"	0.329	"	"	"	"	"
N-Nitrosodi-n-butylamine	ND		"	0.329	"	"	"	"	"
N-Nitrosodi-n-propylamine	ND		"	0.329	"	"	"	"	"
N-Nitrosodiphenylamine	ND		"	0.329	"	"	"	"	"
N-Nitrosopiperidine	ND		"	0.329	"	"	"	"	"
Pentachloronitrobenzene	ND		"	0.329	"	"	"	"	"
Pentachlorophenol	ND		"	1.69	"	"	"	"	"

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Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalaea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-03 (DU3 - Solid/Soil) - cont.					Sampled: 06/28/07 15:51		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Phenacetin	ND		"	0.329	"	"	"	"	"
Phenanthrene	ND		"	0.329	"	"	"	"	"
Phenol	ND		"	0.329	"	"	"	"	"
Pronamide	ND		"	0.329	"	"	"	"	"
Pyrene	ND		"	0.329	"	"	"	"	"
Pyridine	ND		"	0.329	"	"	"	"	"
Surr: 2,4,6-Tribromophenol (32.6-114%)	*67 %*					"	"	"	"
Surr: 2-Fluorobiphenyl (43.9-108%)	*78 %*					"	"	"	"
Surr: 2-Fluorophenol (19.4-103%)	*30 %*					"	"	"	"
Surr: Nitrobenzene-d5 (37.2-107%)	*74 %*					"	"	"	"
Surr: Phenol-d6 (49.6-103%)	*38 %*					"	"	"	"
Surr: Terphenyl-d14 (43.7-133%)	*92 %*					"	"	"	"
Total Metals by SW 846 Series Methods									
Arsenic	3.98		mg/kg	0.980	1	07/20/07 13:02	07/10/07	7G10005	SW6010B
Lead	1.97		"	1.96	"	"	"	"	"
Sample ID: HQG0016-04 (DU4 - Solid/Soil)					Sampled: 06/28/07 16:30		Recvd: 07/02/07 12:35		
Polychlorinated Biphenyls by EPA Method 8082									
Aroclor 1016	ND	C-01	mg/kg	0.0331	1	07/07/07 04:13	07/05/07	7G05005	SW8082
Aroclor 1221	ND	C-01	"	0.0662	"	"	"	"	"
Aroclor 1232	ND	C-01	"	0.0331	"	"	"	"	"
Aroclor 1242	ND	C-01	"	0.0331	"	"	"	"	"
Aroclor 1248	ND	C-01	"	0.0331	"	"	"	"	"
Aroclor 1254	ND	C-01	"	0.0331	"	"	"	"	"
Aroclor 1260	ND	C-01	"	0.0331	"	"	"	"	"
Surr: Decachlorobiphenyl (24-134%)	*113 %*	*C-01*				"	"	"	"
Semivolatile Organics by GC/MS									
1,2,4,5-Tetrachlorobenzene	ND		mg/kg	0.320	1	07/27/07 03:19	07/11/07	7G11004	SW8270C
1,2,4-Trichlorobenzene	ND		"	0.320	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.320	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.320	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.320	"	"	"	"	"
1-Chloronaphthalene	ND		"	0.320	"	"	"	"	"
1-Naphthylamine	ND		"	0.641	"	"	"	"	"
2,3,4,6-Tetrachlorophenol	ND		"	0.320	"	"	"	"	"
2,4,5-Trichlorophenol	ND		"	0.320	"	"	"	"	"
2,4,6-Trichlorophenol	ND		"	0.320	"	"	"	"	"
2,4-Dichlorophenol	ND		"	0.320	"	"	"	"	"
2,4-Dimethylphenol	ND		"	0.320	"	"	"	"	"
2,4-Dinitrophenol	ND		"	1.65	"	"	"	"	"
2,4-Dinitrotoluene	ND		"	0.641	"	"	"	"	"
2,6-Dichlorophenol	ND		"	0.320	"	"	"	"	"
2,6-Dinitrotoluene	ND		"	0.320	"	"	"	"	"
2-Chloronaphthalene	ND		"	0.320	"	"	"	"	"
2-Chlorophenol	ND		"	0.320	"	"	"	"	"
2-Methylnaphthalene	ND		"	0.320	"	"	"	"	"

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-04 (DU4 - Solid/Soil) - cont.					Sampled: 06/28/07 16:30		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
2-Methylphenol (o-Cresol)	ND		"	0.320	"	"	"	"	"
2-Naphthylamine	ND		"	0.641	"	"	"	"	"
2-Nitroaniline	ND		"	1.65	"	"	"	"	"
2-Nitrophenol	ND		"	0.320	"	"	"	"	"
2-Picoline	ND		"	0.320	"	"	"	"	"
3,3'-Dichlorobenzidine	ND		"	0.320	"	"	"	"	"
3-Methylcholanthrene	ND		"	0.320	"	"	"	"	"
3-Nitroaniline	ND		"	1.65	"	"	"	"	"
4,6-Dinitro-2-methylphenol	ND		"	1.65	"	"	"	"	"
4-Aminobiphenyl	ND		"	0.641	"	"	"	"	"
4-Bromophenyl phenyl ether	ND		"	0.320	"	"	"	"	"
4-Chloro-3-methylphenol	ND		"	0.320	"	"	"	"	"
4-Chloroaniline	ND		"	0.320	"	"	"	"	"
4-Chlorophenyl phenyl ether	ND		"	0.320	"	"	"	"	"
4-Methylphenol (p-Cresol)	ND		"	0.320	"	"	"	"	"
4-Nitroaniline	ND		"	0.320	"	"	"	"	"
4-Nitrophenol	ND		"	1.65	"	"	"	"	"
7,12-Dimethylbenz (a) anthracene	ND		"	0.320	"	"	"	"	"
a,a-Dimethylphenethylamine	ND		"	1.65	"	"	"	"	"
Acenaphthene	ND		"	0.320	"	"	"	"	"
Acenaphthylene	ND		"	0.320	"	"	"	"	"
Acetophenone	ND		"	0.320	"	"	"	"	"
Aniline	ND		"	0.320	"	"	"	"	"
Anthracene	ND		"	0.320	"	"	"	"	"
Azobenzene	ND		"	0.320	"	"	"	"	"
Benzidine	ND		"	1.65	"	"	"	"	"
Benzo (a) anthracene	ND		"	0.320	"	"	"	"	"
Benzo (a) pyrene	ND		"	0.320	"	"	"	"	"
Benzo (b) fluoranthene	ND		"	0.320	"	"	"	"	"
Benzo (g,h,i) perylene	ND		"	0.320	"	"	"	"	"
Benzo (k) fluoranthene	ND		"	0.320	"	"	"	"	"
Benzoic acid	ND		"	1.65	"	"	"	"	"
Benzyl alcohol	ND		"	0.320	"	"	"	"	"
Bis(2-chloroethoxy)methane	ND		"	0.320	"	"	"	"	"
Bis(2-chloroethyl)ether	ND		"	0.320	"	"	"	"	"
Bis(2-chloroisopropyl) ether	ND		"	0.320	"	"	"	"	"
Bis(2-ethylhexyl)phthalate	ND		"	0.320	"	"	"	"	"
Butyl benzyl phthalate	ND		"	0.320	"	"	"	"	"
Chrysene	ND		"	0.320	"	"	"	"	"
Dibenz (a,j) acridine	ND		"	0.320	"	"	"	"	"
Dibenzo (a,h) anthracene	ND		"	0.320	"	"	"	"	"
Dibenzofuran	ND		"	0.320	"	"	"	"	"
Diethyl phthalate	ND		"	0.320	"	"	"	"	"
Dimethyl phthalate	ND		"	0.320	"	"	"	"	"
Dimethylaminoazobenzene	ND		"	0.641	"	"	"	"	"
Di-n-butyl phthalate	ND		"	0.320	"	"	"	"	"
Di-n-octyl phthalate	ND		"	0.320	"	"	"	"	"

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-04 (DU4 - Solid/Soil) - cont.					Sampled: 06/28/07 16:30		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Ethyl Methanesulfonate	ND		"	0.320	"	"	"	"	"
Fluoranthene	ND		"	0.320	"	"	"	"	"
Fluorene	ND		"	0.320	"	"	"	"	"
Hexachlorobenzene	ND		"	0.320	"	"	"	"	"
Hexachlorobutadiene	ND		"	0.320	"	"	"	"	"
Hexachlorocyclopentadiene	ND		"	0.320	"	"	"	"	"
Hexachloroethane	ND		"	0.320	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND		"	0.320	"	"	"	"	"
Isophorone	ND		"	0.320	"	"	"	"	"
Methyl Methanesulfonate	ND		"	0.641	"	"	"	"	"
Naphthalene	ND		"	0.320	"	"	"	"	"
Nitrobenzene	ND		"	0.320	"	"	"	"	"
N-Nitrosodimethylamine	ND		"	0.320	"	"	"	"	"
N-Nitrosodi-n-butylamine	ND		"	0.320	"	"	"	"	"
N-Nitrosodi-n-propylamine	ND		"	0.320	"	"	"	"	"
N-Nitrosodiphenylamine	ND		"	0.320	"	"	"	"	"
N-Nitrosopiperidine	ND		"	0.320	"	"	"	"	"
Pentachloronitrobenzene	ND		"	0.320	"	"	"	"	"
Pentachlorophenol	ND		"	1.65	"	"	"	"	"
Phenacetin	ND		"	0.320	"	"	"	"	"
Phenanthrene	ND		"	0.320	"	"	"	"	"
Phenol	ND		"	0.320	"	"	"	"	"
Pronamide	ND		"	0.320	"	"	"	"	"
Pyrene	ND		"	0.320	"	"	"	"	"
Pyridine	ND		"	0.320	"	"	"	"	"
Surr: 2,4,6-Tribromophenol (52.6-114%)	*63 %*				"	"	"	"	"
Surr: 2-Fluorobiphenyl (45.9-108%)	*70 %*				"	"	"	"	"
Surr: 2-Fluorophenol (39.4-103%)	*63 %*				"	"	"	"	"
Surr: Nitrobenzene-d5 (37.2-107%)	*63 %*				"	"	"	"	"
Surr: Phenol-d6 (49.6-103%)	*46 %*	Z			"	"	"	"	"
Surr: Terphenyl-d14 (43.7-133%)	*89 %*				"	"	"	"	"
Total Metals by SW 846 Series Methods									
Arsenic	3.64		mg/kg	0.980	1	07/20/07 13:06	07/10/07	7G10005	SW6010B
Lead	ND		"	1.96	"	"	"	"	"

Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-05 (DU5 - Solid/Soil)					Sampled: 06/28/07 16:50		Recvd: 07/02/07 12:35		
Polychlorinated Biphenyls by EPA Method 8082									
Aroclor 1016	ND	C-01	mg/kg	0.0323	1	07/07/07 04:41	07/05/07	7G05005	SW8082
Aroclor 1221	ND	C-01	"	0.0645	"	"	"	"	"
Aroclor 1232	ND	C-01	"	0.0323	"	"	"	"	"
Aroclor 1242	ND	C-01	"	0.0323	"	"	"	"	"
Aroclor 1248	ND	C-01	"	0.0323	"	"	"	"	"
Aroclor 1254	ND	C-01	"	0.0323	"	"	"	"	"
Aroclor 1260	ND	C-01	"	0.0323	"	"	"	"	"
Surr: Decachlorobiphenyl (24-134%)	*114 %*	*C-01*				"	"	"	"
Semivolatile Organics by GC/MS									
1,2,4,5-Tetrachlorobenzene	ND		mg/kg	0.317	1	07/27/07 04:05	07/11/07	7G11004	SW8270C
1,2,4-Trichlorobenzene	ND		"	0.317	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.317	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.317	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.317	"	"	"	"	"
1-Chloronaphthalene	ND		"	0.317	"	"	"	"	"
1-Naphthylamine	ND		"	0.635	"	"	"	"	"
2,3,4,6-Tetrachlorophenol	ND		"	0.317	"	"	"	"	"
2,4,5-Trichlorophenol	ND		"	0.317	"	"	"	"	"
2,4,6-Trichlorophenol	ND		"	0.317	"	"	"	"	"
2,4-Dichlorophenol	ND		"	0.317	"	"	"	"	"
2,4-Dimethylphenol	ND		"	0.317	"	"	"	"	"
2,4-Dinitrophenol	ND		"	1.63	"	"	"	"	"
2,4-Dinitrotoluene	ND		"	0.635	"	"	"	"	"
2,6-Dichlorophenol	ND		"	0.317	"	"	"	"	"
2,6-Dinitrotoluene	ND		"	0.317	"	"	"	"	"
2-Chloronaphthalene	ND		"	0.317	"	"	"	"	"
2-Chlorophenol	ND		"	0.317	"	"	"	"	"
2-Methylnaphthalene	ND		"	0.317	"	"	"	"	"
2-Methylphenol (o-Cresol)	ND		"	0.317	"	"	"	"	"
2-Naphthylamine	ND		"	0.635	"	"	"	"	"
2-Nitroaniline	ND		"	1.63	"	"	"	"	"
2-Nitrophenol	ND		"	0.317	"	"	"	"	"
2-Picoline	ND		"	0.317	"	"	"	"	"
3,3'-Dichlorobenzidine	ND		"	0.317	"	"	"	"	"
3-Methylcholanthrene	ND		"	0.317	"	"	"	"	"
3-Nitroaniline	ND		"	1.63	"	"	"	"	"
4,6-Dinitro-2-methylphenol	ND		"	1.63	"	"	"	"	"
4-Aminobiphenyl	ND		"	0.635	"	"	"	"	"
4-Bromophenyl phenyl ether	ND		"	0.317	"	"	"	"	"
4-Chloro-3-methylphenol	ND		"	0.317	"	"	"	"	"
4-Chloroaniline	ND		"	0.317	"	"	"	"	"
4-Chlorophenyl phenyl ether	ND		"	0.317	"	"	"	"	"
4-Methylphenol (p-Cresol)	ND		"	0.317	"	"	"	"	"
4-Nitroaniline	ND		"	0.317	"	"	"	"	"
4-Nitrophenol	ND		"	1.63	"	"	"	"	"
7,12-Dimethylbenz (a) anthracene	ND		"	0.317	"	"	"	"	"
a,a-Dimethylphenethylamine	ND		"	1.63	"	"	"	"	"

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Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-05 (DU5 - Solid/Soil) - cont.					Sampled: 06/28/07 16:50		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Acenaphthene	ND		"	0.317	"	"	"	"	"
Acenaphthylene	ND		"	0.317	"	"	"	"	"
Acetophenone	ND		"	0.317	"	"	"	"	"
Aniline	ND		"	0.317	"	"	"	"	"
Anthracene	ND		"	0.317	"	"	"	"	"
Azobenzene	ND		"	0.317	"	"	"	"	"
Benzidine	ND		"	1.63	"	"	"	"	"
Benzo (a) anthracene	ND		"	0.317	"	"	"	"	"
Benzo (a) pyrene	ND		"	0.317	"	"	"	"	"
Benzo (b) fluoranthene	ND		"	0.317	"	"	"	"	"
Benzo (g,h,i) perylene	ND		"	0.317	"	"	"	"	"
Benzo (k) fluoranthene	ND		"	0.317	"	"	"	"	"
Benzoic acid	ND		"	1.63	"	"	"	"	"
Benzyl alcohol	ND		"	0.317	"	"	"	"	"
Bis(2-chloroethoxy)methane	ND		"	0.317	"	"	"	"	"
Bis(2-chloroethyl)ether	ND		"	0.317	"	"	"	"	"
Bis(2-chloroisopropyl) ether	ND		"	0.317	"	"	"	"	"
Bis(2-ethylhexyl)phthalate	ND		"	0.317	"	"	"	"	"
Butyl benzyl phthalate	ND		"	0.317	"	"	"	"	"
Chrysene	ND		"	0.317	"	"	"	"	"
Dibenz (a,j) acridine	ND		"	0.317	"	"	"	"	"
Dibenzo (a,h) anthracene	ND		"	0.317	"	"	"	"	"
Dibenzofuran	ND		"	0.317	"	"	"	"	"
Diethyl phthalate	ND		"	0.317	"	"	"	"	"
Dimethyl phthalate	ND		"	0.317	"	"	"	"	"
Dimethylaminoazobenzene	ND		"	0.635	"	"	"	"	"
Di-n-butyl phthalate	ND		"	0.317	"	"	"	"	"
Di-n-octyl phthalate	ND		"	0.317	"	"	"	"	"
Ethyl Methanesulfonate	ND		"	0.317	"	"	"	"	"
Fluoranthene	ND		"	0.317	"	"	"	"	"
Fluorene	ND		"	0.317	"	"	"	"	"
Hexachlorobenzene	ND		"	0.317	"	"	"	"	"
Hexachlorobutadiene	ND		"	0.317	"	"	"	"	"
Hexachlorocyclopentadiene	ND		"	0.317	"	"	"	"	"
Hexachloroethane	ND		"	0.317	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND		"	0.317	"	"	"	"	"
Isophorone	ND		"	0.317	"	"	"	"	"
Methyl Methanesulfonate	ND		"	0.635	"	"	"	"	"
Naphthalene	ND		"	0.317	"	"	"	"	"
Nitrobenzene	ND		"	0.317	"	"	"	"	"
N-Nitrosodimethylamine	ND		"	0.317	"	"	"	"	"
N-Nitrosodi-n-butylamine	ND		"	0.317	"	"	"	"	"
N-Nitrosodi-n-propylamine	ND		"	0.317	"	"	"	"	"
N-Nitrosodiphenylamine	ND		"	0.317	"	"	"	"	"
N-Nitrosopiperidine	ND		"	0.317	"	"	"	"	"
Pentachloronitrobenzene	ND		"	0.317	"	"	"	"	"
Pentachlorophenol	ND		"	1.63	"	"	"	"	"

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-05 (DU5 - Solid/Soil) - cont.					Sampled: 06/28/07 16:50		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Phenacetin	ND		"	0.317	"	"	"	"	"
Phenanthrene	ND		"	0.317	"	"	"	"	"
Phenol	ND		"	0.317	"	"	"	"	"
Pronamide	ND		"	0.317	"	"	"	"	"
Pyrene	ND		"	0.317	"	"	"	"	"
Pyridine	ND		"	0.317	"	"	"	"	"
Surr: 2,4,6-Tribromophenol (32.6-114%)	*70 %*					"	"	"	"
Surr: 2-Fluorobiphenyl (43.9-108%)	*69 %*					"	"	"	"
Surr: 2-Fluorophenol (39.4-103%)	*48 %*					"	"	"	"
Surr: Nitrobenzene-d5 (37.2-107%)	*63 %*					"	"	"	"
Surr: Phenol-d6 (49.6-103%)	*48 %*	Z				"	"	"	"
Surr: Terphenyl-d14 (43.7-133%)	*93 %*					"	"	"	"
Total Metals by SW 846 Series Methods									
Arsenic	3.33		mg/kg	0.952	1	07/20/07 13:10	07/10/07	7G10005	SW6010B
Lead	ND		"	1.90	"	"	"	"	"
Sample ID: HQG0016-06 (DU6 - Solid/Soil)					Sampled: 06/29/07 10:10		Recvd: 07/02/07 12:35		
Polychlorinated Biphenyls by EPA Method 8082									
Aroclor 1016	ND	C-01	mg/kg	0.0326	1	07/07/07 05:08	07/05/07	7G05005	SW8082
Aroclor 1221	ND	C-01	"	0.0651	"	"	"	"	"
Aroclor 1232	ND	C-01	"	0.0326	"	"	"	"	"
Aroclor 1242	ND	C-01	"	0.0326	"	"	"	"	"
Aroclor 1248	ND	C-01	"	0.0326	"	"	"	"	"
Aroclor 1254	ND	C-01	"	0.0326	"	"	"	"	"
Aroclor 1260	ND	C-01	"	0.0326	"	"	"	"	"
Surr: Decachlorobiphenyl (24-154%)	*111 %*	*C-01*				"	"	"	"
Semivolatile Organics by GC/MS									
1,2,4,5-Tetrachlorobenzene	ND		mg/kg	0.329	1	07/27/07 09:24	07/11/07	7G11004	SW8270C
1,2,4-Trichlorobenzene	ND		"	0.329	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.329	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.329	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.329	"	"	"	"	"
1-Chloronaphthalene	ND		"	0.329	"	"	"	"	"
1-Naphthylamine	ND		"	0.658	"	"	"	"	"
2,3,4,6-Tetrachlorophenol	ND		"	0.329	"	"	"	"	"
2,4,5-Trichlorophenol	ND		"	0.329	"	"	"	"	"
2,4,6-Trichlorophenol	ND		"	0.329	"	"	"	"	"
2,4-Dichlorophenol	ND		"	0.329	"	"	"	"	"
2,4-Dimethylphenol	ND		"	0.329	"	"	"	"	"
2,4-Dinitrophenol	ND		"	1.69	"	"	"	"	"
2,4-Dinitrotoluene	ND		"	0.658	"	"	"	"	"
2,6-Dichlorophenol	ND		"	0.329	"	"	"	"	"
2,6-Dinitrotoluene	ND		"	0.329	"	"	"	"	"
2-Chloronaphthalene	ND		"	0.329	"	"	"	"	"
2-Chlorophenol	ND		"	0.329	"	"	"	"	"
2-Methylnaphthalene	ND		"	0.329	"	"	"	"	"

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-06 (DU6 - Solid/Soil) - cont.					Sampled: 06/29/07 10:10		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
2-Methylphenol (o-Cresol)	ND		"	0.329	"	"	"	"	"
2-Naphthylamine	ND		"	0.658	"	"	"	"	"
2-Nitroaniline	ND		"	1.69	"	"	"	"	"
2-Nitrophenol	ND		"	0.329	"	"	"	"	"
2-Picoline	ND		"	0.329	"	"	"	"	"
3,3'-Dichlorobenzidine	ND		"	0.329	"	"	"	"	"
3-Methylcholanthrene	ND		"	0.329	"	"	"	"	"
3-Nitroaniline	ND		"	1.69	"	"	"	"	"
4,6-Dinitro-2-methylphenol	ND		"	1.69	"	"	"	"	"
4-Aminobiphenyl	ND		"	0.658	"	"	"	"	"
4-Bromophenyl phenyl ether	ND		"	0.329	"	"	"	"	"
4-Chloro-3-methylphenol	ND		"	0.329	"	"	"	"	"
4-Chloroaniline	ND		"	0.329	"	"	"	"	"
4-Chlorophenyl phenyl ether	ND		"	0.329	"	"	"	"	"
4-Methylphenol (p-Cresol)	ND		"	0.329	"	"	"	"	"
4-Nitroaniline	ND		"	0.329	"	"	"	"	"
4-Nitrophenol	ND		"	1.69	"	"	"	"	"
7,12-Dimethylbenz (a) anthracene	ND		"	0.329	"	"	"	"	"
a,a-Dimethylphenethylamine	ND		"	1.69	"	"	"	"	"
Acenaphthene	ND		"	0.329	"	"	"	"	"
Acenaphthylene	ND		"	0.329	"	"	"	"	"
Acetophenone	ND		"	0.329	"	"	"	"	"
Aniline	ND		"	0.329	"	"	"	"	"
Anthracene	ND		"	0.329	"	"	"	"	"
Azobenzene	ND		"	0.329	"	"	"	"	"
Benzidine	ND		"	1.69	"	"	"	"	"
Benzo (a) anthracene	ND		"	0.329	"	"	"	"	"
Benzo (a) pyrene	ND		"	0.329	"	"	"	"	"
Benzo (b) fluoranthene	ND		"	0.329	"	"	"	"	"
Benzo (g,h,i) perylene	ND		"	0.329	"	"	"	"	"
Benzo (k) fluoranthene	ND		"	0.329	"	"	"	"	"
Benzoic acid	ND		"	1.69	"	"	"	"	"
Benzyl alcohol	ND		"	0.329	"	"	"	"	"
Bis(2-chloroethoxy)methane	ND		"	0.329	"	"	"	"	"
Bis(2-chloroethyl)ether	ND		"	0.329	"	"	"	"	"
Bis(2-chloroisopropyl) ether	ND		"	0.329	"	"	"	"	"
Bis(2-ethylhexyl)phthalate	ND		"	0.329	"	"	"	"	"
Butyl benzyl phthalate	ND		"	0.329	"	"	"	"	"
Chrysene	ND		"	0.329	"	"	"	"	"
Dibenz (a,j) acridine	ND		"	0.329	"	"	"	"	"
Dibenzo (a,h) anthracene	ND		"	0.329	"	"	"	"	"
Dibenzofuran	ND		"	0.329	"	"	"	"	"
Diethyl phthalate	ND		"	0.329	"	"	"	"	"
Dimethyl phthalate	ND		"	0.329	"	"	"	"	"
Dimethylaminoazobenzene	ND		"	0.658	"	"	"	"	"
Di-n-butyl phthalate	ND		"	0.329	"	"	"	"	"
Di-n-octyl phthalate	ND		"	0.329	"	"	"	"	"

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-06 (DU6 - Solid/Soil) - cont.					Sampled: 06/29/07 10:10		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Ethyl Methanesulfonate	ND		"	0.329	"	"	"	"	"
Fluoranthene	ND		"	0.329	"	"	"	"	"
Fluorene	ND		"	0.329	"	"	"	"	"
Hexachlorobenzene	ND		"	0.329	"	"	"	"	"
Hexachlorobutadiene	ND		"	0.329	"	"	"	"	"
Hexachlorocyclopentadiene	ND		"	0.329	"	"	"	"	"
Hexachloroethane	ND		"	0.329	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND		"	0.329	"	"	"	"	"
Isophorone	ND		"	0.329	"	"	"	"	"
Methyl Methanesulfonate	ND		"	0.658	"	"	"	"	"
Naphthalene	ND		"	0.329	"	"	"	"	"
Nitrobenzene	ND		"	0.329	"	"	"	"	"
N-Nitrosodimethylamine	ND		"	0.329	"	"	"	"	"
N-Nitrosodi-n-butylamine	ND		"	0.329	"	"	"	"	"
N-Nitrosodi-n-propylamine	ND		"	0.329	"	"	"	"	"
N-Nitrosodiphenylamine	ND		"	0.329	"	"	"	"	"
N-Nitrosopiperidine	ND		"	0.329	"	"	"	"	"
Pentachloronitrobenzene	ND		"	0.329	"	"	"	"	"
Pentachlorophenol	ND		"	1.69	"	"	"	"	"
Phenacetin	ND		"	0.329	"	"	"	"	"
Phenanthrene	ND		"	0.329	"	"	"	"	"
Phenol	ND		"	0.329	"	"	"	"	"
Pronamide	ND		"	0.329	"	"	"	"	"
Pyrene	ND		"	0.329	"	"	"	"	"
Pyridine	ND		"	0.329	"	"	"	"	"
Surr: 2,4,6-Tribromophenol (32.6-114%)	*63 %*					"	"	"	"
Surr: 2-Fluorobiphenyl (43.9-108%)	*73 %*					"	"	"	"
Surr: 2-Fluorophenol (39.4-103%)	*49 %*					"	"	"	"
Surr: Nitrobenzene-d5 (37.2-107%)	*69 %*					"	"	"	"
Surr: Phenol-d6 (49.6-103%)	*33 %*					"	"	"	"
Surr: Terphenyl-d14 (43.7-133%)	*91 %*					"	"	"	"
Total Metals by SW 846 Series Methods									
Arsenic	3.58		mg/kg	0.943	1	07/20/07 13:14	07/10/07	7G10005	SW6010B
Lead	ND		"	1.89	"	"	"	"	"

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-07 (DU7 - Solid/Soil)					Sampled: 06/29/07 11:10		Recvd: 07/02/07 12:35		
Polychlorinated Biphenyls by EPA Method 8082									
Aroclor 1016	ND	C-01	mg/kg	0.0330	1	07/07/07 05:36	07/05/07	7G05005	SW8082
Aroclor 1221	ND	C-01	"	0.0660	"	"	"	"	"
Aroclor 1232	ND	C-01	"	0.0330	"	"	"	"	"
Aroclor 1242	ND	C-01	"	0.0330	"	"	"	"	"
Aroclor 1248	ND	C-01	"	0.0330	"	"	"	"	"
Aroclor 1254	ND	C-01	"	0.0330	"	"	"	"	"
Aroclor 1260	ND	C-01	"	0.0330	"	"	"	"	"
Surr: Decachlorobiphenyl (24-134%)	*113 %*	*C-01*				"	"	"	"
Semivolatile Organics by GC/MS									
1,2,4,5-Tetrachlorobenzene	ND		mg/kg	0.318	1	07/27/07 10:10	07/11/07	7G11004	SW8270C
1,2,4-Trichlorobenzene	ND		"	0.318	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.318	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.318	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.318	"	"	"	"	"
1-Chloronaphthalene	ND		"	0.318	"	"	"	"	"
1-Naphthylamine	ND		"	0.637	"	"	"	"	"
2,3,4,6-Tetrachlorophenol	ND		"	0.318	"	"	"	"	"
2,4,5-Trichlorophenol	ND		"	0.318	"	"	"	"	"
2,4,6-Trichlorophenol	ND		"	0.318	"	"	"	"	"
2,4-Dichlorophenol	ND		"	0.318	"	"	"	"	"
2,4-Dimethylphenol	ND		"	0.318	"	"	"	"	"
2,4-Dinitrophenol	ND		"	1.64	"	"	"	"	"
2,4-Dinitrotoluene	ND		"	0.637	"	"	"	"	"
2,6-Dichlorophenol	ND		"	0.318	"	"	"	"	"
2,6-Dinitrotoluene	ND		"	0.318	"	"	"	"	"
2-Chloronaphthalene	ND		"	0.318	"	"	"	"	"
2-Chlorophenol	ND		"	0.318	"	"	"	"	"
2-Methylnaphthalene	ND		"	0.318	"	"	"	"	"
2-Methylphenol (o-Cresol)	ND		"	0.318	"	"	"	"	"
2-Naphthylamine	ND		"	0.637	"	"	"	"	"
2-Nitroaniline	ND		"	1.64	"	"	"	"	"
2-Nitrophenol	ND		"	0.318	"	"	"	"	"
2-Picoline	ND		"	0.318	"	"	"	"	"
3,3'-Dichlorobenzidine	ND		"	0.318	"	"	"	"	"
3-Methylcholanthrene	ND		"	0.318	"	"	"	"	"
3-Nitroaniline	ND		"	1.64	"	"	"	"	"
4,6-Dinitro-2-methylphenol	ND		"	1.64	"	"	"	"	"
4-Aminobiphenyl	ND		"	0.637	"	"	"	"	"
4-Bromophenyl phenyl ether	ND		"	0.318	"	"	"	"	"
4-Chloro-3-methylphenol	ND		"	0.318	"	"	"	"	"
4-Chloroaniline	ND		"	0.318	"	"	"	"	"
4-Chlorophenyl phenyl ether	ND		"	0.318	"	"	"	"	"
4-Methylphenol (p-Cresol)	ND		"	0.318	"	"	"	"	"
4-Nitroaniline	ND		"	0.318	"	"	"	"	"
4-Nitrophenol	ND		"	1.64	"	"	"	"	"
7,12-Dimethylbenz (a) anthracene	ND		"	0.318	"	"	"	"	"
a,a-Dimethylphenethylamine	ND		"	1.64	"	"	"	"	"

Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-07 (DU7 - Solid/Soil) - cont.					Sampled: 06/29/07 11:10		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Acenaphthene	ND		"	0.318	"	"	"	"	"
Acenaphthylene	ND		"	0.318	"	"	"	"	"
Acetophenone	ND		"	0.318	"	"	"	"	"
Aniline	ND		"	0.318	"	"	"	"	"
Anthracene	ND		"	0.318	"	"	"	"	"
Azobenzene	ND		"	0.318	"	"	"	"	"
Benzidine	ND		"	1.64	"	"	"	"	"
Benzo (a) anthracene	ND		"	0.318	"	"	"	"	"
Benzo (a) pyrene	ND		"	0.318	"	"	"	"	"
Benzo (b) fluoranthene	ND		"	0.318	"	"	"	"	"
Benzo (g,h,i) perylene	ND		"	0.318	"	"	"	"	"
Benzo (k) fluoranthene	ND		"	0.318	"	"	"	"	"
Benzoic acid	ND		"	1.64	"	"	"	"	"
Benzyl alcohol	ND		"	0.318	"	"	"	"	"
Bis(2-chloroethoxy)methane	ND		"	0.318	"	"	"	"	"
Bis(2-chloroethyl)ether	ND		"	0.318	"	"	"	"	"
Bis(2-chloroisopropyl) ether	ND		"	0.318	"	"	"	"	"
Bis(2-ethylhexyl)phthalate	ND		"	0.318	"	"	"	"	"
Butyl benzyl phthalate	ND		"	0.318	"	"	"	"	"
Chrysene	ND		"	0.318	"	"	"	"	"
Dibenz (a,j) acridine	ND		"	0.318	"	"	"	"	"
Dibenzo (a,h) anthracene	ND		"	0.318	"	"	"	"	"
Dibenzofuran	ND		"	0.318	"	"	"	"	"
Diethyl phthalate	ND		"	0.318	"	"	"	"	"
Dimethyl phthalate	ND		"	0.318	"	"	"	"	"
Dimethylaminoazobenzene	ND		"	0.637	"	"	"	"	"
Di-n-butyl phthalate	ND		"	0.318	"	"	"	"	"
Di-n-octyl phthalate	ND		"	0.318	"	"	"	"	"
Ethyl Methanesulfonate	ND		"	0.318	"	"	"	"	"
Fluoranthene	ND		"	0.318	"	"	"	"	"
Fluorene	ND		"	0.318	"	"	"	"	"
Hexachlorobenzene	ND		"	0.318	"	"	"	"	"
Hexachlorobutadiene	ND		"	0.318	"	"	"	"	"
Hexachlorocyclopentadiene	ND		"	0.318	"	"	"	"	"
Hexachloroethane	ND		"	0.318	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND		"	0.318	"	"	"	"	"
Isophorone	ND		"	0.318	"	"	"	"	"
Methyl Methanesulfonate	ND		"	0.637	"	"	"	"	"
Naphthalene	ND		"	0.318	"	"	"	"	"
Nitrobenzene	ND		"	0.318	"	"	"	"	"
N-Nitrosodimethylamine	ND		"	0.318	"	"	"	"	"
N-Nitrosodi-n-butylamine	ND		"	0.318	"	"	"	"	"
N-Nitrosodi-n-propylamine	ND		"	0.318	"	"	"	"	"
N-Nitrosodiphenylamine	ND		"	0.318	"	"	"	"	"
N-Nitrosopiperidine	ND		"	0.318	"	"	"	"	"
Pentachloronitrobenzene	ND		"	0.318	"	"	"	"	"
Pentachlorophenol	ND		"	1.64	"	"	"	"	"

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Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-07 (DU7 - Solid/Soil) - cont.					Sampled: 06/29/07 11:10		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Phenacetin	ND		"	0.318	"	"	"	"	"
Phenanthrene	ND		"	0.318	"	"	"	"	"
Phenol	ND		"	0.318	"	"	"	"	"
Pronamide	ND		"	0.318	"	"	"	"	"
Pyrene	ND		"	0.318	"	"	"	"	"
Pyridine	ND		"	0.318	"	"	"	"	"
Surr: 2,4,6-Tribromophenol (32.6-114%)	*75 %*					"	"	"	"
Surr: 2-Fluorobiphenyl (45.9-108%)	*72 %*					"	"	"	"
Surr: 2-Fluorophenol (39.4-103%)	*50 %*					"	"	"	"
Surr: Nitrobenzene-d5 (37.2-107%)	*61 %*					"	"	"	"
Surr: Phenol-d6 (49.6-103%)	*62 %*					"	"	"	"
Surr: Terphenyl-d14 (45.7-133%)	*87 %*					"	"	"	"
Total Metals by SW 846 Series Methods									
Arsenic	3.10		mg/kg	0.971	1	07/20/07 13:18	07/10/07	7G10005	SW6010B
Lead	ND		"	1.94	"	"	"	"	"
Sample ID: HQG0016-08 (DU8 - Solid/Soil)					Sampled: 06/29/07 12:10		Recvd: 07/02/07 12:35		
Polychlorinated Biphenyls by EPA Method 8082									
Aroclor 1016	ND	C-01	mg/kg	0.0318	1	07/07/07 06:04	07/05/07	7G05005	SW8082
Aroclor 1221	ND	C-01	"	0.0637	"	"	"	"	"
Aroclor 1232	ND	C-01	"	0.0318	"	"	"	"	"
Aroclor 1242	ND	C-01	"	0.0318	"	"	"	"	"
Aroclor 1248	ND	C-01	"	0.0318	"	"	"	"	"
Aroclor 1254	ND	C-01	"	0.0318	"	"	"	"	"
Aroclor 1260	ND	C-01	"	0.0318	"	"	"	"	"
Surr: Decachlorobiphenyl (24-154%)	*116 %*	*C-01*				"	"	"	"
Semivolatile Organics by GC/MS									
1,2,4,5-Tetrachlorobenzene	ND		mg/kg	0.316	1	07/27/07 10:55	07/11/07	7G11004	SW8270C
1,2,4-Trichlorobenzene	ND		"	0.316	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.316	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.316	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.316	"	"	"	"	"
1-Chloronaphthalene	ND		"	0.316	"	"	"	"	"
1-Naphthylamine	ND		"	0.633	"	"	"	"	"
2,3,4,6-Tetrachlorophenol	ND		"	0.316	"	"	"	"	"
2,4,5-Trichlorophenol	ND		"	0.316	"	"	"	"	"
2,4,6-Trichlorophenol	ND		"	0.316	"	"	"	"	"
2,4-Dichlorophenol	ND		"	0.316	"	"	"	"	"
2,4-Dimethylphenol	ND		"	0.316	"	"	"	"	"
2,4-Dinitrophenol	ND		"	1.63	"	"	"	"	"
2,4-Dinitrotoluene	ND		"	0.633	"	"	"	"	"
2,6-Dichlorophenol	ND		"	0.316	"	"	"	"	"
2,6-Dinitrotoluene	ND		"	0.316	"	"	"	"	"
2-Chloronaphthalene	ND		"	0.316	"	"	"	"	"
2-Chlorophenol	ND		"	0.316	"	"	"	"	"
2-Methylnaphthalene	ND		"	0.316	"	"	"	"	"

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-08 (DU8 - Solid/Soil) - cont.					Sampled: 06/29/07 12:10		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
2-Methylphenol (o-Cresol)	ND		"	0.316	"	"	"	"	"
2-Naphthylamine	ND		"	0.633	"	"	"	"	"
2-Nitroaniline	ND		"	1.63	"	"	"	"	"
2-Nitrophenol	ND		"	0.316	"	"	"	"	"
2-Picoline	ND		"	0.316	"	"	"	"	"
3,3'-Dichlorobenzidine	ND		"	0.316	"	"	"	"	"
3-Methylcholanthrene	ND		"	0.316	"	"	"	"	"
3-Nitroaniline	ND		"	1.63	"	"	"	"	"
4,6-Dinitro-2-methylphenol	ND		"	1.63	"	"	"	"	"
4-Aminobiphenyl	ND		"	0.633	"	"	"	"	"
4-Bromophenyl phenyl ether	ND		"	0.316	"	"	"	"	"
4-Chloro-3-methylphenol	ND		"	0.316	"	"	"	"	"
4-Chloroaniline	ND		"	0.316	"	"	"	"	"
4-Chlorophenyl phenyl ether	ND		"	0.316	"	"	"	"	"
4-Methylphenol (p-Cresol)	ND		"	0.316	"	"	"	"	"
4-Nitroaniline	ND		"	0.316	"	"	"	"	"
4-Nitrophenol	ND		"	1.63	"	"	"	"	"
7,12-Dimethylbenz (a) anthracene	ND		"	0.316	"	"	"	"	"
a,a-Dimethylphenethylamine	ND		"	1.63	"	"	"	"	"
Acenaphthene	ND		"	0.316	"	"	"	"	"
Acenaphthylene	ND		"	0.316	"	"	"	"	"
Acetophenone	ND		"	0.316	"	"	"	"	"
Aniline	ND		"	0.316	"	"	"	"	"
Anthracene	ND		"	0.316	"	"	"	"	"
Azobenzene	ND		"	0.316	"	"	"	"	"
Benzidine	ND		"	1.63	"	"	"	"	"
Benzo (a) anthracene	ND		"	0.316	"	"	"	"	"
Benzo (a) pyrene	ND		"	0.316	"	"	"	"	"
Benzo (b) fluoranthene	ND		"	0.316	"	"	"	"	"
Benzo (g,h,i) perylene	ND		"	0.316	"	"	"	"	"
Benzo (k) fluoranthene	ND		"	0.316	"	"	"	"	"
Benzoic acid	ND		"	1.63	"	"	"	"	"
Benzyl alcohol	ND		"	0.316	"	"	"	"	"
Bis(2-chloroethoxy)methane	ND		"	0.316	"	"	"	"	"
Bis(2-chloroethyl)ether	ND		"	0.316	"	"	"	"	"
Bis(2-chloroisopropyl) ether	ND		"	0.316	"	"	"	"	"
Bis(2-ethylhexyl)phthalate	ND		"	0.316	"	"	"	"	"
Butyl benzyl phthalate	ND		"	0.316	"	"	"	"	"
Chrysene	ND		"	0.316	"	"	"	"	"
Dibenz (a,j) acridine	ND		"	0.316	"	"	"	"	"
Dibenzo (a,h) anthracene	ND		"	0.316	"	"	"	"	"
Dibenzofuran	ND		"	0.316	"	"	"	"	"
Diethyl phthalate	ND		"	0.316	"	"	"	"	"
Dimethyl phthalate	ND		"	0.316	"	"	"	"	"
Dimethylaminoazobenzene	ND		"	0.633	"	"	"	"	"
Di-n-butyl phthalate	ND		"	0.316	"	"	"	"	"
Di-n-octyl phthalate	ND		"	0.316	"	"	"	"	"

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-08 (DU8 - Solid/Soil) - cont.					Sampled: 06/29/07 12:10		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Ethyl Methanesulfonate	ND		"	0.316	"	"	"	"	"
Fluoranthene	ND		"	0.316	"	"	"	"	"
Fluorene	ND		"	0.316	"	"	"	"	"
Hexachlorobenzene	ND		"	0.316	"	"	"	"	"
Hexachlorobutadiene	ND		"	0.316	"	"	"	"	"
Hexachlorocyclopentadiene	ND		"	0.316	"	"	"	"	"
Hexachloroethane	ND		"	0.316	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND		"	0.316	"	"	"	"	"
Isophorone	ND		"	0.316	"	"	"	"	"
Methyl Methanesulfonate	ND		"	0.633	"	"	"	"	"
Naphthalene	ND		"	0.316	"	"	"	"	"
Nitrobenzene	ND		"	0.316	"	"	"	"	"
N-Nitrosodimethylamine	ND		"	0.316	"	"	"	"	"
N-Nitrosodi-n-butylamine	ND		"	0.316	"	"	"	"	"
N-Nitrosodi-n-propylamine	ND		"	0.316	"	"	"	"	"
N-Nitrosodiphenylamine	ND		"	0.316	"	"	"	"	"
N-Nitrosopiperidine	ND		"	0.316	"	"	"	"	"
Pentachloronitrobenzene	ND		"	0.316	"	"	"	"	"
Pentachlorophenol	ND		"	1.63	"	"	"	"	"
Phenacetin	ND		"	0.316	"	"	"	"	"
Phenanthrene	ND		"	0.316	"	"	"	"	"
Phenol	ND		"	0.316	"	"	"	"	"
Pronamide	ND		"	0.316	"	"	"	"	"
Pyrene	ND		"	0.316	"	"	"	"	"
Pyridine	ND		"	0.316	"	"	"	"	"
Surr: 2,4,6-Tribromophenol (32.6-114%)	*70 %*					"	"	"	"
Surr: 2-Fluorobiphenyl (45.9-108%)	*63 %*					"	"	"	"
Surr: 2-Fluorophenol (39.4-103%)	*42 %*					"	"	"	"
Surr: Nitrobenzene-d5 (37.3-107%)	*57 %*					"	"	"	"
Surr: Phenol-d6 (49.6-103%)	*46 %*	Z				"	"	"	"
Surr: Terphenyl-d14 (45.7-133%)	*86 %*					"	"	"	"
Total Metals by SW 846 Series Methods									
Arsenic	3.41		mg/kg	0.971	1	07/20/07 13:21	07/10/07	7G10005	SW6010B
Lead	ND		"	1.94	"	"	"	"	"

Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-09 (DU9 - Solid/Soil)					Sampled: 06/29/07 14:10		Recvd: 07/02/07 12:35		
Polychlorinated Biphenyls by EPA Method 8082									
Aroclor 1016	ND	C-01	mg/kg	0.0310	1	07/07/07 06:32	07/05/07	7G05005	SW8082
Aroclor 1221	ND	C-01	"	0.0619	"	"	"	"	"
Aroclor 1232	ND	C-01	"	0.0310	"	"	"	"	"
Aroclor 1242	ND	C-01	"	0.0310	"	"	"	"	"
Aroclor 1248	ND	C-01	"	0.0310	"	"	"	"	"
Aroclor 1254	ND	C-01	"	0.0310	"	"	"	"	"
Aroclor 1260	ND	C-01	"	0.0310	"	"	"	"	"
Surr: Decachlorobiphenyl (24-154%)	*109 %*	*C-01*				"	"	"	"
Semivolatile Organics by GC/MS									
1,2,4,5-Tetrachlorobenzene	ND		mg/kg	0.320	1	07/27/07 11:41	07/11/07	7G11004	SW8270C
1,2,4-Trichlorobenzene	ND		"	0.320	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.320	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.320	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.320	"	"	"	"	"
1-Chloronaphthalene	ND		"	0.320	"	"	"	"	"
1-Naphthylamine	ND		"	0.641	"	"	"	"	"
2,3,4,6-Tetrachlorophenol	ND		"	0.320	"	"	"	"	"
2,4,5-Trichlorophenol	ND		"	0.320	"	"	"	"	"
2,4,6-Trichlorophenol	ND		"	0.320	"	"	"	"	"
2,4-Dichlorophenol	ND		"	0.320	"	"	"	"	"
2,4-Dimethylphenol	ND		"	0.320	"	"	"	"	"
2,4-Dinitrophenol	ND		"	1.65	"	"	"	"	"
2,4-Dinitrotoluene	ND		"	0.641	"	"	"	"	"
2,6-Dichlorophenol	ND		"	0.320	"	"	"	"	"
2,6-Dinitrotoluene	ND		"	0.320	"	"	"	"	"
2-Chloronaphthalene	ND		"	0.320	"	"	"	"	"
2-Chlorophenol	ND		"	0.320	"	"	"	"	"
2-Methylnaphthalene	ND		"	0.320	"	"	"	"	"
2-Methylphenol (o-Cresol)	ND		"	0.320	"	"	"	"	"
2-Naphthylamine	ND		"	0.641	"	"	"	"	"
2-Nitroaniline	ND		"	1.65	"	"	"	"	"
2-Nitrophenol	ND		"	0.320	"	"	"	"	"
2-Picoline	ND		"	0.320	"	"	"	"	"
3,3'-Dichlorobenzidine	ND		"	0.320	"	"	"	"	"
3-Methylcholanthrene	ND		"	0.320	"	"	"	"	"
3-Nitroaniline	ND		"	1.65	"	"	"	"	"
4,6-Dinitro-2-methylphenol	ND		"	1.65	"	"	"	"	"
4-Aminobiphenyl	ND		"	0.641	"	"	"	"	"
4-Bromophenyl phenyl ether	ND		"	0.320	"	"	"	"	"
4-Chloro-3-methylphenol	ND		"	0.320	"	"	"	"	"
4-Chloroaniline	ND		"	0.320	"	"	"	"	"
4-Chlorophenyl phenyl ether	ND		"	0.320	"	"	"	"	"
4-Methylphenol (p-Cresol)	ND		"	0.320	"	"	"	"	"
4-Nitroaniline	ND		"	0.320	"	"	"	"	"
4-Nitrophenol	ND		"	1.65	"	"	"	"	"
7,12-Dimethylbenz (a) anthracene	ND		"	0.320	"	"	"	"	"
a,a-Dimethylphenethylamine	ND		"	1.65	"	"	"	"	"

Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-09 (DU9 - Solid/Soil) - cont.					Sampled: 06/29/07 14:10		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Acenaphthene	ND		"	0.320	"	"	"	"	"
Acenaphthylene	ND		"	0.320	"	"	"	"	"
Acetophenone	ND		"	0.320	"	"	"	"	"
Aniline	ND		"	0.320	"	"	"	"	"
Anthracene	ND		"	0.320	"	"	"	"	"
Azobenzene	ND		"	0.320	"	"	"	"	"
Benzidine	ND		"	1.65	"	"	"	"	"
Benzo (a) anthracene	ND		"	0.320	"	"	"	"	"
Benzo (a) pyrene	ND		"	0.320	"	"	"	"	"
Benzo (b) fluoranthene	ND		"	0.320	"	"	"	"	"
Benzo (g,h,i) perylene	ND		"	0.320	"	"	"	"	"
Benzo (k) fluoranthene	ND		"	0.320	"	"	"	"	"
Benzoic acid	ND		"	1.65	"	"	"	"	"
Benzyl alcohol	ND		"	0.320	"	"	"	"	"
Bis(2-chloroethoxy)methane	ND		"	0.320	"	"	"	"	"
Bis(2-chloroethyl)ether	ND		"	0.320	"	"	"	"	"
Bis(2-chloroisopropyl) ether	ND		"	0.320	"	"	"	"	"
Bis(2-ethylhexyl)phthalate	ND		"	0.320	"	"	"	"	"
Butyl benzyl phthalate	ND		"	0.320	"	"	"	"	"
Chrysene	ND		"	0.320	"	"	"	"	"
Dibenz (a,j) acridine	ND		"	0.320	"	"	"	"	"
Dibenzo (a,h) anthracene	ND		"	0.320	"	"	"	"	"
Dibenzofuran	ND		"	0.320	"	"	"	"	"
Diethyl phthalate	ND		"	0.320	"	"	"	"	"
Dimethyl phthalate	ND		"	0.320	"	"	"	"	"
Dimethylaminoazobenzene	ND		"	0.641	"	"	"	"	"
Di-n-butyl phthalate	ND		"	0.320	"	"	"	"	"
Di-n-octyl phthalate	ND		"	0.320	"	"	"	"	"
Ethyl Methanesulfonate	ND		"	0.320	"	"	"	"	"
Fluoranthene	ND		"	0.320	"	"	"	"	"
Fluorene	ND		"	0.320	"	"	"	"	"
Hexachlorobenzene	ND		"	0.320	"	"	"	"	"
Hexachlorobutadiene	ND		"	0.320	"	"	"	"	"
Hexachlorocyclopentadiene	ND		"	0.320	"	"	"	"	"
Hexachloroethane	ND		"	0.320	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND		"	0.320	"	"	"	"	"
Isophorone	ND		"	0.320	"	"	"	"	"
Methyl Methanesulfonate	ND		"	0.641	"	"	"	"	"
Naphthalene	ND		"	0.320	"	"	"	"	"
Nitrobenzene	ND		"	0.320	"	"	"	"	"
N-Nitrosodimethylamine	ND		"	0.320	"	"	"	"	"
N-Nitrosodi-n-butylamine	ND		"	0.320	"	"	"	"	"
N-Nitrosodi-n-propylamine	ND		"	0.320	"	"	"	"	"
N-Nitrosodiphenylamine	ND		"	0.320	"	"	"	"	"
N-Nitrosopiperidine	ND		"	0.320	"	"	"	"	"
Pentachloronitrobenzene	ND		"	0.320	"	"	"	"	"
Pentachlorophenol	ND		"	1.65	"	"	"	"	"

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-09 (DU9 - Solid/Soil) - cont.					Sampled: 06/29/07 14:10		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Phenacetin	ND		"	0.320	"	"	"	"	"
Phenanthrene	ND		"	0.320	"	"	"	"	"
Phenol	ND		"	0.320	"	"	"	"	"
Pronamide	ND		"	0.320	"	"	"	"	"
Pyrene	ND		"	0.320	"	"	"	"	"
Pyridine	ND		"	0.320	"	"	"	"	"
Surr: 2,4,6-Tribromophenol (32.6-114%)	*67 %*					"	"	"	"
Surr: 2-Fluorobiphenyl (43.9-108%)	*81 %*					"	"	"	"
Surr: 2-Fluorophenol (39.4-103%)	*51 %*					"	"	"	"
Surr: Nitrobenzene-d5 (37.2-107%)	*78 %*					"	"	"	"
Surr: Phenol-d6 (49.6-103%)	*53 %*					"	"	"	"
Surr: Terphenyl-d14 (43.7-133%)	*99 %*					"	"	"	"
Total Metals by SW 846 Series Methods									
Arsenic	2.82		mg/kg	0.935	1	07/20/07 13:25	07/10/07	7G10005	SW6010B
Lead	ND		"	1.87	"	"	"	"	"
Sample ID: HQG0016-10 (DU10 - Solid/Soil)					Sampled: 06/29/07 15:10		Recvd: 07/02/07 12:35		
Polychlorinated Biphenyls by EPA Method 8082									
Aroclor 1016	ND	C-01	mg/kg	0.0324	1	07/07/07 00:30	07/05/07	7G05005	SW8082
Aroclor 1221	ND	C-01	"	0.0647	"	"	"	"	"
Aroclor 1232	ND	C-01	"	0.0324	"	"	"	"	"
Aroclor 1242	ND	C-01	"	0.0324	"	"	"	"	"
Aroclor 1248	ND	C-01	"	0.0324	"	"	"	"	"
Aroclor 1254	ND	C-01	"	0.0324	"	"	"	"	"
Aroclor 1260	ND	C-01	"	0.0324	"	"	"	"	"
Surr: Decachlorobiphenyl (24-154%)	*111 %*	*C-01*				"	"	"	"
Semivolatile Organics by GC/MS									
1,2,4,5-Tetrachlorobenzene	ND		mg/kg	0.316	1	07/27/07 12:27	07/11/07	7G11004	SW8270C
1,2,4-Trichlorobenzene	ND		"	0.316	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.316	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.316	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.316	"	"	"	"	"
1-Chloronaphthalene	ND		"	0.316	"	"	"	"	"
1-Naphthylamine	ND		"	0.633	"	"	"	"	"
2,3,4,6-Tetrachlorophenol	ND		"	0.316	"	"	"	"	"
2,4,5-Trichlorophenol	ND		"	0.316	"	"	"	"	"
2,4,6-Trichlorophenol	ND		"	0.316	"	"	"	"	"
2,4-Dichlorophenol	ND		"	0.316	"	"	"	"	"
2,4-Dimethylphenol	ND		"	0.316	"	"	"	"	"
2,4-Dinitrophenol	ND		"	1.63	"	"	"	"	"
2,4-Dinitrotoluene	ND		"	0.633	"	"	"	"	"
2,6-Dichlorophenol	ND		"	0.316	"	"	"	"	"
2,6-Dinitrotoluene	ND		"	0.316	"	"	"	"	"
2-Chloronaphthalene	ND		"	0.316	"	"	"	"	"
2-Chlorophenol	ND		"	0.316	"	"	"	"	"
2-Methylnaphthalene	ND		"	0.316	"	"	"	"	"

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-10 (DU10 - Solid/Soil) - cont.					Sampled: 06/29/07 15:10		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
2-Methylphenol (o-Cresol)	ND		"	0.316	"	"	"	"	"
2-Naphthylamine	ND		"	0.633	"	"	"	"	"
2-Nitroaniline	ND		"	1.63	"	"	"	"	"
2-Nitrophenol	ND		"	0.316	"	"	"	"	"
2-Picoline	ND		"	0.316	"	"	"	"	"
3,3'-Dichlorobenzidine	ND		"	0.316	"	"	"	"	"
3-Methylcholanthrene	ND		"	0.316	"	"	"	"	"
3-Nitroaniline	ND		"	1.63	"	"	"	"	"
4,6-Dinitro-2-methylphenol	ND		"	1.63	"	"	"	"	"
4-Aminobiphenyl	ND		"	0.633	"	"	"	"	"
4-Bromophenyl phenyl ether	ND		"	0.316	"	"	"	"	"
4-Chloro-3-methylphenol	ND		"	0.316	"	"	"	"	"
4-Chloroaniline	ND		"	0.316	"	"	"	"	"
4-Chlorophenyl phenyl ether	ND		"	0.316	"	"	"	"	"
4-Methylphenol (p-Cresol)	ND		"	0.316	"	"	"	"	"
4-Nitroaniline	ND		"	0.316	"	"	"	"	"
4-Nitrophenol	ND		"	1.63	"	"	"	"	"
7,12-Dimethylbenz (a) anthracene	ND		"	0.316	"	"	"	"	"
a,a-Dimethylphenethylamine	ND		"	1.63	"	"	"	"	"
Acenaphthene	ND		"	0.316	"	"	"	"	"
Acenaphthylene	ND		"	0.316	"	"	"	"	"
Acetophenone	ND		"	0.316	"	"	"	"	"
Aniline	ND		"	0.316	"	"	"	"	"
Anthracene	ND		"	0.316	"	"	"	"	"
Azobenzene	ND		"	0.316	"	"	"	"	"
Benzidine	ND		"	1.63	"	"	"	"	"
Benzo (a) anthracene	ND		"	0.316	"	"	"	"	"
Benzo (a) pyrene	ND		"	0.316	"	"	"	"	"
Benzo (b) fluoranthene	ND		"	0.316	"	"	"	"	"
Benzo (g,h,i) perylene	ND		"	0.316	"	"	"	"	"
Benzo (k) fluoranthene	ND		"	0.316	"	"	"	"	"
Benzoic acid	ND		"	1.63	"	"	"	"	"
Benzyl alcohol	ND		"	0.316	"	"	"	"	"
Bis(2-chloroethoxy)methane	ND		"	0.316	"	"	"	"	"
Bis(2-chloroethyl)ether	ND		"	0.316	"	"	"	"	"
Bis(2-chloroisopropyl) ether	ND		"	0.316	"	"	"	"	"
Bis(2-ethylhexyl)phthalate	ND		"	0.316	"	"	"	"	"
Butyl benzyl phthalate	ND		"	0.316	"	"	"	"	"
Chrysene	ND		"	0.316	"	"	"	"	"
Dibenz (a,j) acridine	ND		"	0.316	"	"	"	"	"
Dibenzo (a,h) anthracene	ND		"	0.316	"	"	"	"	"
Dibenzofuran	ND		"	0.316	"	"	"	"	"
Diethyl phthalate	ND		"	0.316	"	"	"	"	"
Dimethyl phthalate	ND		"	0.316	"	"	"	"	"
Dimethylaminoazobenzene	ND		"	0.633	"	"	"	"	"
Di-n-butyl phthalate	ND		"	0.316	"	"	"	"	"
Di-n-octyl phthalate	ND		"	0.316	"	"	"	"	"

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-10 (DU10 - Solid/Soil) - cont.					Sampled: 06/29/07 15:10		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Ethyl Methanesulfonate	ND		"	0.316	"	"	"	"	"
Fluoranthene	ND		"	0.316	"	"	"	"	"
Fluorene	ND		"	0.316	"	"	"	"	"
Hexachlorobenzene	ND		"	0.316	"	"	"	"	"
Hexachlorobutadiene	ND		"	0.316	"	"	"	"	"
Hexachlorocyclopentadiene	ND		"	0.316	"	"	"	"	"
Hexachloroethane	ND		"	0.316	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND		"	0.316	"	"	"	"	"
Isophorone	ND		"	0.316	"	"	"	"	"
Methyl Methanesulfonate	ND		"	0.633	"	"	"	"	"
Naphthalene	ND		"	0.316	"	"	"	"	"
Nitrobenzene	ND		"	0.316	"	"	"	"	"
N-Nitrosodimethylamine	ND		"	0.316	"	"	"	"	"
N-Nitrosodi-n-butylamine	ND		"	0.316	"	"	"	"	"
N-Nitrosodi-n-propylamine	ND		"	0.316	"	"	"	"	"
N-Nitrosodiphenylamine	ND		"	0.316	"	"	"	"	"
N-Nitrosopiperidine	ND		"	0.316	"	"	"	"	"
Pentachloroalkrobenzene	ND		"	0.316	"	"	"	"	"
Pentachlorophenol	ND		"	1.63	"	"	"	"	"
Phenacetin	ND		"	0.316	"	"	"	"	"
Phenanthrene	ND		"	0.316	"	"	"	"	"
Phenol	ND		"	0.316	"	"	"	"	"
Pronamide	ND		"	0.316	"	"	"	"	"
Pyrene	ND		"	0.316	"	"	"	"	"
Pyridine	ND		"	0.316	"	"	"	"	"
Surr: 2,4,6-Tribromophenol (32.6-114%)	*70 %*					"	"	"	"
Surr: 2-Fluorobiphenyl (43.9-108%)	*73 %*					"	"	"	"
Surr: 2-Fluorophenol (19.4-103%)	*46 %*					"	"	"	"
Surr: Nitrobenzene-d5 (37.2-107%)	*71 %*					"	"	"	"
Surr: Phenol-d6 (49.6-105%)	*53 %*					"	"	"	"
Surr: Terphenyl-d14 (43.7-133%)	*97 %*					"	"	"	"
Total Metals by SW 846 Series Methods									
Arsenic	2.89		mg/kg	0.943	1	07/20/07 13:41	07/10/07	7G10005	SW6010B
Lead	ND		"	1.89	"	"	"	"	"

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-11 (DU1-VOC - Solid/Soil)					Sampled: 06/29/07 16:30		Recvd: 07/02/07 12:35		
Volatile Organic Compounds by EPA 8260B									
1,1,1-Trichloroethane	ND		mg/kg	0.00988	1	07/12/07 00:42	07/11/07	7G12011	SW8260B
1,1,2,2-Tetrachloroethane	ND		"	0.00988	"	"	"	"	"
1,1,2-Trichloroethane	ND		"	0.00988	"	"	"	"	"
1,1-Dichloroethane	ND		"	0.00988	"	"	"	"	"
1,1-Dichloroethene	ND		"	0.00988	"	"	"	"	"
1,2-Dibromo-3-chloropropane	ND		"	0.00988	"	"	"	"	"
1,2-Dibromoethane (EDB)	ND		"	0.00988	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.00988	"	"	"	"	"
1,2-Dichloroethane	ND		"	0.00988	"	"	"	"	"
1,2-Dichloropropane	ND		"	0.00988	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.00988	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.00988	"	"	"	"	"
Bromodichloromethane	ND		"	0.00988	"	"	"	"	"
Bromoform	ND		"	0.00988	"	"	"	"	"
Bromomethane	ND		"	0.0988	"	"	"	"	"
Carbon Tetrachloride	ND		"	0.00988	"	"	"	"	"
Chlorobenzene	ND		"	0.00988	"	"	"	"	"
Chlorodibromomethane	ND		"	0.00988	"	"	"	"	"
Chloroethane	ND		"	0.0494	"	"	"	"	"
Chloroform	ND		"	0.00988	"	"	"	"	"
Chloromethane	ND		"	0.0494	"	"	"	"	"
cis-1,2-Dichloroethene	ND		"	0.00988	"	"	"	"	"
cis-1,3-Dichloropropene	ND		"	0.00988	"	"	"	"	"
Dichlorodifluoromethane	ND		"	0.0494	"	"	"	"	"
Methylene Chloride	ND		"	0.0494	"	"	"	"	"
Tetrachloroethene	ND		"	0.00988	"	"	"	"	"
trans-1,2-Dichloroethene	ND		"	0.00988	"	"	"	"	"
trans-1,3-Dichloropropene	ND		"	0.00988	"	"	"	"	"
Trichloroethene	ND		"	0.00988	"	"	"	"	"
Trichlorofluoromethane	ND		"	0.00988	"	"	"	"	"
Vinyl chloride	ND		"	0.0494	"	"	"	"	"
Surr: 1,2-Dichloroethane-d4 (58.3-136%)	*109 %*					"	"	"	"
Surr: 4-Bromofluorobenzene (72.1-136%)	*133 %*					"	"	"	"
Surr: Dibromofluoromethane (63.2-149%)	*104 %*					"	"	"	"
Surr: Toluene-d8 (70.5-145%)	*122 %*					"	"	"	"

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-12 (DU1-VOC - Solid/Soil)					Sampled: 06/29/07 15:55		Recvd: 07/02/07 12:35		
Volatile Organic Compounds by EPA 8260B									
1,1,1-Trichloroethane	ND		mg/kg	0.00977	1	07/12/07 01:09	07/11/07	7G12011	SW8260B
1,1,2,2-Tetrachloroethane	ND		"	0.00977	"	"	"	"	"
1,1,2-Trichloroethane	ND		"	0.00977	"	"	"	"	"
1,1-Dichloroethane	ND		"	0.00977	"	"	"	"	"
1,1-Dichloroethene	ND		"	0.00977	"	"	"	"	"
1,2-Dibromo-3-chloropropane	ND		"	0.00977	"	"	"	"	"
1,2-Dibromoethane (EDB)	ND		"	0.00977	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.00977	"	"	"	"	"
1,2-Dichloroethane	ND		"	0.00977	"	"	"	"	"
1,2-Dichloropropane	ND		"	0.00977	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.00977	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.00977	"	"	"	"	"
Bromodichloromethane	ND		"	0.00977	"	"	"	"	"
Bromoform	ND		"	0.00977	"	"	"	"	"
Bromomethane	ND		"	0.0977	"	"	"	"	"
Carbon Tetrachloride	ND		"	0.00977	"	"	"	"	"
Chlorobenzene	ND		"	0.00977	"	"	"	"	"
Chlorodibromomethane	ND		"	0.00977	"	"	"	"	"
Chloroethane	ND		"	0.0488	"	"	"	"	"
Chloroform	ND		"	0.00977	"	"	"	"	"
Chloromethane	ND		"	0.0488	"	"	"	"	"
cis-1,2-Dichloroethene	ND		"	0.00977	"	"	"	"	"
cis-1,3-Dichloropropene	ND		"	0.00977	"	"	"	"	"
Dichlorodifluoromethane	ND		"	0.0488	"	"	"	"	"
Methylene Chloride	ND		"	0.0488	"	"	"	"	"
Tetrachloroethene	ND		"	0.00977	"	"	"	"	"
trans-1,2-Dichloroethene	ND		"	0.00977	"	"	"	"	"
trans-1,3-Dichloropropene	ND		"	0.00977	"	"	"	"	"
Trichloroethene	ND		"	0.00977	"	"	"	"	"
Trichlorofluoromethane	ND		"	0.00977	"	"	"	"	"
Vinyl chloride	ND		"	0.0488	"	"	"	"	"
Surr: 1,2-Dichloroethane-d4 (38.3-136%)	*113 %*					"	"	"	"
Surr: 4-Bromofluorobenzene (72.1-136%)	*149 %*					"	"	"	"
Surr: Dibromofluoromethane (63.2-149%)	*109 %*					"	"	"	"
Surr: Toluene-d8 (70.3-143%)	*132 %*					"	"	"	"

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-13 (DU3-VOC - Solid/Soil)					Sampled: 06/29/07 15:23		Recvd: 07/02/07 12:35		
Volatile Organic Compounds by EPA 8260B									
1,1,1-Trichloroethane	ND		mg/kg	0.00998	1	07/12/07 02:02	07/11/07	7G12011	SW8260B
1,1,2,2-Tetrachloroethane	ND		"	0.00998	"	"	"	"	"
1,1,2-Trichloroethane	ND		"	0.00998	"	"	"	"	"
1,1-Dichloroethane	ND		"	0.00998	"	"	"	"	"
1,1-Dichloroethene	ND		"	0.00998	"	"	"	"	"
1,2-Dibromo-3-chloropropane	ND		"	0.00998	"	"	"	"	"
1,2-Dibromoethane (EDB)	ND		"	0.00998	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.00998	"	"	"	"	"
1,2-Dichloroethane	ND		"	0.00998	"	"	"	"	"
1,2-Dichloropropane	ND		"	0.00998	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.00998	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.00998	"	"	"	"	"
Bromodichloromethane	ND		"	0.00998	"	"	"	"	"
Bromoform	ND		"	0.00998	"	"	"	"	"
Bromomethane	ND		"	0.0998	"	"	"	"	"
Carbon Tetrachloride	ND		"	0.00998	"	"	"	"	"
Chlorobenzene	ND		"	0.00998	"	"	"	"	"
Chlorodibromomethane	ND		"	0.00998	"	"	"	"	"
Chloroethane	ND		"	0.0499	"	"	"	"	"
Chloroform	ND		"	0.00998	"	"	"	"	"
Chloromethane	ND		"	0.0499	"	"	"	"	"
cis-1,2-Dichloroethene	ND		"	0.00998	"	"	"	"	"
cis-1,3-Dichloropropene	ND		"	0.00998	"	"	"	"	"
Dichlorodifluoromethane	ND		"	0.0499	"	"	"	"	"
Methylene Chloride	ND		"	0.0499	"	"	"	"	"
Tetrachloroethene	ND		"	0.00998	"	"	"	"	"
trans-1,2-Dichloroethene	ND		"	0.00998	"	"	"	"	"
trans-1,3-Dichloropropene	ND		"	0.00998	"	"	"	"	"
Trichloroethene	ND		"	0.00998	"	"	"	"	"
Trichlorofluoromethane	ND		"	0.00998	"	"	"	"	"
Vinyl chloride	ND		"	0.0499	"	"	"	"	"
Surr: 1,2-Dichloroethane-d4 (38.3-136%)	*114 %*					"	"	"	"
Surr: 4-Bromofluorobenzene (72.1-136%)	*143 %*					"	"	"	"
Surr: Dibromofluoromethane (63.2-149%)	*109 %*					"	"	"	"
Surr: Toluene-d8 (70.3-143%)	*123 %*					"	"	"	"

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Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-14 (DU4-VOC - Solid/Soil)					Sampled: 06/29/07 14:53		Recvd: 07/02/07 12:35		
Volatile Organic Compounds by EPA 8260B									
1,1,1-Trichloroethane	ND		mg/kg	0.0100	1	07/12/07 02:29	07/11/07	7G12011	SW8260B
1,1,2,2-Tetrachloroethane	ND		"	0.0100	"	"	"	"	"
1,1,2-Trichloroethane	ND		"	0.0100	"	"	"	"	"
1,1-Dichloroethane	ND		"	0.0100	"	"	"	"	"
1,1-Dichloroethene	ND		"	0.0100	"	"	"	"	"
1,2-Dibromo-3-chloropropane	ND		"	0.0100	"	"	"	"	"
1,2-Dibromoethane (EDB)	ND		"	0.0100	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.0100	"	"	"	"	"
1,2-Dichloroethane	ND		"	0.0100	"	"	"	"	"
1,2-Dichloropropane	ND		"	0.0100	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.0100	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.0100	"	"	"	"	"
Bromodichloromethane	ND		"	0.0100	"	"	"	"	"
Bromoform	ND		"	0.0100	"	"	"	"	"
Bromomethane	ND		"	0.100	"	"	"	"	"
Carbon Tetrachloride	ND		"	0.0100	"	"	"	"	"
Chlorobenzene	ND		"	0.0100	"	"	"	"	"
Chlorodibromomethane	ND		"	0.0100	"	"	"	"	"
Chloroethane	ND		"	0.0500	"	"	"	"	"
Chloroform	ND		"	0.0100	"	"	"	"	"
Chloromethane	ND		"	0.0500	"	"	"	"	"
cis-1,2-Dichloroethene	ND		"	0.0100	"	"	"	"	"
cis-1,3-Dichloropropene	ND		"	0.0100	"	"	"	"	"
Dichlorodifluoromethane	ND		"	0.0500	"	"	"	"	"
Methylene Chloride	ND		"	0.0500	"	"	"	"	"
Tetrachloroethene	ND		"	0.0100	"	"	"	"	"
trans-1,2-Dichloroethene	ND		"	0.0100	"	"	"	"	"
trans-1,3-Dichloropropene	ND		"	0.0100	"	"	"	"	"
Trichloroethene	ND		"	0.0100	"	"	"	"	"
Trichlorofluoromethane	ND		"	0.0100	"	"	"	"	"
Vinyl chloride	ND		"	0.0500	"	"	"	"	"
Surr: 1,2-Dichloroethane-d4 (58.3-156%)	*113 %*					"	"	"	"
Surr: 4-Bromofluorobenzene (72.1-156%)	*134 %*					"	"	"	"
Surr: Dibromofluoromethane (63.2-149%)	*110 %*					"	"	"	"
Surr: Toluene-d8 (70.3-145%)	*125 %*					"	"	"	"

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THE LEADER IN ENVIRONMENTAL TESTING

99-193 Aiea Heights Drive, Suite 121 Aiea, HI 96701 * 808-486-5227 * Fax 808-486-2456

Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-15 (DU5-VOC - Solid/Soil)					Sampled: 06/29/07 14:26		Recvd: 07/02/07 12:35		
Volatile Organic Compounds by EPA 8260B									
1,1,1-Trichloroethane	ND		mg/kg	0.00998	1	07/12/07 04:16	07/11/07	7G12011	SW8260B
1,1,2,2-Tetrachloroethane	ND		"	0.00998	"	"	"	"	"
1,1,2-Trichloroethane	ND		"	0.00998	"	"	"	"	"
1,1-Dichloroethane	ND		"	0.00998	"	"	"	"	"
1,1-Dichloroethene	ND		"	0.00998	"	"	"	"	"
1,2-Dibromo-3-chloropropane	ND		"	0.00998	"	"	"	"	"
1,2-Dibromoethane (EDB)	ND		"	0.00998	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.00998	"	"	"	"	"
1,2-Dichloroethane	ND		"	0.00998	"	"	"	"	"
1,2-Dichloropropane	ND		"	0.00998	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.00998	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.00998	"	"	"	"	"
Bromodichloromethane	ND		"	0.00998	"	"	"	"	"
Bromoform	ND		"	0.00998	"	"	"	"	"
Bromomethane	ND		"	0.0998	"	"	"	"	"
Carbon Tetrachloride	ND		"	0.00998	"	"	"	"	"
Chlorobenzene	ND		"	0.00998	"	"	"	"	"
Chlorodibromomethane	ND		"	0.00998	"	"	"	"	"
Chloroethane	ND		"	0.0499	"	"	"	"	"
Chloroform	ND		"	0.00998	"	"	"	"	"
Chloromethane	ND		"	0.0499	"	"	"	"	"
cis-1,2-Dichloroethene	ND		"	0.00998	"	"	"	"	"
cis-1,3-Dichloropropene	ND		"	0.00998	"	"	"	"	"
Dichlorodifluoromethane	ND		"	0.0499	"	"	"	"	"
Methylene Chloride	ND		"	0.0499	"	"	"	"	"
Tetrachloroethene	ND		"	0.00998	"	"	"	"	"
trans-1,2-Dichloroethene	ND		"	0.00998	"	"	"	"	"
trans-1,3-Dichloropropene	ND		"	0.00998	"	"	"	"	"
Trichloroethene	ND		"	0.00998	"	"	"	"	"
Trichlorofluoromethane	ND		"	0.00998	"	"	"	"	"
Vinyl chloride	ND		"	0.0499	"	"	"	"	"
Surr: 1,2-Dichloroethane-d4 (58.3-156%)	*125 %*					"	"	"	"
Surr: 4-Bromofluorobenzene (72.1-156%)	*139 %*					"	"	"	"
Surr: Dibromofluoromethane (63.2-149%)	*112 %*					"	"	"	"
Surr: Toluene-d8 (70.3-145%)	*142 %*					"	"	"	"

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THE LEADER IN ENVIRONMENTAL TESTING

99-193 Aiea Heights Drive, Suite 121 Aiea, HI 96701 * 808-486-5227 * Fax 808-486-2456

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-16 (DU6-VOC - Solid/Soil)					Sampled: 06/29/07 13:53		Recvd: 07/02/07 12:35		
Volatile Organic Compounds by EPA 8260B									
1,1,1-Trichloroethane	ND		mg/kg	0.00998	1	07/12/07 04:42	07/11/07	7G12011	SW8260B
1,1,2,2-Tetrachloroethane	ND		"	0.00998	"	"	"	"	"
1,1,2-Trichloroethane	ND		"	0.00998	"	"	"	"	"
1,1-Dichloroethane	ND		"	0.00998	"	"	"	"	"
1,1-Dichloroethene	ND		"	0.00998	"	"	"	"	"
1,2-Dibromo-3-chloropropane	ND		"	0.00998	"	"	"	"	"
1,2-Dibromoethane (EDB)	ND		"	0.00998	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.00998	"	"	"	"	"
1,2-Dichloroethane	ND		"	0.00998	"	"	"	"	"
1,2-Dichloropropane	ND		"	0.00998	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.00998	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.00998	"	"	"	"	"
Bromodichloromethane	ND		"	0.00998	"	"	"	"	"
Bromoform	ND		"	0.00998	"	"	"	"	"
Bromomethane	ND		"	0.0998	"	"	"	"	"
Carbon Tetrachloride	ND		"	0.00998	"	"	"	"	"
Chlorobenzene	ND		"	0.00998	"	"	"	"	"
Chlorodibromomethane	ND		"	0.00998	"	"	"	"	"
Chloroethane	ND		"	0.0499	"	"	"	"	"
Chloroform	ND		"	0.00998	"	"	"	"	"
Chloromethane	ND		"	0.0499	"	"	"	"	"
cis-1,2-Dichloroethene	ND		"	0.00998	"	"	"	"	"
cis-1,3-Dichloropropene	ND		"	0.00998	"	"	"	"	"
Dichlorodifluoromethane	ND		"	0.0499	"	"	"	"	"
Methylene Chloride	ND		"	0.0499	"	"	"	"	"
Tetrachloroethene	ND		"	0.00998	"	"	"	"	"
trans-1,2-Dichloroethene	ND		"	0.00998	"	"	"	"	"
trans-1,3-Dichloropropene	ND		"	0.00998	"	"	"	"	"
Trichloroethene	ND		"	0.00998	"	"	"	"	"
Trichlorofluoromethane	ND		"	0.00998	"	"	"	"	"
Vinyl chloride	ND		"	0.0499	"	"	"	"	"
Surr: 1,2-Dichloroethane-d4 (58.3-156%)	*113 %*					"	"	"	"
Surr: 4-Bromofluorobenzene (72.1-156%)	*138 %*					"	"	"	"
Surr: Dibromofluoromethane (63.2-149%)	*104 %*					"	"	"	"
Surr: Toluene-d8 (70.3-143%)	*118 %*					"	"	"	"

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THE LEADER IN ENVIRONMENTAL TESTING

99-193 Aiea Heights Drive, Suite 121 Aiea, HI 96701 * 808-486-5227 * Fax 808-486-2456

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-17 (DU7-VOC - Solid/Soil)					Sampled: 06/29/07 13:25		Recvd: 07/02/07 12:35		
Volatile Organic Compounds by EPA 8260B									
1,1,1-Trichloroethane	ND		mg/kg	0.00992	1	07/12/07 05:09	07/11/07	7G12011	SW8260B
1,1,2,2-Tetrachloroethane	ND		"	0.00992	"	"	"	"	"
1,1,2-Trichloroethane	ND		"	0.00992	"	"	"	"	"
1,1-Dichloroethane	ND		"	0.00992	"	"	"	"	"
1,1-Dichloroethene	ND		"	0.00992	"	"	"	"	"
1,2-Dibromo-3-chloropropane	ND		"	0.00992	"	"	"	"	"
1,2-Dibromoethane (EDB)	ND		"	0.00992	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.00992	"	"	"	"	"
1,2-Dichloroethane	ND		"	0.00992	"	"	"	"	"
1,2-Dichloropropane	ND		"	0.00992	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.00992	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.00992	"	"	"	"	"
Bromodichloromethane	ND		"	0.00992	"	"	"	"	"
Bromoform	ND		"	0.00992	"	"	"	"	"
Bromomethane	ND		"	0.0992	"	"	"	"	"
Carbon Tetrachloride	ND		"	0.00992	"	"	"	"	"
Chlorobenzene	ND		"	0.00992	"	"	"	"	"
Chlorodibromomethane	ND		"	0.00992	"	"	"	"	"
Chloroethane	ND		"	0.0496	"	"	"	"	"
Chloroform	ND		"	0.00992	"	"	"	"	"
Chloromethane	ND		"	0.0496	"	"	"	"	"
cis-1,2-Dichloroethene	ND		"	0.00992	"	"	"	"	"
cis-1,3-Dichloropropene	ND		"	0.00992	"	"	"	"	"
Dichlorodifluoromethane	ND		"	0.0496	"	"	"	"	"
Methylene Chloride	ND		"	0.0496	"	"	"	"	"
Tetrachloroethene	ND		"	0.00992	"	"	"	"	"
trans-1,2-Dichloroethene	ND		"	0.00992	"	"	"	"	"
trans-1,3-Dichloropropene	ND		"	0.00992	"	"	"	"	"
Trichloroethene	ND		"	0.00992	"	"	"	"	"
Trichlorofluoromethane	ND		"	0.00992	"	"	"	"	"
Vinyl chloride	ND		"	0.0496	"	"	"	"	"
Surr: 1,2-Dichloroethane-d4 (58.3-156%)	*118 %*					"	"	"	"
Surr: 4-Bromofluorobenzene (72.1-156%)	*132 %*					"	"	"	"
Surr: Dibromofluoromethane (63.2-149%)	*111 %*					"	"	"	"
Surr: Toluene-d8 (70.3-143%)	*128 %*					"	"	"	"

Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-18 (DU8-VOC - Solid/Soil)					Sampled: 06/29/07 12:33		Recvd: 07/02/07 12:35		
Volatile Organic Compounds by EPA 8260B									
1,1,1-Trichloroethane	ND		mg/kg	0.0100	1	07/12/07 05:56	07/11/07	7G12011	SW8260B
1,1,2,2-Tetrachloroethane	ND		"	0.0100	"	"	"	"	"
1,1,2-Trichloroethane	ND		"	0.0100	"	"	"	"	"
1,1-Dichloroethane	ND		"	0.0100	"	"	"	"	"
1,1-Dichloroethene	ND		"	0.0100	"	"	"	"	"
1,2-Dibromo-3-chloropropane	ND		"	0.0100	"	"	"	"	"
1,2-Dibromoethane (EDB)	ND		"	0.0100	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.0100	"	"	"	"	"
1,2-Dichloroethane	ND		"	0.0100	"	"	"	"	"
1,2-Dichloropropane	ND		"	0.0100	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.0100	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.0100	"	"	"	"	"
Bromodichloromethane	ND		"	0.0100	"	"	"	"	"
Bromoform	ND		"	0.0100	"	"	"	"	"
Bromomethane	ND		"	0.100	"	"	"	"	"
Carbon Tetrachloride	ND		"	0.0100	"	"	"	"	"
Chlorobenzene	ND		"	0.0100	"	"	"	"	"
Chlorodibromomethane	ND		"	0.0100	"	"	"	"	"
Chloroethane	ND		"	0.0501	"	"	"	"	"
Chloroform	ND		"	0.0100	"	"	"	"	"
Chloromethane	ND		"	0.0501	"	"	"	"	"
cis-1,2-Dichloroethene	ND		"	0.0100	"	"	"	"	"
cis-1,3-Dichloropropene	ND		"	0.0100	"	"	"	"	"
Dichlorodifluoromethane	ND		"	0.0501	"	"	"	"	"
Methylene Chloride	ND		"	0.0501	"	"	"	"	"
Tetrachloroethene	ND		"	0.0100	"	"	"	"	"
trans-1,2-Dichloroethene	ND		"	0.0100	"	"	"	"	"
trans-1,3-Dichloropropene	ND		"	0.0100	"	"	"	"	"
Trichloroethene	ND		"	0.0100	"	"	"	"	"
Trichlorofluoromethane	ND		"	0.0100	"	"	"	"	"
Vinyl chloride	ND		"	0.0501	"	"	"	"	"
Surr: 1,1-Dichloroethane-d4 (38.3-136%)	*113 %*					"	"	"	"
Surr: 4-Bromofluorobenzene (72.1-136%)	*130 %*					"	"	"	"
Surr: Dibromofluoromethane (63.2-149%)	*108 %*					"	"	"	"
Surr: Toluene-d8 (70.5-145%)	*117 %*					"	"	"	"

Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-19 (Drum1 - Solid/Soil)					Sampled: 06/29/07 19:07		Recvd: 07/02/07 12:35		
Extractable Petroleum Hydrocarbons by 8015M									
DRO	ND		mg/kg	6.55	1	07/10/07 11:41	07/06/07	7G06006	SW8015M
RRO	ND		"	19.7	"	"	"	"	"
Surr: o-Terphenyl (34.7-135%)	*74 %*					"	"	"	"
Gasoline Range Organics/BTEX/MTBE by EPA 8015M/8260B									
Benzene	ND		mg/kg	0.00198	1	07/12/07 06:03	07/11/07	7G12011	SW8015B/8260B
Ethylbenzene	ND		"	0.00198	"	"	"	"	"
GRO	ND		"	0.495	"	"	"	"	"
m,p-Xylene	ND		"	0.00396	"	"	"	"	"
o-Xylene	ND		"	0.00198	"	"	"	"	"
Toluene	ND		"	0.00198	"	"	"	"	"
Surr: Toluene-d8 (88.2-117%)	*110 %*	*Z5*				"	"	"	"
Surr: Toluene-d8 (88.2-117%)	*120 %*	*Z5*				"	"	"	"
Polychlorinated Biphenyls by EPA Method 8082									
Aroclor 1016	ND	C-01	mg/kg	0.0330	1	07/07/07 07:00	07/05/07	7G05005	SW8082
Aroclor 1221	ND	C-01	"	0.0660	"	"	"	"	"
Aroclor 1232	ND	C-01	"	0.0330	"	"	"	"	"
Aroclor 1242	ND	C-01	"	0.0330	"	"	"	"	"
Aroclor 1248	ND	C-01	"	0.0330	"	"	"	"	"
Aroclor 1254	ND	C-01	"	0.0330	"	"	"	"	"
Aroclor 1260	ND	C-01	"	0.0330	"	"	"	"	"
Surr: Decachlorobiphenyl (24-134%)	*113 %*	*C-01*				"	"	"	"
Semivolatile Organics by GC/MS									
1,2,4,5-Tetrachlorobenzene	ND		mg/kg	0.320	1	07/27/07 13:25	07/11/07	7G11004	SW8270C
1,2,4-Trichlorobenzene	ND		"	0.320	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.320	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.320	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.320	"	"	"	"	"
1-Chloronaphthalene	ND		"	0.320	"	"	"	"	"
1-Naphthylamine	ND		"	0.641	"	"	"	"	"
2,3,4,6-Tetrachlorophenol	ND		"	0.320	"	"	"	"	"
2,4,5-Trichlorophenol	ND		"	0.320	"	"	"	"	"
2,4,6-Trichlorophenol	ND		"	0.320	"	"	"	"	"
2,4-Dichlorophenol	ND		"	0.320	"	"	"	"	"
2,4-Dimethylphenol	ND		"	0.320	"	"	"	"	"
2,4-Dinitrophenol	ND		"	1.65	"	"	"	"	"
2,4-Dinitrotoluene	ND		"	0.641	"	"	"	"	"
2,6-Dichlorophenol	ND		"	0.320	"	"	"	"	"
2,6-Dinitrotoluene	ND		"	0.320	"	"	"	"	"
2-Chloronaphthalene	ND		"	0.320	"	"	"	"	"
2-Chlorophenol	ND		"	0.320	"	"	"	"	"
2-Methylnaphthalene	ND		"	0.320	"	"	"	"	"
2-Methylphenol (o-Cresol)	ND		"	0.320	"	"	"	"	"
2-Naphthylamine	ND		"	0.641	"	"	"	"	"
2-Nitroaniline	ND		"	1.65	"	"	"	"	"
2-Nitrophenol	ND		"	0.320	"	"	"	"	"
2-Picoline	ND		"	0.320	"	"	"	"	"

Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-19 (Drum1 - Solid/Soil) - cont.					Sampled: 06/29/07 19:07		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
3,3'-Dichlorobenzidine	ND		"	0.320	"	"	"	"	"
3-Methylcholanthrene	ND		"	0.320	"	"	"	"	"
3-Nitroaniline	ND		"	1.65	"	"	"	"	"
4,6-Dinitro-2-methylphenol	ND		"	1.65	"	"	"	"	"
4-Aminobiphenyl	ND		"	0.641	"	"	"	"	"
4-Bromophenyl phenyl ether	ND		"	0.320	"	"	"	"	"
4-Chloro-3-methylphenol	ND		"	0.320	"	"	"	"	"
4-Chloroaniline	ND		"	0.320	"	"	"	"	"
4-Chlorophenyl phenyl ether	ND		"	0.320	"	"	"	"	"
4-Methylphenol (p-Cresol)	ND		"	0.320	"	"	"	"	"
4-Nitroaniline	ND		"	0.320	"	"	"	"	"
4-Nitrophenol	ND		"	1.65	"	"	"	"	"
7,12-Dimethylbenz (a) anthracene	ND		"	0.320	"	"	"	"	"
a,a-Dimethylphenethylamine	ND		"	1.65	"	"	"	"	"
Acenaphthene	ND		"	0.320	"	"	"	"	"
Acenaphthylene	ND		"	0.320	"	"	"	"	"
Acetophenone	ND		"	0.320	"	"	"	"	"
Aniline	ND		"	0.320	"	"	"	"	"
Anthracene	ND		"	0.320	"	"	"	"	"
Azobenzene	ND		"	0.320	"	"	"	"	"
Benzidine	ND		"	1.65	"	"	"	"	"
Benzo (a) anthracene	ND		"	0.320	"	"	"	"	"
Benzo (a) pyrene	ND		"	0.320	"	"	"	"	"
Benzo (b) fluoranthene	ND		"	0.320	"	"	"	"	"
Benzo (g,h,i) perylene	ND		"	0.320	"	"	"	"	"
Benzo (k) fluoranthene	ND		"	0.320	"	"	"	"	"
Benzoic Acid	ND		"	1.65	"	"	"	"	"
Benzyl alcohol	ND		"	0.320	"	"	"	"	"
Bis(2-chloroethoxy)methane	ND		"	0.320	"	"	"	"	"
Bis(2-chloroethyl)ether	ND		"	0.320	"	"	"	"	"
Bis(2-chloroisopropyl) ether	ND		"	0.320	"	"	"	"	"
Bis(2-ethylhexyl)phthalate	ND		"	0.320	"	"	"	"	"
Butyl benzyl phthalate	ND		"	0.320	"	"	"	"	"
Chrysene	ND		"	0.320	"	"	"	"	"
Dibenz (a,j) acridine	ND		"	0.320	"	"	"	"	"
Dibenzo (a,h) anthracene	ND		"	0.320	"	"	"	"	"
Dibenzofuran	ND		"	0.320	"	"	"	"	"
Diethyl phthalate	ND		"	0.320	"	"	"	"	"
Dimethyl phthalate	ND		"	0.320	"	"	"	"	"
Dimethylaminoazobenzene	ND		"	0.641	"	"	"	"	"
Di-n-butyl phthalate	ND		"	0.320	"	"	"	"	"
Di-n-octyl phthalate	ND		"	0.320	"	"	"	"	"
Ethyl Methanesulfonate	ND		"	0.320	"	"	"	"	"
Fluoranthene	ND		"	0.320	"	"	"	"	"
Fluorene	ND		"	0.320	"	"	"	"	"
Hexachlorobenzene	ND		"	0.320	"	"	"	"	"
Hexachlorobutadiene	ND		"	0.320	"	"	"	"	"

Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-19 (Drum1 - Solid/Soil) - cont.					Sampled: 06/29/07 19:07		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Hexachlorocyclopentadiene	ND		"	0.320	"	"	"	"	"
Hexachloroethane	ND		"	0.320	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND		"	0.320	"	"	"	"	"
Isophorone	ND		"	0.320	"	"	"	"	"
Methyl Methanesulfonate	ND		"	0.641	"	"	"	"	"
Naphthalene	ND		"	0.320	"	"	"	"	"
Nitrobenzene	ND		"	0.320	"	"	"	"	"
N-Nitrosodimethylamine	ND		"	0.320	"	"	"	"	"
N-Nitrosodi-n-butylamine	ND		"	0.320	"	"	"	"	"
N-Nitrosodi-n-propylamine	ND		"	0.320	"	"	"	"	"
N-Nitrosodiphenylamine	ND		"	0.320	"	"	"	"	"
N-Nitrosopiperidine	ND		"	0.320	"	"	"	"	"
Pentachloronitrobenzene	ND		"	0.320	"	"	"	"	"
Pentachlorophenol	ND		"	1.65	"	"	"	"	"
Phenacetin	ND		"	0.320	"	"	"	"	"
Phenanthrene	ND		"	0.320	"	"	"	"	"
Phenol	ND		"	0.320	"	"	"	"	"
Pronamide	ND		"	0.320	"	"	"	"	"
Pyrene	ND		"	0.320	"	"	"	"	"
Pyridine	ND		"	0.320	"	"	"	"	"
Surr: 2,4,6-Tribromophenol (52.6-114%)	*88 %*					"	"	"	"
Surr: 2-Fluorobiphenyl (45.9-108%)	*84 %*					"	"	"	"
Surr: 2-Fluorophenol (39.4-103%)	*73 %*					"	"	"	"
Surr: Nitrobenzene-d5 (37.2-107%)	*88 %*					"	"	"	"
Surr: Phenol-d6 (49.6-103%)	*70 %*					"	"	"	"
Surr: Terphenyl-d14 (45.7-133%)	*107 %*					"	"	"	"
Total Metals by SW 846 Series Methods									
Arsenic	ND		mg/kg	4.50	1	07/17/07 14:43	07/16/07	7G16005	SW6010B
Barium	**107**		"	9.01	"	"	"	"	"
Cadmium	**3.88**		"	1.80	"	"	"	"	"
Chromium	**140**		"	4.50	"	"	"	"	"
Lead	**60.8**		"	9.01	"	"	"	"	"
Mercury	ND		"	0.0192	"	07/11/07 19:04	07/11/07	7G11013	SW7471
Selenium	ND		"	9.01	"	07/17/07 14:43	07/16/07	7G16005	SW6010B
Silver	ND		"	4.50	"	"	"	"	"
Volatile Organic Compounds by EPA 8260B									
1,1,1-Trichloroethane	ND		mg/kg	0.00990	1	07/12/07 06:03	07/11/07	7G12011	SW8260B
1,1,2,2-Tetrachloroethane	ND		"	0.00990	"	"	"	"	"
1,1,2-Trichloroethane	ND		"	0.00990	"	"	"	"	"
1,1-Dichloroethane	ND		"	0.00990	"	"	"	"	"
1,1-Dichloroethene	ND		"	0.00990	"	"	"	"	"
1,2-Dibromo-3-chloropropane	ND		"	0.00990	"	"	"	"	"
1,2-Dibromoethane (EDB)	ND		"	0.00990	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.00990	"	"	"	"	"
1,2-Dichloroethane	ND		"	0.00990	"	"	"	"	"
1,2-Dichloropropane	ND		"	0.00990	"	"	"	"	"

Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-19 (Drum1 - Solid/Soil) - cont.					Sampled: 06/29/07 19:07		Recvd: 07/02/07 12:35		
Volatile Organic Compounds by EPA 8260B - cont.									
1,3-Dichlorobenzene	ND		"	0.00990	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.00990	"	"	"	"	"
Bromodichloromethane	ND		"	0.00990	"	"	"	"	"
Bromoform	ND		"	0.00990	"	"	"	"	"
Bromomethane	ND		"	0.0990	"	"	"	"	"
Carbon Tetrachloride	ND		"	0.00990	"	"	"	"	"
Chlorobenzene	ND		"	0.00990	"	"	"	"	"
Chlorodibromomethane	ND		"	0.00990	"	"	"	"	"
Chloroethane	ND		"	0.0495	"	"	"	"	"
Chloroform	ND		"	0.00990	"	"	"	"	"
Chloromethane	ND		"	0.0495	"	"	"	"	"
cis-1,2-Dichloroethene	ND		"	0.00990	"	"	"	"	"
cis-1,3-Dichloropropene	ND		"	0.00990	"	"	"	"	"
Dichlorodifluoromethane	ND		"	0.0495	"	"	"	"	"
Methylene Chloride	ND		"	0.0495	"	"	"	"	"
Tetrachloroethene	ND		"	0.00990	"	"	"	"	"
trans-1,2-Dichloroethene	ND		"	0.00990	"	"	"	"	"
trans-1,3-Dichloropropene	ND		"	0.00990	"	"	"	"	"
Trichloroethene	ND		"	0.00990	"	"	"	"	"
Trichlorofluoromethane	ND		"	0.00990	"	"	"	"	"
Vinyl chloride	ND		"	0.0495	"	"	"	"	"
Surr: 1,2-Dichloroethane-d4 (58.3-156%)	*107 %*				"	"	"	"	"
Surr: 4-Bromofluorobenzene (72.1-136%)	*129 %*				"	"	"	"	"
Surr: Dibromofluoromethane (63.2-149%)	*103 %*				"	"	"	"	"
Surr: Toluene-d8 (70.5-145%)	*120 %*				"	"	"	"	"
Sample ID: HQG0016-20 (Drum2 - Solid/Soil)					Sampled: 06/29/07 19:07		Recvd: 07/02/07 12:35		
Extractable Petroleum Hydrocarbons by 8015M									
DRO	ND		mg/kg	6.66	1	07/10/07 12:00	07/06/07	7G06006	SW8015M
RRO	21.9		"	20.0	"	"	"	"	"
Surr: o-Terphenyl (34.7-135%)	*88 %*				"	"	"	"	"
Gasoline Range Organics/BTEX/MTBE by EPA 8015M/8260B									
Benzene	ND		mg/kg	0.00195	1	07/12/07 06:29	07/11/07	7G12011	SW8015B/8260B
Ethylbenzene	ND		"	0.00195	"	"	"	"	"
GRO	ND		"	0.488	"	"	"	"	"
m,p-Xylene	ND		"	0.00391	"	"	"	"	"
o-Xylene	ND		"	0.00195	"	"	"	"	"
Toluene	ND		"	0.00195	"	"	"	"	"
Surr: Toluene-d8 (88.2-117%)	*132 %*	*Z3*			"	"	"	"	"
Surr: Toluene-d8 (88.2-117%)	*132 %*	*Z3*			"	"	"	"	"
Polychlorinated Biphenyls by EPA Method 8082									
Aroclor 1016	ND	C-01	mg/kg	0.0333	1	07/07/07 07:27	07/05/07	7G05005	SW8082
Aroclor 1221	ND	C-01	"	0.0667	"	"	"	"	"
Aroclor 1232	ND	C-01	"	0.0333	"	"	"	"	"
Aroclor 1242	ND	C-01	"	0.0333	"	"	"	"	"
Aroclor 1248	ND	C-01	"	0.0333	"	"	"	"	"

Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-20 (Drum2 - Solid/Soil) - cont.					Sampled: 06/29/07 19:07		Recvd: 07/02/07 12:35		
Polychlorinated Biphenyls by EPA Method 8082 - cont.									
Aroclor 1254	ND	C-01	"	0.0333	"	"	"	"	"
Aroclor 1260	ND	C-01	"	0.0333	"	"	"	"	"
Surr: Decachlorobiphenyl (24-154%)	*109 %*	*C-01*			"	"	"	"	"
Semivolatile Organics by GC/MS									
1,2,4,5-Tetrachlorobenzene	ND		mg/kg	0.322	1	07/09/07 09:48	07/11/07	7G11004	SW8270C
1,2,4-Trichlorobenzene	ND		"	0.322	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.322	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.322	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.322	"	"	"	"	"
1-Chloronaphthalene	ND		"	0.322	"	"	"	"	"
1-Naphthylamine	ND		"	0.645	"	"	"	"	"
2,3,4,6-Tetrachlorophenol	ND		"	0.322	"	"	"	"	"
2,4,5-Trichlorophenol	ND		"	0.322	"	"	"	"	"
2,4,6-Trichlorophenol	ND		"	0.322	"	"	"	"	"
2,4-Dichlorophenol	ND		"	0.322	"	"	"	"	"
2,4-Dimethylphenol	ND		"	0.322	"	"	"	"	"
2,4-Dinitrophenol	ND		"	1.66	"	"	"	"	"
2,4-Dinitrotoluene	ND		"	0.645	"	"	"	"	"
2,6-Dichlorophenol	ND		"	0.322	"	"	"	"	"
2,6-Dinitrotoluene	ND		"	0.322	"	"	"	"	"
2-Chloronaphthalene	ND		"	0.322	"	"	"	"	"
2-Chlorophenol	ND		"	0.322	"	"	"	"	"
2-Methylnaphthalene	ND		"	0.322	"	"	"	"	"
2-Methylphenol (o-Cresol)	ND		"	0.323	"	"	"	"	"
2-Naphthylamine	ND		"	0.645	"	"	"	"	"
2-Nitroaniline	ND		"	1.66	"	"	"	"	"
2-Nitrophenol	ND		"	0.322	"	"	"	"	"
2-Picoline	ND		"	0.322	"	"	"	"	"
3,3'-Dichlorobenzidine	ND		"	0.322	"	"	"	"	"
3-Methylcholanthrene	ND		"	0.322	"	"	"	"	"
3-Nitroaniline	ND		"	1.66	"	"	"	"	"
4,6-Dinitro-2-methylphenol	ND		"	1.66	"	"	"	"	"
4-Aminobiphenyl	ND		"	0.645	"	"	"	"	"
4-Bromophenyl phenyl ether	ND		"	0.322	"	"	"	"	"
4-Chloro-3-methylphenol	ND		"	0.322	"	"	"	"	"
4-Chloroaniline	ND		"	0.322	"	"	"	"	"
4-Chlorophenyl phenyl ether	ND		"	0.322	"	"	"	"	"
4-Methylphenol (p-Cresol)	ND		"	0.322	"	"	"	"	"
4-Nitroaniline	ND		"	0.322	"	"	"	"	"
4-Nitrophenol	ND		"	1.66	"	"	"	"	"
7,12-Dimethylbenz (a) anthracene	ND		"	0.322	"	"	"	"	"
a,a-Dimethylphenethylamine	ND		"	1.66	"	"	"	"	"
Acenaphthene	ND		"	0.322	"	"	"	"	"
Acenaphthylene	ND		"	0.322	"	"	"	"	"
Acetophenone	ND		"	0.322	"	"	"	"	"
Aniline	ND		"	0.322	"	"	"	"	"
Anthracene	ND		"	0.322	"	"	"	"	"

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-20 (Drum2 - Solid/Soil) - cont.					Sampled: 06/29/07 19:07		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Azobenzene	ND		"	0.322	"	"	"	"	"
Benzidine	ND		"	1.66	"	"	"	"	"
Benzo (a) anthracene	ND		"	0.322	"	"	"	"	"
Benzo (a) pyrene	ND		"	0.322	"	"	"	"	"
Benzo (b) fluoranthene	ND		"	0.322	"	"	"	"	"
Benzo (g,h,i) perylene	ND		"	0.322	"	"	"	"	"
Benzo (k) fluoranthene	ND		"	0.322	"	"	"	"	"
Benzoic acid	ND		"	1.66	"	"	"	"	"
Benzyl alcohol	ND		"	0.322	"	"	"	"	"
Bis(2-chloroethoxy)methane	ND		"	0.322	"	"	"	"	"
Bis(2-chloroethyl)ether	ND		"	0.322	"	"	"	"	"
Bis(2-chloroisopropyl) ether	ND		"	0.322	"	"	"	"	"
Bis(2-ethylhexyl)phthalate	ND		"	0.322	"	"	"	"	"
Butyl benzyl phthalate	ND		"	0.322	"	"	"	"	"
Chrysene	ND		"	0.322	"	"	"	"	"
Dibenz (a,j) acridine	ND		"	0.322	"	"	"	"	"
Dibenzo (a,h) anthracene	ND		"	0.322	"	"	"	"	"
Dibenzofuran	ND		"	0.322	"	"	"	"	"
Diethyl phthalate	ND		"	0.322	"	"	"	"	"
Dimethyl phthalate	ND		"	0.322	"	"	"	"	"
Dimethylaminoazobenzene	ND		"	0.645	"	"	"	"	"
Di-n-butyl phthalate	ND		"	0.322	"	"	"	"	"
Di-n-octyl phthalate	ND		"	0.322	"	"	"	"	"
Ethyl Methanesulfonate	ND		"	0.322	"	"	"	"	"
Fluoranthene	ND		"	0.322	"	"	"	"	"
Fluorene	ND		"	0.322	"	"	"	"	"
Hexachlorobenzene	ND		"	0.322	"	"	"	"	"
Hexachlorobutadiene	ND		"	0.322	"	"	"	"	"
Hexachlorocyclopentadiene	ND		"	0.322	"	"	"	"	"
Hexachloroethane	ND		"	0.322	"	"	"	"	"
Indeno (1,2,3-cd) pyrene	ND		"	0.322	"	"	"	"	"
Isophorone	ND		"	0.322	"	"	"	"	"
Methyl Methanesulfonate	ND		"	0.645	"	"	"	"	"
Naphthalene	ND		"	0.322	"	"	"	"	"
Nitrobenzene	ND		"	0.322	"	"	"	"	"
N-Nitrosodimethylamine	ND		"	0.322	"	"	"	"	"
N-Nitrosodi-n-butylamine	ND		"	0.322	"	"	"	"	"
N-Nitrosodi-n-propylamine	ND		"	0.322	"	"	"	"	"
N-Nitrosodiphenylamine	ND		"	0.322	"	"	"	"	"
N-Nitrosopiperidine	ND		"	0.322	"	"	"	"	"
Pentachloronitrobenzene	ND		"	0.322	"	"	"	"	"
Pentachlorophenol	ND		"	1.66	"	"	"	"	"
Phenacetin	ND		"	0.322	"	"	"	"	"
Phenanthrene	ND		"	0.322	"	"	"	"	"
Phenol	ND		"	0.322	"	"	"	"	"
Pronamide	ND		"	0.322	"	"	"	"	"
Pyrene	ND		"	0.322	"	"	"	"	"

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-20 (Drum2 - Solid/Soil) - cont.					Sampled: 06/29/07 19:07		Recvd: 07/02/07 12:35		
Semivolatile Organics by GC/MS - cont.									
Pyridine	ND		"	0.322	"	"	"	"	"
Surr: 2,4,6-Tribromophenol (32.6-114%)	*38 %*					"	"	"	"
Surr: 2-Fluorobiphenyl (45.9-108%)	*72 %*					"	"	"	"
Surr: 2-Fluorophenol (39.4-103%)	*54 %*					"	"	"	"
Surr: Nitrobenzene-d5 (37.2-107%)	*74 %*					"	"	"	"
Surr: Phenol-d5 (49.6-103%)	*42 %*	Z				"	"	"	"
Surr: Terphenyl-d14 (43.7-133%)	*107 %*					"	"	"	"
Total Metals by SW 846 Series Methods									
Arsenic	ND		mg/kg	4.55	1	07/17/07 14:47	07/16/07	7G16005	SW6010B
Barium	95.3		"	9.09	"	"	"	"	"
Cadmium	2.26		"	1.82	"	"	"	"	"
Chromium	171		"	4.55	"	"	"	"	"
Lead	124		"	9.09	"	"	"	"	"
Mercury	0.0511		"	0.0181	"	07/11/07 19:06	07/11/07	7G11013	SW7471
Selenium	ND		"	9.09	"	07/17/07 14:47	07/16/07	7G16005	SW6010B
Silver	ND		"	4.55	"	"	"	"	"
Volatile Organic Compounds by EPA 8260B									
1,1,1-Trichloroethane	ND		mg/kg	0.00977	1	07/12/07 06:29	07/11/07	7G12011	SW8260B
1,1,2,2-Tetrachloroethane	ND		"	0.00977	"	"	"	"	"
1,1,2-Trichloroethane	ND		"	0.00977	"	"	"	"	"
1,1-Dichloroethane	ND		"	0.00977	"	"	"	"	"
1,1-Dichloroethene	ND		"	0.00977	"	"	"	"	"
1,2-Dibromo-3-chloropropane	ND		"	0.00977	"	"	"	"	"
1,2-Dibromoethane (EDB)	ND		"	0.00977	"	"	"	"	"
1,2-Dichlorobenzene	ND		"	0.00977	"	"	"	"	"
1,2-Dichloroethane	ND		"	0.00977	"	"	"	"	"
1,2-Dichloropropane	ND		"	0.00977	"	"	"	"	"
1,3-Dichlorobenzene	ND		"	0.00977	"	"	"	"	"
1,4-Dichlorobenzene	ND		"	0.00977	"	"	"	"	"
Bromodichloromethane	ND		"	0.00977	"	"	"	"	"
Bromoform	ND		"	0.00977	"	"	"	"	"
Bromomethane	ND		"	0.0977	"	"	"	"	"
Carbon Tetrachloride	ND		"	0.00977	"	"	"	"	"
Chlorobenzene	ND		"	0.00977	"	"	"	"	"
Chlorodibromomethane	ND		"	0.00977	"	"	"	"	"
Chloroethane	ND		"	0.0488	"	"	"	"	"
Chloroform	ND		"	0.00977	"	"	"	"	"
Chloromethane	ND		"	0.0488	"	"	"	"	"
cis-1,2-Dichloroethene	ND		"	0.00977	"	"	"	"	"
cis-1,3-Dichloropropene	ND		"	0.00977	"	"	"	"	"
Dichlorodifluoromethane	ND		"	0.0488	"	"	"	"	"
Methylene Chloride	ND		"	0.0488	"	"	"	"	"
Tetrachloroethene	ND		"	0.00977	"	"	"	"	"
trans-1,2-Dichloroethene	ND		"	0.00977	"	"	"	"	"
trans-1,3-Dichloropropene	ND		"	0.00977	"	"	"	"	"
Trichloroethene	ND		"	0.00977	"	"	"	"	"

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

ANALYTICAL REPORT

Analyte	Sample Result	Data Qualifiers	Units	Rpt Limit	Dilution	Date Analyzed	Prep Date	Seq/ Batch	Method
Sample ID: HQG0016-20 (Drum2 - Solid/Soil) - cont.					Sampled: 06/29/07 19:07		Recvd: 07/02/07 12:35		
Volatile Organic Compounds by EPA 8260B - cont.									
Trichlorofluoromethane	ND		"	0.00977	"	"	"	"	"
Vinyl chloride	ND		"	0.0488	"	"	"	"	"
Surr: 1,2-Dichloroethane-d4 (38.3-136%)	*114 %*					"	"	"	"
Surr: 4-Bromofluorobenzene (72.1-136%)	*131 %*					"	"	"	"
Surr: Dibromofluoromethane (63.3-149%)	*107 %*					"	"	"	"
Surr: Toluene-d8 (70.3-143%)	*132 %*					"	"	"	"

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

LABORATORY BLANK QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	Dup Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Extractable Petroleum Hydrocarbons by 8015M													
Batch\Seq: 7G06006 Extracted: 07/06/07													
Blank Analyzed: 07/10/2007 (7G06006-BLK1)													
DRO			mg/kg	N/A	6.66	ND							
RRO			mg/kg	N/A	20.0	ND							
Surrogate: o-Terphenyl			mg/kg					*72*		*34.7-135*			
Gasoline Range Organics/BTEX/MTBE by EPA 8015M/8260B													
Batch\Seq: 7G12011 Extracted: 07/11/07													
Blank Analyzed: 07/11/2007 (7G12011-BLK1)													
Benzene			mg/kg	N/A	0.00200	ND							
Ethylbenzene			mg/kg	N/A	0.00200	ND							
GRO			mg/kg	N/A	0.500	ND							
m,p-Xylene			mg/kg	N/A	0.00400	ND							
o-Xylene			mg/kg	N/A	0.00200	ND							
Toluene			mg/kg	N/A	0.00200	ND							
Surrogate: Toluene-d8			mg/kg					*107*		*88.2-117*			
Surrogate: Toluene-d8			mg/kg					*107*		*88.2-117*			
Polychlorinated Biphenyls by EPA Method 8082													
Batch\Seq: 7G05005 Extracted: 07/05/07													
Blank Analyzed: 07/06/2007 (7G05005-BLK1)													
Aroclor 1016			mg/kg	N/A	0.0333	ND							C-01
Aroclor 1221			mg/kg	N/A	0.0667	ND							C-01
Aroclor 1232			mg/kg	N/A	0.0333	ND							C-01
Aroclor 1242			mg/kg	N/A	0.0333	ND							C-01
Aroclor 1248			mg/kg	N/A	0.0333	ND							C-01
Aroclor 1254			mg/kg	N/A	0.0333	ND							C-01
Aroclor 1260			mg/kg	N/A	0.0333	ND							C-01
Aroclor 1262			mg/kg	N/A	0.0333	ND							C-01
Aroclor 1268			mg/kg	N/A	0.0333	ND							C-01
Surrogate: Decachlorobiphenyl			mg/kg					*103*		*24-154*			C-01
Blank Analyzed: 07/09/2007 (7G05005-BLK2)													
Aroclor 1016			mg/kg	N/A	0.0333	ND							C-02,C-01
Aroclor 1221			mg/kg	N/A	0.0667	ND							C-02,C-01
Aroclor 1232			mg/kg	N/A	0.0333	ND							C-02,C-01
Aroclor 1242			mg/kg	N/A	0.0333	ND							C-02,C-01
Aroclor 1248			mg/kg	N/A	0.0333	ND							C-02,C-01
Aroclor 1254			mg/kg	N/A	0.0333	ND							C-02,C-01
Aroclor 1260			mg/kg	N/A	0.0333	ND							C-02,C-01
Aroclor 1262			mg/kg	N/A	0.0333	ND							C-02,C-01
Surrogate: Decachlorobiphenyl			mg/kg					*87*		*24-154*			C-02,C-01
Semivolatile Organics by GC/MS													
Batch\Seq: 7G11004 Extracted: 07/11/07													
Blank Analyzed: 07/26/2007 (7G11004-BLK1)													
1,2,4,5-Tetrachlorobenzene			mg/kg	N/A	0.330	ND							
1,2,4-Trichlorobenzene			mg/kg	N/A	0.330	ND							
1,2-Dichlorobenzene			mg/kg	N/A	0.330	ND							

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

LABORATORY BLANK QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	Dup Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Semivolatile Organics by GC/MS													
Batch\Seq: 7G11004 Extracted: 07/11/07													
Blank Analyzed: 07/26/2007 (7G11004-BLK1)													
1,3-Dichlorobenzene			mg/kg	N/A	0.330	ND							
1,4-Dichlorobenzene			mg/kg	N/A	0.330	ND							
1-Chloronaphthalene			mg/kg	N/A	0.330	ND							
1-Naphthylamine			mg/kg	N/A	0.660	ND							
2,3,4,6-Tetrachlorophenol			mg/kg	N/A	0.330	ND							
2,4,5-Trichlorophenol			mg/kg	N/A	0.330	ND							
2,4,6-Trichlorophenol			mg/kg	N/A	0.330	ND							
2,4-Dichlorophenol			mg/kg	N/A	0.330	ND							
2,4-Dimethylphenol			mg/kg	N/A	0.330	ND							
2,4-Dinitrophenol			mg/kg	N/A	1.70	ND							
2,4-Dinitrotoluene			mg/kg	N/A	0.660	ND							
2,6-Dichlorophenol			mg/kg	N/A	0.330	ND							
2,6-Dinitrotoluene			mg/kg	N/A	0.330	ND							
2-Chloronaphthalene			mg/kg	N/A	0.330	ND							
2-Chlorophenol			mg/kg	N/A	0.330	ND							
2-Methylnaphthalene			mg/kg	N/A	0.330	ND							
2-Methylphenol (o-Cresol)			mg/kg	N/A	0.330	ND							
2-Naphthylamine			mg/kg	N/A	0.660	ND							
2-Nitroaniline			mg/kg	N/A	1.70	ND							
2-Nitrophenol			mg/kg	N/A	0.330	ND							
2-Picoline			mg/kg	N/A	0.330	ND							
3,3'-Dichlorobenzidine			mg/kg	N/A	0.330	ND							
3-Methylcholanthrene			mg/kg	N/A	0.330	ND							
3-Nitroaniline			mg/kg	N/A	1.70	ND							
4,6-Dinitro-2-methylphenol			mg/kg	N/A	1.70	ND							
4-Aminobiphenyl			mg/kg	N/A	0.660	ND							
4-Bromophenyl phenyl ether			mg/kg	N/A	0.330	ND							
4-Chloro-3-methylphenol			mg/kg	N/A	0.330	ND							
4-Chloroaniline			mg/kg	N/A	0.330	ND							
4-Chlorophenyl phenyl ether			mg/kg	N/A	0.330	ND							
4-Methylphenol (p-Cresol)			mg/kg	N/A	0.330	ND							
4-Nitroaniline			mg/kg	N/A	0.330	ND							
4-Nitrophenol			mg/kg	N/A	1.70	ND							
7,12-Dimethylbenz (a) anthracene			mg/kg	N/A	0.330	ND							
a,a-Dimethylphenethylamine			mg/kg	N/A	1.70	ND							
Acenaphthene			mg/kg	N/A	0.330	ND							
Acenaphthylene			mg/kg	N/A	0.330	ND							
Acetophenone			mg/kg	N/A	0.330	ND							
Aniline			mg/kg	N/A	0.330	ND							
Anthracene			mg/kg	N/A	0.330	ND							
Azobenzene			mg/kg	N/A	0.330	ND							
Benzidine			mg/kg	N/A	1.70	ND							
Benzo (a) anthracene			mg/kg	N/A	0.330	ND							
Benzo (a) pyrene			mg/kg	N/A	0.330	ND							
Benzo (b) fluoranthene			mg/kg	N/A	0.330	ND							
Benzo (g,h,i) perylene			mg/kg	N/A	0.330	ND							

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

LABORATORY BLANK QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	Dup Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Semivolatile Organics by GC/MS													
Batch\Seq: 7G11004 Extracted: 07/11/07													
Blank Analyzed: 07/26/2007 (7G11004-BLK1)													
Benzo (k) fluoranthene			mg/kg	N/A	0.330	ND							
Benzoic acid			mg/kg	N/A	1.70	ND							
Benzyl alcohol			mg/kg	N/A	0.330	ND							
Bis(2-chloroethoxy)methane			mg/kg	N/A	0.330	ND							
Bis(2-chloroethyl)ether			mg/kg	N/A	0.330	ND							
Bis(2-chloroisopropyl) ether			mg/kg	N/A	0.330	ND							
Bis(2-ethylhexyl)phthalate			mg/kg	N/A	0.330	ND							
Butyl benzyl phthalate			mg/kg	N/A	0.330	ND							
Chrysene			mg/kg	N/A	0.330	ND							
Dibenz (a,j) acridine			mg/kg	N/A	0.330	ND							
Dibenzo (a,h) anthracene			mg/kg	N/A	0.330	ND							
Dibenzofuran			mg/kg	N/A	0.330	ND							
Diethyl phthalate			mg/kg	N/A	0.330	ND							
Dimethyl phthalate			mg/kg	N/A	0.330	ND							
Dimethylaminoazobenzene			mg/kg	N/A	0.660	ND							
Di-n-butyl phthalate			mg/kg	N/A	0.330	ND							
Di-n-octyl phthalate			mg/kg	N/A	0.330	ND							
Ethyl Methanesulfonate			mg/kg	N/A	0.330	ND							
Fluoranthene			mg/kg	N/A	0.330	ND							
Fluorene			mg/kg	N/A	0.330	ND							
Hexachlorobenzene			mg/kg	N/A	0.330	ND							
Hexachlorobutadiene			mg/kg	N/A	0.330	ND							
Hexachlorocyclopentadiene			mg/kg	N/A	0.330	ND							
Hexachloroethane			mg/kg	N/A	0.330	ND							
Indeno (1,2,3-cd) pyrene			mg/kg	N/A	0.330	ND							
Isophorone			mg/kg	N/A	0.330	ND							
Methyl Methanesulfonate			mg/kg	N/A	0.660	ND							
Naphthalene			mg/kg	N/A	0.330	ND							
Nitrobenzene			mg/kg	N/A	0.330	ND							
N-Nitrosodimethylamine			mg/kg	N/A	0.330	ND							
N-Nitrosodi-n-butylamine			mg/kg	N/A	0.330	ND							
N-Nitrosodi-n-propylamine			mg/kg	N/A	0.330	ND							
N-Nitrosodiphenylamine			mg/kg	N/A	0.330	ND							
N-Nitrosopiperidine			mg/kg	N/A	0.330	ND							
Pentachloronitrobenzene			mg/kg	N/A	0.330	ND							
Pentachlorophenol			mg/kg	N/A	1.70	ND							
Phenacetin			mg/kg	N/A	0.330	ND							
Phenanthrene			mg/kg	N/A	0.330	ND							
Phenol			mg/kg	N/A	0.330	ND							
Pronamide			mg/kg	N/A	0.330	ND							
Pyrene			mg/kg	N/A	0.330	ND							
Pyridine			mg/kg	N/A	0.330	ND							
Surrogate: 2,4,6-Tribromophenol			mg/kg					60		32.6-114			
Surrogate: 2-Fluorobiphenyl			mg/kg					72		45.9-108			
Surrogate: 2-Fluorophenol			mg/kg					63		39.4-101			
Surrogate: Nitrobenzene-d5			mg/kg					73		37.2-107			

Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

LABORATORY BLANK QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	Dup Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Semivolatile Organics by GC/MS													
Batch\Seq: 7G11004 Extracted: 07/11/07													
Blank Analyzed: 07/26/2007 (7G11004-BLK1)													
Surrogate: Phenol-d6			mg/kg					*61*		*49.6-105*			
Surrogate: Terphenyl-d14			mg/kg					*94*		*43.7-133*			
Total Metals by SW 846 Series Methods													
Batch\Seq: 7G10005 Extracted: 07/10/07													
Blank Analyzed: 07/20/2007 (7G10005-BLK1)													
Arsenic			mg/kg	N/A	1.00	ND							
Lead			mg/kg	N/A	2.00	ND							
Batch\Seq: 7G11013 Extracted: 07/11/07													
Blank Analyzed: 07/11/2007 (7G11013-BLK1)													
Mercury			mg/kg	N/A	0.0200	ND							
Batch\Seq: 7G16005 Extracted: 07/16/07													
Blank Analyzed: 07/17/2007 (7G16005-BLK1)													
Arsenic			mg/kg	N/A	5.00	ND							
Barium			mg/kg	N/A	10.0	ND							
Cadmium			mg/kg	N/A	2.00	ND							
Chromium			mg/kg	N/A	5.00	ND							
Lead			mg/kg	N/A	10.0	ND							
Selenium			mg/kg	N/A	10.0	ND							
Silver			mg/kg	N/A	5.00	ND							
Volatile Organic Compounds by EPA 8260B													
Batch\Seq: 7G12011 Extracted: 07/11/07													
Blank Analyzed: 07/11/2007 (7G12011-BLK1)													
1,1,1-Trichloroethane			mg/kg	N/A	0.0100	ND							
1,1,2,2-Tetrachloroethane			mg/kg	N/A	0.0100	ND							
1,1,2-Trichloroethane			mg/kg	N/A	0.0100	ND							
1,1-Dichloroethane			mg/kg	N/A	0.0100	ND							
1,1-Dichloroethene			mg/kg	N/A	0.0100	ND							
1,2-Dibromo-3-chloropropane			mg/kg	N/A	0.0100	ND							
1,2-Dibromoethane (EDB)			mg/kg	N/A	0.0100	ND							
1,2-Dichlorobenzene			mg/kg	N/A	0.0100	ND							
1,2-Dichloroethane			mg/kg	N/A	0.0100	ND							
1,2-Dichloropropane			mg/kg	N/A	0.0100	ND							
1,3-Dichlorobenzene			mg/kg	N/A	0.0100	ND							
1,4-Dichlorobenzene			mg/kg	N/A	0.0100	ND							
Bromodichloromethane			mg/kg	N/A	0.0100	ND							
Bromoform			mg/kg	N/A	0.0100	ND							
Bromomethane			mg/kg	N/A	0.100	ND							
Carbon Tetrachloride			mg/kg	N/A	0.0100	ND							
Chlorobenzene			mg/kg	N/A	0.0100	ND							
Chlorodibromomethane			mg/kg	N/A	0.0100	ND							
Chloroethane			mg/kg	N/A	0.0500	ND							
Chloroform			mg/kg	N/A	0.0100	ND							
Chloromethane			mg/kg	N/A	0.0500	ND							

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Element Environmental LLC
62-180 Emerson Rd.
Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

LABORATORY BLANK QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	Dup Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Volatile Organic Compounds by EPA 8260B													
Batch\Seq: 7G12011 Extracted: 07/11/07													
Blank Analyzed: 07/11/2007 (7G12011-BLK1)													
cis-1,2-Dichloroethene			mg/kg	N/A	0.0100	ND							
cis-1,3-Dichloropropene			mg/kg	N/A	0.0100	ND							
Dichlorodifluoromethane			mg/kg	N/A	0.0500	ND							
Methylene Chloride			mg/kg	N/A	0.0500	ND							
Tetrachloroethene			mg/kg	N/A	0.0100	ND							
trans-1,2-Dichloroethene			mg/kg	N/A	0.0100	ND							
trans-1,3-Dichloropropene			mg/kg	N/A	0.0100	ND							
Trichloroethene			mg/kg	N/A	0.0100	ND							
Trichlorofluoromethane			mg/kg	N/A	0.0100	ND							
Vinyl chloride			mg/kg	N/A	0.0500	ND							
Surrogate: 1,2-Dichloroethane-d4			mg/kg					*97*		*38.3-136*			
Surrogate: 4-Bromofluorobenzene			mg/kg					*106*		*72.1-156*			
Surrogate: Dibromofluoromethane			mg/kg					*96*		*63.2-149*			
Surrogate: Toluene-d8			mg/kg					*107*		*70.3-143*			

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

LABORATORY DUPLICATE QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Polychlorinated Biphenyls by EPA Method 8082												
Batch\Seq: 7G05005 Extracted: 07/05/07												
Duplicate Analyzed: 07/06/2007 (7G05005-DUP1)				QC Source Sample: HQG0016-01								
Aroclor 1016	ND		mg/kg	N/A	0.0319	ND					30	C-01
Aroclor 1221	ND		mg/kg	N/A	0.0639	ND					30	C-01
Aroclor 1232	ND		mg/kg	N/A	0.0319	ND					30	C-01
Aroclor 1242	ND		mg/kg	N/A	0.0319	ND					30	C-01
Aroclor 1248	ND		mg/kg	N/A	0.0319	ND					30	C-01
Aroclor 1254	ND		mg/kg	N/A	0.0319	ND					30	C-01
Aroclor 1260	ND		mg/kg	N/A	0.0319	ND					30	C-01
Aroclor 1262	ND		mg/kg	N/A	0.0319	ND					0	C-01
Aroclor 1268	ND		mg/kg	N/A	0.0319	ND					0	C-01
Surrogate: Decachlorobiphenyl			mg/kg				*111*		*24-154*			C-01
Duplicate Analyzed: 07/06/2007-07/09/2007 (7G05005-DUP2)				QC Source Sample: HQG0009-01								
Aroclor 1016	3.25		mg/kg	N/A	0.645	2.79				15	30	C-01
Aroclor 1221	ND		mg/kg	N/A	1.29	ND					30	C-01
Aroclor 1232	ND		mg/kg	N/A	0.645	ND					30	C-01
Aroclor 1242	ND		mg/kg	N/A	0.645	ND					30	C-01
Aroclor 1248	4.55		mg/kg	N/A	0.645	3.41				29	30	C-01
Aroclor 1254	7.05		mg/kg	N/A	0.645	1.84				117	30	C-01
Aroclor 1260	4.08		mg/kg	N/A	0.645	3.11				27	30	C-01
Aroclor 1262	ND		mg/kg	N/A	0.645	ND					0	C-01
Aroclor 1268	ND		mg/kg	N/A	0.645	ND					0	C-01
Surrogate: Decachlorobiphenyl			mg/kg				*196*		*24-154*			Z3,C-01
Duplicate Analyzed: 07/06/2007-07/09/2007 (7G05005-DUP3)				QC Source Sample: HQG0009-01								
Aroclor 1016	3.25		mg/kg	N/A	0.654	3.32				2	30	C-01
Aroclor 1221	ND		mg/kg	N/A	1.31	ND					30	C-01
Aroclor 1232	ND		mg/kg	N/A	0.654	ND					30	C-01
Aroclor 1242	ND		mg/kg	N/A	0.654	ND					30	C-01
Aroclor 1248	4.55		mg/kg	N/A	0.654	4.58				1	30	C-01
Aroclor 1254	7.05		mg/kg	N/A	0.654	2.78				87	30	C-01
Aroclor 1260	4.08		mg/kg	N/A	0.654	4.01				2	30	C-01
Aroclor 1262	ND		mg/kg	N/A	0.654	ND					0	C-01
Aroclor 1268	ND		mg/kg	N/A	0.654	ND					0	C-01
Surrogate: Decachlorobiphenyl			mg/kg				*271*		*24-154*			C-01,Z3
Semivolatile Organics by GC/MS												
Batch\Seq: 7G11004 Extracted: 07/11/07												
Duplicate Analyzed: 07/16/2007 (7G11004-DUP1)				QC Source Sample: HQG0016-03								
1,2,4,5-Tetrachlorobenzene	ND		mg/kg	N/A	0.308	ND					30	
1,2,4-Trichlorobenzene	ND		mg/kg	N/A	0.308	ND					30	
1,2-Dichlorobenzene	ND		mg/kg	N/A	0.308	ND					30	
1,3-Dichlorobenzene	ND		mg/kg	N/A	0.308	ND					30	
1,4-Dichlorobenzene	ND		mg/kg	N/A	0.308	ND					30	
1-Chloronaphthalene	ND		mg/kg	N/A	0.308	ND					30	
1-Naphthylamine	ND		mg/kg	N/A	0.617	ND					30	
2,3,4,6-Tetrachlorophenol	ND		mg/kg	N/A	0.308	ND					30	
2,4,5-Trichlorophenol	ND		mg/kg	N/A	0.308	ND					30	
2,4,6-Trichlorophenol	ND		mg/kg	N/A	0.308	ND					30	

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

LABORATORY DUPLICATE QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Semivolatile Organics by GC/MS												
Batch\Seq: 7G11004 Extracted: 07/11/07												
Duplicate Analyzed: 07/16/2007 (7G11004-DUP1)				QC Source Sample: HQG0016-03								
2,4-Dichlorophenol	ND		mg/kg	N/A	0.308	ND					30	
2,4-Dimethylphenol	ND		mg/kg	N/A	0.308	ND					30	
2,4-Dinitrophenol	ND		mg/kg	N/A	1.59	ND					30	
2,4-Dinitrotoluene	ND		mg/kg	N/A	0.617	ND					30	
2,6-Dichlorophenol	ND		mg/kg	N/A	0.308	ND					30	
2,6-Dinitrotoluene	ND		mg/kg	N/A	0.308	ND					30	
2-Chloronaphthalene	ND		mg/kg	N/A	0.308	ND					30	
2-Chlorophenol	ND		mg/kg	N/A	0.308	ND					30	
2-Methylnaphthalene	ND		mg/kg	N/A	0.308	ND					30	
2-Methylphenol (o-Cresol)	ND		mg/kg	N/A	0.308	ND					30	
2-Naphthylamine	ND		mg/kg	N/A	0.617	ND					30	
2-Nitroaniline	ND		mg/kg	N/A	1.59	ND					30	
2-Nitrophenol	ND		mg/kg	N/A	0.308	ND					30	
2-Picoline	ND		mg/kg	N/A	0.308	ND					30	
3,3'-Dichlorobenzidine	ND		mg/kg	N/A	0.308	ND					30	
3-Methylcholanthrene	ND		mg/kg	N/A	0.308	ND					30	
3-Nitroaniline	ND		mg/kg	N/A	1.59	ND					30	
4,6-Dinitro-2-methylphenol	ND		mg/kg	N/A	1.59	ND					30	
4-Aminobiphenyl	ND		mg/kg	N/A	0.617	ND					30	
4-Bromophenyl phenyl ether	ND		mg/kg	N/A	0.308	ND					30	
4-Chloro-3-methylphenol	ND		mg/kg	N/A	0.308	ND					30	
4-Chloroaniline	ND		mg/kg	N/A	0.308	ND					30	
4-Chlorophenyl phenyl ether	ND		mg/kg	N/A	0.308	ND					30	
4-Methylphenol (p-Cresol)	ND		mg/kg	N/A	0.308	ND					30	
4-Nitroaniline	ND		mg/kg	N/A	0.308	ND					30	
4-Nitrophenol	ND		mg/kg	N/A	1.59	ND					30	
7,12-Dimethylbenz (a) anthracene	ND		mg/kg	N/A	0.308	ND					30	
a,a-Dimethylphenethylamine	0.00233		mg/kg	N/A	1.59	ND					30	
Acenaphthene	ND		mg/kg	N/A	0.308	ND					30	
Acenaphthylene	ND		mg/kg	N/A	0.308	ND					30	
Acetophenone	ND		mg/kg	N/A	0.308	ND					30	
Aniline	ND		mg/kg	N/A	0.308	ND					30	
Anthracene	ND		mg/kg	N/A	0.308	ND					30	
Azobenzene	ND		mg/kg	N/A	0.308	ND					30	
Benzidine	ND		mg/kg	N/A	1.59	ND					30	
Benzo (a) anthracene	ND		mg/kg	N/A	0.308	ND					30	
Benzo (a) pyrene	ND		mg/kg	N/A	0.308	ND					30	
Benzo (b) fluoranthene	ND		mg/kg	N/A	0.308	ND					30	
Benzo (g,h,i) perylene	ND		mg/kg	N/A	0.308	ND					30	
Benzo (k) fluoranthene	ND		mg/kg	N/A	0.308	ND					30	
Benzoic acid	ND		mg/kg	N/A	1.59	ND					30	
Benzyl alcohol	ND		mg/kg	N/A	0.308	ND					30	
Bis(2-chloroethoxy)methane	ND		mg/kg	N/A	0.308	ND					30	
Bis(2-chloroethyl)ether	ND		mg/kg	N/A	0.308	ND					30	
Bis(2-chloroisopropyl) ether	ND		mg/kg	N/A	0.308	ND					30	
Bis(2-ethylhexyl)phthalate	ND		mg/kg	N/A	0.308	ND					30	

Element Environmental LLC
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Haleiwa, HI 96712
Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

LABORATORY DUPLICATE QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Semivolatile Organics by GC/MS												
Batch\Seq: 7G11004 Extracted: 07/11/07												
Duplicate Analyzed: 07/26/2007 (7G11004-DUP1)				QC Source Sample: HQG0016-03								
Butyl benzyl phthalate	ND		mg/kg	N/A	0.308	ND					30	
Chrysene	ND		mg/kg	N/A	0.308	ND					30	
Dibenz (a,j) acridine	ND		mg/kg	N/A	0.308	ND					30	
Dibenzo (a,h) anthracene	ND		mg/kg	N/A	0.308	ND					30	
Dibenzofuran	ND		mg/kg	N/A	0.308	ND					30	
Diethyl phthalate	ND		mg/kg	N/A	0.308	ND					30	
Dimethyl phthalate	ND		mg/kg	N/A	0.308	ND					30	
Dimethylaminoazobenzene	ND		mg/kg	N/A	0.617	ND					30	
Di-n-butyl phthalate	ND		mg/kg	N/A	0.308	ND					30	
Di-n-octyl phthalate	ND		mg/kg	N/A	0.308	ND					30	
Ethyl Methanesulfonate	ND		mg/kg	N/A	0.308	ND					30	
Fluoranthene	ND		mg/kg	N/A	0.308	ND					30	
Fluorene	ND		mg/kg	N/A	0.308	ND					30	
Hexachlorobenzene	ND		mg/kg	N/A	0.308	ND					30	
Hexachlorobutadiene	ND		mg/kg	N/A	0.308	ND					30	
Hexachlorocyclopentadiene	ND		mg/kg	N/A	0.308	ND					30	
Hexachloroethane	ND		mg/kg	N/A	0.308	ND					30	
Indeno (1,2,3-cd) pyrene	ND		mg/kg	N/A	0.308	ND					30	
Isophorone	ND		mg/kg	N/A	0.308	ND					30	
Methyl Methanesulfonate	ND		mg/kg	N/A	0.617	ND					30	
Naphthalene	ND		mg/kg	N/A	0.308	ND					30	
Nitrobenzene	ND		mg/kg	N/A	0.308	ND					30	
N-Nitrosodimethylamine	ND		mg/kg	N/A	0.308	ND					30	
N-Nitrosodi-n-butylamine	ND		mg/kg	N/A	0.308	0.120					30	
N-Nitrosodi-n-propylamine	0.224		mg/kg	N/A	0.308	0.237				5	30	
N-Nitrosodiphenylamine	ND		mg/kg	N/A	0.308	ND					30	
N-Nitrosopiperidine	ND		mg/kg	N/A	0.308	ND					30	
Pentachloronitrobenzene	ND		mg/kg	N/A	0.308	ND					30	
Pentachlorophenol	ND		mg/kg	N/A	1.59	ND					30	
Phenacetin	ND		mg/kg	N/A	0.308	ND					30	
Phenanthrene	ND		mg/kg	N/A	0.308	ND					30	
Phenol	ND		mg/kg	N/A	0.308	ND					30	
Pronamide	ND		mg/kg	N/A	0.308	ND					30	
Pyrene	ND		mg/kg	N/A	0.308	ND					30	
Pyridine	ND		mg/kg	N/A	0.308	ND					30	
Surrogate: 2,4,6-Tribromophenol			mg/kg				*82*		*32.6-114*			
Surrogate: 2-Fluorobiphenyl			mg/kg				*97*		*45.9-108*			
Surrogate: 2-Fluorophenol			mg/kg				*35*		*39.4-103*			
Surrogate: Nitrobenzene-d5			mg/kg				*88*		*37.2-107*			
Surrogate: Phenol-d6			mg/kg				*59*		*49.6-105*			
Surrogate: Terphenyl-d14			mg/kg				*110*		*45.7-133*			

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Matt Neal

Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

LCS/LCS DUPLICATE QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	Dup Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Extractable Petroleum Hydrocarbons by 8015M													
Batch\Seq: 7G06006 Extracted: 07/06/07													
LCS Analyzed: 07/10/2007 (7G06006-BS1)													
DRO		167	mg/kg	N/A	6.66	145		87		50-107			
Surrogate: o-Terphenyl			mg/kg					*83*		*34.7-133*			
Gasoline Range Organics/BTEX/MTBE by EPA 8015M/8260B													
Batch\Seq: 7G12011 Extracted: 07/11/07													
LCS Analyzed: 07/11/2007 (7G12011-BS1)													
Benzene		0.100	mg/kg	N/A	0.00200	0.108	0.106	108	106	77.9-124	1	30	
Ethylbenzene		0.100	mg/kg	N/A	0.00200	0.106	0.104	106	104	77.1-129	2	30	
m,p-Xylene		0.200	mg/kg	N/A	0.00400	0.209	0.213	105	107	69.7-126	2	30	
o-Xylene		0.100	mg/kg	N/A	0.00200	0.0969	0.0999	97	100	70.3-124	3	30	
Toluene		0.100	mg/kg	N/A	0.00200	0.103	0.102	103	102	77.8-125	1	30	
Surrogate: Toluene-d8			mg/kg					*100*	*99*	*88.2-117*			
LCS Analyzed: 07/11/2007 (7G12011-BS2)													
GRO		4.40	mg/kg	N/A	0.500	4.88	5.19	111	118	70-130	6	30	
Surrogate: Toluene-d8			mg/kg					*103*	*96*	*88.2-117*			
Polychlorinated Biphenyls by EPA Method 8082													
Batch\Seq: 7G05005 Extracted: 07/05/07													
LCS Analyzed: 07/06/2007 (7G05005-BS1)													
Aroclor 1016		0.167	mg/kg	N/A	0.0333	0.171		102		65-128			C-01
Aroclor 1260		0.167	mg/kg	N/A	0.0333	0.176		106		63-130			C-01
Surrogate: Decachlorobiphenyl			mg/kg					*117*		*24-154*			C-01
LCS Analyzed: 07/09/2007 (7G05005-BS2)													
Aroclor 1016		0.167	mg/kg	N/A	0.0333	0.151		90		65-128			C-01,C-02
Aroclor 1260		0.167	mg/kg	N/A	0.0333	0.158		95		63-130			C-01,C-02
Surrogate: Decachlorobiphenyl			mg/kg					*89*		*24-154*			C-01,C-02
Semivolatile Organics by GC/MS													
Batch\Seq: 7G11004 Extracted: 07/11/07													
LCS Analyzed: 07/26/2007 (7G11004-BS1)													
1,2,4,5-Tetrachlorobenzene			mg/kg	N/A	0.330	ND				64.4-103			
1,2,4-Trichlorobenzene		1.67	mg/kg	N/A	0.330	1.25		75		47.9-94.6			
1,2-Dichlorobenzene		1.67	mg/kg	N/A	0.330	1.20		72		48.8-91			
1,3-Dichlorobenzene		1.67	mg/kg	N/A	0.330	1.20		72		49.6-90.1			
1,4-Dichlorobenzene		1.67	mg/kg	N/A	0.330	1.22		73		51.7-88			
1-Naphthylamine			mg/kg	N/A	0.660	ND				26-94.6			
2,3,4,6-Tetrachlorophenol			mg/kg	N/A	0.330	ND				61.1-112			
2,4,5-Trichlorophenol		1.67	mg/kg	N/A	0.330	1.33		80		66.1-108			
2,4,6-Trichlorophenol		1.67	mg/kg	N/A	0.330	1.28		77		59.4-105			
2,4-Dichlorophenol		1.67	mg/kg	N/A	0.330	1.24		75		53.8-98			
2,4-Dimethylphenol		1.67	mg/kg	N/A	0.330	1.07		64		52.6-103			
2,4-Dinitrophenol		1.67	mg/kg	N/A	1.70	1.54		92		36-155			
2,4-Dinitrotoluene		1.67	mg/kg	N/A	0.660	1.42		85		55.5-118			
2,6-Dichlorophenol			mg/kg	N/A	0.330	ND				55.7-98.6			
2,6-Dinitrotoluene		1.67	mg/kg	N/A	0.330	1.41		84		60.9-111			
2-Chloronaphthalene		1.67	mg/kg	N/A	0.330	1.16		70		57.8-98			

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LCS/LCS DUPLICATE QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	Dup Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Semivolatile Organics by GC/MS													
Batch\Seq: 7G11004 Extracted: 07/11/07													
LCS Analyzed: 07/26/2007 (7G11004-BS1)													
2-Chlorophenol		1.67	mg/kg	N/A	0.330	1.19		72		54-92.5			
2-Methylnaphthalene		1.67	mg/kg	N/A	0.330	1.27		76		55.9-95.5			
2-Methylphenol (o-Cresol)			mg/kg	N/A	0.330	1.22				59.3-95.2			
2-Naphthylamine			mg/kg	N/A	0.660	ND				1.16-97.7			
2-Nitroaniline		1.67	mg/kg	N/A	1.70	1.43		86		62.5-109			
2-Nitrophenol		1.67	mg/kg	N/A	0.330	1.24		74		54.6-94.9			
2-Picoline			mg/kg	N/A	0.330	ND				4.88-65.6			
3,3'-Dichlorobenzidine			mg/kg	N/A	0.330	ND				51.4-92.7			
3-Methylcholanthrene			mg/kg	N/A	0.330	ND				59.1-108			
3-Nitroaniline		1.67	mg/kg	N/A	1.70	1.26		75		58.9-109			
4,6-Dinitro-2-methylphenol		1.67	mg/kg	N/A	1.70	1.62		97		57.6-125			
4-Aminobiphenyl			mg/kg	N/A	0.660	ND				29.5-85.1			
4-Bromophenyl phenyl ether		1.67	mg/kg	N/A	0.330	1.30		78		64.1-104			
4-Chloro-3-methylphenol		1.67	mg/kg	N/A	0.330	1.41		84		58.8-110			
4-Chloroaniline		1.67	mg/kg	N/A	0.330	0.469		28		49.6-89			L2
4-Chlorophenyl phenyl ether		1.67	mg/kg	N/A	0.330	1.42		85		56-109			
4-Methylphenol (p-Cresol)			mg/kg	N/A	0.330	1.28				38.7-110			
4-Nitroaniline		1.67	mg/kg	N/A	0.330	1.26		75		71.2-113			
4-Nitrophenol		1.67	mg/kg	N/A	1.70	1.46		87		39.7-138			
7,12-Dimethylbenz (a) anthracene			mg/kg	N/A	0.330	ND				55.8-152			
a,a-Dimethylphenethylamine			mg/kg	N/A	1.70	0.0820				-7.04-12.2			
Acenaphthene		1.67	mg/kg	N/A	0.330	1.37		82		64.6-99.2			
Acenaphthylene		1.67	mg/kg	N/A	0.330	1.21		73		58.6-103			
Acetophenone			mg/kg	N/A	0.330	ND				48.8-96.1			
Aniline			mg/kg	N/A	0.330	ND				29.7-92.8			
Anthracene		1.67	mg/kg	N/A	0.330	1.33		80		68.6-104			
Azobenzene		1.67	mg/kg	N/A	0.330	1.32		79		69.5-104			
Benzidine			mg/kg	N/A	1.70	ND				-42.6-66.5			
Benzo (a) anthracene		1.67	mg/kg	N/A	0.330	1.43		86		64.2-107			
Benzo (a) pyrene		1.67	mg/kg	N/A	0.330	2.42		145		61.4-111			L1
Benzo (b) fluoranthene		1.67	mg/kg	N/A	0.330	2.59		156		58.3-119			L1
Benzo (g,h,i) perylene		1.67	mg/kg	N/A	0.330	2.12		127		57.6-102			L1
Benzo (k) fluoranthene		1.67	mg/kg	N/A	0.330	2.97		178		66.3-114			L1
Bis(2-chloroethoxy)methane		1.67	mg/kg	N/A	0.330	1.26		75		60.3-107			
Bis(2-chloroethyl)ether		1.67	mg/kg	N/A	0.330	1.31		78		58.3-86.3			
Bis(2-chloroisopropyl) ether		1.67	mg/kg	N/A	0.330	1.31		79		58.7-89.3			
Bis(2-ethylhexyl)phthalate		1.67	mg/kg	N/A	0.330	1.46		88		56.5-126			
Butyl benzyl phthalate		1.67	mg/kg	N/A	0.330	1.41		85		60.2-120			
Chrysene		1.67	mg/kg	N/A	0.330	1.52		91		64.7-110			
Dibenz (a,j) acridine			mg/kg	N/A	0.330	ND				-2.91-24.8			
Dibenzo (a,h) anthracene		1.67	mg/kg	N/A	0.330	3.49		209		61.4-102			L1
Dibenzofuran		1.67	mg/kg	N/A	0.330	1.34		80		61-104			
Diethyl phthalate		1.67	mg/kg	N/A	0.330	1.44		86		60.2-113			
Dimethyl phthalate		1.67	mg/kg	N/A	0.330	1.40		84		59.6-110			
Dimethylaminoazobenzene			mg/kg	N/A	0.660	ND				59.8-112			
Di-n-butyl phthalate		1.67	mg/kg	N/A	0.330	1.40		84		63.8-117			

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LCS/LCS DUPLICATE QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	Dup Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Semivolatile Organics by GC/MS													
Batch\Seq: 7G11004 Extracted: 07/11/07													
LCS Analyzed: 07/26/2007 (7G11004-BS1)													
Di-n-octyl phthalate		1.67	mg/kg	N/A	0.330	1.30		78		55.6-120			
Ethyl Methanesulfonate			mg/kg	N/A	0.330	ND				59.5-91.8			
Fluoranthene		1.67	mg/kg	N/A	0.330	1.47		88		64.8-118			
Fluorene		1.67	mg/kg	N/A	0.330	1.42		85		61.4-105			
Hexachlorobenzene		1.67	mg/kg	N/A	0.330	1.44		86		62.9-108			
Hexachlorobutadiene		1.67	mg/kg	N/A	0.330	1.27		76		42.9-97.8			
Hexachlorocyclopentadiene		1.67	mg/kg	N/A	0.330	0.930		56		-14.3-125			
Hexachloroethane		1.67	mg/kg	N/A	0.330	1.24		74		52.2-88.8			
Indeno (1,2,3-cd) pyrene		1.67	mg/kg	N/A	0.330	2.27		136		61.2-102			L1
Isophorone		1.67	mg/kg	N/A	0.330	1.35		81		49.2-90.7			
Methyl Methanesulfonate			mg/kg	N/A	0.660	ND				27.1-140			
Naphthalene		1.67	mg/kg	N/A	0.330	1.20		72		52.4-91.9			
Nitrobenzene		1.67	mg/kg	N/A	0.330	1.31		78		53.2-89			
N-Nitrosodimethylamine		1.67	mg/kg	N/A	0.330	1.27		76		38.3-94.9			
N-Nitrosodi-n-butylamine			mg/kg	N/A	0.330	ND				55.7-104			
N-Nitrosodi-n-propylamine		1.67	mg/kg	N/A	0.330	1.45		87		40.4-119			
N-Nitrosodiphenylamine			mg/kg	N/A	0.330	ND				73.5-112			
N-Nitrosopiperidine			mg/kg	N/A	0.330	ND				53.5-96			
Pentachloronitrobenzene			mg/kg	N/A	0.330	ND				58.7-117			
Pentachlorophenol		1.67	mg/kg	N/A	1.70	1.33		80		63.3-124			
Phenacetin			mg/kg	N/A	0.330	0.0723				60.7-116			
Phenanthrene		1.67	mg/kg	N/A	0.330	1.43		86		75-104			
Phenol		1.67	mg/kg	N/A	0.330	1.14		69		56.5-93.6			
Pronamide			mg/kg	N/A	0.330	ND				67.3-121			
Pyrene		1.67	mg/kg	N/A	0.330	1.39		83		61.2-114			
Pyridine			mg/kg	N/A	0.330	ND				-18-106			
Surrogate: 2,4,6-Tribromophenol			mg/kg					*83*		*57.7-131*			
Surrogate: 2-Fluorobiphenyl			mg/kg					*79*		*51.2-99.2*			
Surrogate: 2-Fluorophenol			mg/kg					*67*		*43.1-92.3*			
Surrogate: Nitrobenzene-d5			mg/kg					*77*		*43.5-94.6*			
Surrogate: Phenol-d6			mg/kg					*73*		*32.3-97*			
Surrogate: Terphenyl-d14			mg/kg					*90*		*58.1-112*			
Total Metals by SW 846 Series Methods													
Batch\Seq: 7G10005 Extracted: 07/10/07													
LCS Analyzed: 07/20/2007 (7G10005-BS1)													
Arsenic		20.0	mg/kg	N/A	1.00	19.5		98		80-120			
Lead		20.0	mg/kg	N/A	2.00	18.5		92		80-120			
Batch\Seq: 7G11013 Extracted: 07/11/07													
LCS Analyzed: 07/11/2007 (7G11013-BS1)													
Mercury		0.333	mg/kg	N/A	0.0200	0.375		112		80-120			
Batch\Seq: 7G16005 Extracted: 07/16/07													
LCS Analyzed: 07/17/2007 (7G16005-BS1)													
Arsenic		100	mg/kg	N/A	5.00	94.1		94		80-120			
Barium		100	mg/kg	N/A	10.0	94.7		95		80-120			
Cadmium		100	mg/kg	N/A	2.00	92.0		92		80-120			

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Work Order: HQG0016
Project: Maalea
Project Number: Maalaea Phase II ESA

Received: 07/02/07
Reported: 08/08/07 09:34

LCS/LCS DUPLICATE QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	Dup Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Total Metals by SW 846 Series Methods													
Batch\Seq: 7G16005 Extracted: 07/16/07													
LCS Analyzed: 07/17/2007 (7G16005-BS1)													
Chromium		100	mg/kg	N/A	5.00	88.8		89		80-120			
Lead		100	mg/kg	N/A	10.0	89.5		89		80-120			
Selenium		100	mg/kg	N/A	10.0	95.2		95		80-120			
Silver		10.0	mg/kg	N/A	5.00	8.52		85		80-120			C2
Volatile Organic Compounds by EPA 8260B													
Batch\Seq: 7G12011 Extracted: 07/11/07													
LCS Analyzed: 07/11/2007 (7G12011-BS1)													
1,1-Dichloroethene		0.100	mg/kg	N/A	0.0100	0.103	0.103	103	103	65.1-127	0	30	
Chlorobenzene		0.100	mg/kg	N/A	0.0100	0.105	0.106	105	106	74.4-119	0	30	
Trichloroethene		0.100	mg/kg	N/A	0.0100	0.106	0.108	106	108	72.9-119	2	30	
Surrogate: 1,2-Dichloroethane-d4			mg/kg					*102*	*104*	*58.3-156*			
Surrogate: 4-Bromofluorobenzene			mg/kg					*100*	*99*	*72.1-156*			
Surrogate: Dibromofluoromethane			mg/kg					*99*	*99*	*63.2-149*			
Surrogate: Toluene-d8			mg/kg					*100*	*99*	*70.3-143*			

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MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	Dup Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Extractable Petroleum Hydrocarbons by 8015M													
Batch\Seq: 7G06006 Extracted: 07/06/07													
Matrix Spike Analyzed: 07/10/2007 (7G06006-MS1)				QC Source Sample: HQG0014-19									
DRO	ND	164	mg/kg	N/A	6.55	137	144	83	88	50-107	5	30	
Surrogate: o-Terphenyl			mg/kg					*77*	*82*	*34.7-135*			
Gasoline Range Organics/BTEX/MTBE by EPA 8015M/8260B													
Batch\Seq: 7G12011 Extracted: 07/11/07													
Matrix Spike Analyzed: 07/12/2007 (7G12011-MS1)				QC Source Sample: HQG0016-12									
Benzene	ND	0.0998	mg/kg	N/A	0.00200	0.109		109		77.9-124			
Ethylbenzene	ND	0.0998	mg/kg	N/A	0.00200	0.105		106		77.1-129			
m,p-Xylene	ND	0.200	mg/kg	N/A	0.00399	0.198		99		69.7-126			
o-Xylene	ND	0.0998	mg/kg	N/A	0.00200	0.107		107		70.3-124			
Toluene	ND	0.0998	mg/kg	N/A	0.00200	0.122		122		77.8-125			
Surrogate: Toluene-d8			mg/kg					*118*		*88.2-117*			Z5
Polychlorinated Biphenyls by EPA Method 8082													
Batch\Seq: 7G05005 Extracted: 07/05/07													
Matrix Spike Analyzed: 07/06/2007 (7G05005-MS1)				QC Source Sample: HQG0016-10									
Aroclor 1016	ND	0.164	mg/kg	N/A	0.0329	0.172	0.164	105	100	65-128	5	50	C-01
Aroclor 1260	ND	0.164	mg/kg	N/A	0.0329	0.173	0.166	105	101	63-130	4	50	C-01
Surrogate: Decachlorobiphenyl			mg/kg					*110*	*103*	*24-154*			C-01
Semivolatile Organics by GC/MS													
Batch\Seq: 7G11004 Extracted: 07/11/07													
Matrix Spike Analyzed: 07/26/2007 (7G11004-MS1)				QC Source Sample: HQG0016-02									
1,2,4,5-Tetrachlorobenzene	ND		mg/kg	N/A	0.319	ND	ND			64.4-103		30	
1,2,4-Trichlorobenzene	ND	1.61	mg/kg	N/A	0.319	1.19	0.868	74	56	47.9-94.6	31	30	MI
1,2-Dichlorobenzene	ND	1.61	mg/kg	N/A	0.319	1.10	0.800	68	51	48.8-91	31	30	MI
1,3-Dichlorobenzene	ND	1.61	mg/kg	N/A	0.319	1.07	0.772	66	50	49.6-90.1	32	30	MI
1,4-Dichlorobenzene	ND	1.61	mg/kg	N/A	0.319	1.09	0.787	68	51	51.7-88	32	30	MI
1-Chloronaphthalene	ND		mg/kg	N/A	0.319	1.61	1.30			54.6-103	22	30	
1-Naphthylamine	ND		mg/kg	N/A	0.639	ND	ND			26-94.6		30	
2,3,4,6-Tetrachlorophenol	ND		mg/kg	N/A	0.319	ND	ND			61.1-112		30	
2,4,5-Trichlorophenol	ND	1.61	mg/kg	N/A	0.319	1.37	1.22	85	78	66.1-108	12	30	
2,4,6-Trichlorophenol	ND	1.61	mg/kg	N/A	0.319	1.25	1.08	78	69	59.4-105	15	30	
2,4-Dichlorophenol	ND	1.61	mg/kg	N/A	0.319	1.27	0.973	79	62	53.8-98	27	30	
2,4-Dimethylphenol	ND	1.61	mg/kg	N/A	0.319	0.326	0.215	20	14	52.6-103	41	30	MI
2,4-Dinitrophenol	ND	1.61	mg/kg	N/A	1.65	0.691	0.566	43	36	36-135	20	30	
2,4-Dinitrotoluene	ND	1.61	mg/kg	N/A	0.639	1.46	1.34	91	86	55.5-118	9	30	
2,6-Dichlorophenol	ND		mg/kg	N/A	0.319	ND	ND			55.7-98.6		30	
2,6-Dinitrotoluene	ND	1.61	mg/kg	N/A	0.319	1.48	1.35	92	86	60.9-111	10	30	
2-Chloronaphthalene	ND	1.61	mg/kg	N/A	0.319	1.27	1.02	79	65	57.8-98	22	30	
2-Chlorophenol	ND	1.61	mg/kg	N/A	0.319	1.06	0.772	66	50	54-92.5	31	30	MI
2-Methylnaphthalene	ND	1.61	mg/kg	N/A	0.319	1.33	1.02	82	63	55.9-95.5	26	30	
2-Methylphenol (o-Cresol)	ND		mg/kg	N/A	0.319	0.827	0.551			59.3-95.2	40	30	MI
2-Naphthylamine	ND		mg/kg	N/A	0.639	ND	ND			1.16-97.7		30	
2-Nitroaniline	ND	1.61	mg/kg	N/A	1.65	1.49	1.34	93	86	62.5-109	11	30	
2-Nitrophenol	ND	1.61	mg/kg	N/A	0.319	1.20	0.865	75	56	54.6-94.9	33	30	MI

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	Dup Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Semivolatile Organics by GC/MS													
Batch\Seq: 7G11004 Extracted: 07/11/07													
Matrix Spike Analyzed: 07/26/2007 (7G11004-MS1)				QC Source Sample: HQG0016-01									
2-Picoline	ND		mg/kg	N/A	0.319	ND	ND			4.88-65.6		30	
3,3'-Dichlorobenzidine	ND		mg/kg	N/A	0.319	ND	ND			51.4-92.7		30	
3-Methylcholanthrene	ND		mg/kg	N/A	0.319	ND	ND			59.1-108		30	
3-Nitroaniline	ND	1.61	mg/kg	N/A	1.65	1.27	1.14	79	73	58.9-109	11	30	
4,6-Dinitro-2-methylphenol	ND	1.61	mg/kg	N/A	1.65	1.36	1.21	84	78	57.6-125	11	30	
4-Aminobiphenyl	ND		mg/kg	N/A	0.639	ND	ND			29.5-85.1		30	
4-Bromophenyl phenyl ether	ND	1.61	mg/kg	N/A	0.319	1.39	1.26	86	81	64.1-104	10	30	
4-Chloro-3-methylphenol	ND	1.61	mg/kg	N/A	0.319	1.32	1.15	82	74	58.8-110	14	30	
4-Chloroaniline	ND	1.61	mg/kg	N/A	0.319	0.731	0.549	45	35	49.6-89	28	30	M1
4-Chlorophenyl phenyl ether	ND	1.61	mg/kg	N/A	0.319	1.49	1.34	92	86	56-109	11	30	
4-Methylphenol (p-Cresol)	ND		mg/kg	N/A	0.319	0.749	0.500			38.7-110	40	30	M1
4-Nitroaniline	ND	1.61	mg/kg	N/A	0.319	1.27	1.14	79	73	71.2-113	11	30	
4-Nitrophenol	ND	1.61	mg/kg	N/A	1.65	1.18	1.05	73	68	39.7-138	11	30	
7,12-Dimethylbenz (a) anthracene	ND		mg/kg	N/A	0.319	ND	ND			55.8-152		30	
a,a-Dimethylphenethylamine	0.00233		mg/kg	N/A	1.65	0.0800	0.0586			-7.04-12.2	31	30	M1
Acenaphthene	ND	1.61	mg/kg	N/A	0.319	1.44	1.25	89	80	64.6-99.2	14	30	
Acenaphthylene	ND	1.61	mg/kg	N/A	0.319	1.33	1.12	82	72	58.6-103	17	30	
Acetophenone	ND		mg/kg	N/A	0.319	ND	ND			48.8-96.1		30	
Aniline	ND		mg/kg	N/A	0.319	ND	ND			29.7-92.8		30	
Anthracene	ND	1.61	mg/kg	N/A	0.319	1.51	1.32	94	85	68.6-104	14	30	
Azobenzene	ND	1.61	mg/kg	N/A	0.319	1.40	1.26	87	81	69.5-104	11	30	
Benzidine	ND		mg/kg	N/A	1.65	ND	ND			-42.6-66.5		30	
Benzo (a) anthracene	ND	1.61	mg/kg	N/A	0.319	1.44	1.39	89	89	64.2-107	4	30	
Benzo (a) pyrene	ND	1.61	mg/kg	N/A	0.319	2.46	2.33	152	151	61.4-111	4	30	M1
Benzo (b) fluoranthene	ND	1.61	mg/kg	N/A	0.319	2.36	2.34	146	150	58.3-119	1	30	M1
Benzo (g,h,i) perylene	ND	1.61	mg/kg	N/A	0.319	2.01	1.79	125	115	57.6-102	12	30	M1
Benzo (k) fluoranthene	ND	1.61	mg/kg	N/A	0.319	2.93	2.82	182	181	66.3-114	4	30	M1
Bis(2-chloroethoxy)methane	ND	1.61	mg/kg	N/A	0.319	1.26	0.918	78	59	60.3-107	31	30	M1
Bis(2-chloroethyl)ether	ND	1.61	mg/kg	N/A	0.319	1.19	0.872	74	56	58.3-86.3	31	30	M1
Bis(2-chloroisopropyl) ether	ND	1.61	mg/kg	N/A	0.319	1.17	0.863	72	55	58.7-89.3	30	30	M1
Bis(2-ethylhexyl)phthalate	ND	1.61	mg/kg	N/A	0.319	1.44	1.40	89	90	56.5-126	3	30	
Butyl benzyl phthalate	ND	1.61	mg/kg	N/A	0.319	1.39	1.35	86	87	60.2-120	3	30	
Chrysene	ND	1.61	mg/kg	N/A	0.319	1.51	1.48	93	95	64.7-110	2	30	
Dibenz (a,j) acridine	ND		mg/kg	N/A	0.319	ND	ND			-2.91-24.8		30	
Dibenzo (a,h) anthracene	ND	1.61	mg/kg	N/A	0.319	3.35	3.05	208	196	61.4-102	9	30	M1
Dibenzofuran	ND	1.61	mg/kg	N/A	0.319	1.44	1.27	89	82	61-104	13	30	
Diethyl phthalate	ND	1.61	mg/kg	N/A	0.319	1.49	1.36	92	87	60.2-113	9	30	
Dimethyl phthalate	ND	1.61	mg/kg	N/A	0.319	1.44	1.31	89	84	59.6-110	10	30	
Dimethylaminoazobenzene	ND		mg/kg	N/A	0.639	ND	ND			59.8-112		30	
Di-n-butyl phthalate	ND	1.61	mg/kg	N/A	0.319	1.55	1.38	96	89	63.8-117	11	30	
Di-n-octyl phthalate	ND	1.61	mg/kg	N/A	0.319	1.33	1.29	83	83	53.6-120	3	30	
Ethyl Methanesulfonate	ND		mg/kg	N/A	0.319	ND	ND			59.5-91.8		30	
Fluoranthene	ND	1.61	mg/kg	N/A	0.319	1.63	1.40	101	90	64.8-118	15	30	
Fluorene	ND	1.61	mg/kg	N/A	0.319	1.49	1.37	93	88	61.4-105	9	30	
Hexachlorobenzene	ND	1.61	mg/kg	N/A	0.319	1.53	1.38	95	88	62.9-108	11	30	
Hexachlorobutadiene	ND	1.61	mg/kg	N/A	0.319	1.19	0.855	74	55	42.9-97.8	32	30	M1

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Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	Dup Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Semivolatile Organics by GC/MS													
Batch\Seq: 7G11004 Extracted: 07/11/07													
Matrix Spike Analyzed: 07/26/2007 (7G11004-MS1)				QC Source Sample: HQG0016-01									
Hexachlorocyclopentadiene	ND	1.61	mg/kg	N/A	0.319	1.06	0.714	66	46	-14.3-125	39	30	M1
Hexachloroethane	ND	1.61	mg/kg	N/A	0.319	1.09	0.777	68	50	52.2-88.8	34	30	M1
Indeno (1,2,3-cd) pyrene	ND	1.61	mg/kg	N/A	0.319	2.17	1.97	135	126	61.2-102	10	30	M1
Isophorone	ND	1.61	mg/kg	N/A	0.319	1.34	1.02	83	66	49.2-90.7	27	30	
Methyl Methanesulfonate	ND		mg/kg	N/A	0.639	ND	ND			27.1-140		30	
Naphthalene	ND	1.61	mg/kg	N/A	0.319	1.16	0.864	72	53	52.4-91.9	30	30	
Nitrobenzene	ND	1.61	mg/kg	N/A	0.319	1.21	0.895	75	57	53.2-89	30	30	
N-Nitrosodimethylamine	ND	1.61	mg/kg	N/A	0.319	1.07	0.783	67	50	38.3-94.9	31	30	M1
N-Nitrosodi-n-butylamine	ND		mg/kg	N/A	0.319	ND	ND			55.7-104		30	
N-Nitrosodi-n-propylamine	0.212	1.61	mg/kg	N/A	0.319	1.41	1.06	75	54	40.4-119	29	30	
N-Nitrosodiphenylamine	ND		mg/kg	N/A	0.319	ND	ND			73.3-112		30	
N-Nitrosopiperidine	ND		mg/kg	N/A	0.319	ND	ND			53.5-96		30	
Pentachloronitrobenzene	ND		mg/kg	N/A	0.319	ND	ND			58.7-117		30	
Pentachlorophenol	ND	1.61	mg/kg	N/A	1.65	0.871	0.714	54	46	63.3-124	20	30	M1
Phenacetin	ND		mg/kg	N/A	0.319	0.0768	0.0701			60.7-116	9	30	
Phenanthrene	ND	1.61	mg/kg	N/A	0.319	1.50	1.35	93	86	75-104	11	30	
Phenol	ND	1.61	mg/kg	N/A	0.319	1.02	0.751	63	48	56.5-93.6	30	30	M1
Pronamide	ND		mg/kg	N/A	0.319	ND	ND			67.3-121		30	
Pyrene	ND	1.61	mg/kg	N/A	0.319	1.34	1.29	83	83	61.2-114	4	30	
Pyridine	ND		mg/kg	N/A	0.319	ND	ND			-18-106		30	
Surrogate: 2,4,6-Tribromophenol			mg/kg					*84*	*77*	*37.7-121*			
Surrogate: 2-Fluorobiphenyl			mg/kg					*89*	*73*	*51.2-99.2*			
Surrogate: 2-Fluorophenol			mg/kg					*57*	*41*	*43.1-92.5*			Z
Surrogate: Nitrobenzene-d5			mg/kg					*76*	*59*	*43.5-94.6*			
Surrogate: Phenol-d6			mg/kg					*67*	*52*	*52.3-97*			Z
Surrogate: Terphenyl-d14			mg/kg					*89*	*89*	*38.1-112*			
Total Metals by SW 846 Series Methods													
Batch\Seq: 7G10005 Extracted: 07/10/07													
Matrix Spike Analyzed: 07/10/2007 (7G10005-MS1)				QC Source Sample: HQG0016-10									
Arsenic	2.89	18.7	mg/kg	N/A	0.935	3.25	4.24	2	7	80-120	26	20	M1
Lead	ND	18.7	mg/kg	N/A	1.87	9.62	12.3	51	62	80-120	25	20	M1,RJ
Batch\Seq: 7G11013 Extracted: 07/11/07													
Matrix Spike Analyzed: 07/11/2007 (7G11013-MS1)				QC Source Sample: HQG0033-01									
Mercury	76.4	0.241	mg/kg	N/A	7.22	66.8	86.8	-3970	3100	75-125	26	20	MHA
Batch\Seq: 7G16005 Extracted: 07/16/07													
Matrix Spike Analyzed: 07/17/2007 (7G16005-MS1)				QC Source Sample: HQG0007-07									
Arsenic	6.71	93.5	mg/kg	N/A	4.67	88.8	83.3	88	88	80-120	6	20	
Barium	23.2	93.5	mg/kg	N/A	9.35	105	95.5	87	83	80-120	9	20	
Cadmium	ND	93.5	mg/kg	N/A	1.87	66.4	61.1	71	70	80-120	8	20	M1
Chromium	13.6	93.5	mg/kg	N/A	4.67	97.1	92.2	89	90	80-120	5	20	
Lead	1.68	93.5	mg/kg	N/A	9.35	75.4	69.8	79	78	80-120	8	20	M1
Selenium	0.771	93.5	mg/kg	N/A	9.35	78.5	71.6	83	81	80-120	9	20	
Silver	ND	9.35	mg/kg	N/A	4.67	7.33	6.61	78	76	80-120	10	20	M1

Volatile Organic Compounds by EPA 8260B

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

MATRIX SPIKE/MATRIX SPIKE DUPLICATE QC DATA

Analyte	Source Result	Spike Level	Units	MDL	MRL	Result	Dup Result	% REC	Dup %REC	% REC Limits	RPD	RPD Limit	Q
Volatile Organic Compounds by EPA 8260B													
Batch\Seq: 7G12011 Extracted: 07/11/07													
Matrix Spike Analyzed: 07/12/2007 (7G12011-MS1)				QC Source Sample: HQG0016-12									
1,1-Dichloroethene	ND	0.0998	mg/kg	N/A	0.00998	0.0861		86		65.1-127			
Chlorobenzene	ND	0.0998	mg/kg	N/A	0.00998	0.110		110		74.4-119			
Trichloroethene	ND	0.0998	mg/kg	N/A	0.00998	0.0920		92		72.9-119			
Surrogate: 1,2-Dichloroethane-d4			mg/kg					*136*		*58.3-156*			
Surrogate: 4-Bromofluorobenzene			mg/kg					*130*		*72.1-156*			
Surrogate: Dibromofluoromethane			mg/kg					*115*		*63.2-149*			
Surrogate: Toluene-d8			mg/kg					*118*		*70.5-145*			

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

CERTIFICATION SUMMARY

Subcontracted Laboratories

Anatek Labs,

1282 Alturas Dr. - Moscow, ID 83843

Analysis Performed: 8270Modified Pest. Screen
Samples: HQG0016-01, HQG0016-02, HQG0016-03, HQG0016-04, HQG0016-05, HQG0016-06, HQG0016-07, HQG0016-08, HQG0016-09, HQG0016-10

Analysis Performed: 8321 Carbamate Herbicides
Samples: HQG0016-01, HQG0016-02, HQG0016-03, HQG0016-04, HQG0016-05, HQG0016-06, HQG0016-07, HQG0016-08, HQG0016-09, HQG0016-10

STL - Seattle, WA

5755 8th Street East - Tacoma,, WA 98424

Analysis Performed: 8081A Pesticides
Samples: HQG0016-01, HQG0016-02, HQG0016-03, HQG0016-04, HQG0016-05, HQG0016-06, HQG0016-07, HQG0016-08, HQG0016-09, HQG0016-10, HQG0016-19, HQG0016-20

Analysis Performed: 8151 Herbicides
Samples: HQG0016-01, HQG0016-02, HQG0016-03, HQG0016-04, HQG0016-05, HQG0016-06, HQG0016-07, HQG0016-08, HQG0016-09, HQG0016-10, HQG0016-19, HQG0016-20

Any abnormalities or departures from sample acceptance policy shall be documented on the 'Sample Receipt and Termperature Log Form' and 'Sample Non-conformance Form' (if applicable) included with this report.

For information concerning certifications of this facility or another TestAmerica facility, please visit our website at www.TestAmericaInc.com

Samples collected by TestAmerica Field Services personnel are noted on the Chain of Custody (COC) and are sampled in accordance with TA-CF SOP CF09-01.

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING

99-193 Aiea Heights Drive, Suite 121 Aiea, HI 96701 * 808-486-5227 * Fax 808-486-2456

Element Environmental LLC 62-180 Emerson Rd. Haleiwa, HI 96712 Matt Neal	Work Order: HQG0016 Project: Maalea Project Number: Maalaea Phase II ESA	Received: 07/02/07 Reported: 08/08/07 09:34	

DATA QUALIFIERS AND DEFINITIONS

C-01	To reduce matrix interference, the sample extract has undergone sulfuric acid clean-up, method 3665A, which is specific to hydrocarbon contamination.
C-02	To reduce matrix interference, the sample extract has undergone copper clean-up, method 3660, which is specific to sulfur contamination.
C2	Calibration Verification recovery was below the method control limit for this analyte, however the average % difference for all analytes met method criteria. See Calibration Summary form. 91.15%
L1	Laboratory Control Sample and/or Laboratory Control Sample Duplicate recovery was above acceptance limits.
L2	Laboratory Control Sample and/or Laboratory Control Sample Duplicate recovery was below acceptance limits.
M1	The MS and/or MSD were outside the acceptance limits due to sample matrix interference. See Blank Spike (LCS).
MHA	Due to high levels of analyte in the sample, the MS/MSD calculation does not provide useful spike recovery information. See Blank Spike (LCS).
R3	The RPD exceeded the acceptance limit due to sample matrix effects.
Z	Due to sample matrix effects, the surrogate recovery was below the acceptance limits.
Z3	The sample required a dilution due to the nature of the sample matrix. Because of this dilution, the surrogate spike concentration in the sample was reduced to a level where the recovery calculation does not provide useful information.
Z5	Due to sample matrix effects, the surrogate recovery was outside acceptance limits. Secondary surrogate recovery was within the acceptance limits.

ADDITIONAL COMMENTS

Oceanic Analytical Laboratory, Inc.

99-193 Aiea Heights Drive, Suite 121 Aiea, Hawaii 96701-3900
Telephone: (808)486-LABS (5227) Fax: (808)486-2456 E-mail: info@oceanic-labs.com

Chain of Custody / Analysis Request Form

LABORATORY USE ONLY
LAB JOB NO. HQG0016
LOCATION
CONTAINERS

Report To: Matt Neal
Company Name: Element Environmental LLC
Address: 62-180 Emerson Road
City: Haleiwa State: HI Zip: 96712
Phone: 637-1200 Fax: 637-0001
Sampler: MN # of Samples in Shipment: 20

Project Identification
Job Name: Maalaea Phase II ESA
Job Number: Rm
P.O. Number:
Date of Sample Shipment: 7/2/07
Date Results Needed: Standard TAT

Indicate Analysis Requested: ICP Metals (Arsenic & Lead), SVOCs, Chlorinated Herbicides, Organochlorine Pesticides, PCBs

Item No.	Client Sample I.D.	MULTI-INCREMENT COMP	GRAB	Matrix: Water	Soil	Wastewater	Drinking water	Sludge	Liquid	Solid	Oil	Other	Preservation Method	Sampling: Date	Time	Number of Containers	ICP Metals (Arsenic & Lead)	SVOCs	Chlorinated Herbicides	Organochlorine Pesticides	PCBs	Laboratory No.
1	DU1	X			X								—	6/29/07	16:45	1	X	X	X	X	X	HQF0016-01
2	DU2	X												6/28/07	13:30	2						-02
3	DU3	X												6/20/07	15:51	2						-03
4	DU4	X												6/20/07	16:30	2						-04
5	DU5	X												6/28/07	16:50	2						-05
6	DU6	X												6/29/07	10:10	2						-06
7	DU7	X												6/29/07	11:10	2						-07
8	DU8	X												6/29/07	12:10	1						-08
9	DU9	X												6/29/07	14:10	1						-09
10	DU10	X												6/29/07	15:10	1						-10

Released by (Print/Signature)	Date / Time Released	Delivery Method	Received by (Print/Signature)	Company / Agency Affiliation	Date / Time Received	Condition Noted
Matt Neal / [signature]	7/2/07 1235	Hand	[signature]	TA HON	7/2/07 1235	wet ice 0-3°C

Comments: Samples DU1 – DU10 are Multi Increment Samples

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(1)
CLIENT: Element Environmental LLC
CONTACT: Matt Neal PHONE NO: (808) 637-1200
PROJECT: Maalaea Phase II ESA SITE/PWSID#:
REPORTS TO: Matt Neal FAX NO.: (673) -0001
INVOICE TO: QUOTE #
P.O. NUMBER

CT&E Reference:

PAGE 2 OF 2

(2)

LAB NO.	SAMPLE IDENTIFICATION	DATE	TIME	MATRIX	No CONTAINERS	SAMPLE TYPE C= COMP G= GRAB	(3) HVOC (1,3-dichloropropene)	Fuel Fingerprint/Gas, diesel/oil	RCRA 8 Total Metals	Chlorinated herbicides	Organochlorine pesticides	PCBs	HVOCs	SVOCs		REMARKS
HQF0016-11	DU1-VOC	6/29/07	16:30	Soil	2	G	X									
-12	DU2-VOC		15:55		2		X									
-13	DU3-VOC		15:23		2		X									
-14	DU4-VOC		14:53		2		X									
-15	DU5-VOC		14:26		2		X									
-16	DU6-VOC		13:53		1		X									
-17	DU7-VOC		13:25		2		X									
-18	DU8-VOC		12:33		2		X									
-19	DRUM 1		19:07		4			X	X	X	X	X	X	X		
-20	DRUM 2		19:17		4			X	X	X	X	X	X	X		

HQG0016

(5)

Collected/Relinquished By: (1)	Date	Time	Received By:
Matt Neal / Meg Ne	7/2/07	1235	Yvonne Voti Pey
Relinquished By: (2)	Date	Time	Received By:
Relinquished By: (3)	Date	Time	Received By:
Relinquished By: (4)	Date	Time	Received By:

(4)
Shipping Carrier:
Shipping Ticket No:
Special Deliverable Requirements:
Samples Received Cold? (Circle) YES NO
Temperature °C: 0 . 3°C
Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT
Requested Turnaround Time and Special Instructions:

J 200 W. Potter Drive Anchorage, AK 99518 Tel: (907) 562-2343 Fax: (907) 561-5301
Q 1200 Conrad Industrial Drive Ludington, MI 48431 Tel: (231) 845-1677 Fax: (231) 845-0947
Q 151 James Drive West St. Rose, LA 70087 Tel: (504) 469-6401 Fax: (504) 463-3304

White - Retained by Lab

STL

ANALYTICAL REPORT

Job Number: 580-6454-1

Job Description: HQG0016

For:
TestAmerica Analytical Testing Corp.
99-193 Aiea Heights Drive
Suite 121
Aiea, HI 96701

Attention: Yvonne Parry

Tiffany Ryan
Project Mgmt. Assistant
tiffany.ryan@testamericainc.com
07/23/2007

Project Manager: Terri L Torres

STL Seattle is a part of Severn Trent Laboratories, Inc.

This report is issued solely for the use of the person or company to whom it is addressed. Any use, copying or disclosure other than by the intended recipient is unauthorized. If you have received this report in error, please notify the sender immediately at 253-922-2310 and destroy this report immediately.

Severn Trent Laboratories, Inc.
STL Seattle 5755 8th Street East, Tacoma, WA 98424
Tel (253) 922-2310 Fax (253) 922-5047 www.stl-inc.com

GC Semi VOA - Method 8081A
The matrix spike / matrix spike duplicate (MS/MSD) recoveries for batch 580-20818 were outside control limits for delta-BHC, Endosulfan II, Endosulfan sulfate, Endrin aldehyde, Endrin ketone, and Methoxychlor. It is believed that this is due to matrix interference. The associated laboratory control standard (LCS) met acceptance criteria. The data has been reported as is.

The surrogate recovery of Tetrachloro-m-xylene (126%) in sample 580-6454-4 associated with batch 580-20899 exceeded QC limits (49-123%). All other surrogates were within control limits. No further action was taken on this outlier.

No other analytical or quality issues were noted.

METHOD SUMMARY

Client: TestAmerica Analytical Testing Corp. Job Number: 580-6454-1

Description	Lab Location	Method	Preparation Method
Matrix: Solid			
Chlorinated Herbicides by GC-MS	STL SEA	SW846 8151A	
Chlorinated Herbicides by GC - Solids Prep	STL SEA		SW846 8151A
Organochlorine Pesticides by Gas Chromatography	STL SEA	SW846 8081A	
Ultrasonic Extraction (Low Level)	STL SEA		SW846 3550B

LAB REFERENCES:

STL SEA = STL Seattle

METHOD REFERENCES:

SW846 - "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

SAMPLE SUMMARY

Client: TestAmerica Analytical Testing Corp. Job Number: 580-6454-1

Lab Sample ID	Client Sample ID	Client Matrix	Date/Time Sampled	Date/Time Received
580-6454-1	HQG0016-01	Solid	06/29/2007 1645	07/09/2007 1150
580-6454-2	HQG0016-02	Solid	06/28/2007 1330	07/09/2007 1150
580-6454-3	HQG0016-03	Solid	06/28/2007 1551	07/09/2007 1150
580-6454-4	HQG0016-04	Solid	06/28/2007 1630	07/09/2007 1150
580-6454-5	HQG0016-05	Solid	06/28/2007 1650	07/09/2007 1150
580-6454-6	HQG0016-06	Solid	06/29/2007 1010	07/09/2007 1150
580-6454-7	HQG0016-07	Solid	06/29/2007 1110	07/09/2007 1150
580-6454-8	HQG0016-08	Solid	06/29/2007 1210	07/09/2007 1150
580-6454-9	HQG0016-09	Solid	06/29/2007 1410	07/09/2007 1150
580-6454-10	HQG0016-10	Solid	06/29/2007 1510	07/09/2007 1150
580-6454-11	HQG0016-19	Solid	06/29/2007 1907	07/09/2007 1150
580-6454-12	HQG0016-20	Solid	06/29/2007 1907	07/09/2007 1150

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-01

Lab Sample ID: 580-6454-1
Client Matrix: Solid

Date Sampled: 06/29/2007 1645
Date Received: 07/09/2007 1150

8151A Chlorinated Herbicides by GC-MS

Method: 8151A
Preparation: 8151A
Dilution: 1.0
Date Analyzed: 07/13/2007 0727
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441

Instrument ID: SEA008
Lab File ID: L23796.D
Initial Weight/Volume: 30.0012 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Dalapon		ND		8.3
4-Nitrophenol		ND		3.3
Dicamba		ND		3.3
MCPP		ND		3.3
MCPA		ND		3.3
Dichlorprop		ND		3.3
2,4-D		ND		3.3
Pentachlorophenol		ND		3.3
Silvex (2,4,5-TP)		ND		3.3
2,4,5-T		ND		3.3
Dinoseb		ND		8.3
2,4-DB		ND		3.3

Surrogate	%Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	99	51 - 129

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-02

Lab Sample ID: 580-6454-2
Client Matrix: Solid

Date Sampled: 06/28/2007 1330
Date Received: 07/09/2007 1150

8151A Chlorinated Herbicides by GC-MS

Method: 8151A
Preparation: 8151A
Dilution: 1.0
Date Analyzed: 07/13/2007 0750
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441

Instrument ID: SEA008
Lab File ID: L23797.D
Initial Weight/Volume: 30.4377 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Dalapon		ND		8.2
4-Nitrophenol		ND		3.3
Dicamba		ND		3.3
MCPP		ND		3.3
MCPA		ND		3.3
Dichlorprop		ND		3.3
2,4-D		ND		3.3
Pentachlorophenol		ND		3.3
Silvex (2,4,5-TP)		ND		3.3
2,4,5-T		ND		3.3
Dinoseb		ND		8.2
2,4-DB		ND		3.3

Surrogate	%Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	97	51 - 129

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-03

Lab Sample ID: 580-6454-3
Client Matrix: Solid

Date Sampled: 06/28/2007 1551
Date Received: 07/09/2007 1150

8151A Chlorinated Herbicides by GC-MS

Method: 8151A
Preparation: 8151A
Dilution: 1.0
Date Analyzed: 07/13/2007 0812
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441

Instrument ID: SEA008
Lab File ID: L23798.D
Initial Weight/Volume: 30.5788 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Dalapon		ND		8.2
4-Nitrophenol		ND		3.3
Dicamba		ND		3.3
MCPP		ND		3.3
MCPA		ND		3.3
Dichlorprop		ND		3.3
2,4-D		ND		3.3
Pentachlorophenol		ND		3.3
Silvex (2,4,5-TP)		ND		3.3
2,4,5-T		ND		3.3
Dinoseb		ND		8.2
2,4-DB		ND		3.3

Surrogate	%Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	100	51 - 129

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-04

Lab Sample ID: 580-6454-4
Client Matrix: Solid

Date Sampled: 06/28/2007 1630
Date Received: 07/09/2007 1150

8151A Chlorinated Herbicides by GC-MS

Method: 8151A
Preparation: 8151A
Dilution: 1.0
Date Analyzed: 07/13/2007 0835
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441

Instrument ID: SEA008
Lab File ID: L23799.D
Initial Weight/Volume: 30.6799 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Dalapon		ND		8.1
4-Nitrophenol		ND		3.3
Dicamba		ND		3.3
MCPP		ND		3.3
MCPA		ND		3.3
Dichlorprop		ND		3.3
2,4-D		ND		3.3
Pentachlorophenol		ND		3.3
Silvex (2,4,5-TP)		ND		3.3
2,4,5-T		ND		3.3
Dinoseb		ND		8.1
2,4-DB		ND		3.3

Surrogate	%Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	98	51 - 129

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-05

Lab Sample ID: 580-6454-5
Client Matrix: Solid

Date Sampled: 06/28/2007 1650
Date Received: 07/09/2007 1150

8151A Chlorinated Herbicides by GC-MS

Method: 8151A
Preparation: 8151A
Dilution: 1.0
Date Analyzed: 07/13/2007 1106
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441

Instrument ID: SEA008
Lab File ID: L23800.D
Initial Weight/Volume: 31.0234 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Dalapon		ND		8.1
4-Nitrophenol		ND		3.2
Dicamba		ND		3.2
MCPP		ND		3.2
MCPA		ND		3.2
Dichlorprop		ND		3.2
2,4-D		ND		3.2
Pentachlorophenol		ND		3.2
Silvex (2,4,5-TP)		ND		3.2
2,4,5-T		ND		3.2
Dinoseb		ND		8.1
2,4-DB		ND		3.2

Surrogate	%Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	101	51 - 129

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-06

Lab Sample ID: 580-6454-6
Client Matrix: Solid

Date Sampled: 06/29/2007 1010
Date Received: 07/09/2007 1150

8151A Chlorinated Herbicides by GC-MS

Method: 8151A
Preparation: 8151A
Dilution: 1.0
Date Analyzed: 07/13/2007 1129
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441

Instrument ID: SEA008
Lab File ID: L23801.D
Initial Weight/Volume: 30.4567 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Dalapon		ND		8.2
4-Nitrophenol		ND		3.3
Dicamba		ND		3.3
MCPP		ND		3.3
MCPA		ND		3.3
Dichlorprop		ND		3.3
2,4-D		ND		3.3
Pentachlorophenol		ND		3.3
Silvex (2,4,5-TP)		ND		3.3
2,4,5-T		ND		3.3
Dinoseb		ND		8.2
2,4-DB		ND		3.3

Surrogate	%Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	99	51 - 129

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-07

Lab Sample ID: 580-6454-7
Client Matrix: Solid

Date Sampled: 06/29/2007 1110
Date Received: 07/09/2007 1150

8151A Chlorinated Herbicides by GC-MS

Method: 8151A
Preparation: 8151A
Dilution: 1.0
Date Analyzed: 07/13/2007 1151
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441

Instrument ID: SEA008
Lab File ID: L23802.D
Initial Weight/Volume: 30.0123 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Dalapon		ND		8.3
4-Nitrophenol		ND		3.3
Dicamba		ND		3.3
MCPP		ND		3.3
MCPA		ND		3.3
Dichlorprop		ND		3.3
2,4-D		ND		3.3
Pentachlorophenol		ND		3.3
Silvex (2,4,5-TP)		ND		3.3
2,4,5-T		ND		3.3
Dinoseb		ND		8.3
2,4-DB		ND		3.3

Surrogate	%Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	105	51 - 129

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-08

Lab Sample ID: 580-6454-8
Client Matrix: Solid

Date Sampled: 06/29/2007 1210
Date Received: 07/09/2007 1150

8151A Chlorinated Herbicides by GC-MS

Method: 8151A
Preparation: 8151A
Dilution: 1.0
Date Analyzed: 07/13/2007 1214
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441

Instrument ID: SEA008
Lab File ID: L23803.D
Initial Weight/Volume: 31.9987 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Dalapon		ND		7.8
4-Nitrophenol		ND		3.1
Dicamba		ND		3.1
MCPP		ND		3.1
MCPA		ND		3.1
Dichlorprop		ND		3.1
2,4-D		ND		3.1
Pentachlorophenol		ND		3.1
Silvex (2,4,5-TP)		ND		3.1
2,4,5-T		ND		3.1
Dinoseb		ND		7.8
2,4-DB		ND		3.1

Surrogate	%Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	89	51 - 129

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-09

Lab Sample ID: 580-6454-9
Client Matrix: Solid

Date Sampled: 06/29/2007 1410
Date Received: 07/09/2007 1150

8151A Chlorinated Herbicides by GC-MS

Method: 8151A
Preparation: 8151A
Dilution: 1.0
Date Analyzed: 07/13/2007 1236
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441

Instrument ID: SEA008
Lab File ID: L23804.D
Initial Weight/Volume: 30.0123 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Dalapon		ND		8.3
4-Nitrophenol		ND		3.3
Dicamba		ND		3.3
MCPP		ND		3.3
MCPA		ND		3.3
Dichlorprop		ND		3.3
2,4-D		ND		3.3
Pentachlorophenol		ND		3.3
Silvex (2,4,5-TP)		ND		3.3
2,4,5-T		ND		3.3
Dinoseb		ND		8.3
2,4-DB		ND		3.3

Surrogate	%Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	90	51 - 129

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-10

Lab Sample ID: 580-6454-10
Client Matrix: Solid

Date Sampled: 06/29/2007 1510
Date Received: 07/09/2007 1150

8151A Chlorinated Herbicides by GC-MS

Method: 8151A
Preparation: 8151A
Dilution: 1.0
Date Analyzed: 07/13/2007 1259
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441

Instrument ID: SEA008
Lab File ID: L23805.D
Initial Weight/Volume: 31.3457 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Dalapon		ND		8.0
4-Nitrophenol		ND		3.2
Dicamba		ND		3.2
MCPP		ND		3.2
MCPA		ND		3.2
Dichlorprop		ND		3.2
2,4-D		ND		3.2
Pentachlorophenol		ND		3.2
Silvex (2,4,5-TP)		ND		3.2
2,4,5-T		ND		3.2
Dinoseb		ND		8.0
2,4-DB		ND		3.2

Surrogate	%Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	82	51 - 129

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-19

Lab Sample ID: 580-6454-11
Client Matrix: Solid

Date Sampled: 06/29/2007 1907
Date Received: 07/09/2007 1150

8151A Chlorinated Herbicides by GC-MS

Method: 8151A
Preparation: 8151A
Dilution: 1.0
Date Analyzed: 07/13/2007 1321
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441

Instrument ID: SEA008
Lab File ID: L23806.D
Initial Weight/Volume: 30.1256 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Dalapon		ND		8.3
4-Nitrophenol		ND		3.3
Dicamba		ND		3.3
MCPP		ND		3.3
MCPA		ND		3.3
Dichlorprop		ND		3.3
2,4-D		ND		3.3
Pentachlorophenol		ND		3.3
Silvex (2,4,5-TP)		ND		3.3
2,4,5-T		ND		3.3
Dinoseb		ND		8.3
2,4-DB		ND		3.3

Surrogate	%Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	86	51 - 129

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-20

Lab Sample ID: 580-6454-12
Client Matrix: Solid

Date Sampled: 06/29/2007 1907
Date Received: 07/09/2007 1150

8151A Chlorinated Herbicides by GC-MS

Method: 8151A
Preparation: 8151A
Dilution: 1.0
Date Analyzed: 07/13/2007 1344
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441

Instrument ID: SEA008
Lab File ID: L23807.D
Initial Weight/Volume: 30.1447 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Dalapon		ND		8.3
4-Nitrophenol		ND		3.3
Dicamba		ND		3.3
MCPP		ND		3.3
MCPA		ND		3.3
Dichlorprop		ND		3.3
2,4-D		ND		3.3
Pentachlorophenol		ND		3.3
Silvex (2,4,5-TP)		ND		3.3
2,4,5-T		ND		3.3
Dinoseb		ND		8.3
2,4-DB		ND		3.3

Surrogate	%Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	79	51 - 129

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-01

Lab Sample ID: 580-6454-1
Client Matrix: Solid

Date Sampled: 06/29/2007 1645
Date Received: 07/09/2007 1150

8081A Organochlorine Pesticides by Gas Chromatography

Method: 8081A
Preparation: 3550B
Dilution: 1.0
Date Analyzed: 07/20/2007 1749
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818

Instrument ID: SEA035
Lab File ID: ECD26325.D
Initial Weight/Volume: 30.5664 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Aldrin		ND	H	0.65
alpha-BHC		ND	H	0.65
beta-BHC		ND	H	0.65
delta-BHC		ND	H	0.65
gamma-BHC (Lindane)		ND	H	0.65
4,4'-DDD		ND	H	1.3
4,4'-DDE		ND	H	1.3
4,4'-DDT		ND	H	1.3
Dieldrin		ND	H	1.3
Endosulfan I		ND	H	0.65
Endosulfan II		ND	H	1.3
Endosulfan sulfate		ND	H	1.3
Endrin		ND	H	1.3
Endrin aldehyde		ND	H	1.3
Heptachlor		ND	H	0.65
Heptachlor epoxide		ND	H	0.65
Methoxychlor		ND	H	6.5
Endrin ketone		ND	H	1.3
Toxaphene		ND	H	65
alpha-Chlordane		ND	H	0.65
gamma-Chlordane		ND	H	0.65

Surrogate	%Rec	Acceptance Limits
Tetrachloro-m-xylene	103	49 - 123
DCB Decachlorobiphenyl	95	40 - 158

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-02

Lab Sample ID: 580-6454-2
Client Matrix: Solid

Date Sampled: 06/28/2007 1330
Date Received: 07/09/2007 1150

8081A Organochlorine Pesticides by Gas Chromatography

Method: 8081A
Preparation: 3550B
Dilution: 1.0
Date Analyzed: 07/20/2007 1808
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818

Instrument ID: SEA035
Lab File ID: ECD26326.D
Initial Weight/Volume: 30.6645 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Aldrin		ND	H	0.65
alpha-BHC		ND	H	0.65
beta-BHC		ND	H	0.65
delta-BHC		ND	H	0.65
gamma-BHC (Lindane)		ND	H	0.65
4,4'-DDD		ND	H	1.3
4,4'-DDE		ND	H	1.3
4,4'-DDT		ND	H	1.3
Dieldrin		ND	H	1.3
Endosulfan I		ND	H	0.65
Endosulfan II		ND	H	1.3
Endosulfan sulfate		ND	H	1.3
Endrin		ND	H	1.3
Endrin aldehyde		ND	H	1.3
Heptachlor		ND	H	0.65
Heptachlor epoxide		ND	H	0.65
Methoxychlor		ND	H	6.5
Endrin ketone		ND	H	1.3
Toxaphene		ND	H	65
alpha-Chlordane		ND	H	0.65
gamma-Chlordane		ND	H	0.65

Surrogate	%Rec	Acceptance Limits
Tetrachloro-m-xylene	101	49 - 123
DCB Decachlorobiphenyl	85	40 - 158

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-03

Lab Sample ID: 580-6454-3
Client Matrix: Solid

Date Sampled: 06/28/2007 1551
Date Received: 07/09/2007 1150

8081A Organochlorine Pesticides by Gas Chromatography

Method: 8081A
Preparation: 3550B
Dilution: 1.0
Date Analyzed: 07/20/2007 1828
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818

Instrument ID: SEA035
Lab File ID: ECD26327.D
Initial Weight/Volume: 30.8802 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Aldrin		ND	H	0.65
alpha-BHC		ND	H	0.65
beta-BHC		ND	H	0.65
delta-BHC		ND	H	0.65
gamma-BHC (Lindane)		ND	H	0.65
4,4'-DDD		ND	H	1.3
4,4'-DDE		ND	H	1.3
4,4'-DDT		ND	H	1.3
Dieldrin		ND	H	1.3
Endosulfan I		ND	H	0.65
Endosulfan II		ND	H	1.3
Endosulfan sulfate		ND	H	1.3
Endrin		ND	H	1.3
Endrin aldehyde		ND	H	1.3
Heptachlor		ND	H	0.65
Heptachlor epoxide		ND	H	0.65
Methoxychlor		ND	H	6.5
Endrin ketone		ND	H	1.3
Toxaphene		ND	H	65
alpha-Chlordane		ND	H	0.65
gamma-Chlordane		ND	H	0.65

Surrogate	%Rec		Acceptance Limits
Tetrachloro-m-xylene	105		49 - 123
DCB Decachlorobiphenyl	97		40 - 158

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-04

Lab Sample ID: 580-6454-4
Client Matrix: Solid

Date Sampled: 06/28/2007 1630
Date Received: 07/09/2007 1150

8081A Organochlorine Pesticides by Gas Chromatography

Method: 8081A
Preparation: 3550B
Dilution: 1.0
Date Analyzed: 07/20/2007 1847
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818

Instrument ID: SEA035
Lab File ID: ECD26328.D
Initial Weight/Volume: 30.7934 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Aldrin		ND	H	0.65
alpha-BHC		ND	H	0.65
beta-BHC		ND	H	0.65
delta-BHC		ND	H	0.65
gamma-BHC (Lindane)		ND	H	0.65
4,4'-DDD		ND	H	1.3
4,4'-DDE		ND	H	1.3
4,4'-DDT		ND	H	1.3
Dieldrin		ND	H	1.3
Endosulfan I		ND	H	0.65
Endosulfan II		ND	H	1.3
Endosulfan sulfate		ND	H	1.3
Endrin		ND	H	1.3
Endrin aldehyde		ND	H	1.3
Heptachlor		ND	H	0.65
Heptachlor epoxide		ND	H	0.65
Methoxychlor		ND	H	6.5
Endrin ketone		ND	H	1.3
Toxaphene		ND	H	65
alpha-Chlordane		ND	H	0.65
gamma-Chlordane		ND	H	0.65

Surrogate	%Rec		Acceptance Limits
Tetrachloro-m-xylene	126	X	49 - 123
DCB Decachlorobiphenyl	112		40 - 158

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-05

Lab Sample ID: 580-6454-5
Client Matrix: Solid

Date Sampled: 06/28/2007 1650
Date Received: 07/09/2007 1150

8081A Organochlorine Pesticides by Gas Chromatography

Method: 8081A
Preparation: 3550B
Dilution: 1.0
Date Analyzed: 07/20/2007 1907
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818

Instrument ID: SEA035
Lab File ID: ECD26329.D
Initial Weight/Volume: 30.9321 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Aldrin		ND	H	0.65
alpha-BHC		ND	H	0.65
beta-BHC		ND	H	0.65
delta-BHC		ND	H	0.65
gamma-BHC (Lindane)		ND	H	0.65
4,4'-DDD		ND	H	1.3
4,4'-DDE		ND	H	1.3
4,4'-DDT		ND	H	1.3
Dieldrin		ND	H	1.3
Endosulfan I		ND	H	0.65
Endosulfan II		ND	H	1.3
Endosulfan sulfate		ND	H	1.3
Endrin		ND	H	1.3
Endrin aldehyde		ND	H	1.3
Heptachlor		ND	H	0.65
Heptachlor epoxide		ND	H	0.65
Methoxychlor		ND	H	6.5
Endrin ketone		ND	H	1.3
Toxaphene		ND	H	65
alpha-Chlordane		ND	H	0.65
gamma-Chlordane		ND	H	0.65

Surrogate	%Rec	Acceptance Limits
Tetrachloro-m-xylene	57	49 - 123
DCB Decachlorobiphenyl	51	40 - 158

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-06

Lab Sample ID: 580-6454-6
Client Matrix: Solid

Date Sampled: 06/29/2007 1010
Date Received: 07/09/2007 1150

8081A Organochlorine Pesticides by Gas Chromatography

Method: 8081A
Preparation: 3550B
Dilution: 1.0
Date Analyzed: 07/20/2007 1926
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818

Instrument ID: SEA035
Lab File ID: ECD26330.D
Initial Weight/Volume: 31.1468 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Aldrin		ND	H	0.64
alpha-BHC		ND	H	0.64
beta-BHC		ND	H	0.64
delta-BHC		ND	H	0.64
gamma-BHC (Lindane)		ND	H	0.64
4,4'-DDD		ND	H	1.3
4,4'-DDE		ND	H	1.3
4,4'-DDT		ND	H	1.3
Dieldrin		ND	H	1.3
Endosulfan I		ND	H	0.64
Endosulfan II		ND	H	1.3
Endosulfan sulfate		ND	H	1.3
Endrin		ND	H	1.3
Endrin aldehyde		ND	H	1.3
Heptachlor		ND	H	0.64
Heptachlor epoxide		ND	H	0.64
Methoxychlor		ND	H	6.4
Endrin ketone		ND	H	1.3
Toxaphene		ND	H	64
alpha-Chlordane		ND	H	0.64
gamma-Chlordane		ND	H	0.64

Surrogate	%Rec	Acceptance Limits
Tetrachloro-m-xylene	67	49 - 123
DCB Decachlorobiphenyl	59	40 - 158

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-07

Lab Sample ID: 580-6454-7
Client Matrix: Solid

Date Sampled: 06/29/2007 1110
Date Received: 07/09/2007 1150

8081A Organochlorine Pesticides by Gas Chromatography

Method: 8081A
Preparation: 3550B
Dilution: 1.0
Date Analyzed: 07/20/2007 1946
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818

Instrument ID: SEA035
Lab File ID: ECD26331.D
Initial Weight/Volume: 29.8976 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Aldrin		ND	H	0.67
alpha-BHC		ND	H	0.67
beta-BHC		ND	H	0.67
delta-BHC		ND	H	0.67
gamma-BHC (Lindane)		ND	H	0.67
4,4'-DDD		ND	H	1.3
4,4'-DDE		ND	H	1.3
4,4'-DDT		ND	H	1.3
Dieldrin		ND	H	1.3
Endosulfan I		ND	H	0.67
Endosulfan II		ND	H	1.3
Endosulfan sulfate		ND	H	1.3
Endrin		ND	H	1.3
Endrin aldehyde		ND	H	1.3
Heptachlor		ND	H	0.67
Heptachlor epoxide		ND	H	0.67
Methoxychlor		ND	H	6.7
Endrin ketone		ND	H	1.3
Toxaphene		ND	H	67
alpha-Chlordane		ND	H	0.67
gamma-Chlordane		ND	H	0.67

Surrogate	%Rec	Acceptance Limits
Tetrachloro-m-xylene	91	49 - 123
DCB Decachlorobiphenyl	83	40 - 158

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-08

Lab Sample ID: 580-6454-8
Client Matrix: Solid

Date Sampled: 06/29/2007 1210
Date Received: 07/09/2007 1150

8081A Organochlorine Pesticides by Gas Chromatography

Method: 8081A
Preparation: 3550B
Dilution: 1.0
Date Analyzed: 07/20/2007 2045
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818

Instrument ID: SEA035
Lab File ID: ECD26334.D
Initial Weight/Volume: 30.6358 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Aldrin		ND	H	0.65
alpha-BHC		ND	H	0.65
beta-BHC		ND	H	0.65
delta-BHC		ND	H	0.65
gamma-BHC (Lindane)		ND	H	0.65
4,4'-DDD		ND	H	1.3
4,4'-DDE		ND	H	1.3
4,4'-DDT		ND	H	1.3
Dieldrin		ND	H	1.3
Endosulfan I		ND	H	0.65
Endosulfan II		ND	H	1.3
Endosulfan sulfate		ND	H	1.3
Endrin		ND	H	1.3
Endrin aldehyde		ND	H	1.3
Heptachlor		ND	H	0.65
Heptachlor epoxide		ND	H	0.65
Methoxychlor		ND	H	6.5
Endrin ketone		ND	H	1.3
Toxaphene		ND	H	65
alpha-Chlordane		ND	H	0.65
gamma-Chlordane		ND	H	0.65

Surrogate	%Rec	Acceptance Limits
Tetrachloro-m-xylene	85	49 - 123
DCB Decachlorobiphenyl	74	40 - 158

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-09

Lab Sample ID: 580-6454-9
Client Matrix: Solid

Date Sampled: 06/29/2007 1410
Date Received: 07/09/2007 1150

8081A Organochlorine Pesticides by Gas Chromatography

Method: 8081A
Preparation: 3550B
Dilution: 1.0
Date Analyzed: 07/20/2007 2104
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818

Instrument ID: SEA035
Lab File ID: ECD26335.D
Initial Weight/Volume: 30.9676 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Aldrin		ND	H	0.65
alpha-BHC		ND	H	0.65
beta-BHC		ND	H	0.65
delta-BHC		ND	H	0.65
gamma-BHC (Lindane)		ND	H	0.65
4,4'-DDD		ND	H	1.3
4,4'-DDE		ND	H	1.3
4,4'-DDT		ND	H	1.3
Dieldrin		ND	H	1.3
Endosulfan I		ND	H	0.65
Endosulfan II		ND	H	1.3
Endosulfan sulfate		ND	H	1.3
Endrin		ND	H	1.3
Endrin aldehyde		ND	H	1.3
Heptachlor		ND	H	0.65
Heptachlor epoxide		ND	H	0.65
Methoxychlor		ND	H	6.5
Endrin ketone		ND	H	1.3
Toxaphene		ND	H	65
alpha-Chlordane		ND	H	0.65
gamma-Chlordane		ND	H	0.65

Surrogate	%Rec	Acceptance Limits
Tetrachloro-m-xylene	97	49 - 123
DCB Decachlorobiphenyl	89	40 - 158

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-10

Lab Sample ID: 580-6454-10
Client Matrix: Solid

Date Sampled: 06/29/2007 1510
Date Received: 07/09/2007 1150

8081A Organochlorine Pesticides by Gas Chromatography

Method: 8081A
Preparation: 3550B
Dilution: 1.0
Date Analyzed: 07/20/2007 2124
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818

Instrument ID: SEA035
Lab File ID: ECD26336.D
Initial Weight/Volume: 30.1861 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Aldrin		ND	H	0.66
alpha-BHC		ND	H	0.66
beta-BHC		ND	H	0.66
delta-BHC		ND	H	0.66
gamma-BHC (Lindane)		ND	H	0.66
4,4'-DDD		ND	H	1.3
4,4'-DDE		ND	H	1.3
4,4'-DDT		ND	H	1.3
Dieldrin		ND	H	1.3
Endosulfan I		ND	H	0.66
Endosulfan II		ND	H	1.3
Endosulfan sulfate		ND	H	1.3
Endrin		ND	H	1.3
Endrin aldehyde		ND	H	1.3
Heptachlor		ND	H	0.66
Heptachlor epoxide		ND	H	0.66
Methoxychlor		ND	H	6.6
Endrin ketone		ND	H	1.3
Toxaphene		ND	H	66
alpha-Chlordane		ND	H	0.66
gamma-Chlordane		ND	H	0.66

Surrogate	%Rec	Acceptance Limits
Tetrachloro-m-xylene	95	49 - 123
DCB Decachlorobiphenyl	94	40 - 158

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-19

Lab Sample ID: 580-6454-11
Client Matrix: Solid

Date Sampled: 06/29/2007 1907
Date Received: 07/09/2007 1150

8081A Organochlorine Pesticides by Gas Chromatography

Method: 8081A
Preparation: 3550B
Dilution: 1.0
Date Analyzed: 07/20/2007 2223
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818

Instrument ID: SEA035
Lab File ID: ECD26339.D
Initial Weight/Volume: 30.4557 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Aldrin		ND	H	0.66
alpha-BHC		ND	H	0.66
beta-BHC		ND	H	0.66
delta-BHC		ND	H	0.66
gamma-BHC (Lindane)		ND	H	0.66
4,4'-DDD		ND	H	1.3
4,4'-DDE		ND	H	1.3
4,4'-DDT		ND	H	1.3
Dieldrin		ND	H	1.3
Endosulfan I		ND	H	0.66
Endosulfan II		ND	H	1.3
Endosulfan sulfate		ND	H	1.3
Endrin		ND	H	1.3
Endrin aldehyde		ND	H	1.3
Heptachlor		ND	H	0.66
Heptachlor epoxide		ND	H	0.66
Methoxychlor		ND	H	6.6
Endrin ketone		ND	H	1.3
Toxaphene		ND	H	66
alpha-Chlordane		ND	H	0.66
gamma-Chlordane		ND	H	0.66

Surrogate	%Rec	Acceptance Limits
Tetrachloro-m-xylene	97	49 - 123
DCB Decachlorobiphenyl	79	40 - 158

Analytical Data

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Client Sample ID: HQG0016-20

Lab Sample ID: 580-6454-12
Client Matrix: Solid

Date Sampled: 06/29/2007 1907
Date Received: 07/09/2007 1150

8081A Organochlorine Pesticides by Gas Chromatography

Method: 8081A
Preparation: 3550B
Dilution: 1.0
Date Analyzed: 07/20/2007 2242
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818

Instrument ID: SEA035
Lab File ID: ECD26340.D
Initial Weight/Volume: 31.3384 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	DryWt Corrected: N	Result (ug/Kg)	Qualifier	RL
Aldrin		ND	H	0.64
alpha-BHC		ND	H	0.64
beta-BHC		ND	H	0.64
delta-BHC		ND	H	0.64
gamma-BHC (Lindane)		ND	H	0.64
4,4'-DDD		ND	H	1.3
4,4'-DDE		ND	H	1.3
4,4'-DDT		ND	H	1.3
Dieldrin		ND	H	1.3
Endosulfan I		ND	H	0.64
Endosulfan II		ND	H	1.3
Endosulfan sulfate		ND	H	1.3
Endrin		ND	H	1.3
Endrin aldehyde		ND	H	1.3
Heptachlor		ND	H	0.64
Heptachlor epoxide		ND	H	0.64
Methoxychlor		ND	H	6.4
Endrin ketone		ND	H	1.3
Toxaphene		ND	H	64
alpha-Chlordane		ND	H	0.64
gamma-Chlordane		ND	H	0.64

Surrogate	%Rec	Acceptance Limits
Tetrachloro-m-xylene	88	49 - 123
DCB Decachlorobiphenyl	67	40 - 158

Quality Control Results

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Method Blank - Batch: 580-20441

Method: 8151A
Preparation: 8151A

Lab Sample ID: MB 580-20441/1-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 07/13/2007 0534
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441
Units: ug/Kg

Instrument ID: SEA008
Lab File ID: L23791.D
Initial Weight/Volume: 30.0000 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	Result	Qual	RL
Dalapon	ND		8.3
4-Nitrophenol	ND		3.3
Dicamba	ND		3.3
MCPP	ND		3.3
MCPA	ND		3.3
Dichlorprop	ND		3.3
2,4-D	ND		3.3
Pentachlorophenol	ND		3.3
Silvex (2,4,5-TP)	ND		3.3
2,4,5-T	ND		3.3
Dinoseb	ND		8.3
2,4-DB	ND		3.3

Surrogate	% Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	100	51 - 129

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Lab Control Spike/
Lab Control Spike Duplicate Recovery Report - Batch: 580-20441

Method: 8151A
Preparation: 8151A

LCS Lab Sample ID: LCS 580-20441/2-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 07/13/2007 0557
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441
Units: ug/Kg

Instrument ID: SEA008
Lab File ID: L23792.D
Initial Weight/Volume: 30.0000 g
Final Weight/Volume: 10 mL
Injection Volume:

LCSD Lab Sample ID: LCSD 580-20441/3-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 07/13/2007 0620
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441
Units: ug/Kg

Instrument ID: SEA008
Lab File ID: L23793.D
Initial Weight/Volume: 30.0000 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	% Rec. LCS	% Rec. LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
Dalapon	57	59	16 - 74	4	30		
4-Nitrophenol	68	73	50 - 150	7	30		
Dicamba	94	90	48 - 123	4	30		
MCPP	105	111	53 - 154	5	30		
MCPA	107	106	50 - 150	1	30		
Dichlorprop	114	121	75 - 140	6	30		
2,4-D	86	92	46 - 136	6	30		
Pentachlorophenol	107	100	50 - 150	6	30		
Silvex (2,4,5-TP)	99	99	52 - 137	0	30		
2,4,5-T	99	104	45 - 135	4	30		
Dinoseb	68	80	18 - 157	15	30		
2,4-DB	107	113	50 - 155	5	30		

Surrogate	LCS % Rec	LCSD % Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	104	99	51 - 129

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 580-20441

Method: 8151A
Preparation: 8151A

MS Lab Sample ID: 580-6454-12
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 07/13/2007 0642
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441

Instrument ID: SEA008
Lab File ID: L23794.D
Initial Weight/Volume: 15.0126 g
Final Weight/Volume: 10 mL
Injection Volume:

MSD Lab Sample ID: 580-6454-12
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 07/13/2007 0704
Date Prepared: 07/11/2007 1401

Analysis Batch: 580-20656
Prep Batch: 580-20441

Instrument ID: SEA008
Lab File ID: L23795.D
Initial Weight/Volume: 15.1266 g
Final Weight/Volume: 10 mL
Injection Volume:

Analyte	% Rec. MS	% Rec. MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
Dalapon	23	23	16 - 74	1	30		
4-Nitrophenol	55	57	50 - 150	2	30		
Dicamba	65	71	48 - 123	8	30		
MCPP	78	86	53 - 154	9	30		
MCPA	69	75	50 - 150	7	30		
Dichlorprop	76	81	75 - 140	6	30		
2,4-D	55	62	48 - 138	11	30		
Pentachlorophenol	120	137	50 - 150	12	30		
Silvex (2,4,5-TP)	80	90	52 - 137	11	30		
2,4,5-T	66	73	45 - 135	9	30		
Dinoseb	104	105	18 - 157	0	30		
2,4-DB	122	130	50 - 155	6	30		

Surrogate	MS % Rec	MSD % Rec	Acceptance Limits
2,4-Dichlorophenylacetic acid	80	80	51 - 129

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Method Blank - Batch: 580-20818

Method: 8081A
Preparation: 3550B

Lab Sample ID: MB 580-20818/1-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 07/20/2007 1650
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818
Units: ug/Kg

Instrument ID: SEA035
Lab File ID: ECD26322.D
Initial Weight/Volume: 30 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	Result	Qual	RL
Aldrin	ND		0.67
alpha-BHC	ND		0.67
beta-BHC	ND		0.67
delta-BHC	ND		0.67
gamma-BHC (Lindane)	ND		0.67
4,4'-DDD	ND		1.3
4,4'-DDE	ND		1.3
4,4'-DDT	ND		1.3
Dieldrin	ND		1.3
Endosulfan I	ND		0.67
Endosulfan II	ND		1.3
Endosulfan sulfate	ND		1.3
Endrin	ND		1.3
Endrin aldehyde	ND		1.3
Heptachlor	ND		0.67
Heptachlor epoxide	ND		0.67
Methoxychlor	ND		6.7
Endrin ketone	ND		1.3
Toxaphene	ND		67
alpha-Chlordane	ND		0.67
gamma-Chlordane	ND		0.67

Surrogate	% Rec	Acceptance Limits
Tetrachloro-m-xylene	111	49 - 123
DCB Decachlorobiphenyl	111	40 - 158

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: TestAmerica Analytical Testing Corp. Job Number: 580-6454-1

Lab Control Spike/
Lab Control Spike Duplicate Recovery Report - Batch: 580-20818

Method: 8081A
Preparation: 3550B

LCS Lab Sample ID: LCS 580-20818/2-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 07/20/2007 1709
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818
Units: ug/Kg

Instrument ID: SEA035
Lab File ID: ECD26323.D
Initial Weight/Volume: 30 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

LCSD Lab Sample ID: LCSD 580-20818/3-A
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 07/20/2007 1729
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818
Units: ug/Kg

Instrument ID: SEA035
Lab File ID: ECD26324.D
Initial Weight/Volume: 30 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	% Rec. LCS	% Rec. LCSD	Limit	RPD	RPD Limit	LCS Qual	LCSD Qual
Aldrin	108	108	53 - 126	1	24		
alpha-BHC	99	101	41 - 128	1	28		
beta-BHC	99	98	48 - 121	1	32		
delta-BHC	43	43	22 - 153	1	36		
gamma-BHC (Lindane)	98	99	50 - 127	1	29		
4,4'-DDD	104	97	44 - 141	6	41		
4,4'-DDE	104	100	47 - 140	4	40		
4,4'-DDT	96	90	34 - 159	6	47		
Dieldrin	101	98	53 - 134	3	32		
Endosulfan I	105	103	52 - 122	2	31		
Endosulfan II	105	100	53 - 132	5	36		
Endosulfan sulfate	85	81	42 - 128	6	43		
Endrin	100	96	46 - 138	4	36		
Endrin aldehyde	96	92	12 - 179	4	47		
Heptachlor	102	105	50 - 130	2	31		
Heptachlor epoxide	105	104	49 - 123	2	31		
Methoxychlor	100	94	46 - 154	7	46		
Endrin ketone	99	93	45 - 127	7	45		
alpha-Chlordane	101	98	46 - 118	3	33		
gamma-Chlordane	103	100	49 - 122	3	32		

Surrogate	LCS % Rec	LCSD % Rec	Acceptance Limits
Tetrachloro-m-xylene	106	108	49 - 123
DCB Decachlorobiphenyl	96	89	40 - 158

Calculations are performed before rounding to avoid round-off errors in calculated results.

Quality Control Results

Client: TestAmerica Analytical Testing Corp. Job Number: 580-6454-1

Matrix Spike/
Matrix Spike Duplicate Recovery Report - Batch: 580-20818

Method: 8081A
Preparation: 3550B

MS Lab Sample ID: 580-6454-10
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 07/20/2007 2143
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818

Instrument ID: SEA035
Lab File ID: ECD26337.D
Initial Weight/Volume: 30.2004 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

MSD Lab Sample ID: 580-6454-10
Client Matrix: Solid
Dilution: 1.0
Date Analyzed: 07/20/2007 2203
Date Prepared: 07/20/2007 0855

Analysis Batch: 580-20899
Prep Batch: 580-20818

Instrument ID: SEA035
Lab File ID: ECD26338.D
Initial Weight/Volume: 30.2453 g
Final Weight/Volume: 20 mL
Injection Volume:
Column ID: PRIMARY

Analyte	% Rec. MS	% Rec. MSD	Limit	RPD	RPD Limit	MS Qual	MSD Qual
Aldrin	107	100	53 - 126	7	24		
alpha-BHC	82	74	41 - 128	10	28		
beta-BHC	62	64	48 - 121	14	32		
delta-BHC	12	10	22 - 153	22	36	F	F
gamma-BHC (Lindane)	75	70	50 - 127	8	29		
4,4'-DDD	87	72	44 - 141	18	41		
4,4'-DDE	107	98	47 - 140	9	40		
4,4'-DDT	81	69	34 - 159	16	47		
Dieldrin	72	63	53 - 134	14	32		
Endosulfan I	88	75	52 - 122	16	31		
Endosulfan II	14	12	53 - 132	17	36	F	F
Endosulfan sulfate	5	4	42 - 128	14	43	F	F
Endrin	75	61	46 - 138	20	36		
Endrin aldehyde	4	6	12 - 179	22	47	F	F
Heptachlor	96	90	50 - 130	6	31		
Heptachlor epoxide	85	76	49 - 123	11	31		
Methoxychlor	42	34	46 - 154	21	46	F	F
Endrin ketone	16	14	45 - 127	10	45	F	F
alpha-Chlordane	89	80	46 - 118	10	33		
gamma-Chlordane	84	76	49 - 122	10	32		

Surrogate	MS % Rec	MSD % Rec	Acceptance Limits
Tetrachloro-m-xylene	93	87	49 - 123
DCB Decachlorobiphenyl	98	88	40 - 158

Calculations are performed before rounding to avoid round-off errors in calculated results.

DATA REPORTING QUALIFIERS

Client: TestAmerica Analytical Testing Corp. Job Number: 580-6454-1

Lab Section	Qualifier	Description
GC Semi VOA		
	F	MS or MSD exceeds the control limits
	H	Sample was prepped or analyzed beyond the specified holding time
	X	Surrogate exceeds the control limits

SUBCONTRACT ORDER

TestAmerica - Honolulu, HI

HQG0016

STD TAT
7 days
6454

SENDING LABORATORY:

TestAmerica - Honolulu, HI
99-193 Aiea Heights Drive, Suite 121
Aiea, HI 96701
Phone: 808-486-5227
Fax: 808-486-2456
Project Manager: Yvonne K. Parry
Client: Element Environmental LLC

RECEIVING LABORATORY:

STL - Seattle, WA
5755 8th Street East
Tacoma,, WA 98424
Phone :(253) 922-2310
Fax: 253
Project Location: Hawaii
Receipt Temperature: 20.5 °C Ice: Y / N

Analysis	Due	Expires	Interlab	Surch	Comments
Sample ID: HQG0016-01	Solid/Soil		Sampled: 06/29/07 16:45		
8081A Pesticides	07/13/07 12:00	07/13/07 16:45	$135.00	0%	
8151 Herbicides	07/13/07 12:00	07/06/07 16:45	$195.00	0%	
Containers Supplied:					
Sample ID: HQG0016-02	Solid/Soil		Sampled: 06/28/07 13:30		
8081A Pesticides	07/13/07 12:00	07/12/07 13:30	$135.00	0%	
8151 Herbicides	07/13/07 12:00	07/05/07 13:30	$195.00	0%	
Containers Supplied:					
Sample ID: HQG0016-03	Solid/Soil		Sampled: 06/28/07 15:51		
8081A Pesticides	07/13/07 12:00	07/12/07 15:51	$135.00	0%	
8151 Herbicides	07/13/07 12:00	07/05/07 15:51	$195.00	0%	
Containers Supplied:					
Sample ID: HQG0016-04	Solid/Soil		Sampled: 06/28/07 16:30		
8081A Pesticides	07/13/07 12:00	07/12/07 16:30	$135.00	0%	
8151 Herbicides	07/13/07 12:00	07/05/07 16:30	$195.00	0%	
Containers Supplied:					
Sample ID: HQG0016-05	Solid/Soil		Sampled: 06/28/07 16:50		
8081A Pesticides	07/13/07 12:00	07/12/07 16:50	$135.00	0%	
8151 Herbicides	07/13/07 12:00	07/05/07 16:50	$195.00	0%	
Containers Supplied:					

Samples 1-10 are multiincremental, please extract entire jar provided (~30g)

Released By	Date/Time	Received By	Date/Time
Yvonne Ketin PCP	7/5/07 13:45	K Presley	7/9/07 1150A

7

SUBCONTRACT ORDER

TestAmerica - Honolulu, HI

HQG0016

Analysis	Due	Expires	Interlab	Surch	Comments
Sample ID: HQG0016-06	Solid/Soil		Sampled: 06/29/07 10:10		
8081A Pesticides	07/13/07 12:00	07/13/07 10:10	$135.00	0%	
8151 Herbicides	07/13/07 12:00	07/06/07 10:10	$195.00	0%	
Containers Supplied:					
Sample ID: HQG0016-07	Solid/Soil		Sampled: 06/29/07 11:10		
8081A Pesticides	07/13/07 12:00	07/13/07 11:10	$135.00	0%	
8151 Herbicides	07/13/07 12:00	07/06/07 11:10	$195.00	0%	
Containers Supplied:					
Sample ID: HQG0016-08	Solid/Soil		Sampled: 06/29/07 12:10		
8081A Pesticides	07/13/07 12:00	07/13/07 12:10	$135.00	0%	
8151 Herbicides	07/13/07 12:00	07/06/07 12:10	$195.00	0%	
Containers Supplied:					
Sample ID: HQG0016-09	Solid/Soil		Sampled: 06/29/07 14:10		
8081A Pesticides	07/13/07 12:00	07/13/07 14:10	$135.00	0%	
8151 Herbicides	07/13/07 12:00	07/06/07 14:10	$195.00	0%	
Containers Supplied:					
Sample ID: HQG0016-10	Solid/Soil		Sampled: 06/29/07 15:10		
8081A Pesticides	07/13/07 12:00	07/13/07 15:10	$135.00	0%	
8151 Herbicides	07/13/07 12:00	07/06/07 15:10	$195.00	0%	
Containers Supplied:					
Sample ID: HQG0016-19	Solid/Soil		Sampled: 06/29/07 19:07		
8081A Pesticides	07/13/07 12:00	07/13/07 19:07	$135.00	0%	
8151 Herbicides	07/13/07 12:00	07/06/07 19:07	$195.00	0%	
Containers Supplied:					
Sample ID: HQG0016-20	Solid/Soil		Sampled: 06/29/07 19:07		
8081A Pesticides	07/13/07 12:00	07/13/07 19:07	$135.00	0%	
8151 Herbicides	07/13/07 12:00	07/06/07 19:07	$195.00	0%	
Containers Supplied:					

LOGIN SAMPLE RECEIPT CHECK LIST

Client: TestAmerica Analytical Testing Corp.

Job Number: 580-6454-1

Login Number: 6454

Question	T/F/NA	Comment
Radioactivity either was not measured or, if measured, is at or below background		
The cooler's custody seal, if present, is intact.		
The cooler or samples do not appear to have been compromised or tampered with.		
Samples were received on ice.		
Cooler Temperature is acceptable.		
Cooler Temperature is recorded.		
COC is present.		
COC is filled out in ink and legible.		
COC is filled out with all pertinent information.		
There are no discrepancies between the sample IDs on the containers and the COC.		
Samples are received within Holding Time.		
Sample containers have legible labels.		
Containers are not broken or leaking.		
Sample collection date/times are provided.		
Appropriate sample containers are used.		
Sample bottles are completely filled.		
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs		
VOA sample vials do not have headspace or bubble is <6mm (1/4") in diameter.		
If necessary, staff have been informed of any short hold time or quick TAT needs		
Multiphasic samples are not present.		
Samples do not require splitting or compositing.		

Anatek Labs, Inc.

1282 Alturas Drive • Moscow, ID 83843 • (208) 883-2839 • Fax (208) 882-9246 • email moscow@anateklabs.com
504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Client: TEST AMERICA - HONOLULU, HI
Address: 99-193 AIEA HEIGHTS DRIVE
AIEA, HI 96701-3900
Attn: YVONNE PARRY

Batch #: 070712032
Project Name: HQG0016

Analytical Results Report

Sample Number 070712032-001 **Sampling Date** 6/29/2007 **Date/Time Received** 7/12/2007 11:00 AM
Client Sample ID HQG0016-01 **Sampling Time** 4:45 PM **Extraction Date** 7/12/2007
Matrix: Soil

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Ametryne	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Atrazine	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Diazinon	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Fenamiphos	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Hexazinone	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Metribuzin	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Diuron	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
Oxamyl	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
%moisture	5.2	Percent		7/16/2007	CH	%moisture	

Surrogate Data

Sample Number 070712032-001

Surrogate Standard	Method	Percent Recovery	Control Limits
Terphenyl-d14	EPA 8270C	99.4	30-140

Comments:

Anatek Labs, Inc.

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504 E Sprague Ste. D • Spokane WA 99202 • (509) 838-3999 • Fax (509) 838-4433 • email spokane@anateklabs.com

Client: TEST AMERICA - HONOLULU, HI
Address: 99-193 AIEA HEIGHTS DRIVE
AIEA, HI 96701-3900
Attn: YVONNE PARRY

Batch #: 070712032
Project Name: HQG0016

Analytical Results Report

Sample Number 070712032-002 **Sampling Date** 6/28/2007 **Date/Time Received** 7/12/2007 11:00 AM
Client Sample ID HQG0016-02 **Sampling Time** 1:30 PM **Extraction Date** 7/12/2007
Matrix: Soil

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Ametryne	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Atrazine	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Diazinon	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Fenamiphos	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Hexazinone	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Metribuzin	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Diuron	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
Oxamyl	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
%moisture	5.6	Percent		7/16/2007	CH	%moisture	

Surrogate Data

Sample Number 070712032-002

Surrogate Standard	Method	Percent Recovery	Control Limits
Terphenyl-d14	EPA 8270C	128.4	30-140

Comments:

Anatek Labs, Inc.

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Client: TEST AMERICA - HONOLULU, HI
Address: 99-193 AIEA HEIGHTS DRIVE
AIEA, HI 96701-3900
Attn: YVONNE PARRY

Batch #: 070712032
Project Name: HQG0016

Analytical Results Report

Sample Number 070712032-003 **Sampling Date** 6/28/2007 **Date/Time Received** 7/12/2007 11:00 AM
Client Sample ID HQG0016-03 **Sampling Time** 3:51 PM **Extraction Date** 7/12/2007
Matrix: Soil

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Ametryne	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Atrazine	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Diazinon	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Fenamiphos	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Hexazinone	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Metribuzin	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Diuron	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
Oxamyl	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
%moisture	6.1	Percent		7/16/2007	CH	%moisture	

Surrogate Data

Sample Number 070712032-003

Surrogate Standard	Method	Percent Recovery	Control Limits
Terphenyl-d14	EPA 8270C	137.2	30-140

Comments:

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Address: 99-193 AIEA HEIGHTS DRIVE
AIEA, HI 96701-3900
Attn: YVONNE PARRY

Batch #: 070712032
Project Name: HQG0016

Analytical Results Report

Sample Number 070712032-004 **Sampling Date** 6/28/2007 **Date/Time Received** 7/12/2007 11:00 AM
Client Sample ID HQG0016-04 **Sampling Time** 4:30 PM **Extraction Date** 7/12/2007
Matrix: Soil

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Ametryne	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Atrazine	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Diazinon	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Fenamiphos	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Hexazinone	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Metribuzin	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Diuron	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
Oxamyl	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
%moisture	5.9	Percent		7/16/2007	CH	%moisture	

Surrogate Data

Sample Number 070712032-004

Surrogate Standard	Method	Percent Recovery	Control Limits
Terphenyl-d14	EPA 8270C	120.6	30-140

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Address: 99-193 AIEA HEIGHTS DRIVE
AIEA, HI 96701-3900
Attn: YVONNE PARRY

Batch #: 070712032
Project Name: HQG0016

Analytical Results Report

Sample Number 070712032-005 **Sampling Date** 6/28/2007 **Date/Time Received** 7/12/2007 11:00 AM
Client Sample ID HQG0016-05 **Sampling Time** 4:50 PM **Extraction Date** 7/12/2007
Matrix: Soil

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Ametryne	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Atrazine	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Diazinon	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Fenamiphos	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Hexazinone	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Metribuzin	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Diuron	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
Oxamyl	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
%moisture	5.9	Percent		7/16/2007	CH	%moisture	

Surrogate Data

Sample Number 070712032-005

Surrogate Standard	Method	Percent Recovery	Control Limits
Terphenyl-d14	EPA 8270C	125.8	30-140

Comments:

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Address: 99-193 AIEA HEIGHTS DRIVE
AIEA, HI 96701-3900
Attn: YVONNE PARRY

Batch #: 070712032
Project Name: HQG0016

Analytical Results Report

Sample Number 070712032-006 **Sampling Date** 6/29/2007 **Date/Time Received** 7/12/2007 11:00 AM
Client Sample ID HQG0016-06 **Sampling Time** 10:10 AM **Extraction Date** 7/12/2007
Matrix: Soil

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Ametryne	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Atrazine	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Diazinon	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Fenamiphos	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Hexazinone	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Metribuzin	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Diuron	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
Oxamyl	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
%moisture	5.9	Percent		7/16/2007	CH	%moisture	

Surrogate Data

Sample Number 070712032-006

Surrogate Standard	Method	Percent Recovery	Control Limits
Terphenyl-d14	EPA 8270C	105.0	30-140

Comments:

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AIEA, HI 96701-3900
Attn: YVONNE PARRY

Batch #: 070712032
Project Name: HQG0016

Analytical Results Report

Sample Number 070712032-007
Client Sample ID HQG0016-07
Matrix: Soil

Sampling Date 6/29/2007
Sampling Time 11:10 AM

Date/Time Received 7/12/2007 11:00 AM
Extraction Date 7/12/2007

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Ametryne	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Atrazine	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Diazinon	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Fenamiphos	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Hexazinone	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Metribuzin	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Diuron	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
Oxamyl	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
%moisture	5.6	Percent		7/16/2007	CH	%moisture	

Surrogate Data

Sample Number 070712032-007

Surrogate Standard	Method	Percent Recovery	Control Limits
Terphenyl-d14	EPA 8270C	117.8	30-140

Comments:

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AIEA, HI 96701-3900
Attn: YVONNE PARRY

Batch #: 070712032
Project Name: HQG0016

Analytical Results Report

Sample Number 070712032-008
Client Sample ID HQG0016-08
Matrix: Soil

Sampling Date 6/29/2007
Sampling Time 12:10 PM

Date/Time Received 7/12/2007 11:00 AM
Extraction Date 7/12/2007

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Ametryne	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Atrazine	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Diazinon	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Fenamiphos	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Hexazinone	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Metribuzin	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Diuron	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
Oxamyl	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
%moisture	4.8	Percent		7/16/2007	CH	%moisture	

Surrogate Data

Sample Number 070712032-008

Surrogate Standard	Method	Percent Recovery	Control Limits
Terphenyl-d14	EPA 8270C	128.4	30-140

Comments:

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Attn: YVONNE PARRY

Batch #: 070712032
Project Name: HQG0016

Analytical Results Report

Sample Number 070712032-009
Client Sample ID HQG0016-09
Matrix: Soil

Sampling Date 6/29/2007
Sampling Time 2:10 PM

Date/Time Received 7/12/2007 11:00 AM
Extraction Date 7/12/2007

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Ametryne	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Atrazine	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Diazinon	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Fenamiphos	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Hexazinone	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Metribuzin	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Diuron	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
Oxamyl	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
%moisture	6	Percent		7/16/2007	CH	%moisture	

Surrogate Data

Sample Number 070712032-009

Surrogate Standard	Method	Percent Recovery	Control Limits
Terphenyl-d14	EPA 8270C	125.0	30-140

Comments:

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Client: TEST AMERICA - HONOLULU, HI
Address: 99-193 AIEA HEIGHTS DRIVE
AIEA, HI 96701-3900
Attn: YVONNE PARRY

Batch #: 070712032
Project Name: HQG0016

Analytical Results Report

Sample Number 070712032-010
Client Sample ID HQG0016-10
Matrix: Soil

Sampling Date 6/29/2007
Sampling Time 3:10 PM

Date/Time Received 7/12/2007 11:00 AM
Extraction Date 7/12/2007

Parameter	Result	Units	PQL	Analysis Date	Analyst	Method	Qualifier
Ametryne	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Atrazine	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Diazinon	ND	mg/Kg	0.05	7/26/2007	EMP	EPA 8270C	
Fenamiphos	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Hexazinone	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Metribuzin	ND	mg/kg	0.05	7/26/2007	EMP	EPA 8270C	
Diuron	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
Oxamyl	ND	mg/kg	0.02	7/25/2007	TGT	EPA 8321A	
%moisture	5.6	Percent		7/16/2007	CH	%moisture	

Surrogate Data

Sample Number 070712032-010

Surrogate Standard	Method	Percent Recovery	Control Limits
Terphenyl-d14	EPA 8270C	112.6	30-140

Authorized Signature

MCL EPA's Maximum Contaminant Level
ND Not Detected
PQL Practical Quantitation Limit

Comments:

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Email: moscow@anateklabs.com

Pesticide Screen EPA 8270C-MOD - Quality Control Report

Lab #	070712032-010
Blank	MB 7/12
Units	mg/Kg
Sample	
Extract date	7/12/2007
Analysis date	7/26/2007

Analyte	BLANK	Spike	LCS	%R	%R AR	LCS %R Failure
Diazinon	0.00	1.00	0.94	93.9	50-150	
Atrazine	0.00	1.00	0.62	61.8	50-150	

Analyte	Sample	Spike	MS	%R	MSD	%R	RPD	RPD AR	%R AR	MS %R Failure	MSD %R Failure	RPD Failure
Diazinon	0.00	1.00	1.01	100.7	1.01	101.0	0.3	25	50-150			
Atrazine	0.00	1.00	0.62	62.3	0.58	57.5	7.9	25	50-150			

R>2S = Result is more than 2X the spike added

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EPA 8321MOD - MS/LFB Report

Lab #	070712032-010
Units	mg/Kg
Extraction date	7/13/2007
Analysis date	7/25/2007

Analyte	Sample	Spike	MS	%R	MS %R Failure
Diuron	0.00	0.1	0.0865	86.5	
Bromacil	0.00	0.1	0.106	106	
Oxamyl	0.00	1.0	0.556	55.6	

Lab #	070712032-010
Units	mg/Kg
Extraction date	7/13/2007
Analysis date	7/25/2007

Analyte	Sample	Spike	MS	%R	MS %R Failure
Diuron	0.00	0.1	0.0745	74.5	
Bromacil	0.00	0.1	0.104	104	
Oxamyl	0.00	1.0	0.774	77.4	

Lab #	LCS
Units	mg/Kg

Analyte	BLANK	Spike	LFB	%R	%R AR	LCS %R Failure
Diuron	0.00	0.1	0.0776	77.6	25-150	
Bromacil	0.00	0.1	0.0664	66.4	25-150	
Oxamyl	0.00	1	0.624	62.4	25-150	

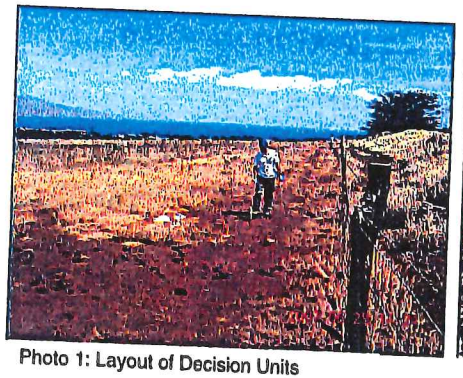


Photo 1: Layout of Decision Units

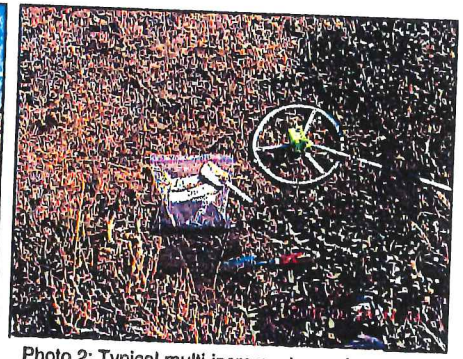


Photo 2: Typical multi-increment sample.

Photo 3: Boring for volatile sample collection.

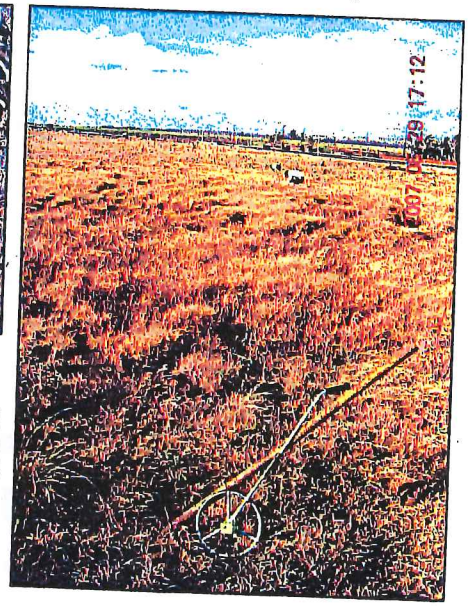


Photo 4: Sampling row for multi-increment sampling.

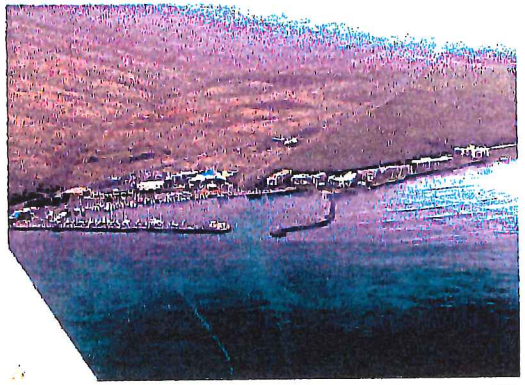
Photo 5: Drum area sample collection.

Appendix P

Water Quality and Marine Biological Resources Survey

AECOS No. 1094

Maalaea Mauka Development: Water Quality and Marine Biology of Ma'alaea Harbor and Nearby Ma'alaea Bay



Ma'alaea aerial view from the south Photo credit: NOAA/NOS

AECOS, Inc.
45-939 Kamehameha Highway, Room 104
Kane'ohe, Hawai'i 96744

September 5, 2006

Maalaea Properties is proposing to develop a residential community on a 260 acre parcel on the central Maui plain above Ma'alaea Small Boat Harbor. In 2005, *AECOS* undertook surveys of the water quality and biota of the adjacent marine area to assess "baseline" conditions. Overall, waters adjacent to the shore at Ma'alaea are generally murky with re-suspended sediments, have high nutrient levels, have most hard surfaces covered by seaweed, and support almost no live coral. Conversely, just offshore (at and exceeding about 6 ft depth), waters are generally clear, nutrient levels are lower, seaweed cover is less, and live coral cover ranges from 5% to over 50% of available hard bottom.

The water quality of northwest Ma'alaea Bay is degraded and does not meet the Water Quality Standards set by the Hawaii Department of Health for most nutrients (nitrate + nitrite, total nitrogen, and total phosphorus), chlorophyll α (an indicator of phytoplankton growth), and turbidity (an indicator of suspended sediments). These waters appear to be largely affected by groundwater inputs and not surface water run-off. However, during infrequent major storm events, surface water runoff is significant and is the primary source of particulates to nearshore waters.

New buildings, roads, and sidewalks to be built as part of this project will increase the amount of impervious surfaces in the watershed, leading to a reduction in rainfall infiltration into the ground and an increase in peak runoff. The runoff from the development project may reach the nearshore community via existing drainage systems and affect Kapoli Beach Park, Ma'alaea Small Boat Harbor, and Kanaio Beach.

The nearshore marine community of northwest Ma'alaea Bay is quite variable, ranging from the sand and mud bottom within Ma'alaea Small Boat Harbor to a reef supporting in excess of 50% coral cover found off Kanaio. The nearshore marine community is adapted to elevated levels of silt and sediment associated with runoff, especially along the shoreline and in the Harbor where many silt-tolerant species occur. However, of particular concern are the impacts on algal and coral communities that could be subjected to project associated runoff.

During the construction phase, it will be necessary to: (1) employ Best Management Practices (BMPs) to prevent soil erosion and surface runoff from getting into the Bay; (2) have detention basins in place and functional prior to other land grubbing and grading; and (3) develop a water quality monitoring program to ensure the short and long-term effectiveness of the BMPs. Limiting early site grading work to the dry season on Maui can reduce runoff impacts. If proper BMPs are employed during construction and runoff into the nearshore waters minimized, the proposed development should have minimal long-term adverse effects on the nearby marine communities.

Maalaea Mauka Development: Water Quality and Marine Biology of Ma'alaea Harbor and Nearby Ma'alaea Bay[1]

September 5, 2006 *AECOS* No. 1094

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Introduction

Ma'alaea Properties, LLC is proposing the development of a 260 acre parcel on the central Maui plain above Ma'alaea Small Boat Harbor, Wailuku District, Island of Maui, Hawai'i (Fig. 1). The now vacant agricultural lands proposed for development are on the mauka side of Honoapiilani Highway, beginning near the intersection of Honoapiilani and Kuihelani highways and extending southwest nearly to the west intersection of Honoapiilani Highway and Ma'alaea Road (Fig. 2).

The proposed project includes construction of a residential development with approximately 950 single family and multi-family dwelling units and some 27 acres set aside for open space. The creation of buildings, roads, and sidewalks will increase the impervious surfaces and lead to a reduction in rainfall infiltrated into the ground. Increased peak runoff flow from the development is to be addressed by a series of drainage detention basins on the mauka (mountain) side of Honoapiilani Highway (M & E Pacific, 2005).

The purpose of this report is to identify sensitive biological resources in the nearby marine environment that may be potentially impacted by runoff associated with the proposed development. This report includes results from a marine biological survey and water quality sampling in nearshore waters of Ma'alaea Bay and Ma'alaea Small Boat Harbor into which drainage from the project area may flow. The survey

[1] This document has been prepared for Ma`alaea Properties, LLC for inclusion in an Environmental Assessment entitled "Environmental Impact Statement for Proposed Maalaea Mauka Residential Subdivision" and will therefore become part of the public record.

area spans the coastline from Kapoli Park, west of the Boat Harbor, to Kanaio drainage ditch and includes the Boat Harbor itself.

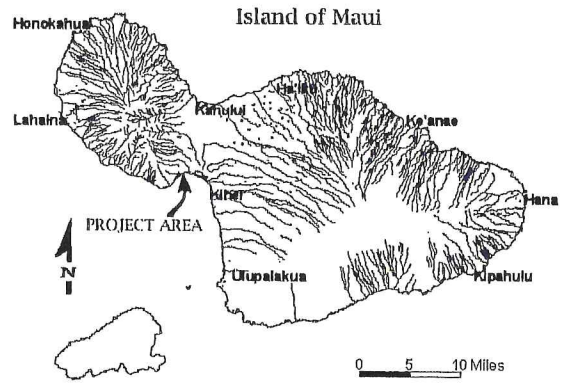

Figure 1. Project location at Ma'alaea on the Island of Maui.

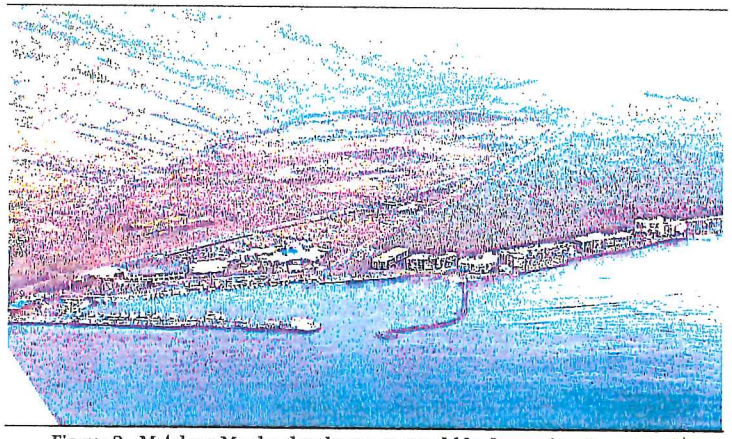

Figure 2. Ma'alaea Mauka development would be located in the area of agricultural lots across Honoapiilani Highway from Ma'alaea (upslope, behind the harbor in this aerial photograph from NOAA/NOS, 2003).

Methods

Water Quality Survey

Water quality samples were collected for this survey on three different occasions (September 9, 2005; January 12, 2006; and June 2, 2006) on four nearshore transects in the vicinity of potential drainage discharges from the Maalaea Mauka Project area. Each transect included a shoreline station and a station at or close to the 6 ft (2 m) depth contour directly offshore from the shoreline station (Fig. 3). These water samples were collected to update an existing data base on water quality conditions in and near Ma'alaea Small Boat Harbor where potential drainage discharges from the project would go.

Water samples were analyzed for physical parameters (salinity, temperature, pH, dissolved oxygen, turbidity, and total suspended solids), for nutrients (ammonia, nitrate+nitrite, total nitrogen and total phosphorus), and for chlorophyll α. Temperature, pH, salinity, and dissolved oxygen (DO) were measured in the field. Samples for turbidity, salinity, total suspended solids (TSS), nutrients and chlorophyll were collected in appropriate containers, placed on ice, and taken to *AECOS*, Inc. laboratory on O'ahu for analyses. The analytical methods and instruments used on these samples are presented in Table 1.

Table 1. Analytical methods used in the water quality sampling program for the Ma`alaea Mauka Project.

Analysis	Method	Reference	Instrument
Ammonia	alkaline phenol	Karoleff in Grasshoff et al. (1986)	Technicon AutoAnalyzer II
Chlorophyll α	10200 H	Standard Methods, 18th Edition (1992)	Turner Model 112 fluorometer
Dissolved Oxygen	EPA 360.1	EPA (1979)	YSI Model 550 DO meter
Nitrate + Nitrite	EPA 353.2	EPA (1993)	Technicon AutoAnalyzer II
pH	EPA 150.1	EPA (1993)	SA 250
Salinity	bench salinometer	Grasshoff in Grasshoff et al. (1986)	AGE Model 2100 salinometer
Temperature	Thermister calibrated to NBS cert. thermometer (EPA 170.1)	EPA (1979)	YSI Model 550 DO meter
Total Nitrogen	persulfate digestion/EPA 353.2	D'Elia et al. (1977) / EPA (1993)	Technicon AutoAnalyzer II

Table 1 (continued).

Analysis	Method	Reference	Instrument
Total Phosphorus	persulfate digestion/EPA 365.1	Karoleff in Grasshoff et al. (1986)/EPA (1993)	Technicon AutoAnalyzer II
Total Suspended Solids	Method 2540D (EPA 160.2)	Standard Methods 18th Edition (1992); EPA (1979)	Mettler H31 balance
Turbidity	Method 2130B (EPA 180.1)	Standard Methods 18th Edition (1992); EPA (1993)	Hach 2100P Turbidimeter

D'Elia, C.F., P.A. Stendler, & N. Corwin. 1977. *Limnol. Oceanogr.* 22(4): 760-764.
EPA. 1979. Methods for Chemical Analysis of Water and Wastes. U.S. Environmental Protection Agency, EPA 600/4-79-020.
EPA. 1993. Methods for the Determination of Inorganic Substances in Environmental Samples. EPA 600/R-93/100.
EPA. 1994. Methods for Determination of Metals in Environmental Samples, Supplement 1. EPA/600/R-94/111. May 1994.
Grasshoff, K., M. Ehrhardt, & K. Kremling (eds). 1986. Methods of Seawater Analysis (2nd ed). Verlag Chemie, GmbH, Weinheim.
Standard Methods. 1992. Standard Methods for the Examination of Water and Wastewater, 18th Edition. 1992. (Greenberg, Clesceri, and Eaton, eds.). APHA, AWWA, & WEF. 1100 p.

Marine Biological Survey

On September 30, 2005 a marine reconnaissance survey was undertaken by AECOS biologists snorkeling three areas likely to be impacted by storm water runoff originating from the project area. These survey areas are shown in Fig. 3 and, from west to east, are referred to as south breakwater, east of east breakwater, and Kanaio drainage. Species of macroalgae and marine animals observed in each of the three areas were recorded and estimates of relative abundances noted. The faunal survey included species of fishes, coral, and other macro-invertebrates. Cryptic and nocturnal species were likely not encountered or noted during this daytime survey.

To survey the south breakwater area, biologists snorkeled from Kapoli Beach Park parallel to the breakwater and out to the 6 ft (2 m) depth contour. To survey the east of east breakwater area, biologists started adjacent to the Maalaea Kai condominium and swam perpendicular to shore out to the 6 ft (2 m) depth contour. To survey the Kanaio drainage ditch area, biologists swam perpendicular to the shoreline beginning on either side of a shallow shoal between Island Sands and Banyans condominiums and out to the 6 ft (2 m) depth contour.

Most specimens encountered were identified in the field based on the experience of the biologists and various published texts: algae were identified using Magruder and Hunt (1979), Abbott (1999), and Abbott and Huisman (2004); coral species were identified using Fenner (2005), macroinvertebrates were identified using Hoover (1998); and fish species were identified using Randall (1996) and Hoover (1993).

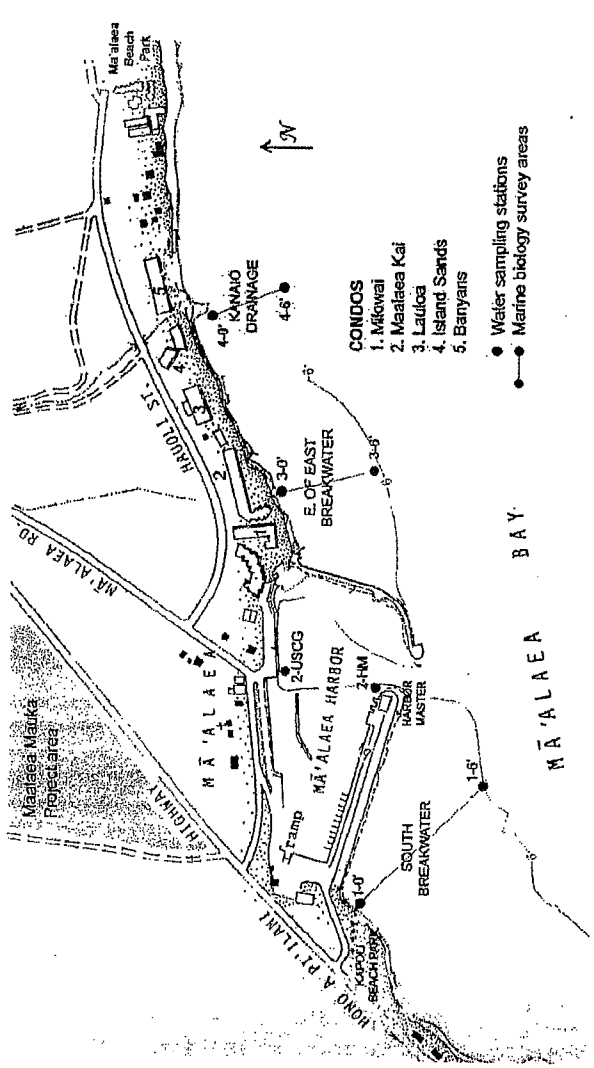

Figure 3. Location of the September 30, 2005 marine biological survey areas and water quality sample stations for the Maalaea Mauka Project (base map from *AECOS*, 1980).

Water Quality

Ma'alaea Bay is a large open bight on the southern coast of Maui. Bay waters are subject to the water quality standards and criteria of Hawaii Administrative Rules Title 11, Department of Health Chapter 54, Water Quality Standards (HDOH, 2004) and classified as Class A open coastal waters. Ma'alaea Boat Harbor is classified by these State regulations as a Class A embayment. The objective of Class A waters is that their use for recreational purposes and aesthetic enjoyment be protected. Any other use shall be permitted as long as it is compatible with the protection and propagation of fish, shellfish, and wildlife, and with recreation in and on these waters (HDOH, 2004).

Historical Review

Department of Health monitoring

The Hawaii Department of Health (HDOH) maintains a coastal water quality monitoring program that includes Ma'alaea Boat Harbor and several beaches along the east side of Ma'alaea Bay between Kihei and Makena. Water quality data for these sites were obtained from the EPA STORET database (USEPA, 2005) and are described herein based on sampling off four beaches along the Kihei-Wailea coastline of Ma'alaea Bay and southward. These beach locations are indicated in Figure 4. The data are summarized in Table 2 and represent samples collected between 1990 and 2005.

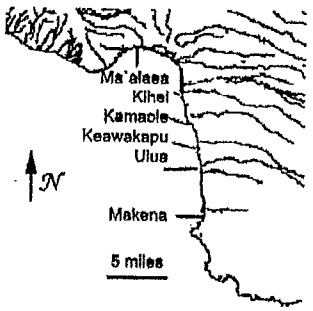

Figure 4. The four beach (Kihei, Kamaole, Keawakapu, and Ulua) and Ma'alaea Boat Harbor locations where water quality data were collected by HDOH in Ma'alaea Bay on the Island of Maui.

Table 2. Historic water quality data from selected nearshore areas along the Ma'alaea-Kihei-Makena coast (after USEPA, 2005).

Location (Collection Period)		Salinity (ppt)	Temp. (°C)	DO sat. (ppt)	pH	Turbidity (ntu)	NO_3+NO_2 (µg N/l)	Total N (µg N/l)	Total P (µg P/l)	Chl. α (µg/l)
Ma'alaea Boat Harbor (9/90 – 01/06)	mean	34.00	25.0	96	8.2	3.80	33.4	218	21.8	0.77
	range	31.0 - 35.4	18.7 - 28.2	55 - 134	7.6 - 8.8	0.6 - 142	0.5 - 200	100 - 530	11.0 - 100	0.10 - 19.4
	n	*403*	*328*	*289*	*181*	*308*	*51*	*26*	*41*	*50*
Kihei Beach Park (09/89 – 08/90)	mean	28.63	22.3	80	8.1	2.30	82	402	55.0	64.50
	range	21.90 – 31.50	19.0 – 26.8	45 – 130	8.0 - 8.1	0.48 – 5.09	10 – 560	100 – 860	31 – 96	4.40 – 417
	n	*12*	*12*	*12*	*10*	*10*	*12*	*9.0*	*12*	*12*
Kamaole Beach (09/90 - 12/98)	mean	34.08	24.7	72	8.2	0.66	44	147	10.2	0.52
	range	32.00 - 35.00	19.0 - 28.6	72 - 86	7.2 - 8.9	0.05 - 4.2	2.7 - 232	71 - 316	5.0 - 24	0.07 - 10.3
	n	*113*	*62*	*51*	*53*	*38*	*41*	*41*	*25*	*50*
Keawakapu Beach (09/90 – 12/98)	mean	34.57	24.6	87	8.2	0.92	28	126	9.7	0.91
	range	33.00 – 35.20	19.3 – 28.8	71 – 112	7.7 - 8.9	0.15 - 3.0	1.6 - 105	71 – 360	3.7 – 22	0.08 -11.1
	n	*106*	*55*	*43*	*47*	*31*	*41*	*41*	*41*	*41*
Ulua Beach (09/90 – 12/98)	mean	34.44	25.0	108	8.2	0.87	45	142	9.4	0.66
	range	32.73 – 35.20	19.20 – 29.3	89 – 134	7.2 - 8.9	0.22 – 6.00	4.6 – 351	15.9 – 460	2.5 – 112	0.04 – 0.66
	n	*110*	*61*	*49*	*52*	*37*	*40*	*49*	*40*	*48*

Average salinity levels and temperature values were quite similar at all of the monitored stations with the exception of Kihei Beach Park where both salinity and temperature means were notably lower. Salinity was consistently low at Kihei Beach Park as indicated by the range of salinities over the monitoring period (21.9 - 31.5 ppt) and indicates that there is a more or less continuous input of fresh water at this location. The average pH at Kihei Beach Park was also slightly lower than the other three locations. Mean dissolved oxygen (DO) saturation levels were quite variable between the four stations. Geometric mean values for turbidity ranged from a low of 0.66 ntu at Kama'ole Beach to a high of 3.80 ntu in Ma'alaea Boat Harbor. The lowest geometric mean nutrient levels occurred at Kama'ole Beach and the highest at Kihei Beach Park, while the lowest chlorophyll levels were noted at Ulua Beach and the highest at Kihei Beach Park.

Table 3. A summary of the physical water quality parameters measured in the nearshore waters of Ma'alaea Bay and Ma'alaea Small Boat Harbor (*AECOS*, 1994).

Station		Salinity (ppt)	Temp. (°C)	DO sat. (%)	pH	Turbidity (ntu)	TSS (mg/l)
1 - 0							
	mean	33.63	25.5	112	8.43	2.48	5.2
	range	33.34 - 33.88	24.2 - 26.5	103 - 122	8.42 - 8.44	1.65 - 3.21	4.2 - 7.4
	n	*3*	*3*	*2*	*3*	*3*	*3*
1 - 6							
	mean	34.40	25.3	95	8.29	0.77	2
	range	34.27 - 34.57	---	---	8.20 - 8.41	0.68 - 1.01	1.5 - 3.4
	n	*5*	*1*	*1*	*3*	*6*	*5*
2 - USGS							
	mean	32.43	25.5	87	8.22	3.11	5.7
	range	32.15 - 32.63	25.3 - 25.8	83 - 90	8.20 - 8.24	2.02 - 4.85	5.5 - 6.0
	n	*3*	*3*	*2*	*3*	*3*	*3*
2 - HM							
	mean	33.54	25.8	94	8.28	1.46	2.9
	range	33.41 - 33.77	25.6 - 26.0	91 - 98	8.26 - 8.30	1.24 - 1.64	2.6 - 3.3
	n	*3*	*3*	*2*	*3*	*3*	*3*
3 - 0							
	mean	29.59	26.7	189	8.59	2.67	6.4
	range	27.45 - 33.79	26.5 - 27.0	173 - 205	8.50 - 8.70	1.40 - 5.08	4.1 - 10.1
	n	*3*	*3*	*2*	*3*	*2*	*2*
4 - 0							
	mean	33.5	25.7	105	8.33	3.58	12.1
	range	---	---	---	---	---	---
	n	*1*	*1*	*1*	*1*	*1*	*1*

Maui Ocean Center

AECOS prepared an Environmental Assessment for Maalaea Triangle and Maui Ocean Center (*AECOS*, 1994) and collected samples from several of the same stations that

were sampled during the present survey. The water quality results from this earlier survey are presented in Tables 3 (above) and 4. Note that in these tables station designations from the earlier survey have been changed to correspond to station naming convention used in the present survey.

Table 4. A summary of the nutrient and chlorophyll water quality parameters measured in the nearshore waters of Ma'alaea Bay (*AECOS*, 1994).

Station	NH_3 (µg N/l)	NO_3+NO_2 (µg N/l)	TN (µg N/l)	TP (µg P/l)	Chl. α (µg/l)
1 - 0					
mean	7	24	168	14	1.00
range	5 - 9	12 - 51	137 - 201	11 - 15	0.84 - 1.12
n	*3*	*3*	*3*	*3*	*3*
1 - 6					
mean	2	22	137	15	0.39
range	2 - 3	16-26	128 - 153	10 - 21	0.24 - 0.52
n	*3*	*3*	*3*	*3*	*3*
2 - USGS					
mean	19	217	342	39	1.08
range	15 - 22	192 - 264	315 - 399	34 - 44	0.91 - 1.35
n	*3*	*3*	*3*	*3*	*3*
2 - HM					
mean	12	82	219	21	0.83
range	10 - 13	69 - 98	205 - 226	20 - 21	0.61 - 1.35
n	*3*	*3*	*3*	*3*	*3*
3 - 0					
mean	6	171	446	35	2.45
range	<1 - 24	61 - 320	361 - 511	28 - 48	2.04 - 2.94
n	*3*	*3*	*3*	*3*	*2*
4 - 0					
mean	5.5	88	232	32	3.7
range	5 - 6	70 - 111	196 - 275	21 - 48	---
n	*2*	*2*	*2*	*2*	*1*

Salinity levels in the, 1994, study ranged from a low of 27.45 ppt at Sta. 3-0 to a high of 34.57 ppt at Sta. 1-6, while mean temperature varied from 24.2 'C at Sta. 1-0 to 27.0 'C at Sta. 2-USGS (Table 2). pH ranged from a low of 8.20 at Sta. 1-6 and Sta. 2-USGS to a high of 8.70 at Sta. 3-0. Dissolved oxygen (DO) saturation levels were quite variable with a range from 83% of saturation at Sta. 2-USGS to 205% at Sta. 3-0. Turbidity values ranged from 0.68 ntu at Sta. 1-6 to 5.08 ntu at Sta. 3-0, while total suspended solids (TSS) varied from 1.5 mg/l at Sta. 1-6 to 12.1 mg/l at Sta.4-0.

Ammonia concentrations ranged from undetectable at Sta. 3-0 to 24 µg/l at the same station. Nitrate + nitrite concentrations were variable, ranging from 12 µg N/l at Sta. 1-0 to 320 µg N/l at Sta. 3-0. Total nitrogen (TN) varied from 137 µg N/l at Sta. 1-0 to 511 µg N/l at Sta. 3-0, while total phosphorus (TP) varied from 10 µg P/l

at Sta. 1-6 to 48 µg P/l at Sta. 3-0 and Sta. 4-0. Chlorophyll ranged from 0.24 µg/l at Sta. 1-6 to 3.7 µg/l at Sta. 4-0.

Maui and Molokai TMDL

A DOH project entitled "Maui and Molokai TMDL" (TMDL = Total Maximum Daily Load) included (in addition to other locations on Maui and Moloka'i) a series of sampling events at stations scattered along the shoreline of Ma'alaea Bay from Ma'alaea Boat Harbor in the northwest to Keawakapu (see Fig. 4) in the south (Laws, 2001). These samples were collected mostly at the mouths of drainage discharge points between December 2000 and March 2001. The results from these sampling events are presented in Table 5.

Table 5. Geometric mean concentrations of water quality parameters at nearshore stations in the Ma'alaea/Kihei area (after Laws, 2001).

Station	Salinity (ppt)	Tubidity (ntu)	TSS (mg/L)	TDP† (µg P/L)	NO_3+NO_2 (µg N/L)	NH_3 (µg N/L)	TDN† (µg N/L)	Chl. α (µg/L)
Ma'alaea harbor	31.3	9.7	35.1	17.98	208.6	5.2	402	5.1
Kealia Pond	35.4	1.4	20.3	6.51	2.8	1.0	113	0.5
Mokulele	34	3.4	33.1	9.92	56	1.3	234	1.5
Kaunoulu	30.9	9.6	47.9	8.99	247.8	1.5	389	1.8
Kalepolepo Pond	32.6	5.2	29.9	7.13	75.6	2.8	234	1.4
Kulanihakoi	32.3	23.7	64.9	9.3	100.8	5.2	281	3.3
Luana Kai	33.1	16.1	45.7	6.82	29.4	8.7	218	1.4
South Lipoa	32.8	8.8	35.6	7.13	8.4	1.5	147	0.9
Kalama Park	34	20.7	57.7	8.68	8.4	6.0	182	3.2
Cove Park	32.7	6.5	33.6	18.6	134.4	1.1	295	2.3
Maui Coast	34.9	1.8	22.3	8.37	15.4	1.3	125	0.7
South Kamaole II	35.1	1.1	21.4	9.92	18.2	1.5	123	0.6
Kihei Boat Ramp	28.2	3.3	22.8	8.99	291.2	1.4	759	1.4
Keawakapu	35.3	1.2	21.5	7.13	19.6	1.4	140	0.8

† TDP and TDN represent total dissolved phosphorus and nitrogen respectively as opposed to total phosphorus and total nitrogen and therefore are not directly comparable with State water quality criteria or other nitrogen and phosphorus values presented in this report.

In general, the values reported by Laws fall within the ranges reported elsewhere in this document with several exceptions. The TSS results are unrealistically high and likely caused by some procedural or analytical error. Typically such values suggest that the filters were not well washed with distilled water prior to drying, so the weight of the salt on the filter is included in the suspended solids weight. Another common source of deviation from typical values comes from sampling in the surf zone, which causes fine sand to be incorporated in the TSS sample (not an error, but results in elevated TSS and poor correspondence between TSS and turbidity). The mean nitrate + nitrite concentration in Ma'alaea Boat Harbor is high compared

with other studies at this location. This result might be from the specific sampling site; i.e., samples collected closer to the actual land discharge site compared with the other surveys. The values reported for total dissolved phosphorus and nitrogen are expectedly low compared with other surveys which measured total phosphorus and total nitrogen levels (i.e., both dissolved and particulate fractions) as required by HDOH protocols. Based on the results of his study, Laws (2001) concluded that much of the nutrient enrichment occurring in the coastal waters of Ma'alaea Bay was related to groundwater inputs.

2005-2006 (Present) Survey

The results from the 2005-06 sampling events are presented in Table 6. Salinity was consistently lower at the shoreline stations (Sta. 1-0, Sta. 2-USCG, Sta. 3-0 and Sta. 4-0) compared with those stations along the 6 ft (2 m) depth contour (Table 6). Also, at the shoreline stations, average salinity tended to decrease from west to east; i.e., from Sta. 1-0 to Sta. 4-0, except at Station 3-0 which had the lowest mean salinity. Average salinity at the 6 ft (2 m) contour stations did not show such a trend. Temperature values did not show any trends moving away from the shoreline, but average temperature values did increase from west to east at the shoreline stations.

Dissolved oxygen (DO) saturation levels were generally higher at the shoreline stations when compared with stations further out, except within Ma'alaea Boat Harbor where the average DO saturation level was higher at Sta. 2-HM nearer the harbor mouth. pH did not demonstrate any particular trends, ranging from a low of 7.81 at Sta.3-0 to a high of 8.42 at Sta. 4-0. Particulate levels (turbidity and TSS) were consistently higher at the shoreline stations when compared with the 6 ft (2 m) depth contour stations.

Table 6. Physical water quality characteristics in Ma'alaea Bay and Harbor from the 2005-06 survey.

Station Date	Salinity (ppt)	Temp (°C)	DO sat. (%)	pH	Turbidity (ntu)	TSS (mg/l)
1 - 0						
9-Sep-05	35	26.7	101	8.26	2.76	8.8
12-Jan-06	33.1	23.2	93	8.11	1.70	7.6
2-Jun-06	33.95	24.8	99	8.07	4.38	11.3
Mean	**34.0**	**24.9**	**98**	**8.15**	**2.74**	**9.1**
1 - 6						
9-Sep-05	35	26.5	90	8.15	0.74	5.6
12-Jan-06	34.5	23.6	91	8.14	1.04	2.5
2-Jun-06	34.40	24.7	95	8.04	2.38	11.4
Mean	**34.6**	**24.9**	**92**	**8.11**	**1.22**	**5.4**

Table 6 (continued).

Station Date	Salinity (ppt)	Temp (°C)	DO sat. (%)	pH	Turbidity (ntu)	TSS (mg/l)
2 - USCG						
9-Sep-05	35	27.0	89	8.13	1.42	5.3
12-Jan-06	34.0	23.5	85	8.12	0.84	4.9
2-Jun-06	32.57	25.2	92	8.02	4.24	14.7
Mean	**33.7**	**25.2**	**89**	**8.09**	**1.72**	**7.3**
2 - HM						
9-Sep-05	35	26.6	90	8.15	0.88	5.1
12-Jan-06	34.3	23.5	92	8.16	0.82	2.8
2-Jun-06	33.80	25.0	92	8.02	3.60	14.2
Mean	**34.4**	**25.0**	**91**	**8.11**	**1.37**	**5.9**
3 - 0						
9-Sep-05	34	27.9	147	8.34	1.40	9.1
12-Jan-06	30.3	24.3	71	7.81	3.72	13.6
2-Jun-06	32.12	25.5	117	8.18	3.07	13.7
Mean	**32.1**	**25.9**	**112**	**8.11**	**2.52**	**11.9**
3 - 6						
9-Sep-05	35	27.6	84	8.20	0.65	3.9
12-Jan-06	33.6	23.5	96	8.18	0.92	5.2
2-Jun-06	34.66	25.1	99	8.13	1.19	5.7
Mean	**34.4**	**25.4**	**93**	**8.17**	**0.89**	**4.9**
4 - 0						
9-Sep-05	34	27.7	145	8.42	2.53	11.1
12-Jan-06	30.1	25.5	96	8.05	3.58	31.8
2-Jun-06	32.83	26.8	105	8.16	2.95	14.8
Mean	**32.3**	**26.7**	**115**	**8.21**	**2.99**	**17.4**
4 - 6						
9-Sep-05	35	27.6	93	8.22	0.67	6.3
12-Jan-06	32.9	24.1	104	8.16	1.11	5.0
2-Jun-06	34.58	25.7	96	8.11	1.50	8.8
Mean	**34.2**	**25.8**	**98**	**8.16**	**1.04**	**6.5**

The results of nutrient and chlorophyll α analyses are presented in Table 7. Ammonia nitrogen, an intermediate breakdown product of organic nitrogen, was not present in detectable amounts except at Sta. 3-0 and Sta. 4-0 and then only when salinity levels were <32 ppt (see Table 6), indicating an ammonia source either from groundwater inputs or surface water runoff to these nearshore waters. Shoreline station means for nitrate+nitrite, total nitrogen (TN) and total phosphorus (TP) were greater when compared with the 6 ft (2 m) depth contour stations, except in Ma'alaea Harbor (i.e., Sta. 2-USCG & Sta. 2-HM), demonstrating an influence of

terrestrial inputs on these nutrients. Similarly, there was an increase in mean concentration for these nutrients from west to east at the shoreline stations.

Table 7. Nutrient and chlorophyll α water quality characteristics in Ma'alaea Bay and Harbor for 2005-2006.

Station / Date	NH_3 (µg N/l)	NO_3+NO_2 (µg N/l)	TN (µg N/l)	TP (µg P/l)	Chl. α (µg/l)
Sta. 1- 0					
9-Sep-05	<1	52	202	17	1.72
12-Jan-06	<1	46	179	18	3.38
2-Jun-06	<1	21	175	22	2.50
Mean	**<1**	**37**	**185**	**19**	**2.44**
Sta. 1 - 6					
9-Sep-05	<1	16	138	12	0.41
12-Jan-06	<1	17	161	15	1.04
2-Jun-06	<1	5	163	21	1.93
Mean	**<1**	**11**	**154**	**16**	**0.94**
Sta. 2 - USCG					
9-Sep-05	<1	97	247	21	0.53
12-Jan-06	<1	61	173	17	0.64
2-Jun-06	<1	71	250	30	4.00
Mean	**<1**	**75**	**220**	**22**	**1.11**
Sta. 2 - HM					
9-Sep-05	<1	221	403	36	0.56
12-Jan-06	<1	72	199	16	0.69
2-Jun-06	<1	274	429	55	2.84
Mean	**<1**	**163**	**325**	**32**	**1.03**
Sta. 3 - 0					
9-Sep-05	<1	64	230	17	3.62
12-Jan-06	130	252	835	73	21.1
2-Jun-06	<1	186	440	55	5.05
Mean	**3.2**	**144**	**439**	**41**	**7.28**
Sta. 3 - 6					
9-Sep-05	<1	14	146	12	0.37
12-Jan-06	<1	84	188	11	1.80
2-Jun-06	<1	3	137	19	0.84
Mean		**15**	**156**	**14**	**0.82**

Table 7 (continued).

Station / Date	NH3 (µg N/l)	NO3+NO2 (µg N/l)	TN (µg N/l)	TP (µg P/l)	Chl. α (µg/l)
Sta. 4 - 0					
9-Sep-05	11	292	524	36	5.40
12-Jan-06	10	412	692	71	27.10
2-Jun-06	<1	161	374	35	6.45
Mean	**3.8**	**269**	**514**	**45**	**9.81**
Sta. 4 - 6					
9-Sep-05	<1	13	156	12	0.80
12-Jan-06	<1	161	266	16	2.54
2-Jun-06	<1	5	153	17	1.02
Mean	**<1**	**22**	**185**	**15**	**1.27**

Chlorophyll α distribution was similar to that for nitrate + nitrite, TN and TP with higher concentrations close to the shore and a trend of increasing concentration in the nearshore waters from west to east, exceptions being the Ma'alaea Harbor stations.

To determine if a correlation between salinity and the other water quality parameters exists, a coefficient of determination (the square of the correlation coefficient) was calculated for salinity with each of the other measured water quality parameters (Table 8). The coefficient of determination estimates the amount of variation that can be attributed to the causative parameter—in this case salinity. Thus, while salinity had little effect on the physical parameters measured (i.e., temperature, DO, pH and particulates), it accounted for at least 70 percent of the variation in nitrate+nitrite, TN, TP, and chlorophyll concentrations thus demonstrating the influence of salinity—in this case, terrestrial freshwater inputs—on these particular water quality parameters.

Table 8. A comparison of the correlation coefficient (r) and coefficient of determination (r^2) between salinity and the other water quality parameters.

Coefficient	Temp	DO	DO sat.	pH	Turbidity	TSS
R	0.254	-0.166	-0.094	0.353	-0.655	-0.730
r^2	0.06	0.03	0.01	0.12	0.43	0.53

Coefficient	NH_4	NO_3+NO_2	TN	TP	Chl. α
R	-0.551	-0.836	-0.879	-0.852	-0.836
r^2	0.30	0.70	0.77	0.73	0.70

Marine Biology

Ma'alaea Bay

Ma'alaea Bay is used extensively for public recreation and offers easily accessible reef and offshore areas for pleasure divers and fisherman alike. Ma'alaea Small Boat Harbor is one of only two berthing areas for small craft on Maui. The harbor is the home port of a sport charter fishing fleet, a small commercial fishing fleet, whale watching tour boats, as well as Maui headquarters of the U. S. Coast Guard. The harbor also has a launch ramp which is heavily used by Maui's trailer-boat fishermen (*AECOS*, 1980; 1994).

Historically, the shallow water fauna of western Ma'alaea Bay was considered unusual in several respects. A large number of species uncommon elsewhere were found to be relatively common in Ma'alaea Bay. The variety of sponges and bryozoans, and the highly diverse assemblage of gastropod mollusks historically made Ma'alaea Bay an area of special interest for nature study, photography, and scientific research (Maciolek, 1971). Degraded in recent decades, the current status of these special biological resources in is largely unknown (see Butler, 1975).

The long, continuous sand beach east from Kanaio is readily accessible to the public. The small shore break allows easy entry along its entire length. The ocean is relatively calm, and currents are relatively weak, allowing easy access into the water and safe swimming. The shallow waters, less than 30 ft (10 m) deep, between Kanaio and Palalau (by Kealia Pond) are considered best for snorkeling and diving because of the highly diverse flora and fauna and seasonally clear waters (Clark, 1980). The waters off Kapoli Park (west of the boat harbor) are also used by snorkelers.

At least two reef flat areas near the harbor are popular with *limu* (edible seaweed) gatherers: the shallows off and south of Kapoli Park and the reef flat off Ma'alaea Beach Park (Figure 3). Several popular seaweeds such as *limu manauea* (*Gracilaria coronopifolia*) and *limu huluhuluwaena* (*Grateloupia filicina*) are sought in these areas (McDermid, 1990).

Ma'alaea Bay is within the boundaries of the Hawaiian Islands Humpback Whale National Marine Sanctuary. The sanctuary was established in 1992 to protect endangered humpback whales (*Megaptera novaengliae*) and their habitat (HIHWNMSA, 2005).

Waters off Kapoli Beach Park

The marine reef environment found off of Kapoli Beach Park and Ma'alaea Boat Harbor's south breakwater (essentially southwest of the harbor) have been surveyed

by *AECOS* (2005a, 2005b, 1994), USFWS (1993), McDermid (1990), Brewer (1987), Kinzie (1972), and Maciolek (1971). Images representative of the area in 2005 are provided below as Fig. 5 and biological data are presented in the appendix.

The shoreline at Kapoli Beach Park is a mixed sand and basalt boulder beach, with intertidal boulders near the water line supporting the algae, *Ahnfeltia concinna* and *Chaetomorpha antennina* (present survey; *AECOS*, 1994). Subtidally, the same algal grouping exists with the exception of *C. antennina* which drops out and is replaced by *Ulva fasciata* and *Sargassum echinocarpum* (Fig. 5b). In 1994, *Pterocladia capillacea* was prominent with some *Ulva* (*AECOS*, 1994). Supralittoral invertebrates found here and on the south breakwater include the false limpet (*Siphonaria normalis*), the black nerite (*Nerita picea*), the dotted periwinkle (*Littoraria pintado*), the helmet urchin (*Colobocentrotus atratus*), and grapsid crabs (present survey; Brewer, 1987). Brewer (1987) noted unattached algal mats, mostly of *Hypnea musciformis*.

The bottom grades from smooth rounded boulders and cobbles to a wide flat limestone reef or shelf (*AECOS*, 1994) occurring 8-10 m (26 to 33 ft) offshore of the beach, beyond which (20 m/66 ft offshore) an "undulating surface of limestone ..... slopes gently, forming a reef flat of sorts." Algal coverage is substantial, nearly 100% over large areas close to shore and thinning gradually away from shore (Brewer, 1987; *AECOS*, 1994). Brewer (1987) commented on the "...unusually high diversity and abundance of algal macrophytes" and McDermid's (1990) survey of the algal community off of the south breakwater documented 25 species. Especially notable was an extensive growth of *Grateloupia filicina*, considered a culturally important Hawaiian food resource (Abbott, 1999). In 2005, the area was dominated by lush growths of *Ulva reticulata* and *Acanthophora spicifera* (Fig. 5d). Of the twenty-five species recorded by McDermid and the twenty-eight species recorded by *AECOS* in 2005, eight (*Pterocladia capillacea, Melanamansia glomerata, Acanthophora spicifera, Codium edule, Ulva fasciata, Ulva reticulata, Ahnfeltia concinna*, and *Hypnea musciformis*) are considered to be potential food resources for Green sea turtle (*Chelonia mydas*; Forsyth and Balazs, 1989; Russel and Balazs, 2000).

Macro-invertebrates of the reef platform include sea urchins and sea cucumbers, including: blue-black urchin (*Echinothrix diadema*), slate-pencil urchin (*Heterocentrotus mammilatus*), rock-boring urchin (*Echinometra mathaei*), collector urchin (*Tripneustes gratilla*), black sea cucumber (*Holothuria atra*), and white-spotted sea cucumber (*Actinopyga mauritiana*; present survey, 2005; *AECOS*, 1994; USFWS, 1993; Brewer, 1987). Scattered coral colonies (*Porites lobata, Poc. meandrina*, and *Poc. damicornis*) in this area often appeared stunted in their growth form likely due to the shallow, wave-swept conditions.

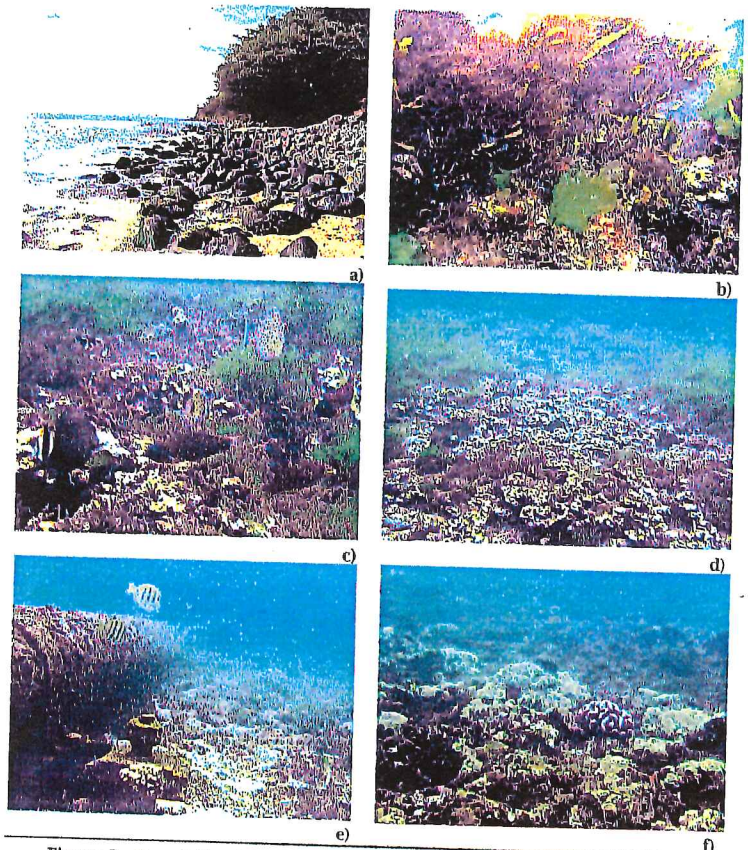

Figure 5. Kapoli Beach Park marine biological survey area, nearshore to offshore. a) Kapoli Park shoreline; b) alga rich shallows (*Hypnea musciformis, Sargassum,* and *Ulva fasciata);* c) diverse fish life (*Acanthophora spicifera,* and an abundance of *Ulva reticulata);* d) coralline algal consolidated bench; e) pipeline with corals f) low profile corals (*Porites lobata, Montiora capitata, Pocillopora meandrina,* and *Porites compressa*).

USFWS (1993) reported a diverse assemblage of fishes on the reef flat including: butterflyfish (*Chaetodon lunula, C. miliaris, C. ornatisssimus, and C. unimaculatus*), damselfish (*Abudefduf abdominalis* and *Stegastes fasciolatus*), goatfish (*Mulloides flavolineolatus, M. vanicolensis, and Parupeneus multifasciatus*), surgeonfish (*Acanthurus triostegus*), wrasse (*Stethojoulis balteata*), and triggerfish (*Rhinecanthus rectangulus*). Likewise, our 2005 survey revealed a diverse assemblage of fishes (Fig. 5c) on the reef flat with many juveniles present, including juvenile *kala* or unicornfish (*Naso unicornis*) and threadfin butterflyfish (*Chaetodon auriga*). Herbivorous surgeonfish (Acanthuridae) and wrasses (Labridae) made up the majority of fishes at this site with the most abundant being *manini* (*Acanthurus triostegus*), as well as the endemic wrasses, saddle wrasse (*Thalassoma duperrey*) and belted wrasse (*Stethojulis balteata*). Other common fishes include raccoon butterflyfish (*Chaetodon lunula*), brighteye damsel (*Plectroglyphidodon johnstonianus*), reef triggerfish (*Rhinecanthus rectangulus*), black surgeon (*Ctenochaetus strigosus*) and unicornfish (*N. unicornis*).

AECOS (1994) and Brewer (1987) recorded low fish abundances on this reef flat, but found a distinct increase in numbers roughly 90 m (300 ft) south of the breakwater where an increase in vertical relief occurs. The present survey did not survey the benthos this far offshore. Acanthurids were again common including: *A. nigroris, A. achilles, A. glaucopareius, A. olivaceous,* and *Manini* (*Acanthurus triostegus*) (Brewer, 1987). *AECOS* (1994) also mentioned the saddle wrasse (*Thalassoma duperrey*) and Moorish idol (*Zanclus cornutus*). Brewer (1987) noted a "conspicuous" absence of butterflyfishes and goatfishes and suggested a possible link between their absence and heavy sport-fishing and aquarium-fish collecting in the area.

Roughly half way down the length of the south breakwater the limestone bench flattens for a short distance and is covered by a layer of sand. In this area a pair of pipelines (Maui Ocean Center seawater intake lines) cross perpendicular from shore (Fig. 5e) and these now host slightly larger coral colonies of the same species (*Porites lobata, Poc. meandrina,* and *Poc. damicornis*) as observed in closer to shore. A large school of adult unicornfish or *kala* (*Naso unicornis*) was observed here in 2005. Beyond this section, the reef topography becomes increasingly diverse, with crevices and small overhangs. This area had the greatest coral cover observed off Kapoli Beach, roughly 10%, with, in order of abundance, scattered small colonies of *P. lobata, Poc. meandrina,* and *Poc. damicornis* (Fig. 5f).

The reef beyond the bench where the reef slope begins is described as having an increase in coral cover (*AECOS,* 1994; USFWS, 1993; Brewer, 1987). This area was not surveyed by the 2005 survey. The following description of this area is from *AECOS* (1994, p. 64 and 65):

At depths of 5 to 6 m (16 to 20 ft), the bottom remains low relief limestone, but with a silty sand veneer. Corals and other large benthic invertebrates are rare, as are fishes due to a lack of vertical relief or cover.

Kinzie (1972) conducted nine transects from the shore out to depths of -20 m (65 ft) to quantify the benthic biota in Ma'alaea Bay. Two transects were located south of Ma'alaea Harbor, the remainder were to the east. The transect closest to Kapoli Park (No. 2) was laid in an ESE direction from the shoreline about 450 ft SW from the base of the south breakwater. No corals were reported on any of the five 20 meter sections sampled along the No. 2 transect. Coral abundance increased further southward and off McGregor Point [a headland southwest of Ma'alaea Harbor] and Manuohule is luxuriant on the reef front (Kinzie, 1972; *AECOS*, 1980).

Likewise, Brewer (1987) and USFWS (1993) noted a near absence of corals fronting the south breakwater. But further out on the reef slope, Brewer (1987) observed approximately 50% coral cover with *Porites lobata* and *Montipora flabellata* most common and *Porites compressa, Poc. Meandrina, and Poc. damicornis* also present. *AECOS* (1994) also notes a sharp increase in coral cover "... perhaps to 15 to 20 % of the bottom over small areas" on the reef front.

Waters East of East Breakwater

USFWS (1993) surveyed the east breakwater and the "fringing reef flat" off the east breakwater; Brewer (1987) surveyed the base of the east breakwater, but not the adjacent reef flat, and *AECOS* (1994) surveyed the "beachrock shelf" east of the harbor including the waters off Kanaio. Images representative of this area in 2005 are presented in Fig. 6 and biological data are presented in the appendix.

In 1987, Brewer described the rocky intertidal of the east breakwater as having a "prominent yellowish-green band in the upper intertidal zone along the entire length of the breakwater" due to thick growth of *Ahnfeltia concinna*. In 1993, thick stands of *Ahnfeltia concinna* were still seen, as well as *Pterocladia capillacea* attached to the wave-washed boulders (USFWS, 1993). The east breakwater also provided habitat for common intertidal mollusks such as *Nerita picea* and the false limpet (*Siphonaria normalis*) [referred to as *Cellana exarata* by USFWS], as well as rock crab (*Grapsus tenuicrustatus*) and helmet urchin (*Colobocentrotus atratus*; Brewer, 1987; USFWS, 1993). Collector urchins (*Tripneustes gratilla*) were common subtidally. Also noted were small colonies of cauliflower coral (*Poc. meandrina*) and *Poc. damicornis* (referred to as *Poc. cespitosa*) subtidally on the breakwater (Brewer, 1987). Fishes at the breakwater were relatively sparse with the Hawaiian flagtail or *aholehole* (*Kuhlia sandvicensis*) most common, followed in abundance by juvenile wrasses, *manini*, Hawaiian sergeant (*Abudefduf abdominalis*), and *Stegastes faciolatus*, and *Monotaxis grandoculis* (Brewer, 1987).

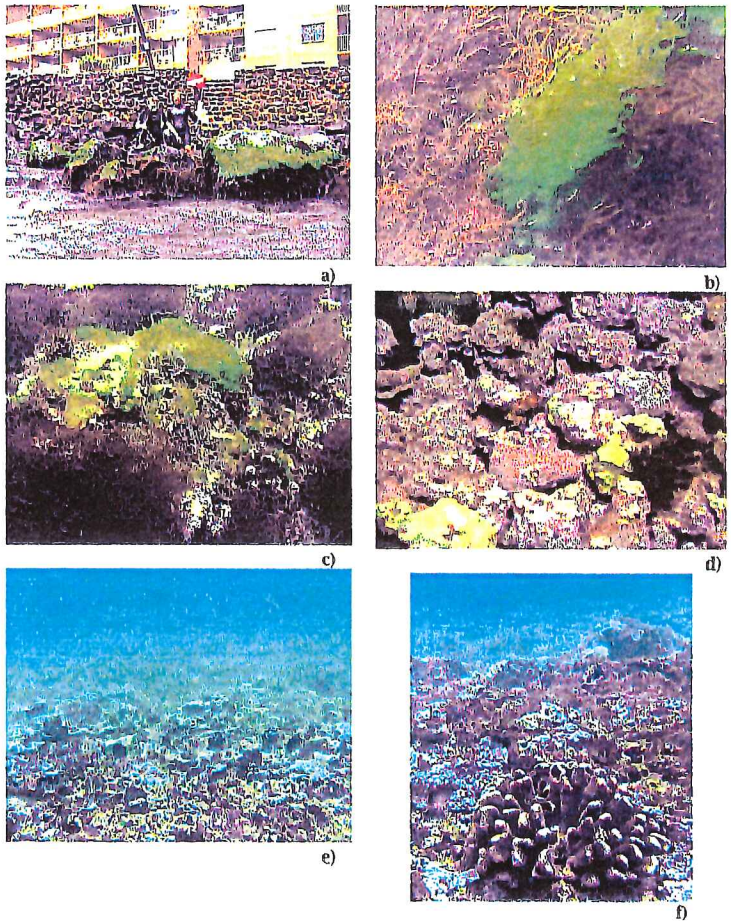

Figure 6. East of east breakwater marine biological survey area; images presented nearshore to offshore: a) algae dominated shoreline; b) boulder with *U. fasciata, Hypnea musciformes* , and *Pterocladiella capillaceae;* c) algal community; d) coralline algal rubble field; e) urchin barren with sparse coral cover; f) corals (*Pocillopora meandrina* and *Montipora flabellata*).

A similar flora and fauna was observed in 2005 close by in the intertidal zone east of the east breakwater. Adjacent to the Maalaea Kai condominium the rocky intertidal is bordered landward by a vertical 2 m (6 ft) rock wall with a section of steps providing access to the water at the shoreline (Fig. 6a, above). The rock and boulder zone that fronts the access point forms a somewhat protected tide pool. The splash zone hosted the thin-shelled rock crab (*Grapsus tenuicrustatus*) and several mollusk species (brown purse shell, black nerite, and dotted periwinkle). The intertidal flora of the wave-washed rocks was similar to that found at the east breakwater and Kapoli Beach except a lush growth of *Ulva fasciata* replaced *Chaetomorpha antennina* alongside *Grateloupia filicina* and *Ahnfeltia concinna* (Fig. 6b). The nearshore waters are murky and heavily littered with drift algae. Due to low visibility conditions, fish observations could not be made here.

Subtidally, the rock and boulder shore gives way to a sand bottom (likely shallow sand over limestone reef) littered with rubble patches and attached algal colonies of *G. filicina* and/or *Hypnea musciformis* (the authors possibly mistook *G. filicina* for *H. musciformis* at times in the field) and the false limpet (*Siphonaria normalis*; Fig. 6c).

Roughly, 10 m (33 ft) from shore the bottom transitions to a rubble field with sparse coral colonies (*Montipora capitata* and *Pocillopora meandrina*) followed by a consolidated reef zone of greater complexity with crevices and small pockets of sand and rubble, previously described as a "beachrock shelf" (*AECOS*, 1994). The reef flat or "beachrock shelf" located east of the east breakwater was found in 1994 to generally not support an abundance of algae (*AECOS*, 1994). Conversely, the 2005 survey found a diverse assemblage of algal species which almost completely covered the bottom. *Ulva fasciata* was again present but greatly reduced in biomass with a cropped back appearance. Prominent were *Melanamansia glomerata* (previously recorded as *Amansia glomerata*) and *Acanthophora spicifera*. Scattered grazing scars, encrusting coralline algae, and live coral colonies (*Montipora flabellata*) were common amongst the algal laden seascape (Fig. 6e).

In 2005, dozens of *Tripneustes gratilla* were observed foraging in the open while rock-boring urchins (*E. mathaei*) lined crevices and blue-black urchins (*Echinothrix diadema*) and slate urchins (*Heterocentrotus mammilatus*) found cover under small overhangs. In 1993 and 1994, the same urchin species were observed as well as Christmas tree worms and spiny lobster (USFWS, 1993; *AECOS*, 1994). Other macro-invertebrates found in 2005 include an unidentified smooth black sponge, sea cucumbers, black-lipped pearl oyster (*Pinctada margaritifera*), snakehead cowry (*Cypraea caputserpentis*), blue swallow tail slug (*Chelidonura hirundina*), and day octopus (*Octopus cyanea*).

Adjacent to the east breakwater coral cover increased with distance from shore with 10% at the east breakwater and 50-75% at approximately 8 m (25 ft) depth where coverage then declined abruptly (USFWS, 1993). Common species were *Porites lobata, Poc. meandrina, Poc. damicornis, Poc. eydouxi, and Montipora flabellata*. In the present survey, coral cover became more substantial around the 6 ft (2 m) depth contour on the reef flat with nearly 40% cover by blue rice coral (*M. flabellata*) and cauliflower coral (*Poc. meandrina*) (Fig. 6f). This area also had two species of corals not recorded at the other 2005 survey areas: crust coral (*Leptastrea purpurea*) and ocellated coral (*Cyphastrea ocellina*), whereas absent was lace coral (*Poc. damicornis*).

The USFWS (1993) noted large feeding aggregations of herbivorous surgeonfishes (Acanthuridae), including *Acanthurus blochii, A. olivaceaus, A. xanthopterus, Naso literatus*, and *N. unicornis* foraging the reef slope off the east breakwater. In 2005, large schools of surgeonfish were not observed. Most common in this area were wrasses (Labridae) followed by butterflyfishes (Chaetodontidae) and damselfishes (Pomacentridae). *AECOS* (1994) found the labrids, *Stethojulis balteata* and *Stegastes fasciolatus*, most common between the harbor and Kanaio, while *Acanthurus nigroris* and *Mulloidichthys flavolineolatus* were most common off of Palalau (an area east of Kanaio).

The area was found to be quite depauperate of fishes in 2005, hosting only 26 species as compared to Kanaio with 49 species. Not previously mentioned by other reports were the many sedentary fishes common during the 2005 study, including the bullethead rock skipper (*Blenniella gibbifrons*), the scarface blenny (*Cirripectes vanderbilti*), the speckled scorpionfish (*Sebastapistes coniorta*), and the triple fin blenny (*Enneapterygius atriceps*). The saddle (*Thalassoma duperrey*) and belted wrasses (*Stethojulis balteata*) were abundant and the reef triggerfish (*Rhinecanthus rectangulus*) common.

Kanaio Drainage

The present (2005) survey was undertaken off a concrete box culvert (Fig. 7a) that passes beneath Hauoli St. between Island Sands and Banyans condominiums in an area known as Kanaio. The concrete drainage structure ends short of a sand beach, but water flow scars were evident out to the upper reach of the beach. The sand beach allows easy access to the nearshore environment (Fig. 7b). The shoreline was littered with algal debris which was also suspended in the first few meters of murky nearshore waters. A sand spit exists seaward of the drainage ditch which was completely littered with small boulders. These intertidal boulders hosted a community dominated by hookweed (*Hypnea musciformis*), *Pterocladiella capillacea*, and *Ulva fasciata* with the false limpet (*Siphonaria normalis*) occurring as well. Submerged boulders had roughly 100% algal cover with nearly equal coverage by *U.*

fasciata and *H. musciformis*. Images representative of this area in 2005 are presented in Fig. 7 and biological data are presented in the appendix.

The sand spit boulder field grades into a coralline algae-encrusted rubble field, which grades to rubble and sand, and eventually becomes a consolidated limestone reef with increasing topographic diversity (Fig. 7c,d). Unlike the reef flat off of the east breakwater, the shallows off Kanaio were found in 1994 to have an abundance of algae (*AECOS*, 1994). Common off Kanaio were, *Ulva reticulata, Grateloupia hawaiiana, Amansia glomerata, and Acanthophora spicifera*. Also noted were sediment resistant species such as *Halimeda discoidea* and *Codium edule* east of Kanaio, close to Kealia Pond. Most of these same species were observed in 2005. *AECOS* (1994) also noted an abundance of urchins (*Tripneustes gratilla* and *Heterocentrotus mammilatus*) amongst their survey areas with the greatest abundance of various urchins occurring off of Kanaio. During the present study, the collector urchin, slate pencil urchin, and rock-boring urchin were all prevalent on the reef flat.

An abundance of fishes with moderate species diversity (37 species) was found during the 2005 survey (Fig. 7d). The most abundant species were belted wrasse and saddle wrasse. Also common were the threadfin butterflyfish (*Chaetodon auriga*), racoon butterflyfish (*Chaetodon lunula*), Hawaiian sergeant (*Abudefduf abdominalis*), brighteye damsel (*Plectroglyphidodon johnstonianus*), lavender tang (*Acanthurus nigrofuscus*), blue lined surgeon (*Acanthurus nigroris*), palenose parrotfish (*Scarus psittacus*), and the reef trigger (*Rhinecanthus rectangulus*), as well as a fair number of juveniles, like the elegant coris (*Coris ventusta*) and the threadfin butterflyfish. Numerous juvenile wrasses were also seen throughout the surveyed areas. In 1994, the belted wrasse (*Stethojulis balteata*), Pacific gregory (*Stegastes fasciolatus*), and bluelined surgeonfish were considered some of the most common fishes off of Palalau (an area east of Kanaio). Also, in 1994, yellowstripe goatfish (*Mulloidichthys flavolineolatus*) were found as common (east of Kanaio) while the present study found them to be rare. A sand channel exists at the east end of the 2005 Kanaio Drainage survey area. A leatherback or *lai* (*Scomberoides lysan*) was sighted at the edge of this channel.

Kinzie (1972) surveyed 9 transects throughout Ma`alaea Bay and reported the greatest coral cover (average of 15%) at Kanaio with the most common species being *Montipora capitata, Poc. meandrina*, and *Montipora patula* (referred to as *Montipora verrucosa, Pocillopora ligulata, and Montipora verrilli*, respectively). In 2005, the coral community was found to be dominated by *Porites lobata, Montipora capitata*, and *Pocillopora meandrina* with scattered colonies of finger coral (*Porites compressa*) and spreading rice coral (*Montipora patula*; Fig. 7e). Coral cover was

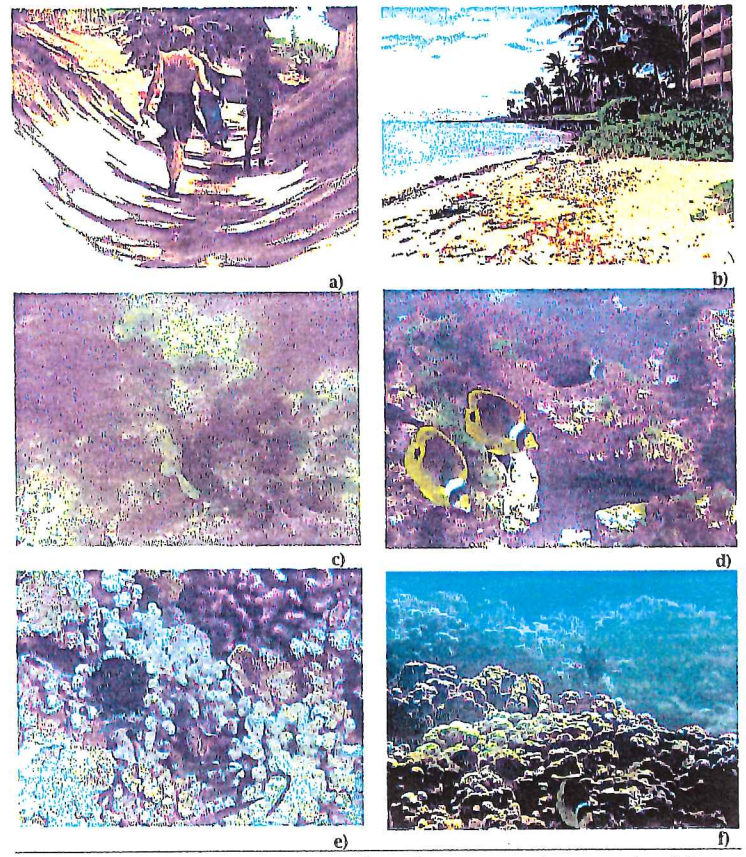

Figure 7. Kanaio Drainage marine biological survey area, images ordered from nearshore to offshore: a) Kanaio drainage ditch; b) sandy shoreline of Kanaio; c) turbid water, coralline algal encrusted gravel bottom with *U. fasciata* and *Arothron hispidus*; d) small boulders, *Chaetodon lunula*, other fish, and algae; e) *Porites compressa, Pocillopora meandrina, Montipora capitata*, and *Tripneustes gratilla* (collector urchin); f) high coral cover and high topographic diversity.

upwards of 60% on portions of the reef and was the greatest of any area visited during the present survey (Fig. 7f). A species not recorded in the other 2005 survey areas, but recorded here, is the antler coral, *Pocillopora eydouxi.*

Ma'alaea Small Boat Harbor

Much of Ma'alaea Small Boat Harbor is soft bottom and supports a variety of infaunal invertebrates typical of this substratum type. Boulder revetments line the margin of the harbor basin and provide surfaces for attachment of intertidal and subtidal forms. A small, dark sand beach occurs in the northeast corner of the harbor. Remnants of the former reef flat remain within the harbor where dredging has not been undertaken.

Below is a description of the harbor and its marine floral and faunal inhabitants compiled from several surveys of the area (*AECOS*, 2005a, 2005b, 1994; USFWS, 1993; McDermid, 1990; Brewer, 1987; USFWS, 1980;). A species listing from the surveys conducted by *AECOS* in 2004 and 2005 are presented in the appendix.

The intertidal habitat within the harbor is predominantly basalt revetment stones and concrete surfaces which host a wide variety of intertidal creatures. Brewer (1987) lists thin-shelled rock crab or *'a'ama* crab (*Grapsus tenuicrustatus*) and common supratidal snails (*Nerita picea, Littorina pintado* and *L. scabra*) as conspicuous inhabitants by the USCG station. Near the low tide line the fleshy green algae, *Ulva fasciata* and *U. reticulata* were occasionally found along with filamentous blue-green algae. Surveys in May and April 1994 found essentially the same species with some additional forms seen further inside the harbor (*AECOS*, 1994). Along the shore west from the USCG station a small species of oyster (*Ostrea* sp.) was common, and in the vicinity of the boat ramp, clusters of mussels (*Brachidontes crebristriatus*) were present near the water line. The *'alamihi* crab (*Metopograpsus thukuhar*) was conspicuous everywhere on rocks just above and below the water line, replacing the *'a'ama* crab which was present, but only common in the eastern part of the harbor. Algae were mostly limited to scattered, large growths of *Ulva reticulata* and some *U. lactuca*, but encrusting, pink *Porolithon onkoides* could be found on boulders. USFWS (1980, 1993) reports of *opihi* (*Cellana exarata*) as being abundant in the harbor may refer to the false limpet (*Siphonaria normalis*). In 2005, dozens of limpet, the thin-shelled rock crab (*Grapsus tenuicrustatus*) and flat crab (*Percnon planissimum*) were observed on the rocks above the water line (*AECOS*, 2005b). Burrowing sentinel crabs (*Macrophthalmus* sp.) were abundant in the mud bottom basin adjacent to the USCG station (*AECOS*, 2005b).

Brewer (1987) noted lace coral (*Pocillopora damicornis*) (reported as *P. cespitosa*) as the "...only significant (and somewhat surprising) benthic organism observed in the

harbor ...attached to the concrete sea wall ...west of the Coast Guard station." Observations made in 1994 along the shore west from the USCG station, noted that coral cover declines further into the harbor, with only small, scattered heads of lace coral present (*AECOS*, 1994). A 1980 USFWS survey, although possibly impaired by low visibility (reported at 3 ft), reported no corals and no macroalgae anywhere along the northern edge of the harbor between the boat ramp (furthest point inside) and the east breakwater.

In the vicinity of the U.S. Coast Guard station dock occurs a mud bottom basin with a small area (less than 10 m^2) of boulders and undredged reef with growth of at least two coral species: rice coral (*Montipora capitata*) and lace coral (*P. damicornis; AECOS*, 1994, 2005b). Rice coral colonies were observed in 1994 and 2005 at sizes of over 10 inches (25 cm) across. In 2005, scattered coral colonies covered up to 30% of the hard surfaces, which was higher than the 10% reported by *AECOS* in 1994 for the same area (*AECOS*, 1994). In addition to rice and lace coral, lobe coral (*Porites lobata*) and sandpaper coral (*Montipora patula*) were also present (*AECOS*, 2005b). Other benthic invertebrates observed were hydroid (?*Halocordyle disticha*), burrowing urchin (*Echinometra mathaei*), and spaghetti worm (*Loimia medusa*). Algal growth was limited to sparse turf with silt and scattered large fronds of *Ulva reticulata.* Hawaiian flagtail fish (*Kuhlia sandvicensis*) were found under sheltered overhangs (*AECOS*, 2005b).

In October 2005, the concrete seawall immediately east of the USCG station was surveyed by *AECOS* (2005b). At about 1 m (3 ft) depth the seawall was densely covered by rice coral colonies (*Montipora capitata*). Roughly 70% of the surface was covered with coral, but in some places the coverage exceeded 100% with colonies overlapping each other on the vertical surface. The Moorish idol (*Zanculus cornutus*) and surgeonfishes (Acanthuridae), and a variety of planktivorous fishes were common in this area.

The trapezoidal shaped reef remnant in the middle of the harbor adjacent to the USCG station was visited by USFWS biologists in 1993. The shoal was covered by sand and silt. The introduced red alga, hookweed (*Hypnea musciformis*), covered much of the shallow bottom. A few small colonies of the corals, *Porites rus* and *Pocillopora damicornis*, and two species of sea urchins, *Diadema paucispinum* and *Echinometra mathaei*, were observed in this area. In 2005, surprisingly nearly 30%, cover of *Montipora capitata* and a fair number of small *Pocillopora damicornis* colonies were noted. A variety of urchins were observed on the reef and a large school of the yellow-stripe goatfish (*Mulloidichthys flavolineatus*) stayed near the eastern edge of the reef.

A shallow flat occurs inside the harbor along the east breakwater. This shallow water area of some 2 acres was surveyed by Brewer (1987) and USFWS (1993). The

biota in 1987 was dominated by "dense, tangled stands of .....*Ulva fasciata*, *Ulva reticulata*, *Hypnea chordacea*, *Amansia glomerata*, *Gracilaria* cf. *bursapastoris*, and *Grateloupia filicina*, with 100% cover in some patches. USFWS (1993) found the reef flat to be heavily infested by the red alga, *Hypnea musciformis*, but *Bryopsis pinnata*, *Codium reediae*, *C. reticulata*, *Ulva fasciata*, and *Sargassum echinocarpum* occurred as well. Large amounts of hookweed could be seen on the small beach inside the harbor, indicating that this species remained abundant on the reef flat. Between 1999 and 2000, Smith (2000) also found an abundance of hookweed with 80% coverage in northwest Ma'alaea Bay. Two species of fishes, *manini* and *aholehole*, were numerically dominant, but numerous juvenile wrasses and a moray eel were noted by Brewer (1987). No live coral was seen in the area, noted as silted over close to the harbor channel, in contrast to that section of the same reef flat lying outside of the east breakwater (*AECOS*, 1994).

Fishes are certainly not abundant, but the harbor fauna includes more than the anchovy or *nehu* (*Stolephorus purpureus*) listed by Brewer (1987). *AECOS* (1994) observed the following species near the sampan wharf (roughly in order of abundance observed): Hawaiian flagtail or *aholehole* (*Kuhlia sandvicensis*), convict tang or *manini* (*Acanthurus sandvicensis*), Hawaiian sergeant or *mamo* (*Abudefduf abdominalis*), moorish idol (*Zanclus cornutus*), box fish (*Ostracion meleagris*), belted wrasse (*Stethojulis balteata*), pearl wrasse or *'opule* (*Anampses cuvier*), Hawaiian white-spotted toby (*Canthigaster jactator*), Hawaiian dascyllus or *alo'ilo'i* (*Dascyllus albisella*), raccoon butterflyfish or *lau hau* (*Chaetodon lunula*), lizardfish (*Synodus* cf. *variegatus*), blacktail snapper or *to`au* (*Lutjanus fulvus*), pualu (*Acanthurus* cf. *xanthopterus*), weke (*Mulloidichthyes vanicolensis*), juvenile sidespot goatfish or *malu* (*Parupeneus pleurostigma*), Jenkin's damsel (*Stegastes fasciolatus*), parrotfish (*Scarus* sp.), and cornetfish (*Fistularia commersoni*). Barracuda (*Sphyraena barracuda*), *aholehole*, and schools of mullet (*Mugil cephalus*) and small silverside (?*Spratelloides delicatulus*) occur throughout the inner harbor. The paucity of fishes recorded from the harbor in 1987 may be attributed to the poor underwater visibility at the time of the survey (Brewer, 1987). USFWS (1980) listed *manini* and *nehu* as abundant, and *aholehole* and barracuda as found in "occasional numbers". The report further mentions that Ma'alaea Harbor supports a "short, but intense seasonal, recreational fishery of bigeye scad or *hahalalu* (*Selar crumenophthalmus*)."

In 2004 and 2005, *AECOS* (2005a, b) observed 57 fish species within the harbor and at the harbor mouth. Twenty-one of these were observed only in the harbor and not in surrounding reef areas. Most notable were observations of eleven species of surgeonfish, eight species of wrasse, six species of goatfish, and spotted eagle ray (*Aetobatis narinari*). At the harbor mouth surgeonfish were represented by eyestripe surgeonfish (*Acanthurus dussumieri*), lavender tang (*Acanthurus*

nigrofuscus), with convict surgeonfish or *manini* (*Acanthurus triostegus*) being most abundant. Two large schools of yellowstripe goatfish were noted here as well.

In 2005, the present survey observed an extensive coral community that extends from the breakwater boulders shoreward inside the east breakwater. Coral coverage approached 90% in the limited space around the tip of the east breakwater with rice coral (*Montipora capitata*), cauliflower coral (*Pocillopora meandrina*), lobe coral (*Porites lobata*), and finger coral (*Porites compressa*) predominating. Commensal snapping shrimp (*Alphaeus deuteropus*) were abundant in surface grooves of lobe coral. The most conspicuous fishes were the large and abundant eyestripe surgeonfish (*Acanthurus dussumieri*). The red reef lobster (*Enoplometopus occidentalis*), usually only seen at night, was recorded from the finding of a detached pincer. The area immediately outside of the channel, fronting the tip of the east breakwater hosts numerous small colonies of blue rice coral (*Montipora flabellata*), cauliflower coral, lobe coral, and finger coral. Urchins and juvenile palenose parrotfish (*Scarus psittacus*) are also very common amongst the many small coral colonies of this high wave energy platform.

Ma'alaea Boat Harbor provides a wide array of habitats and thus supports a high diversity of marine biota. Of the 80 fish species observed in the 2004 and 2005 surveys of NW Ma'alaea Bay (present survey; *AECOS*, 2005a and 2005b), more than 70% (57 species) were observed inside the harbor. Likewise, 70% (32 species) of the macro-invertebrate species were found inside the harbor. The same did not apply to algae and corals with the algal community being the least diverse and the coral community no more diverse than the other areas surveyed.

Discussion

Water Quality

Water quality conditions in the nearshore coastal waters of Hawai'i are determined to a large degree by prevailing salinity regimes. Because of its open configuration, much of Ma'alaea Bay is regularly flushed by open ocean water of oceanic salinity and excellent water quality. At the same time, nearshore waters of the Bay are influenced by both surface water runoff and groundwater inputs from the adjacent land that not only lower salinity levels, but also introduce particulate matter, nutrients and other chemicals which degrade the quality of these coastal waters. Thus, separate State water quality criteria have been developed for "wet" and "dry" conditions in Hawaiian coastal waters (Table 9) based upon the amount of freshwater discharging into the coastal waters (HDOH, 2004). Specifically, the regulations state that "wet" criteria apply when open coastal waters receive more than three million gallons per day of fresh water discharge per mile of shoreline. Conversely, "dry" criteria apply when fresh water discharge per mile is less than

three million gallons per day. The open coast water quality criteria pertain to Sta.s 1-0, 1-6, 3-0, 3-6, 4-0 and 4-6 (all but the Ma'alaea Harbor stations). Since it is difficult to practically make an accurate determination of freshwater discharge, it is assumed herein that "dry" criteria apply since annual rainfall in this region of Maui is typically low: only about 15 inches (M&E Pacific, 2005).

Table 9. State of Hawaii water quality criteria for open coastal waters (after HDOH, 2004).

Parameter	Geometric Mean value not to exceed this value	Value not to be exceeded more than 10% of the time	Value not to be exceeded more than 2% of the time
Total Nitrogen (µg N/l)	110.00 *150.00*	180.00 *250.00*	250.00 *350.00*
Ammonia Nitrogen (µg N/l)	2.00 *3.50*	5.00 *8.50*	9.00 *15.00*
Nitrate+Nitrite (µg N/l)	3.50 *5.00*	10.00 *14.00*	20.00 *25.00*
Total Phosphorus (µg P/l)	16.00 *20.00*	30.00 *40.00*	45.00 *60.00*
Chlorophyll - α (µg/l)	0.15 *0.30*	0.50 *0.90*	1.00 *1.75*
Turbidity (NTU)	0.20 *0.50*	0.50 *1.25*	1.00 *2.00*

Two values: upper, "dry" criteria apply when the open coastal waters receive less than three million gallons per day of freshwater discharge per shoreline mile; lower, "wet" (italicized) criteria apply when the open coastal waters receive more than three million gallons per day of freshwater discharge per shoreline mile.

Other "standards":

- pH units shall not deviate more than 0.5 units from a value of 8.1.
- Dissolved oxygen shall not decrease below 75% of saturation.
- Temperature shall not vary more than 1 C^{o} from ambient conditions.
- Salinity shall not vary more than 10% from natural or seasonal changes.

Sta. 2-USGS & Sta. 2-MH are located within Ma'alaea Boat Harbor and fall under the State water quality standards applicable to embayments (Table 10). As with open coastal waters, HDOH water quality criteria incorporate "wet" and "dry" components, depending upon the amount of fresh water entering the bay on a daily basis. It is assumed that "dry" criteria apply in Ma'alaea Boat Harbor due to the low annual rainfall conditions in this region of Maui.

The water quality data from the shoreline and 6 ft (2 m) contour stations have been combined and are presented in Tables 11 and 12 as transects (e.g., Sta. 1-0 & Sta. 1-6 have been combined as Transect 1 and so forth) for comparison with the State water quality criteria. Since the water quality data collected for this study represent baseline conditions, salinity and temperature at all stations would be considered to be "ambient" as specified above in the footnotes to Table 9 and Table 10 above.

Table 10. State of Hawaii water quality criteria for embayments. (after HDOH, 2004).

Parameter	Geometric Mean value not to exceed this value	Value not to be exceeded more than 10% of the time	Value not to be exceeded more than 2% of the time
Total Nitrogen (µg N/l)	150.00 *200.00*	250.00 *350.00*	350.00 *500.00*
Ammonia Nitrogen (µg N/l)	3.50 *6.00*	8.50 *13.00*	1500 *20.00*
Nitrate+Nitrite (µg N/l)	5.00 *8.00*	14.00 *20.00*	25.00 *35.00*
Total Phosphorus (µg P/l)	20.00 *25.00*	40.00 *50.00*	60.00 *75.00*
Chlorophyll α, (µg/l)	0. 50 *1.50*	1.50 *4.50*	3.00 *8.50*
Turbidity (NTU)	0.40 *1.50*	1.00 *3.00*	1.50 *5.00*

Two values: upper, "dry" criteria apply when average fresh water inflow is less than one percent of the embayment volume per day; lower, "wet" (italicized) criteria apply when average fresh water inflow equals or exceeds one percent of the embayment volume per day.

Other "standards":

- pH units shall not deviate more than 0.5 units from a value of 8.1.
- Dissolved oxygen shall not decrease below 75% of saturation.
- Temperature shall not vary more than 1 C^{o} from ambient conditions.
- Salinity shall not vary more than 10% from natural or seasonal changes.

Dissolved oxygen (DO) saturation levels were within the "...shall be greater than or equal to 75 percent saturation criterion, except at Transect 3 during the January 12, 2006 sampling event (see Table 6). pH levels were consistently within the State criterion range of 7.6 - 8.6 and represent ambient conditions. Turbidity consistently exceeded State criteria for both "wet" and "dry" conditions.

Ammonia concentrations met State criteria (both "wet" and "dry") at all stations, being undetectable most of the time (Table 12). However, ammonia concentration at Transect 3 did reach a high level (130 µg N/l) during the January 12, 2006 sampling event. Since salinity was also quite low at this transect on this date (30.3 ppt), it is likely that the high ammonia concentration was associated with surface runoff from a storm event.

Table 11. Summary statistics for the physical water quality data combining shoreline and 6 ft (2 m) depth contour stations for the Ma`alaea Mauka Project.

Location		Salinity (ppt)	Temp (°C)	DO sat. (%)	pH	Turbidity (NTU)
Transect 1						
	mean	34.3	24.9	95	8.13	1.83
	range	33.1 - 35	23.2 - 26.7	90 - 101	8.04 - 8.30	0.74 - 4.38
	n	*6*	*6*	*6*	*6*	*6*
Transect 2						
	mean	34.1	25.1	90	8.10	1.54
	range	32.57 - 35	23.5 - 27.0	85 - 92	8.02 - 8.16	0.82 - 4.24
	n	*6*	*6*	*6*	*6*	*6*
Transect 3						
	mean	33.3	25.7	102	8.14	1.50
	range	30.3 - 35	23.5 - 27.9	71 - 147	7.8 - 8.34	0.65 - 3.72
	n	*6*	*6*	*6*	*6*	*6*
Transect 4						
	mean	33.2	26.2	106.5	8.19	1.76
	range	30.1 - 35	24.1 - 27.7	93 - 145	8.05 - 8.42	0.67 - 3.58
	n	*6*	*6*	*6*	*6*	*6*

State "dry" criteria were exceeded at all four transects for nitrate + nitrite, total nitrogen, total phosphorus and chlorophyll α geometric means; although total phosphorus just exceeded the geometric mean criterion at Transect 1.

The historic HDOH physical water quality data from Ma'alaea Boat Harbor (Table 2, above) are in reasonable agreement with the results from the Harbor samples collected in the present survey (Sta. 2-USGS and Sta. 2-HM in Table 6 and 7 above). Thus, salinity, temperature and pH means are nearly identical, while DO saturation levels in the present study were somewhat lower as were turbidity levels when compared with the long-term HDOH means. There was less agreement with the nutrient data between the two data sets with nitrate + nitrite means being notably higher in the present study. Total nitrogen, total phosphorus and chlorophyll α levels were also elevated compared with the HDOH data, but all measurements in the 2005 survey fell within the range of the HDOH data.

Mean salinity levels (33.2 - 34.3 ppt) at the three coastal sites in the present survey (Transects 1, 3, and 4) were lower compared with the means for the HDOH surveys, except for the Kihei Beach Park location (28.63 ppt), while mean temperatures in the present survey tended to be somewhat higher. Both DO saturation levels and pH values were comparable for both data sets, while geometric mean values for turbidity in the present survey were higher, except when compared with Kihei Beach Park.

Table 12. Summary statistics for the nutrient and chlorophyll α water quality data collected from the combined shoreline and 6' stations for the Ma`alaea Mauka Project.

Location		NH_4 (µg N/l)	NO_3+NO_2 (µg N/l)	TN (µg N/l)	TP (µg P/l)	Chl. α (µg/l)
Transect 1						
	mean	<1	20	169	17	1.51
	range	---	5.0 - 52	138 - 202	12 -22	0.41 - 3.38
	n	*6*	*6*	*6*	*6*	*6*
Transect 2						
	mean	<1	111	268	26	1.07
	range	---	61 - 274	173 - 429	16 - 55	0.53 - 4.00
	n	*6*	*6*	*6*	*6*	*6*
Transect 3						
	Mean	1.3	47	261	24	2.45
	Range	<1-130	3.0 - 252	137 - 835	11 - 73	0.37 - 21.1
	n	*6*	*6*	*6*	*6*	*6*
Transect 4						
	mean	1.4	77	308	26	3.54
	range	<1 - 11	5.0 - 77	153 - 692	12 - 71	0.80 - 27.1
	n	*6*	*6*	*6*	*6*	*6*

Nitrate+nitrite mean concentrations at the three coastal sites (Transects 1, 3, and 4) in the 2005-06 survey were comparable with those of the HDOH monitoring program. Total nitrogen means, on the other hand, were somewhat elevated compared with the HDOH data, except at the Kihei Beach Park station. Similarly, total phosphorus and chlorophyll means in the 2005-06 survey were higher than those in the HDOH data, except for the Kihei Beach Park station.

Salinity levels were typically lower during the 1994 *AECOS* study (Table 4) as compared with the 2005-06 survey, but there were distinct trends between the two data sets. Thus, there was an increase in salinity between Sta. 1-0 and Sta. 1-6 and Sta. 2-USGS and Sta. 2-HM. Also, the lowest mean salinity occurred at Station 3-0 in

both studies. Temperatures tended to be slightly higher in the 1994 study, except at Sta. 4-0 but were generally within the same range for both studies. Dissolved oxygen saturation levels were fairly similar at Sta. 2-USGS and Sta. 2-HM and the highest levels in both surveys were recorded at Sta. 1-0, Sta. 3-0 and Sta. 4-0.

Particulate concentrations were somewhat variable between the survey efforts as is to be expected, since these parameters are influenced by runoff and both wind and wave action. Nevertheless, TSS levels were high in the present study by something on the order of double, except at Sta. 2-USGS. The reason for this difference is not clear, although it does not appear to be due to runoff as higher salinities were recorded in the most recent survey as compared with the 1994 results.

There was considerable variation between the nutrient and chlorophyll α concentrations between the two surveys (Tables 4 and 7) and no distinct trends were apparent between the two data sets.

Marine Biology

Summary of 2004 and 2005 Surveys

Each of the four areas of NW Ma'alaea Bay discussed above differs in topographic complexity, coral cover, algal cover, and species diversity. However, the three nearshore areas surveyed, with the exception of the Harbor, exhibit a similar nearshore to offshore zonation, grading from an algal-rich nearshore swash zone out to a consolidated coralline reef and then to a zone of increased topographical relief and coral cover yet further off the shore.

The summary presented below reflects data collected during our three recent surveys of NW Ma'alaea Bay and Ma'alaea Boat Harbor conducted in September 2005 (present survey), October 2005 (*AECOS*, 2005b), and November 2004 (*AECOS*, 2005a). Data are compiled in table format as an appendix.

The algal community of northwestern Ma'alaea Bay is diverse and dominates much of the intertidal and subtidal benthos. In general, a swath of immense algal biomass exists within roughly the first 3 m (9 ft) from shore which is eventually replaced by an urchin dominated zone. Thirty-four algal species were recorded with nearly all of those recorded at the South Breakwater. On the other hand, the Harbor itself hosts less than half that number. Many species found throughout the survey area are food resources for humans as well as sea turtles.

A total of eleven coral species were recorded with the following four occurring throughout the survey area including inside the Harbor; in order of abundance these four are *Montipora capitata, Porites lobata, M. flabellata, Pocillopora*

meandrina, and *Porites compressa*. Elevated coral cover occurs around the west tip of the east breakwater, on the reef flat of Kanaio, and surprisingly the inner Harbor east of the USCG station on a concrete wall (*M. capitata*). The southeast portion of the Harbor receives sufficient influx of ocean water through the harbor channel to support an extensive coral community with up to 90 percent cover. The most common corals are rice coral (*Montipora capitata*) and lobe coral (*Porites lobata*). The offshore area east of the east breakwater has nearly 40% cover of *M. flabellata*. Kanaio Drainage was the only area with antler coral.

A total of 45 invertebrate species, other than corals, were recorded, with between 21 and 32 species recorded from each survey area. Urchins are some of the most conspicuous members of the marine community in shallow water here, with rock-boring urchin, *Tripneustes gratilla*, and the collector urchin, *Echinometra methaei*, dominating the seascape. It is worth noting that urchins feed on algae, and their large numbers may well account for a sharp decline in algal abundance offshore.

A total of eighty fish species were recorded during the three recent surveys (present survey; *AECOS*, 2005a; *AECOS*, 2005b). Data presented for south breakwater and the harbor area are from at least two survey dates and resulted in roughly twice the number of fish species recorded as compared to the other two survey areas. Therefore, the number of species reported is likely skewed by the number of site visits. The most common fishes are the saddle wrasse (*Thallasoma duperrey*) and the belted wrasse (*Stethojulis balteata*), both endemic to Hawaiian waters. Butterflyfishes were recorded throughout the study area with the raccoon (*Chaetodon lunula*) and threadfin butterflyfish (*Chaetodon auriga*) most common. The area of greatest fish diversity appears to be along the surge dominated reef flat off of the south breakwater. Of the 62 marine fish species recorded during the present survey, 12 species or 20% are endemic, meaning they are found only in the Hawaiian Islands and no other geographic region. Very few pelagic fishes were recorded; only the bluefin trevally (*Caranx melampygus*) at South Breakwater and the Harbor, the mackerel scad or *opelu* (*Decapterus macarellus*) also at South Breakwater, and the leatherback or *lai* (*Scomberoides lysan*) at the two eastern sites.

No sea turtles or other endangered or threatened species were observed during our survey. However, three species—the humpback whale (*Megaptera novaeangliae*), the hawksbill sea turtle (*Eretmochelys imbricata*), and the green sea turtle (*Chelonia mydas*)—are protected under the Endangered Species Act of 1973 (Federal Register, 1999a, 1999b, and 2001) and Hawaii Administrative Rule (DLNR, 1998) and are reported from Ma'alaea Bay.

Ma'alaea Bay is an important calving, breeding, and nursing area for the endangered humpback whale between December and May each year (Forestell and Brown, 1991). When not migrating, the humpback whales come very close to shore

and Maui offers great opportunities to view the whales from shore or by boat. The threatened green sea turtle (*Chelonia mydas*) and the endangered hawksbill sea turtle (*Eretmochelys imbricata*) are known to frequent Ma'alaea Bay (SRGII, 2004) and USFWS reported a large green sea turtle in the harbor in 1994 (USFWS, 1993).

Assessment

The nearshore marine community of northwest Ma'alaea Bay is quite variable ranging from the mud-lined bottom of Ma'alaea Boat Harbor to the reef supporting in excess of 50% coral cover found off Kanaio. The nearshore marine community is somewhat adapted to elevated levels of silt and sediment associated with runoff, especially along the shoreline and in the Harbor where many silt-tolerant species are found. However, of particular concern are the algal and coral communities which may be most likely impacted by project associated run-off.

There are several sites where run-off may be expected to impact the neashore community via existing drainage systems along northwest Ma'alaea Bay including: Ma'alaea Boat Harbor, Kapoli Beach, and Kanaio drainage ditch. Each of these areas hosts an important marine community. Ma'alaea Boat Harbor serves as a protected area for many juvenile fish and invertebrates and hosts a variety of corals both in the interior of the Harbor, but especially near the mouth of the Harbor. The waters off Kapoli Beach, west of the Boat Harbor, support a species-rich algal community that is important for human consumption and sea turtle consumption. The Kapoli Beach area also boasts a wide variety of fishes, many being juveniles. Land run-off via concrete-lined drainage ditch emptying at the Kanaio shore has the greatest potential for impacting an area of live coral. This ditch could carry run-off from the Maalaea Mauka Development Project not retained by the upslope basins.

It is often difficult to pinpoint the causes of water quality degradation in nearshore coastal waters. In northwest Ma'alaea Bay, 70% of variation in nutrients (except ammonia) and chlorophyll α concentrations can be attributed to variations in salinity, i.e. freshwater inputs or lack thereof. The source of freshwater input at the coastline can be from groundwater or surface water runoff. Based upon the paucity of rainfall in the Ma`alaea area—about 15 inches annually (M&E Pacific, 2005)—it can be concluded that much of the variation in salinity and nutrients in these nearshore coastal waters is the result of groundwater inputs.

Changes in particulate (turbidity and TSS) concentrations, on the other hand, are not necessarily associated with changes in salinity, or any other water quality parameter. In this case, much of the variation in particulates may be associated with turbulence caused by wind and waves stirring up bottom sediments in the shallow coastal water. Certainly, surface runoff is significant during major storm

events and such events are likely the primary source of particulates to these nearshore waters.

Conclusions

The proposed construction of a residential development on a 260-acre parcel on the central Maui plain above Ma'alaea Small Boat Harbor will include the construction of buildings, roads, parking lots, and sidewalks. The construction of these will increase coverage by impervious surfaces and will lead to a reduction in rainfall infiltration into the ground. Because the development is located some distance from the shore, construction will not directly impact the nearshore reef community of northwestern Ma'alaea Bay or Ma'alaea Boat Harbor. However, indirect impacts could occur if care is not taken to control storm water runoff from the project site, most particularly during land grading and early construction phases. In order to reduce the release of fine sediments or other pollutants into the marine environment, suitable BMPs (Best Management Practices) need to be implemented during construction and post-construction phases.

During rain events, water collects from impervious surfaces (roads, roofs, sidewalks, etc.) and follows a downhill path of least resistance. Unimpeded, this run-off continues on its course to the nearshore environment where it introduces an array of land-based pollutants. Drainage pathways for run-off should be directed into percolation areas rather than directly into existing drainage ways which lead to the ocean. In order to reduce the amount of polluted run-off it is recommended to use a) unlined ditches leading to unlined percolation basins and b) to establish planted percolation areas to act as a natural buffer surrounding the planned flood basins along their drainage pathways to the ocean. Vegetation surrounding these surfaces will act as a natural buffer to reduce pollutant levels in run-off and drought-tolerant native plant species should be considered. This approach will also minimize post-construction contributions of pollutants such as pesticides and herbicides, as well as oil and gasoline spills from vehicles.

Overall, if BMPs are followed and if special care is given to reduce silt-laden runoff the Maalaea Mauka development project has the potential to improve rather than degrade the nearby marine environment compared with existing land use practices at the project site. According to aerial photographs taken in 2003, the 960-acre project area has little groundcover in place to reduce surface run-off. Also, the Maalaea Waterfront Plaza which lies downstream from the project site has experienced flooding during large storms under existing drainage conditions (M&E Pacific, 2005).

M&E Pacific (2005) proposes a series of detention basins be developed for the proposed Maalaea Mauka development which should minimize particulates in

storm water runoff into the bay. These detention basins would be located on the mauka side of Honoapiilani Highway and correspond to existing detention basins. Plans include considerations for drainage ways down to the proposed detention basins, but not beyond towards the ocean. The basins should be in place and functional prior to general site grading.

During the construction phase, it will be necessary to: (1) employ Best Management Practices (BMPs) to prevent soil erosion and surface runoff into the bay; and (2) develop a water quality monitoring program to ensure the long-term effectiveness of the BMPs. Since there are no perennial water flows through or near the project site, monitoring should generally duplicate the coastal water quality stations utilized in our survey. Monitoring the water quality of intermittent storm run-off may provide some useful information (and will likely be required under grading regulations), but can be very difficult to interpret in terms of compliance of construction-related BMPs. Visual observations are typically more instructive. Limiting early site grading work to the dry season on Maui can reduce runoff impacts at the time when storm runoff would have the potential to carry the most particulates to coastal waters. If proper BMPs are employed during construction and runoff into the nearshore waters minimized, the proposed development should have minimal long-term adverse effects on the nearby marine communities.

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APPENDIX TABLE

2004-2005 marine species list for the waters off Ma'alaea, Maui

Checklist and abundance of aquatic biota observed in nearshore waters of Ma`alaea Bay (present study & 2005a[1]) and Ma`alaea Small Boat Harbor (AECOS, 2005a[1] & b[2]).

PHYLUM, CLASS, ORDER, FAMILY		Location			
Genus species	Common name	South Breakwater 1	Ma`alaea Harbor 2	East of East Breakwater 3	Kanaio Drainage 4
		ALGAE			
CHLOROPHYTA	GREEN ALGAE				
Bryopsis pennata		O[1]			
Chaetomorpha antennina		A			
Cladophora sp.		P, O[1]	P[1]	P	p
Cladophora fascicularis				P	
Codium edule		P		P	
Halimeda opuntia		P, R[1]	P[1]		
Halimeda discoidea		P			
Ulva fasciata	sea lettuce	A, A[1]	P[1,2]	A	A
Ulva reticulata		A, R[1]	P[1,2]	P	A
Valonia aegagrophila			P[2]		
PHAEOPHYTA	BROWN ALGAE				
Dictyota acutiloba					P
Dictyota bartayresiana	*alani*	P, O[1]		P	P
Giffordia breviarticulata	*hulu`ilio*	U[1]			
Ralfsia pangoensis		P	P[1]		
Sargassum echinocarpum		C			
RHODOPHYTA	RED ALGAE				
Acanthophora spicifera	spiny seaweed	A, C[1]	P[1]	A	A
Ahnfeltia concinna (F)	*'aki`aki*	C[1]			
Coelothrix irregularis				P	
Desmia hornemannii		P		P	
Gracillaria parvispora (F)	*ogo*	P			P
Grateloupia hawaiiana (F)	*huluhuluwaena*	P	P[2]		
Grateloupia filicina (F)		A		A	
Gymnogongrus sp.		P			
Hydrolithon reinboldii		U[1]			
Hypnea musciformis	hookweed	A, O[1]	P[1]	A	A
Jania sp.		P		P	
Laurencia nidifica (F)	*mane`one`o*	P			
Laurencia parvipapillata (F)	*lipe`epe`e*			P	
Melanamansia glomerata		P, C[1]		P	P
Peyssonnelia sp.		P	P[2]	P	P
Peyssonnelia rubra			P[2]		
Porolithon onkodes		P, A[1]	P[2]	P	P
Pterocladiella capillacea		A, O[1]			P
Pterocladiella caerulescens		P		P	
HETEROKONTOPHYTA, BACILLARIOPHYCEAE	BLUE-GREEN ALGAE				
Indet.	pseudofilamentous diatom		P[1]		

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Location: South Breakwater 1	Ma`alaea Harbor 2	East of East Breakwater 3	Kanaio Drainage 4
INVERTEBRATES					
PORIFERA					
indet.	smooth black sponge			R	
CNIDARIA, HYDROZOA					
HYDROIDA					
Pennaria cf. *disticha*	Christmas tree hydroid		P[1]		
CNIDARIA, ANTHOZOA					
CUBOZOA					
Carybdea sp.	box jellyfish	R[1]	P[2]		
SCLERACTINIA, POCILLOPORIDAE					
Pocillopora eydouxi	antler coral				R
Pocillopora damicornis	lace coral	O, R[1]	P[1,2]		R
Pocillopora meandrina	cauliflower coral	C, O[1]	P[1]	A	A
ACROPORIDAE					
Montipora capitata	rice coral	C, O[1]	P[1,2]	C	A
Montipora patula	spreading coral	O	P[1,2]		C
Montipora flabellata	blue rice coral	U, R[1]	P[1]	A	U
PORITIDAE					
Porites lobata	lobe coral	C, C[1]	P[1,2]	C	A
Porites compressa	finger coral	U, R[1]	P[1,2]	U	U
AGARICIIDAE					
Pavona varians	corrugated coral			U	
FAVIIDAE					
Leptastrea purpurea	crust coral			U	
Cyphastrea ocellina	ocellated coral	U	P[1,2]	U	
ZOANTHIDEA, ZOANTHIDAE					
Palythoa caesia	blue-gray zoanthid	R, O[1]	P[1]		
ALCYONACEA, ALCYONIIDAE					
Carijoa riisei	snowflake coral		P[1]		
ANELLIDA, POLYCHAETA,	WORMS				
ACICULATA					
AMPHINOMIDAE					
Pherecardia striata	lined fireworm		P[2]		
CANALIPALAPATA					
SABELLIDAE					
indet.	tube worm		P[2]		
SERPULIDAE					
Sabellastarte sanctijosephi	feather duster worm		P[1,2]		
Spirobranchus giganteus	Christmas-tree worm	U	P[1]		U
TEREBELLIDAE					
Loimia medusa	medusa spaghetti worm	R	P[1,2]	R	R
indet.	unknown pink spaghetti worm		P[2]		

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Location: South Breakwater 1	Ma`alaea Harbor 2	East of East Breakwater 3	Kanaio Drainage 4
MOLLUSCA, GASTROPODA	MOLLUSKS				
PATELLIDAE					
Cellana sandwicensis	yellow-foot `opihi	R[1]	P[2]		
Siphonaria normalis	false `opihi	C[1]	P[1,2]		C
TROCHIDAE					
Trochus intextus	woven top		P[2]	U	
NERITIDAE					
Nerita picea	black nerite	C, O[1]	P[1,2]	C	C
LITTORINIDAE					
Littoraria pintado	dotted periwinkle	C	P[1,2]	C	C
VERMETIDAE					
Serpulorbis variabilis	variable worm snail	O	P[1,2]	O	O
CYPRAEIDAE					
Cypraea caputserpentis	snakehead cowry			R	
CONIDAE					
Conus marmoreus	marbled cone	R			
MOLLUSCA, GASTROPODA,					
CEPHALASPIDEA					
AGLAJIDAE					
Chelidonura hirundina	blue swallowtail slug			R	
MOLLUSCA, BIVALVIA					
ARCIDAE					
Arca ventricosa	ventricose ark shell		P[2]		C
PTERIIDAE					
Pinctada margaritifera	black-lipped pearl oyster	U, R[1]	P[2]	O	U
ISOGNOMONIDAE					
Isognomon perna	brown purse shell	U		C	C
OSTREIDAE					
Ostrea sandvicensis	Hawaiian oyster		P[1,2]		
MOLLUSCA, CEPHALOPODA, OCTOPODA					
OCTOPODIDAE					
Octopus cyanea	day octopus	R[1]			R
MOLLUSCA, CEPHALOPODA, TEUTHOIDEA					
SEPIOLIDAE					
Sepioteuthis lessoniana	oval squid	R[1]			
ARTHOPODA, CRUSTACEA, DECAPODA					
ALPHEIDAE					
Alpheus deuteropus	snapping shrimp	C	P[1]	C	C
TRAPEZIIDAE					
Trapezia flavopunctata	yellow-spotted guard crab				R
Trapezia intermedia	common guard crab			R	
GRAPSIDAE					
Grapsus tenuicrustatus	thin-shelled rock crab	C, C[1]	P[1,2]	C	C
Percnon planissimum	flat rock crab		P[2]		

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Location: South Breakwater 1	Ma`alaea Harbor 2	East of East Breakwater 3	Kanaio Drainage 4
OCYPODIDAE					
Macrophthalmus sp.	sentinel crab		P[2]		
ENOPLOMETOPIDAE					
Enoplometopus occidentalis	red reef lobster †		P[1]		
ECHINODERMATA, OPHIUROIDEA	BRITTLE STARS				
OPHIOCOMIDAE					
Ophiocoma erinaceus	spiny brittle star	U		U	U
ECHINODERMATA, ECHINOIDAE	SEA URCHINS				
DIADEMATIDAE					
Diadema paucispinum	long-spined urchin	O, O[1]	P[1,2]	O	O
Echinothrix calamaris	banded urchin	R[1]	P[2]		U
Echinothrix diadema	blue-black urchin	U[1]	P[1]		O
ECHINOMETRIDAE					
Colobocentrotus atratus	helmet urchin	R[1]			
Echinometra mathaei	rock-boring urchin	C, A[1]	P[1,2]	A	A
Echinometra oblonga	oblong urchin	A[1]			
Heterocentrotus mammillatus	slate-pencil urchin	O, C[1]	P[1,2]	C	C
TOXOPNEUSTIDAE					
Tripneustes gratilla	collector urchin	A,C[1]	P[1,2]	A	A
ECHINODERMATA, HOLOTHUROIDAE	SEA CUCUMBERS				
HOLOTHURIIDAE					
Actinopyga mauritiana	white-spotted sea cucumber	U, O[1]	P[1]	U	U
Holothuria sp.	sea cucumber	C		C	
Holothuria atra	black sea cucumber	U[1]	P[2]	U	
VERTEBRATES					
VERTEBRATA, CHONDRICHTHYES	SHARKS & RAYS				
MYLIOBATIDAE					
Aetobatis narinari	spotted eagle-ray		P[1]		
VERTEBRATA, PICES	FISHES				
MURAENIDAE					
Echidna nebulosa	snowflake moray	R[1]	P[2]		
Gymnomuraena zebra	zebra moray				R
Scuticaria tigrina	tiger moray			R	R
ENGRAULIDAE					
Encrasicholina purpurea	Hawaiian anchovy		P[2]		
AULOSTOMIDAE					
Aulostomus chinensis	trumpetfish	R, R[1]	P[1,2]		
FISTULARIIDAE					
Fistularia commersonii	cornetfish	A, U[1]	P[1,2]		U
SERRANIDAE					
Cephalopholis argus	peacock grouper, *roi*	R			U

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Location: South Breakwater 1	Ma`alaea Harbor 2	East of East Breakwater 3	Kanaio Drainage 4
SYNODONTIDAE					
Saurida sp.	lizardfish		P[1]		
Synodus ulae	*`ulae*		P[2]		
SCORPAENIDAE					
Sebastapistes coniorta (E)	speckled scorpionfish			U	U
Scorpaenopsis diabolus	devil scorpionfish	R[1]			
KUHLIIDAE					
Kuhlia sandvicensis (E)	Hawaiian flagtail		P[1,2]		
CIRRHITIDAE					
Cirrhitops fasciatus	redbarred hawkfish	R			
CARANGIDAE					
Caranx melampygus	bluefin trevally	R[1]	P[1]		
Decapterus macarellus	mackerel scad, *`opelu*	U			
Scomberoides lysan	leatherback, *lai*			R	R
LUTJANIDAE					
Lutjanus fulvus	blacktail snapper		P[2]		
MUGILIDAE					
Mugil cephalus	striped mullet, *`ama`ama*		P[2]		
MULLIDAE					
Mulloidichthys flavolineatus	yellowstripe goatfish	R,R[1]	P[1,2]		R
Mulloidichthys vanicolensis	yellowfin goatfish		P[1,2]		
Parupeneus cyclostomus	blue goatfish		P[1]		
Parupeneus multifasciatus	manybar goatfish	R,R[1]	P[1]	R	R
Parupeneus porphyreus (E)	whitesaddle goatfish	R,R[1]	P[1]		R
Upeneus arge	bandtail goatfish		P[2]		
KYPHOSIDAE					
Kyphosus bigibbus	brown chub		P[1]		
CHAETODONTIDAE					
Chaetodon auriga	threadfin butterflyfish	O	P[1,2]	O	C
Chaetodon lunula	raccoon butterflyfish	C, O[1]	P[1,2]	O	O
Chaetodon miliaris (E)	milletseed butterflyfish		P[1,2]		
Chaetodon unimaculatus	one-spot butterflyfish	R[1]			
POMOCENTRIDAE					
Abudefduf abdominalis (E)	Hawaiian sargeant	U,C[1]	P[1,1]	O	O
Abudefduf sordidus	blackspot sergeant		P[2]		
Chromis vanderbelti	blackfin chromis	U			U
Dascyllus albisella (E)	Hawaiian dascyllus		P[1,2]		R
Plectroglyphidodon imparipennis	brighteye damselfish	C	P[2]	O	C
Plectroglyphidodon johnstonianus	blue-eye damselfish	U			R
Stegastes fasciolatus	Pacific gregory	U,C[1]	P[1,2]		

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Location: South Breakwater 1	Ma`alaea Harbor 2	East of East Breakwater 3	Kanaio Drainage 4
LABRIDAE					
indet.	juveniles	A		A	A
Anampses cuvier (E)	pearl wrasse	R[1]			
Bodianus bilunulatus (E)	Hawaiian hogfish	R[1]			
Cheilio inermis	cigar wrasse	R[1]	P[1]		
Coris gaimard	yellowtail coris	R,R[1]	P[1]		R
Coris venusta (E)	elegant coris				R
Gomphosus varius	bird wrasse	R,U[1]	P[1]	R	R
Labroides phthirophagus (E)	Hawaiian cleaner wrasse	U[1]	P[1]		R
Macropharyngodon geoffrey (E)	shortnose wrasse	R[1]			
Novaculichthys taeniourus	rockmover wrasse	R,R[1]			
Stethojulis balteata (E)	belted wrasse	A	P[1,2]	A	A
Thalassoma ballieui (E)	old woman wrasse		P[2]		
Thalassoma duperrey (E)	saddle wrasse	A, C[1]	P[1,2]	A	A
Thalassoma trilobatum	Christmas wrasse	O,O[1]	P[2]	O	O
SCARIDAE					
indet.	juveniles			O	O
Scarus psittacus	pale nose parrotfish	U	P[2]		C
Scarus rubroviolaceus	red-lip parrotfish		P[2]		
BLENNIIDAE					
Blenniella gibbifrons	bullethead rockskipper		P[2]	R	
Cirripectes vanderbilti (E)	scarface blenny	R		R	
Plagiotremus sp.	fang blenny			R	
TRIPTERYGIIDAE					
Enneapterygius atriceps	triple fin blenny		P[2]	R	
BLENNIIDAE					
Blenniella gibbifrons	bullethead rockskipper		P[2]		
GOBIDAE					
Psilogobius mainlandi (E)	Hawaiian shrimp goby		P[2]		
ZANCLIDAE					
Zanculus cornutus	Moorish idol	R,U[1]	P[1,2]		U
ACANTHURIDAE					
Acanthurus blochii	ring-tail surgeonfish	U,O[1]	P[1,2]	U	O
Acanthurus dussumieri	eye-stripe surgeonfish		P[1]		
Acanthurus guttatus	white-bar surgeonfish	U,C[1]	P[1,2]		
Acanthurus leucopareius	whitespotted surgeonfish	R	P[1,2]		
Acanthurus nigrofuscus	lavender tang	U[1]	P[1,2]		C
Acanthurus nigroris	bluelined surgeonfish	C			U
Acanthurus olivaceus	orangeband surgeonfish	R			
Acanthurus triostegus	*manini*	A,A[1]	P[1,2]	U	U
Acanthurus xanthopterus	yellowfin surgeonfish	U	P[2]		
Ctenochaetus hawaiiensis	black surgeonfish		P[2]		
Ctenochaetus strigosus	goldring surgeon	R,U[1]	P[1,2]		

PHYLUM, CLASS, ORDER, FAMILY *Genus species*	Common name	Location: South Breakwater 1	Ma`alaea Harbor 2	East of East Breakwater 3	Kanaio Drainage 4
ACANTHURIDAE (cont.)					
Naso lituratus	orangespine unicornfish	U,R[1]		R	U
Naso unicornis	unicornfish, *kala*	C,R[1]	P[1]	O	C
Zebrasoma flavescens	yellow tang		P[1,2]		
BALISTIDAE					
Rhinecanthus rectangulus	reef triggerfish	C,U[1]	P[1]	C	C
MONOCANTHIDAE					
Cantherhines dumerilii	barred filefish		P[2]	R	
OSTRACIIDAE					
Ostracion meleagris	spotted boxfish	U,C[1]	P[1,2]	U	R
TETRAODONTIDAE					
Arothron hispidus	stripebelly puffer	R		R	R
Canthigaster amboinensis	ambon toby	U	P[2]		U
Canthigaster jactator (E)	HI white spotted toby		P[2]		

KEY TO SYMBOLS USED IN TABLE 1:

Location:
- 1 - West Breakwater - west of west breakwater, outside harbor off Kapoli Beach.
- 2 - Maalaea Harbor - Ma`alaea Small Boat Harbor & channel (surveyed 2004 & 2005).
- 3 - East of East breakwater - adjacent to Ma`alaea Kai condominium.
- 4 - Kanaio Drainage - adjacent to Island Sands condominium.

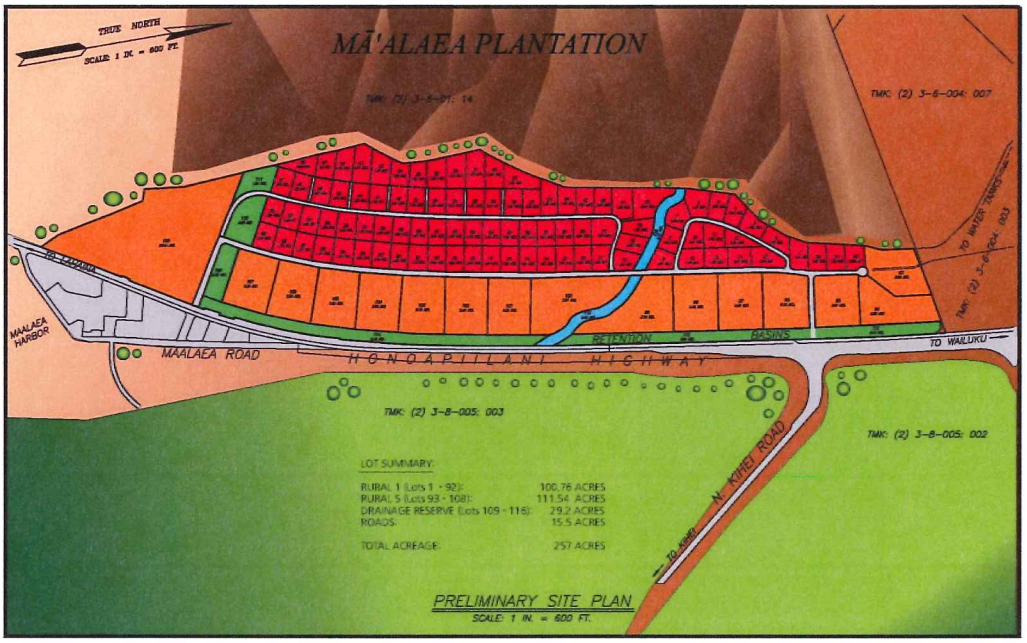
Abundance categories:
- P - Present
- R - Rare - Only one or two individuals observed in area.
- U - Uncommon - Three to no more than a dozen individuals seen in area.
- O- Occasional - Seen irregularly and always in small numbers; more than a dozen individuals in area.
- C - Common - Seen regularly, although generally in small numbers.
- A - Abundant - Found in large numbers and widely distributed.

Other symbols and categories:
- † - Shell, carapace, or test only (not seen alive).
- E - Endemic - Found in Hawaii and nowhere else.
- F - Food resource - Alga collected for consumption.

QC:
Animals were identified in the field on September 30, 2005 by S. Burr, K. Laing, and C. Linebaugh and algae were identified in the laboratory by C. Linebaugh.
[1] Reported in AECOS (2005a), Nov. 17, 2004, Ma`alaea ferry pier survey.
[2] Reported in AECOS (2005b), Oct. 24, 2005, USCG harbor survey.

Appendix Q

Market Demand Study



PREPARED FOR: **MVI LLC**
c/o Mr. Doug Spencer
P.O. Box 97
Kihei, Hawaii 96753

EFFECTIVE DATE: **April 21, 2014**

MARKET STUDY FOR THE PROPOSED MAALAEA PLANTATION SUBDIVISION
MAALAEA, ISLAND OF MAUI, HAWAII

ACM CONSULTANTS, INC.

ACM
CONSULTANTS, INC.

A Real Estate Appraisal, Research & Advisory Group

April 30, 2014

14-9025

Mr. Doug Spencer
MVI LLC
P.O. Box 97
Kihei, Hawaii 96753

Re: Market study for the proposed Maalaea Plantation in Maalaea, Island and County of Maui

Dear Mr. Spencer:

In accordance with your request, we have conducted an extensive study of the general real estate market and rural/agricultural market on the island of Maui, in relation to a proposed 108-lot rural subdivision to be situated on the vacant parcel identified as TMK (2) 3-6-01-018. This *counseling report* is based on a study of current economic and market conditions, a historical review of the real estate market on Maui overall, and a study of rural and agricultural lots on the island. The effective date of this report is April 21, 2014.

The subject involves a single parcel containing approximately 257.78 acres of land located along Honoapiilani Highway in Maalaea, Maui. Preliminary plans for the proposed project, to be known as Maalaea Plantation, include 92 1-acre rural lots, 15 5-acre rural lots and a 27.50-acre rural lot.

The assignment will include the following:

> **Market Analysis -** The Consultant agrees to provide a market analysis for this proposed rural subdivision project by (1) defining and delineating the market area; (2) identifying and analyzing the current supply and demand conditions that comprise the specific real estate market segment; and (3) identifying, measuring and forecasting the effect of anticipated developments or other changes on future supply in the market segment.

The following report presents a narrative review of the market study and our analysis of data along with other pertinent materials on which this report is predicated. It contains data and exhibits gathered in our investigations, and will include a description of the analytical process and our conclusions.

2073 Wells Street, Suite 100 ◆ Wailuku, Maui, HI 96793 ◆ Telephone: (808) 242-6481 ◆ Fax: (808) 242-1852

Thank you for allowing us the opportunity to work on this interesting assignment.

Respectfully submitted,
ACM Consultants, Inc.

Dominic Suguitan
Certified General Appraiser,
State of Hawaii, CGA-576
Expiration: December 31, 2015

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EXHIBITS

Exhibit A Maui County Demographic Snapshot, Claritas, Inc.
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ADDENDA

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PART I – INTRODUCTION

A. EXECUTIVE SUMMARY

Background

The proposed 108-lot rural subdivision project will be located on a single parcel identified as TMKs (2) 3-6-01-018 containing a total of approximately 257.78 acres along Honoapiilani Highway in Maalaea. This project will be known as Maalaea Plantation, and will include 92 1-acre rural lots, 15 5-acre rural lots and a 27.50-acre rural lot. The developer has decided to develop a rural subdivision in Maalaea in order to provide the community a low density development which will preserve the rural character of the area and allow small-scale agricultural uses as intended by State Land Use and County zoning.

Study Objectives

ACM Consultants, Inc. has been retained by Mr. Doug Spencer of MVI LLC to analyze the rural and agricultural market on Maui, as it relates to this proposed rural project. In particular, the Consultants studied economic trends and demographics, and supply and demand factors for rural properties on Maui in general. In the process, we gathered as much information as possible on real estate activity on Maui.

The objectives of the market analysis were as follows: (1) to define and delineate the market area; (2) to identify and analyze the current supply and demand conditions specific to the subject's market; and (3) identify, measure and forecast the effect of anticipated developments or other factors on future supply.

Summary of Conclusions

Maui in general has seen growth in its population, tourism and economy over the past two decades. Similar to many real estate markets on the mainland, Maui's real estate market had seen significant increases from 2000. During that period, median prices attained record highs in 2006 and 2007. As a result, the county administration placed the affordable housing issue among its top priorities, from as early as 2004.

From 2006 to 2011, median sales prices for single family and condominium properties declined dramatically, due to economic woes and more stringent lending practices. From the market bottom of 2011, single family median sales prices are now back to 2009 levels and condominium median prices are just below 2010 levels. Sales volume hit bottom in 2008 for condominiums and 2009 for single family properties, but have since steadily increased through 2013.

There are only a few ongoing residential projects being developed that should provide the immediate supply throughout Maui for the next few years, of which, only one project contains affordable

homes. The Maui Lani and Kehalani Project Districts continue to build their already entitled units in Central Maui. In addition, there are a few other projects in Central Maui that may add inventory to the market in coming years but are still in the process of gaining governmental approvals. Waikapu Gardens Phase II is the only affordable housing project currently being developed on Maui with 56 homes.

Looking forward more than five years becomes more difficult to determine which future projects will actually be brought to the market. The recommended Directed Growth Areas, as shown in the Draft Maui Island Plan for Maui, are estimated to provide additional supply of 11,623 housing units by 2030. However, some of these potential projects will likely meet with governmental or community resistance, leading to long delays; meanwhile, others may never be completed for various financial reasons.

The economic downturn recently witnessed across the nation significantly affected Maui, through a drop in visitor counts and a drastic slowdown of construction. These industries are two of the primary employment forces on the island and their decline has had an adverse impact on the local economy. Unemployment rose steadily from 2006 to 2009 where it peaked at 8.78 percent. Since 2009, the unemployment rate has steadily retreated to 4.7 percent as of the fourth quarter of 2013. Meanwhile, the heavy losses witnessed in the financial sector since the fourth quarter of 2008 diminished the investment capital for other potential buyers. Combined with a more stringent lending environment, it became increasingly difficult to purchase real estate, regardless of market conditions.

At the height of the market, the primary obstacle for buyers was the high asking prices for residential products. Many buyers who did not own a home found it difficult to even come up with enough money for a down payment. Meanwhile, homeowners saw their property values increase to a point where they were able to use their equity appreciation to upgrade to larger, more elaborate accommodations. For many, this option is no longer possible, as the retreat of home prices has caused a significant loss of equity. Currently, the ability of qualified buyers to purchase housing may be more difficult than a few years ago; however, it is fairly safe to assume that as economic conditions improve, housing units within the workforce market segment will continue to be the most sought after. According to Maui MLS statistics, sales volume began to recover in 2008 and 2009 while median prices began to recover in 2012.

If the proposed 108-lot rural subdivision project were to be available today, it would likely incur strong demand due to the extremely limited supply of rural lots available on Maui, and historical strong demand for similar properties in the past. However, the subject will still need to go through entitlement, design

and construction processes before sales can occur. As such, release of the subject's lots may occur at a time faced by uncertain economic conditions. Nonetheless, current market conditions appear to be steadily improving on Maui.
Most importantly, the proposed project will be primarily targeted toward the workforce market segment desiring home ownership. Statistical evidence has clearly shown that regardless of conditions, this market segment has had the most demand for this type of property.

The property owners continue to work diligently with government agencies in an effort to design an affordable project for all of Maui. After consideration of current economic and real estate market conditions; forecasts by Hawaii economists; as well immediate demand for rural lots on Maui, the subject's proposed 108-lot rural subdivision should be well positioned to capitalize on the recovery of the real estate market and help to provide a short-term solution to the housing needs of Maui's workforce.

B. PURPOSE OF THE REPORT

The purpose of this report, as of April 21, 2014, is to generate a market analysis report with respect to the proposed 108-lot rural subdivision project in Maalaea, Maui.

C. INTENDED USE OF THE REPORT

The intended use or function of this report is to provide real property information and real estate market data to be used in conjunction with an Environmental Impact Study.

D. SCOPE OF THE REPORT

The Consultant has agreed to provide a current market analysis of this project by (1) defining and delineating the market area; (2) identifying and analyzing the current supply and demand conditions that make up the specific real estate market; and (3) identifying, measuring and forecasting the effect of anticipated developments or other changes on future supply. The market analysis will be developed and prepared in conformity with, and subject to, the requirements of the Code of Professional Ethics and the Standards of Appraisal Practice of the Appraisal Institute, and the Uniform Standards of Professional Appraisal Practice.

E. STATEMENT OF COMPETENCY

ACM Consultants, Inc. (formerly ACM, Real Estate Appraisers, Inc.) has been actively involved in the real estate appraisal business since 1982. Our business emphasis has focused mainly on the valuation of residential and commercial properties located within the State of Hawaii. The company considers itself competent to conduct a market study for a proposed 108-lot rural subdivision project in Maalaea, Maui.

F. EXTRAORDINARY ASSUMPTIONS AND HYPOTHETICAL CONDITIONS

1. As of April 2014, the subject was still in the preliminary stages of planning. The Consultant is not liable for any changes in the project plan past this date, nor for information that has not been released or communicated to the Consultant.

2. The Consultant has no control over economic conditions and other international events that could have an affect upon Hawaii's economy and the Maui real estate market. As a result, this report has not made any assumptions regarding potential conflicts with other nations, or external factors affecting economic conditions here.

3. The counseling report is also subject to standard "Limiting and Contingent Conditions" located in the pages following.

G. CONFIDENTIALITY PROVISION

The contents of this market study are confidential. The intended user of this report is MVI LLC. Release of this counseling report by ACM Consultants, Inc. is limited to MVI LLC and for its internal use only. Any further release of this report, or portions herein, is strictly prohibited and you shall accept the risk and liability for any such release without the previous written consent of ACM Consultants, Inc. Further, you shall indemnify and defend ACM Consultants, Inc., and its individual consultants/appraisers, from any claims arising out of any such unauthorized disclosure.

H. CERTIFICATION

The undersigned does hereby certify that except as otherwise noted in this appraisal report:

1. The Consultants' compensation is not contingent upon the reporting of a predetermined conclusion that favors the cause of the client, the attainment of a stipulated result, or the occurrence of a subsequent event.

2. The Consultants' have no present or prospective interest in the property that is the subject of this report, and no personal interest or bias with respect to the parties involved. The "Estimate of Market Value" in the consulting report, if any, is not based in whole or in part upon the race, color, or national origin of the prospective owners or occupants of the properties in the vicinity of the property appraised.

3. The Consultant has personally inspected the property, and is a signatory of this Certification.

4. To the best of the Consultants' knowledge and belief, all statements of fact and information in this report are true and correct, and the Consultants' have not knowingly withheld any significant information.

5. No other person provided significant professional assistance to the persons signing this report.

6. The reported analyses, opinions and conclusions are limited only by the reported assumptions and limiting conditions, and are the Consultants' personal unbiased professional analyses, opinions and conclusions.

7. All analyses, opinions and conclusions were developed, and this report has been prepared, in conformity with the Uniform Standards of Appraisal Practice.

8. This counseling report is subject to and in conformance with the Code of Professional Ethics and Standards of Professional Conduct of the Appraisal Institute.

9. This counseling report is to be used only in its entirety and no part is to be used without the whole report. All conclusions and opinions concerning the real estate are set forth in the counseling report were prepared by the Consultant(s) whose signature(s) appears on the counseling report. No change of any item in the counseling report shall be made by anyone other than the Consultant, and the Consultant shall have no responsibility for any such unauthorized change.

11. The use of this report is subject to the requirements of the Appraisal Institute relating to review by its duly authorized representatives.

12. As of the date of this report, Dominic Suguitan has completed the Standards and Ethics Education Requirement for Candidates/Practicing Affiliates of the Appraisal Institute.

ACM Consultants, Inc.

Dominic J. Suguitan
Certified General Appraiser,
State of Hawaii, CGA-576
Expiration: December 31, 2015

I. LIMITING AND CONTINGENT CONDITIONS

1) This is a Counseling Report which is intended to comply with the reporting requirements set forth under Standards Rule 5 of the Uniform Standards of Professional Appraisal Practice for a Counseling Report. The information contained in this report is specific to the needs of the client and for the intended use stated in this report. The Consultant is not responsible for unauthorized use of this report.

This report has not been prepared for federally-related mortgage financing purposes, and has not been prepared in compliance with the requirements of Title XI of the Federal Financial Institutions Reform, Recovery, and Enforcement Act of 1989.

2) No responsibility is assumed for legal or title considerations. Title to the property is assumed to be good and marketable unless otherwise stated in this report.

3) The property analyzed is free and clear of any or all lines and encumbrances unless otherwise stated in this report.

4) Responsible ownership and competent property management are assumed unless otherwise stated in this report.

5) The information furnished by others is believed to be reliable. However, no warranty is given for its accuracy.

6) All engineering, if any, is assumed to be correct. Any plot plans and illustrative material in this report, if any, are included only to assist the reader in visualizing the property.

7) It is assumed that there are no hidden or unapparent conditions of the property, subsoil, or structures that render it more or less valuable. No responsibility is assumed for such conditions or for arranging for engineering studies that may be required to discover them.

8) It is assumed that there is full compliance with all applicable federal, state, and local environmental regulations and laws unless otherwise stated in this report.

9) It is assumed that all applicable zoning and use regulations and restrictions have been complied with, unless a non-conformity has been stated, defined, and considered in this counseling report.

10) It is assumed that all required licenses, certificates of occupancy or other legislative or administrative authority from any local, state, or national governmental or private entity or organization have been or can be obtained or renewed for any use on which the value estimates contained in this report are based.

11) Any sketch in this report may show approximate dimensions and is included to assist the reader in visualizing the property. Maps and exhibits found in this report are provided for reader reference purposes only. No guarantee as to accuracy is expressed or implied unless otherwise stated in this report. No survey has been made for the purpose of this report.

12) It is assumed that the utilization of the land and improvements is within the boundaries or property lines of the property described and that there is no encroachment or trespass unless otherwise stated in this report.

13) The Consultant is not qualified to detect hazardous waste and/or toxic materials. Any comment by the Consultant that might suggest the possibility of the presence of such substances should not be taken as confirmation of the presence of hazardous waste and/or toxic materials. Such determination would require investigation by a qualified expert in the field of environmental assessment. The presence of substances such as asbestos, urea-formaldehyde foam insulation, or other potentially hazardous materials may affect the value of the property. The Consultant's value estimate is predicated on the assumption that there is no such material on or in the property that would cause a loss in value unless otherwise stated in this report. No responsibility is assumed for any environmental conditions, or for any expertise or engineering knowledge required to discover them. The Consultant's descriptions and resulting comments are the result of the routine observations made during the analysis process.

14) Unless otherwise stated in this report, the subject property is evaluated without a specific compliance survey having been conducted to determine if the property is or is not in conformance with the requirements of the Americans with Disabilities Act. The presence of architectural and communications barriers that are structural in nature that would restrict access by disabled individuals may adversely affect the property's value, marketability, or utility.

15) Any proposed improvements are assumed to be completed in a good workmanlike manner in accordance with the submitted plans and specification.

16) The distribution, if any, of the total valuation in this report between land and improvements applies only under the stated program of utilization. The separate allocations for land and buildings must not be used in conjunction with any other appraisal and are invalid if so used.

17) Possession of this report, or a copy thereof, does not carry with it the right of publication. It may not be used for any purpose by any person other than the party to whom it is addressed without

the written consent of the consultant, and in any event, only with property written qualification and only in its entirety.

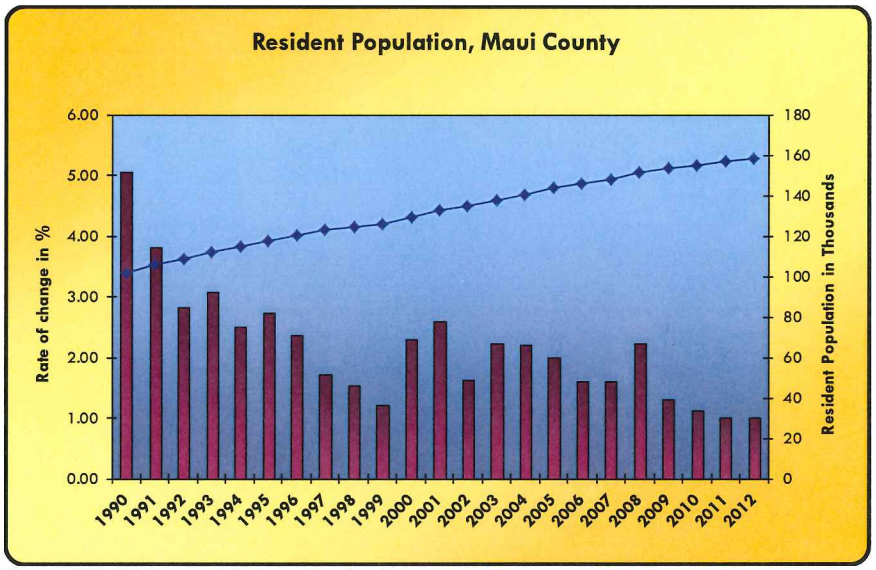
18) Neither all nor any part of the contents of this report (especially any conclusions as to value, the identity of the Consultant, or the firm with which the Consultant is connected) shall be disseminated to the public through advertising, public relations, news sales, or other media without prior written consent and approval of the Consultant.

PART II – FACTUAL DATA

A. REGIONAL DATA - MAUI COUNTY

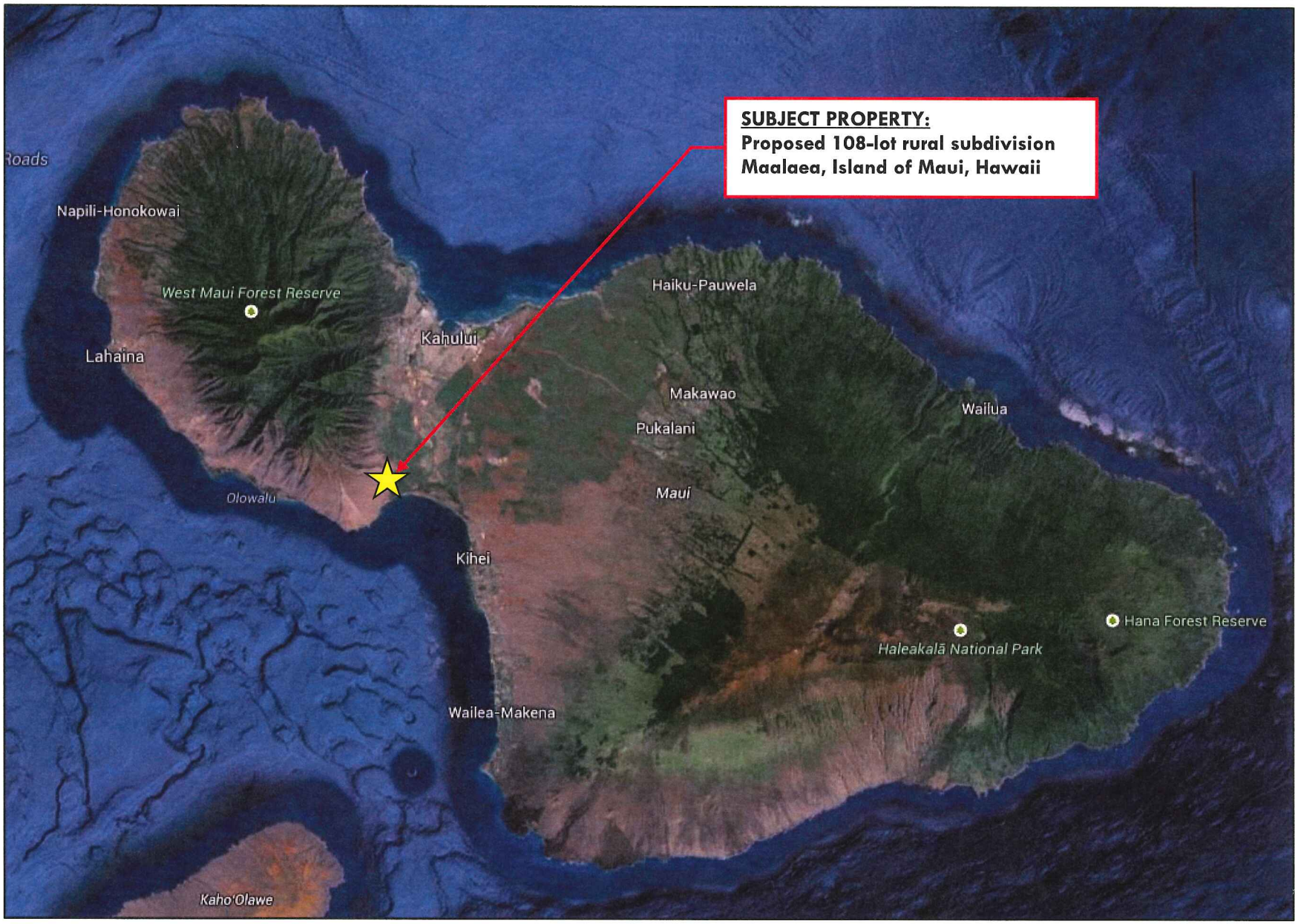
Maui County is the third most populous of the four counties of Hawaii, with a total resident population of 154,834 (2010 Census); a change of 20.12 percent from 2000 and 52.23 percent since 1990. Maui County consists of the islands of Maui, Molokai, Lanai, and Kahoolawe. Ninety percent (90%) of County residents live on Maui Island; The Island of Maui consists of a total of 734.5 square miles, or 470,080 acres.

The following graph illustrates the resident population change in Maui County from 1990 through 2012. The graph indicates that although Maui's population has been steadily growing, it now appears to be rising at a decreasing rate.



Source: UHERO Economic Information Service

Like all the Hawaiian Islands, Maui, Molokai and Lanai are blessed by warm air temperatures year-round, and ocean waters that range from 72-77°F in winter to 77-81°F in summer. The islands' distance from other continents, the moderating effects of the surrounding water and the tropical location combine to create this pleasant climate. Hawaii's topography, particularly the mountains and valleys and location of each island, contributes to the great variety of microclimates within very small areas. On Maui, the West Maui Mountains and Haleakala are the primary geological features affecting the weather. Due in part to the above geographical factors, Maui, for seventeen out of the last eighteen years, was selected "Best Island in the World" by readers of Condé Nast Traveler magazine.

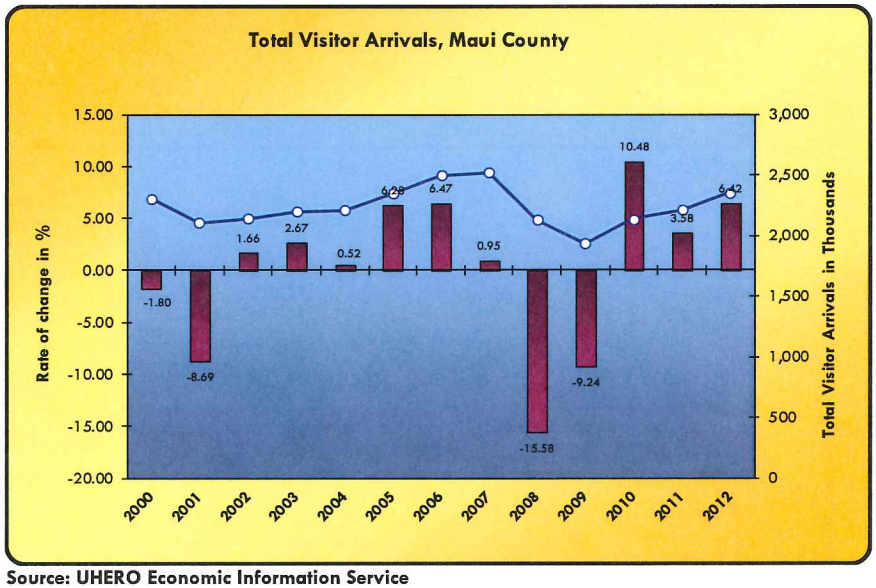

SUBJECT PROPERTY:
Proposed 108-lot rural subdivision
Maalaea, Island of Maui, Hawaii
Napili-Honokowai
West Maui Forest Reserve
Lahaina
Kahului
Haiku-Pauwela
Makawao
Pukalani
Wailua
Maui
Olowalu
Kihei
Hana Forest Reserve
Haleakalā National Park
Wailea-Makena
Kaho'olawe

Visitor Industry

Historically, Maui hotel occupancies typically exceeded any area in the state with the exception of Waikiki. Its high rating is due to a number of factors. First, Maui receives the good fortune of location and climate. Second, Maui has the infrastructure in place to move tourists to a diverse variety of activities with a minimum of inconvenience and down time. The accommodations on Maui are another reason. Maui resort hotels have consistently ranked above other Hawaii resort destinations. In the Condé Nast Traveler magazine, eight (8) of the "Top 20 Hawaii Resorts" for 2011 were Maui County resorts. The Travaasa Hana Hotel topped the list, while other Maui County resorts garnering honors included: Four Seasons Resort Maui at Wailea (2nd); Four Seasons Resort Lanai at Manele Bay (4th); Four Seasons Resort Lanai, The Lodge at Koele (5th); Grand Wailea (11th); Fairmont Kea Lani (12th); Hyatt Regency Maui Resort & Spa (13th); and, Ritz-Carlton Kapalua (14th).

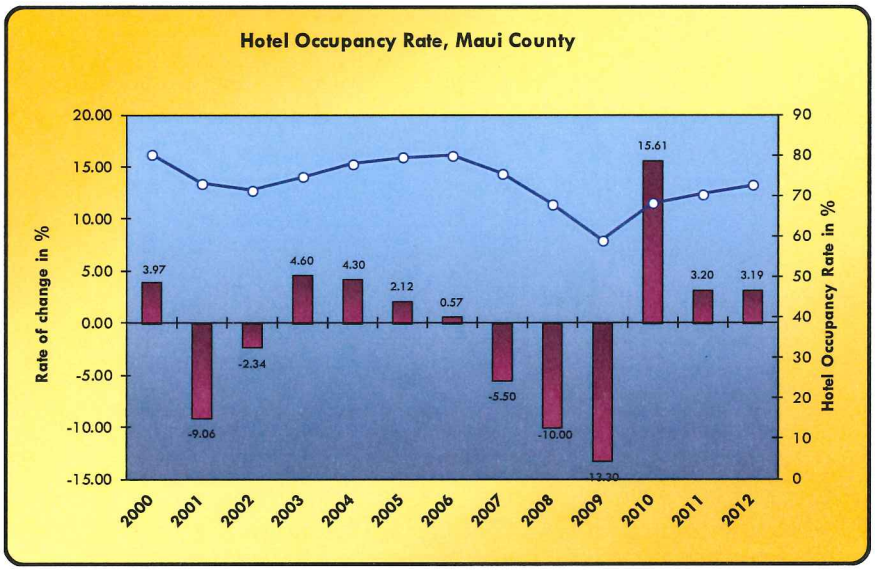
With the possible exception of Kauai, Maui is more dependent on tourism than any of Hawaii's four counties. That sector is not treating Maui very well today. For years, Maui has worked very hard at cultivating a worldwide image as a premier, upscale tropical island destination. In fact, it is the only county government in Hawaii that spends money to support tourism. In the wake of the current financial crisis, Maui's tourism counts and hotel occupancy have fallen significantly. Even the upscale and affluent markets, it appears, have curtailed their spending on trips to the Valley Isle.

Tracking the tourism counts during this decade begins with the effects of the September 11, 2001 terrorist attacks on this country which had a drastic impact on the tourism industry. The final Maui visitor count for 2001 was 2,104,480. In 2002, the visitor count rebounded slightly to 2,139,427 as the visitors slowly returned during the mid to latter part of the year. Visitor totals from 2003 to 2007 indicate positive increases. As a result of the dismal economic conditions in 2008 and 2009, total visitor arrivals declined by 15.58 percent (2,129,040) and 9.24 percent (1,932,360), respectively, in those years. The lowest visitor arrival in Hawaii and many other visitor destinations worldwide were severely impacted by the national and global economic recession. However, in 2010 the visitor count rebounded with a 10.48 percent jump to 2,134,900, as the economic conditions began to show signs of stability, with further increases in 2011 and 2012.



Source: UHERO Economic Information Service

In 2010, Maui County had the second highest occupancy rate of all the Hawaii counties at just 68.2 percent, behind Oahu at 78.25 percent. Meanwhile, Kauai showed occupancy of 59.11 percent and Big Island at 56.44 percent. Maui's occupancy rate steadily increased through 2012. The hotel occupancy rate generally follows the trend of total visitor arrivals.



Source: UHERO Economic Information Service

Visitor shopping opportunities have increased in recent years with the opening of The Maui Marketplace, a 275,000 square foot shopping complex, modeled after Oahu's successful Waikele Center. The Maui Marketplace is now home to such retail superstores like Lowe's Hardware, Pier One Imports, Sports

Authority, Starbucks Coffee, and Office Max, as well as many small local retailers and restaurants. Also opening in the same Kahului area were Home Depot, Wal-Mart, Big K and Costco. In addition, the Shops at Wailea opened in December 2000 and added approximately 150,000 square feet of high-end retail space in the Wailea Resort. At about the same time, the 150,000 square foot Piilani Shopping Center opened in Kihei with Safeway as its anchor tenant. The Lahaina Gateway, which opened in 2007, was dubbed a "lifestyle center". It offers almost 137,000 square feet of gross leasable area. Tenants include Barnes and Noble, Foodland Farms, Office Max, Maui Dive Shop, Central Pacific Bank and many other smaller retail shops. The latest entry into the market is Maui Lani Shopping Center, which is located along Kaahumanu Avenue across Baldwin High School. This center contains a total leasable area of approximately 103,249 square feet, and is anchored by a 58,770 square foot Safeway.

Maui offers more than any other Neighbor Island in the way of proven vacation experiences. It has a larger tourism activities industry relative to the size of its economy than any other county. Such activities include ocean recreation, helicopter tours, biking down Haleakala, zip lining, and golfing, among numerous other activities. Maui's well-developed ocean recreation industry ranges from windsurfing to snorkeling, scuba diving and sailing cruises which leave regularly from Lahaina and Ma`alaea Harbors.

Maui also has theme destinations, such as the Maui Tropical Plantation, Maui Nui Botanical Gardens, Alii Kula Lavender Farm, and Surfing Goat Dairy. But the premier theme destination on the island is the Maui Ocean Center. This center, featuring the marine environment of the Hawaiian Islands, is modeled after five other aquarium parks developed elsewhere in the world by Coral World International. This ocean center is located just behind the Maalaea Boat Harbor, and is easily accessible from Kahului/Wailuku, and the resort areas of Lahaina/Kaanapali and Kihei/Wailea. The Maui Ocean Center anchors the 18-acre Maalaea Harbor Village, which also includes a retail strip shopping center, restaurants and other services.

As the United States and the world in general recover from the recent economic crisis, it is anticipated that Maui will continue to be a strongly favored destination for Mainland tourists. The island has a large share of condominiums available for families and groups on a budget. The California recovery in the early 2000's fueled higher demand for condominium rentals and this may possibly happen again in the next decade.

Construction and Development

The construction industry, in the mid part of this decade, benefitted from a robust economy and building climate.

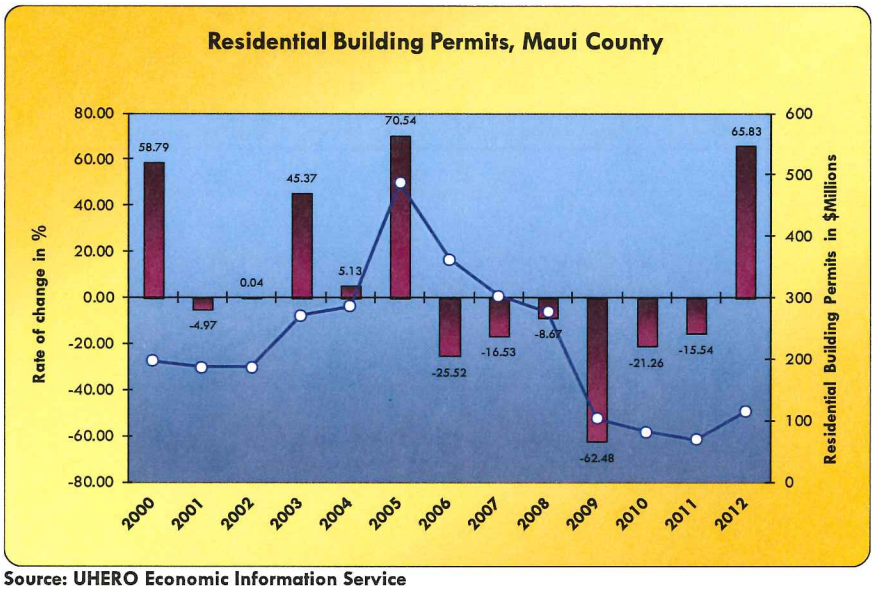
Three new commercial centers were built in 2000. The Wailea Shopping Village had been demolished and was replaced with The Shops at Wailea, which includes 150,000 square feet of upscale retail and restaurant space. Also, the 150,000 square foot Piilani Village shopping center was built at the same time and is anchored by a 55,000 square foot Safeway store, one of the largest Safeway in the state. The Ma'alaea Harbor Village shopping complex, where the premier Maui Ocean Center presently stands, was also built during the same period; however, since then, no other project has been attempted and the majority of the lots in this commercial subdivision sit vacant.

As previously discussed, the Lahaina Gateway was completed in 2008 and injected an additional 137,000 square feet of retail space. The new Maui Lani Shopping center, which was completed in Wailuku in 2013, added an additional 103,249 square feet of leasable retail space, including a new 58,770 square foot Safeway. The upcoming Puunene Shopping Center is currently being developed in Kahului at the intersection of Mokulele Highway and Hookele Street which will contain approximately 275,000 square feet of total leasable retail space, including a 141,241 square foot Target store.

The effects of the late-2008 financial crisis and subsequent economic recession are still clearly visible across the island, as many new commercial and industrial projects completed during this period remain empty, or are having difficulty selling off or leasing units.

Construction of single-family and condominium properties has fallen significantly, as developers have curtailed building to meet their anticipated sales levels. As mentioned earlier, the single-family and condominium real estate markets have softened, with median prices decreasing as well as an increase in marketing days. Although the economic recession has played a big part in the decrease of construction of residential properties; the enactment of two ordinances—the Workforce Housing Ordinance (2006; revised 2010) and the Water Availability Ordinance (2007; revised 2011), which have forced stringent requirements on developers, has also greatly affected construction on Maui.

The following graph illustrates the trend of residential building permits (in dollars) in Maui County from 2000 through 2012. As shown in the following graph, residential permits peaked in 2005 at the height of the real estate market. As previously discussed, many feel that the passage of County ordinances relating to development in 2006 and 2007, coupled with increased construction costs and poor economic conditions, severely lessened the ability to feasibly create new housing projects.



Source: UHERO Economic Information Service

In Central Maui, the majority of the residential construction is within the Kehalani and Maui Lani project districts, which are being developed with several new subdivisions and condominium projects. Situated in the Kehalani district are Koa, which offers both house lots and single-family homes; Akolea and Cottages, both consisting of house and lot packages; Villas at Kehalani and Milo Court, which are townhouse condominium developments. Recently completed projects include Na Hoku and Traditions (single-family homes), Sand Hills Estates (house lots), and Parkways (both house lots and single-family homes). Presently, there are two ongoing projects at Maui Lani including New Traditions at Maui Lani and Parkways at Maui Lani.

The demand for housing in the Central Maui area had been extremely strong up to mid-2006, with projects usually sold out prior to completion of construction. However, the recent recessions saw sales volume and prices plummet for all property types. Sales volume began to recover in 2009, but median prices only recently hit bottom in 2011 and have been slowly increasing since. On-going residential developments in Central Maui are experiencing brisk sales but are timing their construction to keep pace with sales.

Meanwhile, Spencer Homes completed construction of a 410-unit affordable project in 2008, called Waikapu Gardens. Approximately half of the houses met County affordable housing pricing requirements. This project was welcomed by the community as "affordable" prices were stated to be below $300,000. This project gained approval by the Maui Nui Affordable Housing Taskforce which was set up in response to the growing need for affordable housing on Maui. Phase II of Waikapu Gardens is currently in the process of being developed with 56 additional single-family homes south of the existing Waikapu Gardens project.

Up to 2006, Kihei had also seen an upswing in residential development brought upon by ongoing residential projects including Ke Ali`i Ocean Villas (townhouse condominiums) and Moana Estates (single-family homes) by Towne Development, Kamali'i Alayna (single-family homes) by Betsill Brothers, Inc., and Signature Homes' Hokulani Golf Villas (residential condominiums). Other current South Maui projects are Kilohana Waena (house lots) and Kai Ani (townhouse condominiums). Similar to Central Maui, the developers of ongoing projects have slowed construction while continuing to market their units; whereas, previous Kihei developments were often sold out prior to construction completion.

In Wailea, the Shops at Wailea and Wailea Town Center are the only established commercial developments. Both centers target the high-end residents of this resort community and Wailea's upscale visitors. Phase I of Wailea Town Center was completed in 2006 while Phase II was completed in 2007. It contains neighborhood services which include retail and office owner-occupants. The second phase included more commercial condominium units and residential units on the second floor. Current condo owners in this project include Coldwell Banker and First Hawaiian Bank. This development was met with high demand as all of the units have already sold and some have even resold. Another commercial retail/office project, Wailea Gateway Center, was completed in 2009.

Retailing

In retail, the most significant addition to Maui was the Lahaina Gateway situated along Honoapiilani Highway across from the Lahaina Cannery Mall. It was dubbed as a "lifestyle center" with specialty retail shops, services and restaurants. Opened in late 2007, this 137,000 square foot center includes anchor tenants such as Office Max, Barnes & Noble, and Lahaina Farms, a supermarket owned by Foodland's Sullivan family.

Prior to Lahaina Gateway, Maui Marketplace on Dairy Road was the last large retail development to be built, at 275,000 square feet. This center contains the likes of Lowe's Hardware, Office Max, Sports Authority, Old Navy, Petco, Pier One Imports, Burger King and Starbucks Coffee.

Wal-Mart and Home Depot are also located on Dairy Road, immediately west of the Maui Marketplace. These outlets joined earlier arrivals Costco and Kmart, as well as Alexander & Baldwin's neighboring Triangle Square, in carving up the Maui retail pie. However, the local malls are answering the challenge with more food and entertainment, and retailers that can compete in their niche. Maui's largest mall, Queen Kaahumanu Center in Kahului, has been challenged by the presence of these large box retailers and vacancies are very noticeable.

In Kaanapali, Whalers Village has taken a turn toward the luxury market popular with the Japanese. After completing a $3 million renovation and a change in its tenant mix, this oceanfront center now aims for both westbound and eastbound visitors. Japanese visitors are targeted with Duty Free Shoppers, Louis Vuitton, Prada, Loewe and other high-end shops.

The 150,000-square foot Shops at Wailea opened in 2000, offering upscale shopping in its high-end retail shops. Tenants include Louis Vuitton, Coach, Bally, Fendi, Tiffany & Co., Banana Republic, and Georgiou. Restaurants in this mall include Ruth Chris Steak House, Tommy Bahama Café and Emporium, and Longhi's. Other retailers include Crazy Shirts, Hot Topix, Gap, Wolf Camera, and Whalers General Store.

A new addition to the retail market is the 103,000 square foot Maui Lani Shopping Center which opened in 2012, and is anchored by a new Safeway store. However, there are still no other stores in this shopping center. As previously stated, a new shopping center being added to the Central Maui market is the 275,000 square foot Puunene Shopping Center, which will include a new 141,000 square foot Target store at the corner of Mokulele Highway and Hookele Street.

Agriculture

Agriculture on Maui has historically been dominated by larger operations like Maui Land & Pineapple Company and Alexander & Baldwin's Hawaii Commercial and Sugar (HC&S).

Pineapple now confronts more foreign competition from places like Thailand. In 2007, Maui Land & Pineapple Company shut down the canning portion of its operation to rely solely on the more profitable fresh fruit segment. Downsizing of the plantation occurred in 2008, which resulted in a reduction of over 200 employees. In December 2009, Maui Land & Pineapple Company announced that it would be shutting down its agricultural arm, citing continued annual losses. A new company, Haliimaile Pineapple Company, was formed the following week and was able to take over a portion of the pineapple operations.

HC&S survives as Hawaii's only remaining sugar operation due in part to its economies of scale, its land configuration (a relatively compact and contiguous land area in the isthmus of the Valley isle), and its commitment and ability over the years to reinvest and upgrade plant and equipment. But the last active sugar plantation in the state is facing other hardships, namely water. There had been drought conditions on Maui between 2007 and 2009, contributing to low sugar yields. According to HC&S, future viability is dependent on continued stream diversion; however, there has been opposition to this continued practice. HC&S continues to re-evaluate its operations to remain viable, including consideration of potential biofuels and other energy alternatives.

Another of Maui's sugar operation casualties, Pioneer Mill in West Maui, is missed visibly. For years, proponents of maintaining and sustaining Hawaii's sugar industry argued that growing sugarcane imparted to this economy an important, if underestimated, non-pecuniary benefit; sugar kept the land green and attractive, for tourists and locals alike, and its cultivation contributed to the recharge of groundwater resources. Economists call this situation an "externality," an activity that affects others for better or worse, without those others paying or being compensated for activity.

Anyone who doubts that logic now has only to drive the West Maui coast from Olowalu to Kaanapali and look mauka, at an entire mountain side of dry brush and unused fields. As with many cases where sugar plantations have shut down, most diversified agriculture crops are just not land intensive enough to utilize all the vacant land. Coffee and seed corn operations are possibilities, but they make only a small dent.

In addition to sugar and pineapple cultivation, Maui also offers rich opportunities for agricultural diversification by small farmers and large agribusinesses. Top among new agricultural products are: papaya, cut flowers, coffee, Kula onions and strawberries, and Chinese cabbage from Kula. Molokai offers its sweet potatoes, Molokai lettuce and alfalfa, as well as taro.

High-Tech

Maui's contribution to Hawaii's fledgling high-tech industry remains pre-eminent in the state. It also represents genuine diversification of the economy. The Maui Research and Technology Park in Kihei has all of its infrastructure in place, and has completed three major building projects. Most important, it houses one of the country's most powerful supercomputers. The park now hosts over 30 companies and over 300 employees on 415 acres.

With access to one of the most powerful supercomputers in the world, funded by the U.S. Air Force, the Maui Research and Technology Park is continuing its efforts to diversify the Maui economy into something fundamentally different from what exists in the county or anywhere else in the state.

An office building was developed by the Maui Economic Development Board in 2006, and contains approximately 31,500 square feet of rentable area on a 2.8-acre site. Another completed project is Park Plaza, a 26-unit commercial office condominium building developed by Goodfellow Brothers and Betsill Brothers. Since its completion in 2008, sales have been very sluggish.

The Park is sticking to its long-run strategic plan to capitalize on its location at the center of the Pacific Basin. Its extensive fiber-optic network to the U.S. Mainland makes it one of the most fiber-rich

environments in the world, greater than many facilities actually located on the Mainland.

County Government

Maui County is unique in having several inhabited islands in its jurisdiction: Maui, Molokai, as well as Lanai, and the uninhabited island of Kahoolawe.

Maui County has an elected Mayor and County Council, and the Liquor Control Commission is semi-autonomous with appointed directors. Although all courts are conducted by the State, the County is responsible for prosecution and the Mayor appoints the prosecutor. The council has nine members, each residing in one of nine districts; however, voters cast ballots for all nine seats. Unlike other states, Hawaii has only two layers of government: State and County. The State is responsible for many functions that elsewhere come under the jurisdiction of municipalities, such as schools, hospitals, and airports. Also, unlike other states, Hawaii has statewide zoning implemented by the State Land Use Commission. The County has zoning authority within the boundaries established by the commission.

The lack of affordable housing continues to be a concern within the County of Maui. Maui is one of the most expensive counties for single-family home buyers. A record high median price of $780,000 was set in July 2006 for a single-family home. Since then, the median single-family price continued to fall until 2012, with an average monthly median sales price of $627,137 in 2007, $574,760 in 2008, $498,708 in 2009, $462,821 in 2010, and $433,500 in 2011. In 2012, the median single-family sales price increased slightly to $470,000, and again in 2013 to $530,000. According to the latest State of Hawaii Data Book, 8 percent of the houses are overcrowded on Maui and 41.4 percent of the households pay more than the recommended limit of 30 percent of their income on housing. In fact, 27.1 percent pay more than 40 percent on housing.

This heightened effort by the County resulted in the passage of Ordinance 3418 on December 5, 2006, under which all proposed developments are subject to review if they are to contain five or more units or lots. Under this ordinance, if the average sales price is projected to be less than $600,000, 40 percent of the total units must be priced to meet the various affordable categories. If the average sales price in the project is $600,000 or more, then 50 percent of the units must be affordably priced. An alternative to providing the affordable units is to pay an in-lieu fee equal to 30 percent of the average projected sales price of the market rate units multiplied by the number of affordable units required in the development. Or, the owner may elect to provide land which is equal in value to the in-lieu fee. This ordinance has had a profound effect on residential development since its passage. The subsequent reduction in proposed projects had many in the building

and real estate industries questioning whether the ordinance created too much of an obstacle for developers.

In an effort to stimulate residential construction, the ordinance was revised by the County Council as Ordinance No. 3719, effective February 26, 2010, reducing the amount of required affordable housing units built on site to 25 percent, provided the average sales price of the market units is projected to be less than $600,000. If the average sales price in the project is $600,000 or more, then 50 percent of the units must be affordably priced. The new law also clarified the calculation of required affordable units built off site; based on 50 percent of the total number of on-site market units, regardless of their projected average sales price.

The water availability ordinance is another law that has made an impact on the development community. On December 14, 2007, the County of Maui passed into law Ordinance 3502. As a result, the Department of Water Supply (DWS) is presently restricting the issuance of meters for all uses in the central and south Maui service areas and this bill restricts issuance of any building permits until the DWS can issue a meter consistent with the provisions of the bill. In order to do so, the DWS director needs to provide verifiable, long-term supply of water to the property. Landowners and professionals in the development community have been openly critical of the ordinance, some calling it a de facto moratorium on housing. Not surprisingly, sales of vacant development lands have been impacted.

The ordinance was revised by the County Council as Ordinance No. 3818, effective April 5, 2011, exempting infill development (10 residential dwellings or less) within areas already developed and having consistent land use; residential workforce housing units built by a qualified housing provider; residential development projects with 100 percent affordable units; and public or quasi-public development projects. The exemptions are only applicable within areas serviced by the Water Department's Central or West Maui water systems. Time will tell if the latest versions of both ordinances will help to achieve their intended goals.

B. NEIGHBORHOOD DESCRIPTION

Since real estate is fixed in location, its marketability and rentability are strongly influenced by economic and social trends in its immediate environment. The continuing attractiveness of this neighborhood environment to potential users and tenants, and its competitive relation to those of substitute properties, must therefore be evaluated and forecast by the appraiser. In particular, perceived neighborhood trends affect both the quality and quantity of the revenues the subject property can reasonably be expected to generate.

A neighborhood of income-producing properties is a geographic area characterized by similarity of uses and/or users, within which any change has a direct and immediate effect on the subject property and its value.

According to State of Hawaii Tax Maps, the subject is classified as being within the Wailuku District. However, long-term land use for Maalaea on the County level is determined by the Kihei-Makena Community Plan. The following neighborhood description has been excerpted from the Kihei-Makena Community Plan.

The geographic area surrounding the subject property is defined by physical and man-made boundaries, and encompasses an area known as Kihei-Makena. This area extends along the western shoreline of east Maui at the foot of Haleakala.

The boundaries of the Kihei-Makena planning region begin at the shore where Kapuni Gulch enters the ocean. Starting at this point, the boundary travels mauka to the Kahikinui forest reserve, then in the westerly direction along the unimproved Piilani Highway to the Kula Highway at Ulupalakua, then along the highway to the jeep trail running through the center of the Kamaole Ahupua'a, then makai along the jeep trail to the unimproved portion of Waiakoa Road, then in a northerly direction along the unimproved improved portions of Waiakoa Road to its intersection with Spanish Road north of Pulehu Gulch. The boundary then extends along Spanish and Waikapu Roads which traverse the length of the island's isthmus to a point just east of Waikapu at Waikapu Stream, then in a southwesterly direction to Honoapiilani Highway, and finally along the highway to Pohakea Gulch. The boundary then goes mauka along the centerline of the gulch to the ridgeline, and then makai along the centerline of Manawainui Gulch to the shoreline.

The region is comprised of four communities: Maalaea, Kihei, Wailea, and Makena. Community form in the planning region consists of a small shoreline-oriented community at Maalaea and a linear pattern of urbanization extending from the south end of Kealia Pond to Makena. This consists of Kihei proper, extending

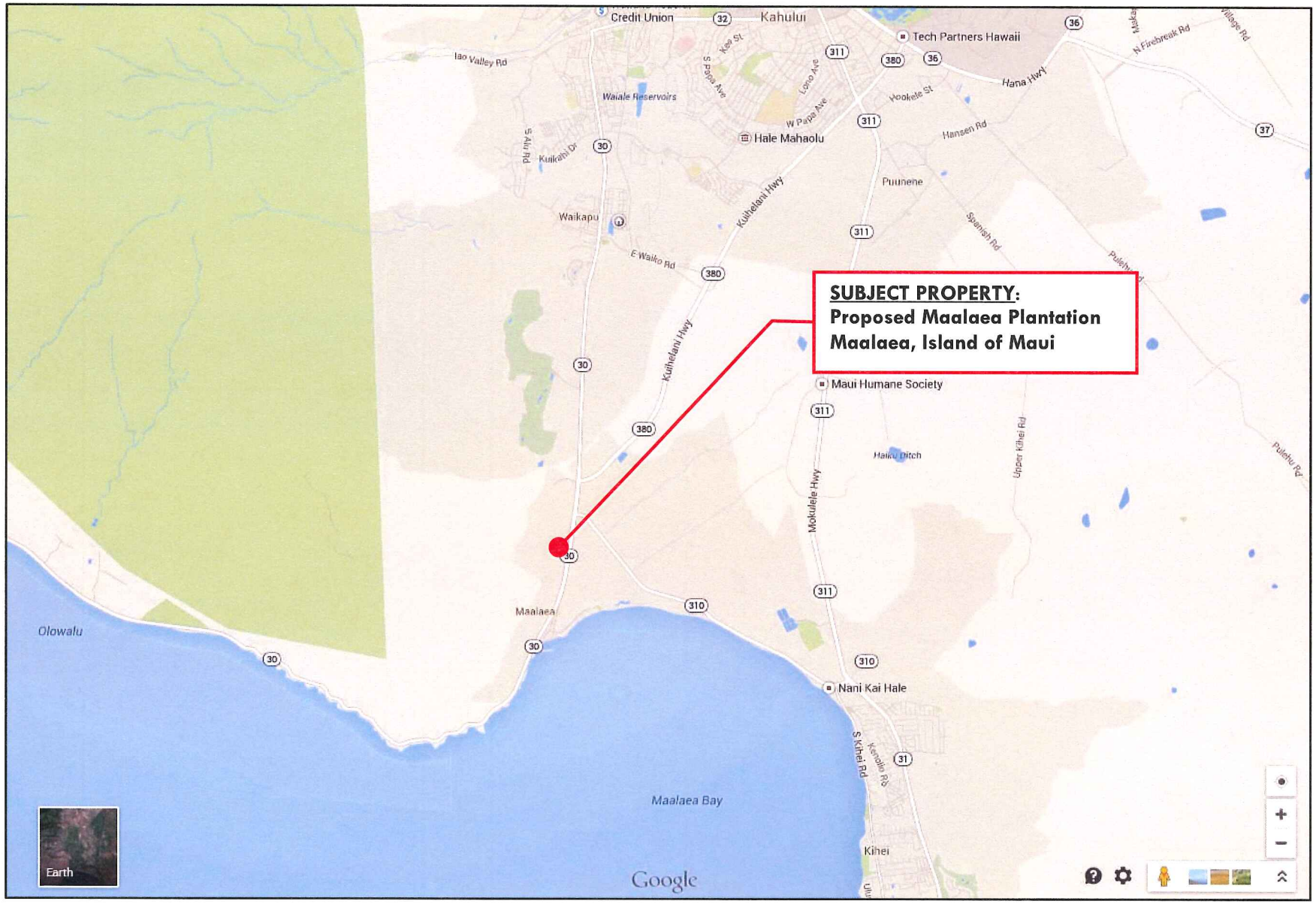
from Kilohana Drive, and the planned resort destination areas at Wailea and Makena.

Kihei is the central residential and commercial area of south Maui. Included in the Kihei area are single family subdivisions, residential and resort condominiums, shopping centers, schools, and recreational and religious facilities. Kihei also provides the bulk of residential oceanfront properties available for private ownership. Access to Kihei is provided by two major thoroughfares: the Mokulele Highway which services traffic from Kahului to Kihei and the North Kihei Road which services traffic from Wailuku Town and Lahaina to Kihei. Both thoroughfares are two-lane asphalt paved roads. The newer Piilani Highway connects with both highways and is considered the "express thoroughfare" while the older South Kihei Road provides access to the majority of properties via numerous secondary and tertiary roads.

All public utilities including electricity, water, sewer, and telephone service are available to the greater Kihei area. Due to increasing demands for domestic water in the south Maui area, a water assessment fee is presently in force and applied to all new large scale residential and commercial developments. Police, fire and ambulatory services are provided by stations directly in Kihei or in nearby Wailuku or Kahului.

A major factor in the growth and development of the Kihei region is tourism. This area of Maui has a sunny climate and possesses beautiful white-sand beaches, and, there, is a popular tourist destination. As a result, hotels have been successfully developed in the area.

Kihei in general experienced rapid and perhaps uncontrolled growth in the 1970's. This growth stabilized during the early 1980's and made a strong return in the latter half of the decade. There are numerous residential subdivisions in Kihei, making it one of Maui's larger suburban areas. Additionally, numerous residential and resort condominiums occupy nearly 20 percent of Kihei proper. The steady growth of Kihei and the south Maui area has also encouraged the development of new shopping complexes and other support facilities serving the resident and visitor population. The Wailea resort area with its luxury hotels, exclusive residential lots, condominiums, and recreational facilities is located on the outskirts of Kihei, and the Makena and Seibu resort areas are also located on the southern outskirts of Kihei.



Not to Scale!

NEIGHBORHOOD MAP

The expansion of the Wailea Resort, along with other developments indicate a boom in the region as dramatic as the one that transpired in West Maui in the 1970's that triggered a rise of traffic, housing and environmental concerns as Maui attempted to cope with an inadequate infrastructure and a rate of growth second only to Oahu. There is currently a stable level of interest by mainland investors in the resort projects of Wailea and Makena.

The Kihei region within the past ten years has experienced rapid growth in residential population and further growth is projected for this community. Population in this region had grown by about 50 percent between 1990 and 2000, resulting in an increasing demand for residential housing. Recently developed subdivisions sold briskly and prices rose at a rapid rate until the economic recession. There were several notable new residential projects developed in Kihei and Wailea, including the 18-unit Walaka Maui, the 112-unit Kai Makani, the 152-unit Hokulani Golf Villas, and the 146-unit Ke Alii Ocean Villas. Single-family subdivisions that were developed include the 23-lot Kihei Kauhale subdivision, 31-lot Kilohana Waena subdivision, the 65-lot Liloa Village subdivision, the 90-unit Kamalii Alayna Subdivision, and the 90-unit Moana Estates.

In Wailea and Makena neighborhoods, the Wailea Beach Villas was completed and consists of 98 condominium units on an 11-acre beachfront site. Original prices ranged from $1,350,000 for a two-bedroom unit without views, to $5,600,000 for a three-bedroom, oceanfront unit. Another high end development, Maluhia at Wailea, features 14 custom-designed luxury condominium residences on 10.5 acres of land. The custom homes range in size from 5,200 to 12,000 square feet. Original prices of the oceanfront homes range from about $7,000,000 to $18,000,000.

Other notable projects in Wailea include the 38-unit Kanani Wailea condominium project, the 120-unit Hoolei luxury condominium project, the 24-unit Papali luxury condominium project, and the 150-unit Kai Malu resort condominium.

With the growth in tourism and resident population, Kihei's commercial activity has expanded, especially along busy South Kihei Road, which runs in a general north-south direction through the entire town of Kihei. It provides the more scenic ocean drive through the town and allows for easy access to all parts of the community. For this reason, this roadway is highly traveled by tourist and resident alike.

Evidence of the commercial growth of this community may be seen in the recent developments along South Kihei Road. In the past, shopping facilities in Kihei were relatively isolated; however, the recent commercial expansion has seen the development of a number of small shopping centers along South Kihei Road.

The continued growth of the south Maui region as a large urban area as well as the continued growth of the Wailea and Makena areas into major resort destinations is anticipated to be a catalyst for further growth in residential, commercial, and various support facilities in the South Maui areas.

C. PROJECT DATA

Environs

The subject is located on the mauka (mountain) side of Honoapiilani Highway in Ma'alaea, Island and County of Maui. Honoapiilani Highway runs in a general north-south direction, in the vicinity of the subject, and connects Wailuku and Waikapu to the Ma'alaea neighborhood. It then continues westward to the communities lying within the West Maui region.

The community of Ma'alaea is situated along Maui's southern coastline. Central to this neighborhood is the small boat harbor, which is home to a number of fishing and sightseeing charter boats, as well as private recreational vessels. The U.S. Coast Guard also has a small office and a dock for its ships. Included within this community are a small number of older oceanfront residences, and 10 oceanfront condominium projects. The condominium developments account for approximately 560 residential apartment units, the majority of which are rented on a short-term hotel basis. The Ma'alaea Triangle Subdivision is home to the Ma'alaea Harbor Shops, a small amusement park, and the Maui Ocean Center aquarium. The area does not have any schools, public recreational facilities (other than the harbor, or residential subdivisions. The nearest employment centers, shopping centers and schools are located in Kihei and Wailuku, both a 10-minute drive from Ma'alaea. Access to Ma'alaea is provided by one major thoroughfare, the Honoapiilani Highway, which also provides the only access to West Maui, one of the island's premier visitor destinations.

In 2013, the harbor completed a multi-million renovation. This project was not part of the harbor expansion, and included reconstructing piers, roadways and the ferry terminal building; construction of sewage pump out stations; electrical upgrades, with a new meter building, power lines and outlets along the piers; renovating the loading docks and public boat launch; and new restrooms, walkways, parking spaces and upgraded drainage.

Description of the Proposed Project

The proposed Maalaea Plantation Subdivision will be located west of and bordering Honoapiilani Highway in Maalaea. The subject consists of approximately 257 acres of land that is currently zoned Agricultural District but is designated as Project District 12 within the Kihei-Community Plan. The project, which is still in its preliminary planning stage, will possess views of Mt. Haleakala, the West Maui Mountains, the southern coastline and the islands offshore.

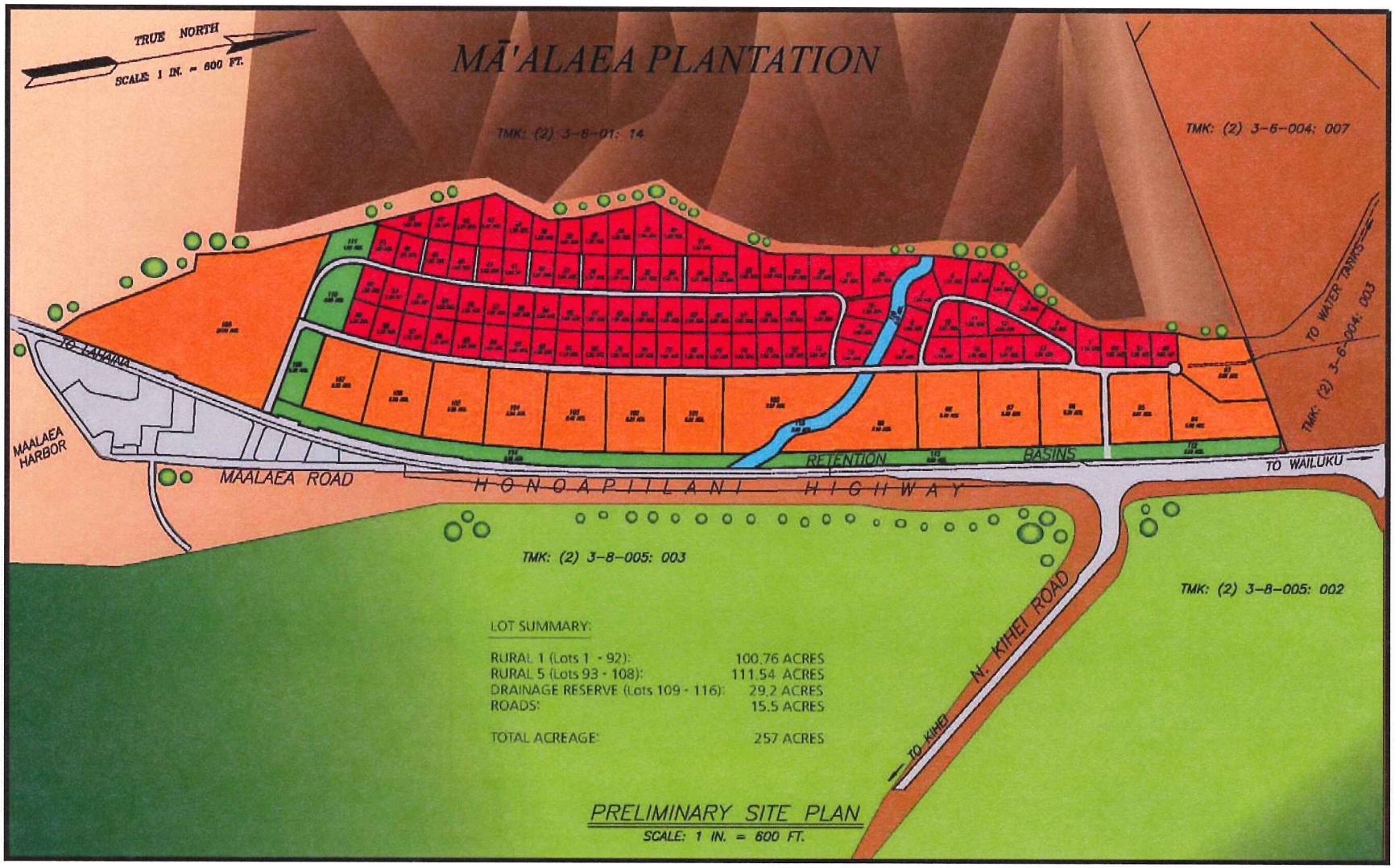
The Consultant has gleaned project information from a preliminary site map, as well as through discussions with the Developer. Maalaea Plantation will consist of 92 1-acre rural lots, 15 5-acre

rural lots and a single 27.50-acre rural lot. Potable and non-potable water for the project will be provided by three water wells and associated infrastructure.

According to the Developer, the proposed land use is as follows:

Proposed Land Use	Acreage
Rural 1 (Lots 1 – 92)	100.76 acres
Rural 5 (Lots 93 – 108)	111.54 acres
Drainage Reserve (Lots 109 – 116)	29.2 acres
Roads	15.5 acres
	Total: ± 257 acres

The developer has decided to develop a rural subdivision in Maalaea in order to provide the community a low density development which will preserve the rural character of the area and allow small-scale agricultural uses as intended by State Land Use and County zoning.


TRUE NORTH
SCALE 1 IN. = 600 FT.
MĀ'ALAEA PLANTATION
TMK: (2) 3-8-01: 14
TMK: (2) 3-6-004: 007
TO WATER TANKS
TMK: (2) 3-6-004: 003
TO LAHAINA
MAALAEA HARBOR
MAALAEA ROAD
RETENTION BASINS
TO WAILUKU
HONOAPIILANI HIGHWAY
TMK: (2) 3-8-005: 003
TMK: (2) 3-8-005: 002
N. KIHEI ROAD
TO KIHEI
LOT SUMMARY:
RURAL 1 (Lots 1 - 92): 100.76 ACRES
RURAL 5 (Lots 93 - 108): 111.54 ACRES
DRAINAGE RESERVE (Lots 109 - 116): 29.2 ACRES
ROADS: 15.5 ACRES
TOTAL ACREAGE: 257 ACRES
PRELIMINARY SITE PLAN
SCALE: 1 IN. = 600 FT.

Note: Boundaries shown are approximate and for illustrative purposes only.

PART III – ANALYSIS AND CONCLUSION

For the purpose of forecasting the market response to this planned rural subdivision development, a market study was conducted to determine how supply and demand for rural and agricultural lots might be affected by the development of the subject's 108-lot rural subdivision project. Therefore, the extent of our survey consisted of analyzing sales and listings throughout Maui, as well as of similar lots in Central Maui. The Appraiser notes that there are currently no new or on-going rural subdivision projects being developed in Central Maui, Kihei or on Maui in general.

OVERVIEW

One of the more difficult factors in determining the success of a project is estimating future project absorption. There are two components to this: First, is the design and pricing of the project. This, of course, is well within the developer's control for a proposed project, but not in an existing project. Second, is the overall market environment at the time of pre-sale and project completion. This is, obviously, more difficult to define because it involves such variables as interest rates, overall market conditions, and general and specific sector real estate market conditions.

The added complication with most projects is the time frames and time lags involved. Since most subdivisions or condominium projects take several years between conception and completion, market and interest rate conditions can change significantly. Thus, a project may commence in a favorable environment and be completed in an unfavorable one (or vice versa). Furthermore, real estate is a cyclical industry and sales activity tends to move in spurts. It is not unusual for a new project to sell half its units in the first year of marketing and require 2 to 3 years (or longer) to sell the remaining half. Of course, these time periods could expand or contract depending upon market conditions. Thus, the notion of a linear sales rate may be deemed unrealistic for practical purposes, but is a useful and convenient tool for planning. This is especially true for large projects like the subject.

RESIDENTIAL SUPPLY CHARACTERISTICS

The Maalaea Plantation Subdivision is centrally located and has relatively uniform travel times to each of the major population centers on Maui. It follows that the subject's primary market area is the Central Maui and South Maui regions, while West Maui is expected to be a secondary market. Central Maui is home to the County and State government offices and is the industrial center of the island with convenient access to the major transportation facilities. South Maui has become a visitor destination with its expansive beaches and retail establishments targeted towards the tourist industry. West Maui is also a major tourist destination and is home to the famous Front Street retail corridor which allows for

pedestrian access to numerous retail establishments within Old Lahaina Town. Further north of Lahaina are the Kaanapali and Kapalua master planned resorts. Clearly, the subject's Maalaea location is highly convenient with respect to all of the major population centers.

Maui's Ongoing Rural/Agricultural Developments

There are currently no on-going rural or agricultural subdivisions being developed on Maui at this time.

Maui's Planned Rural/Agricultural Developments

Other than the subject, the Consultant is unaware of any other large rural or agricultural subdivision development planned for Maui in the near future.

Available New Project Residential Supply

Research was conducted in order to determine the number of housing units in new developments that are currently available in the market. According to this survey, there are 1,017 housing units, which are currently for sale on the Maui market within on-going projects, as well as units from developments which are planned for construction within the next one to two years. Based solely on historical annual absorption rates of other new projects (approximately 528 units per year), the short-term market supply would be expected to last approximately 1.94 years. Of course, a multitude of other factors can influence the capture rate. For instance, the larger percentage of affordable units in the future supply points to a faster-than-normal absorption. Also, the number of buyers from the U.S. mainland and from foreign countries can fluctuate from year to year, and their presence in the market is not as predictable as the demand from local residents.

Shown in the table on **Page 24** is the list of projects representing the short-term housing supply for the Island of Maui. Those that have not begun construction are undergoing their financing processes and are expecting to commence construction in the short-term future. Included in this list are both single-family and condominium units from the island's four major population centers: Central Maui (Wailuku-Kahului); South Maui (Kihei-Wailea); Upcountry (Pukalani-Makawao-Kula) and West Maui (Lahaina to Kapalua).

Of the projects named in the following table, Sandhills Estates, Na Mala O Waihee, Waiolani Mauka, Villas at Kehalani, Milo Court, Ho'olea Terrace, New Traditions at Maui Lani, Kai Malu, Kilohana Waena, Hoolei, Ke Alii Ocean Villas, Kamalii Alayna, Papali, Moana Estates, Hokulani Golf Villas, Kai Ani Village, Kenolio Makai, Maluaka, E Paepae Pukoa, Omaopio Ridge, Piiholo South, Makani O Kula, Omaopio Estates, Lanikeha, Kaanapali Coffee

Estates, Opukea, Honua Kai, The Breakers, and Ho'onanea have already begun closing sales of their units.

The number of units indicated in the table reflects the number of remaining units that have not closed, but may be under contract.

Table 1 – Available Supply in Ongoing Projects on Maui

Maui Projects 2014				
		Number of Units		
Name	Location	Total	Remaining	Type of Development
CENTRAL MAUI				
Sandhills Estates	Maui Lani Proj Dist	108	11	Residential House Lots
Na Mala O Waihee	Waihee	7	1	Agricultural Lots
Waiolani Mauka	Waikapu	105	8	Townhouse Condominiums
Villas at Kehalani	Kehalani Proj Dist	103	64	Townhouse Condominiums
Milo Court at Kehalani	Kehalani Proj Dist	94	21	Residential Duplexes
Ho'olea Terrace	Kehalani Proj Dist	174	35	Townhouse Condominiums
New Traditions at Maui Lani (Schuler)	Maui Lani Proj Dist	144	89	SF Homes
Wai'olu Estates	Kehalani Proj Dist	60	60	Residential House Lots
Parkways at Maui Lani (Towne)	Maui Lani Proj Dist	210	210	SF Homes
SOUTH MAUI				
Kai Malu	Wailea	150	6	Luxury Condominiums
Kilohana Waena	South Kihei	30	9	Residential House Lots
Papali	Wailea	24	1	Luxury Residential Condominiums
Moana Estates	South Kihei	90	6	SF Homes
Hokulani Golf Villas	Central Kihei	152	85	Luxury Residential Condominiums
Kai Ani Village	South Kihei	99	18	Lowrise and Live/Work Condos
Kenolio Makai	North Kihei	18	1	SF Homes
Bluffs at Wailea	Wailea	12	12	Luxury House Lots
UPCOUNTRY/EAST MAUI				
E Paepae Ka Puko'a	Spreckelsville	16	3	1/2 to 1-acre Residential Lots
Omaopio Ridge	Kula	18	8	Agricultural Lots
Piiholo South	Olinda	11	9	Agricultural Lots
Makani O Kula	Kula	10	8	Agricultural Lots
Omaopio Estates	Kula	20	20	Agricultural Lots
Kula `I`o	Kula	35	35	Agricultural Lots
WEST MAUI				
Lanikeha	Kaanapali	132	26	Residential House Lots
Kaanapali Coffee Estates	Kaanapali	52	34	Agricultural Lots
Opukea	Lahaina	114	54	Lowrise Condominiums
Honua Kai	Honokowai	700	126	Luxury Condominiums
West Maui Breakers	Honokowai	114	57	MF Condos
Ho'onanea	Lahaina	100	0	MF Condos
Total Short Term Supply Units			1,017	

Central Maui's Potential Residential Projects

It is also important to discuss the developments on Maui that could be brought to the market over the next 5 to 10 years. As mentioned earlier, many external factors, such as economic or social factors, could affect the supply and demand for real estate in the future. These factors cannot be controlled by developers who must constantly assess market conditions for their prospective construction and sales periods. Many of these projects are still in the initial planning phases and must complete governmental requirements before bringing their products to the market. Combine these factors with "internal" events that could affect a developer and predicting which developments will actually make it to market becomes more difficult.

Nevertheless, the paragraphs below name the projects that are in their preliminary stages of development, but are considered to be potential sources of additional supply to Maui's housing market. This list also includes long term projects that are underway, such as the Kehalani and Maui Lani Project Districts.

Maui Lani consists of approximately 1,012 acres of land in the Central Maui plains. Completed phases include the Greens, Grand Fairways North, Grand Fairways, Sandhills Estates, The Island and The Bluffs, The Legends and Na Hoku. Presently, the only projects under construction at Maui Lani is New Traditions and Parkways, both single-family residential subdivisions.

A 50-lot single-family residential subdivision, Fairways, was also completed in 2008. However, this project ran into legal trouble regarding building height restrictions and the development was subsequently acquired by the County of Maui. To date, there have been approximately 1,300 units constructed in the Maui Lani project district. Based on the maximum density allowed, there are almost 2,400 units remaining to be built.

Kehalani is situated at the base of the West Maui mountain range in Wailuku and consists of approximately 550 acres of developable land area. Completed single-family residential subdivisions include Kaimana, Nanea, Olena, Ohia, Maunaleo, Koa, Akolea, and Cottages; while Iliahi and Kehalani Gardens make up the sold out multi-family projects. Ongoing developments are limited to multi-family projects such as Milo Court, Villas at Kehalani and Ho'olea Terrace. A 60-unit single-family residential house lot subdivision, Wai'olu Estates, has also been marketed, but has had no closings. In addition, a new elementary school (Pu'u Kukui) was recently opened, Longs Drugs was recently completed in Kehalani Village Center, a new Foodland is near completion in Kehalani Village Center, and the potential of approximately 1,000 more residential units remain to be built within the Kehalani project district.

Wai'ale, is a 545-acre master-planned community to be developed by A&B Properties, Inc., located along the western side of Kuihelani Highway, just south of the existing Maui Lani Project District. Plans for Waiale include 2,250 housing units, as well as commercial and light industrial components. An intermediate school, community center, parks and cultural preservation areas are also planned during the 10-year build out anticipated for the project. A 40-acre site is being donated to the County of Maui, who intends to develop up to 300 affordable housing units there. In May 2012, the State Land Use Commission approved reclassification of the land from Agricultural to Urban. As of the effective date, the project is being reviewed for rezoning and community plan amendment.

Pu'unani is a proposed 752-unit project district located west of, and bordering, Honoapiilani Highway in Wailuku. The site consists of approximately 210 acres of land and will possess views of the ocean, as well as the West Maui Mountains and Haleakala. According to a Conceptual Land Use Plan, the subject will contain rural zoned lots, residential zoned lots, and multi-family units. As of the effective date, the project was still in the early entitlement process.

Hale Mua is a 466-unit proposed subdivision, set upon approximately 240 acres. Preliminary plans for this project called for 238 affordable house and lot packages ranging in size from 5,001 to 11,292 square feet; 209 market lots ranging from 10,000 to 16,693 square feet in size. In addition, there were to be a total of 19 large lots ranging from 2.02 to 21.40 acres in size. State Land Use Urban designation was to be sought for the large lots. These lots would not have had the ability to be further subdivided and improvements will be limited to a main and accessory dwelling. However, in March 2012, the developer was foreclosed upon and this status of this proposed project is unknown.

Single-Family Residential Resale Active Listings

Besides the properties available in the projects, the number of resale listings on Maui is a good indication of real estate market conditions. This market evidence is generally viewed as a "counter-cyclical" indicator, which means that it is typically lower in strong markets and higher in weak ones. As previously indicated, the subject's primary market is determined to be Central Maui. The Appraiser researched listings of single-family homes in this region (**Exhibit C**). The investigation of the Maui Multiple Listing Service revealed the following:

As of the effective date, there are 76 resale listings in Central Maui residential properties in the Multiple Listing Service. This total was broken down as follows:

Range of Prices	No. of Listings	Average DOM
Less Than $300,000	4	239
$300,000 to under $500,000	22	57
$500,000 to under $700,000	35	102
$700,000 to under $1,000,000	9	108
$1,000,000 and Above	6	106

There were a total of only four (4) listings in the "Less Than $300,000" category. The lowest priced property was a three-bedroom/one-bath, 750 square foot home on a 5,323 square foot lot, built circa 1926. The high end of the range consisted of a three-bedroom/one half-bath home on an 11,600 square foot lot, built circa 1991. The asking price for this Wailuku offering was $285,000. The property had been on the market for 807 days.

From $300,000 to under $500,000, there were a total of 22 listings with the lowest priced being $349,000 for a two-bedroom/one-bath, 1,186 square foot dwelling. This Kahului Town property had a marketing time of 2 days. The high end was represented by a 1,628 square foot, four-bedroom/three-bath home in Wailuku. This home was listed for $485,000 and had a marketing time of 2 days.

This price range is generally considered to be the market segment that is affordable to Maui's workforce households. Many of the properties in this segment are priced around the median price range for residential properties on Maui. Thus, it is expected to be the most active segment of the market. It is noted that the monthly median price for a single family property in Central Maui was $530,000 in 2013, which is 13 percent higher than 2012. Furthermore, the median price for January through March 2014 is about $585,000, or 13.0 percent higher than the same period in the previous year.

From $500,000 to under $700,000, there are a total of 35 listings with an average "Days on Market" of 102 days. Prior to 2009, the median sales price for single-family homes in Central Maui fell within this price range. From 2005 to 2007, the luxury and second home markets were well represented by new projects. Sales of these high-end homes pushed real estate prices to new heights, and left the working class unable to afford to purchase homes.

From $700,000 to under $1,000,000, there are a total of nine (9) listings with an average marketing time of 108 days. Before the last market peak, it was unheard of to find a non-oceanfront residential property in Central Maui selling for more than $800,000. Properties priced in this range were typically found in The Island, The Bluffs, Wailuku Heights, Wailuku Country Estates, Waiehu Heights, Sandhills, and even Wailuku Town.

At $1,000,000 and above, there were six (6) listings with the highest being $3,500,000 for a four bedroom/four-bath property off Kahekili Highway in Maluhia Estates with 3,557 square feet of living area. This property contains approximately 35 acres of land area. The average marketing time in this category is 106 days.

After the onset of the Great Recession in 2008, the market became flooded with troubled properties. Short sale and bank-owned inventory listings were available at various price points and in all parts of the island. Since 2011, however, these properties have become less abundant. Research revealed only four (4) bank-owned properties and one potential short sale, representing only 1.3 and 5.3 percent of the aforementioned 76 active listings in Central Maui, respectively.

Residential House Lot Listings

The Appraiser also investigated the number of single-family house lots on the market in Central Maui. Potential buyers in the market will look at the house lots on the market while considering the option of purchasing land and building a home versus buying a home already constructed.

The Appraiser searched for finished house lots within a range of 5,000 to 25,000 square feet. Research found a total of 11 listings in Central Maui, with land areas between 8,033 and 14,632 square feet. The listings ranged in price from $150,000 for an 8,033 square foot lot in Sandhills Estates to $300,000 for a 10,182 square foot lot in The Islands at Maui Lani. The majority of the listings were located in the Sandhills Estates subdivision. Average marketing time for these listings was 188 days. None were bank-owned or potential short sales.

Maui County Workforce Housing Ordinance

In December 2006, the Maui County Council enacted the Residential Workforce Housing Ordinance. The purpose of the ordinance is to enhance the public welfare by ensuring that the housing needs of the County are addressed. The intent of the policy is to encourage the provision and maintenance of residential workforce housing units, for both purchase and rental, to meet the needs of income-qualified households for the workforce, students, and special housing target groups.

Essentially, all applicable residential development after the passage of this ordinance, including the subdivision of land and/or the construction of single-family dwelling units; two-family dwelling units; multifamily dwelling units; or hotels; shall be subject to the policy upon final subdivision or building permit approval. Applicable residential development includes, in part: five or more dwelling units, excluding farm labor dwellings or a second farm dwelling, not part of a condominium property regime; five or more

new lots; a combination of dwelling units and new lots totaling five or more.

Prior to final subdivision approval or issuance of a building permit for a development, the developer was to enter into a residential workforce housing agreement that required forty percent of the total number of units and/or lots to be sold or rented to residents within established income-qualified groups, when more than fifty percent of the dwelling units and/or new lots in the development were to be offered for sale for less than $600,000. When fifty percent or more of the dwelling units and/or new lots in the development were to be offered for sale for $600,000 or more, fifty percent of the total number of units and/or lots was to be sold or rented to residents within established income-qualified groups.

Landowners who had already received entitlements, or were at least in the approval or permitting process, were granted an exemption from these requirements; and clearly have an advantage over those who began their entitlement process post-passage. One of the initial concerns to developers was the reduction in sales revenue. Coupled with unprecedented increases in construction costs, potential projects could become financially unfeasible.

Since the passage of this ordinance, there has been a notable drop in new residential construction project starts. Granted, the downward trend of the real estate market, mixed with declining national and local economic conditions, has also led to less construction. However, many in the building industry are of the opinion that the Workforce Housing Ordinance has had the opposite effect from its original intent.

In February 2010, the Maui County Council revisited this ordinance and made several revisions, including reducing the amount of required affordable housing units built on site to 25 percent, provided the average sales price of the market units is projected to be less than $600,000. If the average sales price in the project is $600,000 or more, then 50 percent of the units must be affordably priced. The amended law also clarified the calculation of required affordable units built off site; based on 50 percent of the total number of on-site market units, regardless of their projected average sales price.

Maalaea Plantation will be subject to the Workforce Housing Ordinance; however, the developer is negotiating with the County to use affordable housing credits obtained from the development of Waikapu Gardens.

RESIDENTIAL DEMAND CHARACTERISTICS

Demand is analyzed from two perspectives: The first is "demographic" demand, the number of units needed for a given market or employment base. Second is "effective" demand, the financial demand equation which involves looking at the number of buyers who would be qualified and interested in purchasing residential real estate.

Population

Population growth on Maui over the past 20 years (1990 to 2010) has been exceptionally high, and had outpaced the County's ability to provide adequate infrastructure and housing for this added number of people. Overall, population growth for the County of Maui during 1990 to 2010 was 52.2 percent (Source: US Census). With this growth in population came a surge in real estate prices in the mid-2000s. This increase, driven primarily by foreign and domestic investment and speculation, put the price of homes in Maui County well above the reach of many local residents, and affordable housing has become a major concern to everyone.

The 2010 census figures indicate that population in Maui County increased by 20.1 percent between 2000 and 2010. During this period, Maui County was the second fastest growing county in the state, being outpaced by only Hawaii County at 24.1 percent. Leading the growth was the Central Maui region at 30.8 percent over the 10-year period. The South Maui region registered population growth of 19.2 percent.

Interestingly, household growth for these regions has not always been proportionate to its respective change in population. While Central Maui households increased by 32.6 percent, generally similar to its change in population, South Maui household numbers outpaced population, with a 25.5 percent gain. Conversely, the increase in West Maui households has lagged population growth, with a rise of only 14.5 percent.

According to the Population and Economic Projections for the State of Hawaii to 2035 (Source: State of Hawaii, Department of Business, Economic Development and Tourism), the projected population of Maui County is expected to be 198,724 by the year 2035. This represents a 35.7 percent increase over the 2010 census numbers.

Employment and Household Income

The unemployment rate on Maui had been on a decline since 1995 when unemployment was at 6.7 percent. By 2006, unemployment had reached an all-time low of 2.4 percent. This downward trend reversed course in 2007, as the unemployment rate averaged 2.8 percent. A slowing economy and the financial crisis took its toll on employment on Maui, as unemployment in 2008 jumped to 4.6 percent, before skyrocketing to 8.8 percent in 2009. The

unemployment rate has steadily decreased since 2009 to its current level of 4.9 percent, as of the March 2014.

Household income figures have also been increasing. The 2011 median household income for Maui County was $60,617 (2012 Maui County Data Book), a rise of approximately 22 percent over the 1999 median household income of $49,489 (Source: US Census 2000) and a 56 percent increase over the 1989 figure of $38,771 (Source: US Census 1990). During the 12 year period from 1999 to 2011, this represented an average increase of approximately 1.8 percent per year.

Given this increase in income, one would think that real property would be easier to purchase, especially with the softening of the real estate market. However, this has not been the case, as global financial woes, together with poor national and local economic climates have had the opposite effect. With unemployment rates returning to normalcy, coupled with still-low interest rates, there has been a resurgence of interest in the real estate market since 2011.

Mortgage Interest Rates

From late-1991 to 2002, mortgage rates varied from 6.0 to 9.0 percent. In 2003, mortgage rates for a 30-year fixed rate mortgage fell below 6.0 percent for the first time since Freddie Mac began tracking 30-year mortgage rates in 1971. Over the next six years, the monthly interest rate fluctuated between 5.23 and 6.76 percent. However, due to cuts to the Federal Funds Rate in late 2008, interest rates in 2009 dipped below the 5.0 percent level on numerous occasions, with the average interest rate for 2009 at 5.04 percent. The interest rate for 2010 averaged 4.69 percent, with the lowest rate witnessed in October, at 4.23 percent. In 2011, 2012 and 2013, the monthly interest rates averaged 4.45, 3.66 and 3.98 percent, respectively. It should be noted that the 4.07 percent monthly interest rate for June 2013 was the first time since October 2011 that the 4 percent barrier was broken. As of April 2014, the interest rate stood at 4.33 percent.

Table 2 – Historical Trend of 30 Year, Fixed Mortgage Rates

Source: Freddie Mac-Primary Mortgage Survey

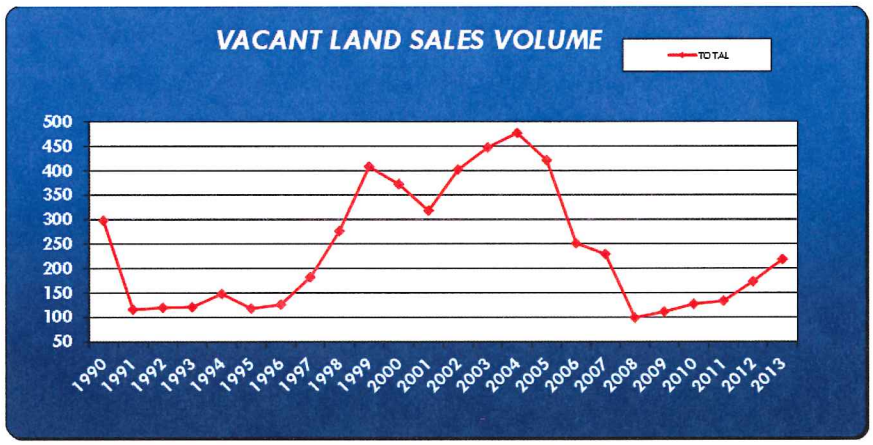
General Real Estate Sales Activity
Island of Maui

The number of units sold is the most basic indicator of market activity and is useful in helping estimate the number of new units which a specific market segment may be capable of absorbing. The downturn in the economy between 1991 and 1998 led to development of low-priced housing on Maui. Zero-lot-line housing projects were popularized during this period as developers strived to make housing affordable to Maui residents. Since 1998, however, real estate began a strong recovery. As evidenced in the following section, prices and number of sales increased while marketing times decreased, up to 2006. Since then, the market has headed in the opposite direction, with year-to-date 2010 showing some evidence of stabilization. The tables on the following pages illustrate the general market trends over the past 20 years on Maui, from 1990 through 2009.

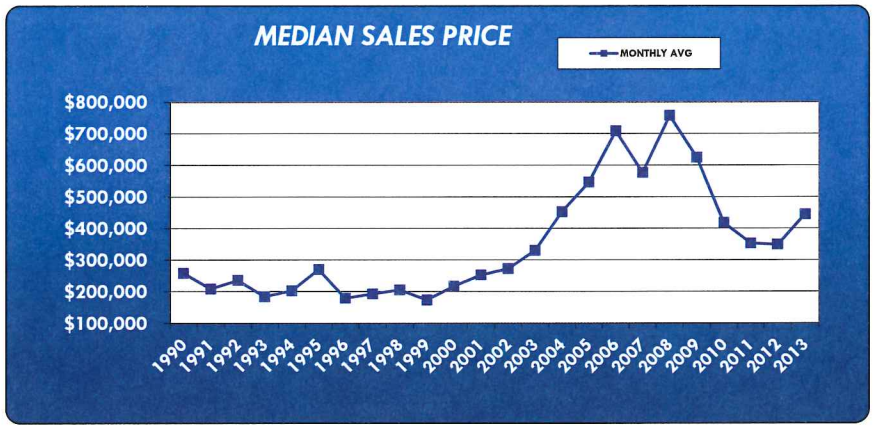
Vacant Land

Sales of vacant land fell sharply after 1990 (298) to a level wavering around 100 to 150 sales for the next 6 years. Weakest sales, in terms of units sold, occurred in 1991 when only 116 properties were sold. In 1998, the number of land sales increased to 276 and in 1999, increased again to 408, reflecting a gain of 48 percent. Sales fell slightly in 2000 with 372 sales and 318 sales in 2001; however, these figures rebounded in 2002, 2003 and 2004 to 402, 447 and 477, respectively. Vacant land sales for 2005 showed a slight decrease to 421 transactions, but dropped 40 percent in 2006, with only 251 sales. This trend continued in 2007, albeit with a more stabilized decrease of 9 percent, at 229 sales. However, in 2008, vacant land sales again decreased significantly by approximately 56 percent with only 99 sales. In 2009, 2010 and 2011 there have been slight year-over-

year increases, with 111, 127 and 133 sales, respectively. This trend followed suit in 2012, with 173 unit sales, and 218 sales in 2013.



Meanwhile, vacant land median prices slowly regained ground from a low of $173,458 in 1999 to $272,483 in 2002, and then sharply increased to $330,075 in 2003, $452,604 in 2004, and $546,540 in 2005. In 2006, the median price jumped approximately 30 percent to $707,998, but retreated by 19 percent in 2007, to $576,729. In 2008, the median sales price peaked at $757,162. Subsequent declines have been witnessed, with the monthly median prices averaging $624,599 in 2009, $417,804 in 2010 and $352,833 in 2011. For 2012, the median price remained generally stable at $348,910, but in 2013, the median price for vacant land increased by 27 percent to $444,719.

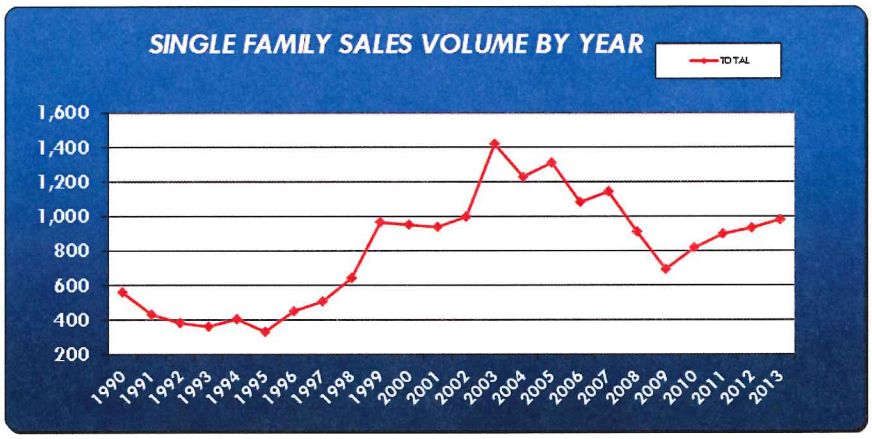


Average monthly days-on-market figures increased steadily from 67 in 1990 to 344 in 1997, but fell to 227 in 2002, 170 days in 2003, increasing slightly to 173 days in 2004. This average escalated in 2005 to 291 days but dropped 29 percent to 205 days in 2006. In 2007, the average marketing time increased 10

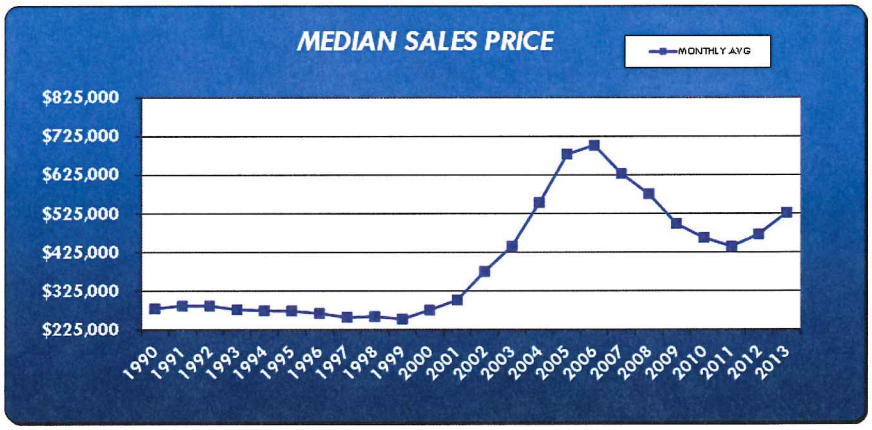
percent to 225 days, followed by a further increase of 6 percent in 2008 to 239 days. Marketing time increased to 274 days in 2009, but has since declined to 213 days in 2010 and 204 days in 2011. A significant jump was witnessed in 2012, to an average of 294 days, but declined dramatically to an average of 207 days in 2013.

Single-Family

Sales of single-family properties exhibited a decrease after 1990 (560) to a level wavering around 350 to 450 sales for the next 6 years. Weakest sales, in terms of units sold, occurred in 1995 when only 331 properties were sold. In 1997, the number of single-family sales increased to 507 and in 1998, exceeded 1990 results with a figure of 641. The number of sales in 1999 (965 units) was 51 percent more than the number of sales in 1998 (641 units). Sales were slightly higher in 2000 at 951 units sold, but leveled off in 2001 at 938 units and 997 units in 2002. Sales sharply increased in 2003 to 1,420 transactions, and then decreased slightly in 2004 to 1,228, before climbing to 1,311 transactions in 2005. In 2006, the total sales dropped 18 percent, to 1,082 for the year. A 6 percent increase was realized in 2007, as sales volume totaled 1,143 units. In 2008, sales volume decreased by 20 percent, to 910 units. This was followed by a low of 693 sales in 2009. The single-family residential market regained traction in 2010 and 2011, with 817 and 898 unit sales, respectively. The upward trend continued with 933 single-family residences sold in 2012, and 980 sold in 2013.



Median prices in 2001 averaged 301,886, showing a 9 percent increase from $275,958 in the year 2000. In 2002, the median price increased even more to a level of $375,810, an enormous increase of 24 percent over 2001. Median prices for 2003 indicated a gain of about 17 percent to $441,062; then another large 25 percent increase to $553,167 in 2004. This trend continued in 2005, with an average median sales price of $678,321, translating into a 22 percent increase. For 2006, prices increased 4 percent over the 2005 median. The average median price peaked in 2006 at $701,882. Between 2007 and 2011 there was a declining trend, as the average median price was $627,887 in 2007, $575,510 in 2008, $498,708 in 2009, $462,346 in 2010 and $440,160 in 2011. The monthly median sales price rebounded in 2012, averaging $471,925. The monthly median sales price continued to increase in 2013, averaging $527,167.

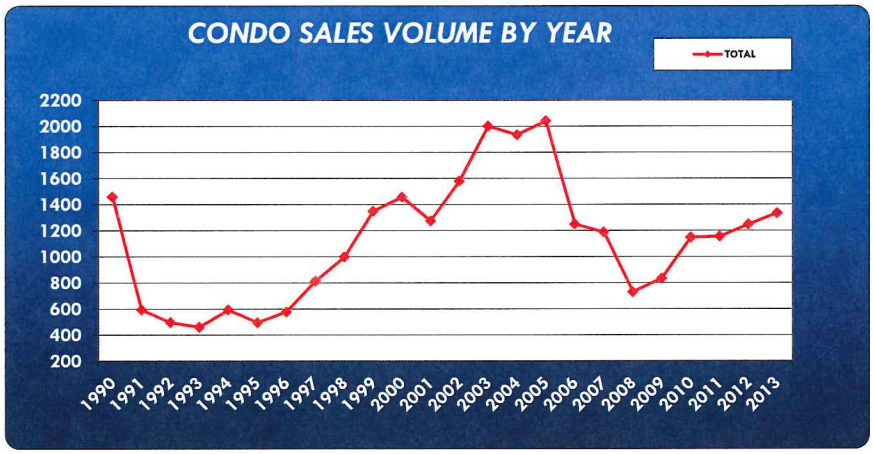


Average monthly days-on-market figures increased steadily from 67 in 1990 to 231 in 1997, but steadily fell to 137 in 2000. It has remained relatively level since that time, except in 2004 when that figure fell to 114 days, before rebounding to 121 days in 2005. The increase continued in 2006 climbing to 129 days, followed by

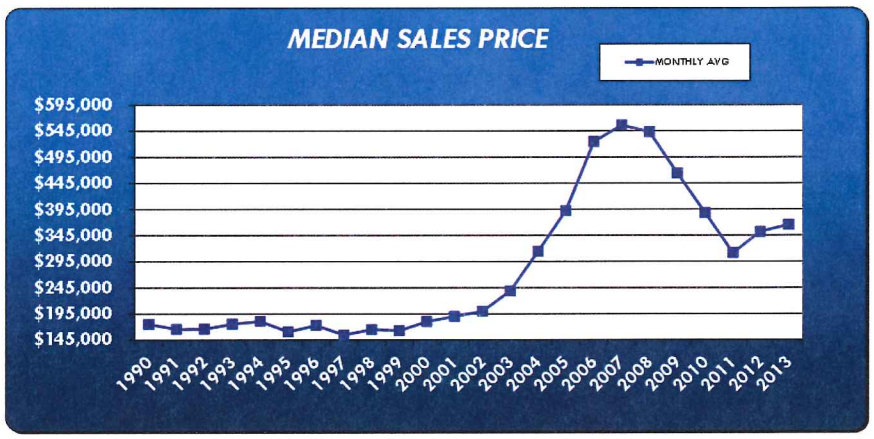
a larger increase to 151 days in 2007, then to 161 days in 2008 and 165 days in 2009. Lower marketing times have been evidenced, with an 11 percent drop in 2010 to 147 days followed by a slight 2 percent decrease to 145 days in 2011, remaining stable at 145 days in 2012. In 2013, the trend reversed to an average of 123 days.

Condominiums

Sales of condominium units fell sharply after 1990 (1,459) to a level wavering between 400 to 600 sales for the next 6 years. Weakest sales, in terms of units sold, occurred in 1993 when only 461 properties were sold. In 1997, however, the number of sales increased to 812 and up to 2,001 units in 2003. 2004 showed a drop in sales, to 1,933 units. This was followed by a record setting year in 2005, with 2,041 units sold. However, --sales volume dropped approximately 39 percent to 1,249 units in 2006, followed by a more stabilized decline of 5 percent in 2007, to 1,188 units. In 2008, sales volume continued its decline by another 39 percent to 730 units. This trend reversed course in 2009 with 730 units sold. A sharper increase was seen in 2010, at 1,148 sales, followed by a stable year in 2011 with 1,155 units sold. For 2012, there was a further uptick, with 1,248 condominium units sold, and an increase of 6.8 percent in 2013 to 1,333 sales.

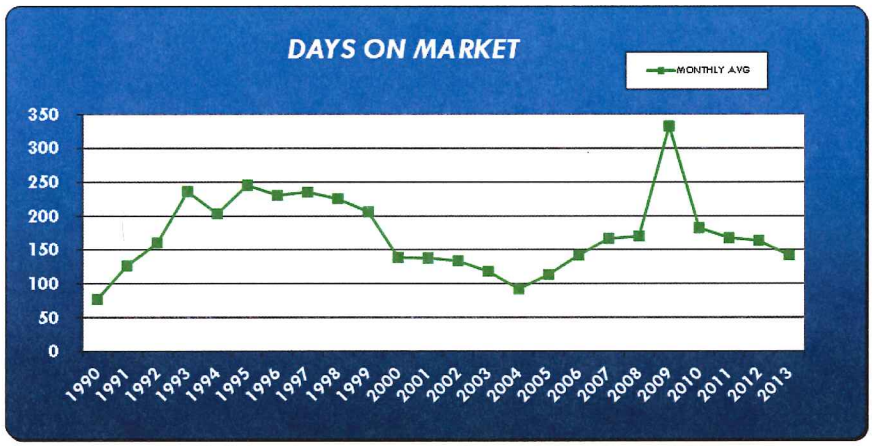


Median prices remained in a range from $154,296 to $180,392 between 1990 and 2000. However, the average monthly median price increased 5 percent to $189,946 in 2001, 5 percent to $200,020 in 2002, and 19 percent in 2003 to $238,755. 2004 indicated a sharp increase of 32 percent, with an average median price of $314,448, followed by a 25 percent gain in 2005, to $392,314. The average median price increased to $524,758 in 2006, an approximate 34 percent increase over 2005. This was followed by a more stabilized gain of 6 percent in 2007, to $556,332. In 2008, median sale price decreased for the first time in 10 years, to $542,932. This trend continued through 2009, 2010 and 2011 with respective medians averaging $464,049, $388,302 and $311,479. However, 2012 saw a rebound to $352,077; the first increase in annual average monthly median price since 2007. The upward trend continued in 2013 where the average monthly median condominium price was $365,385.



Average monthly days-on-market figures increased steadily from 77 days in 1990 to 230 days in 1996, but had decreased considerably to 133 days by the end of 2002. This figure fell to 118 days in 2003, then to 92 days in 2004, before rebounding to

113 days in 2005. It rose further in 2006, to 142 days, followed by another increase to 166 days in 2007. Days on market remained relatively the same in 2008, at 170, but spiked to 332 days in 2009. This was attributed to the closing of a substantial number of developer units within the Honua Kai project in Kaanapali. Marketing time returned to normalcy in 2010, with an average of 182 days. This was followed by a decline to 168 days in 2011 and 163 days in 2012. The downward trend continued in 2013 to an average of 142 days.



Historical Project Absorption

In addition to the absorption rates of the individual projects, research was also conducted to give a historical look at the total residential inventory absorbed on a year to year basis. This survey included large projects that are typically put on the open market. These projects included single family residential homes, residential house lots, condominium projects, as well as agricultural subdivisions. It is also known that individual property owners occasionally subdivide tracts of land and sell off the lots to relatives or to a private list of purchasers. These types of projects are difficult to track and have not been included in the survey. The intent of this survey was to provide an indication of the capacity that the real estate market has to absorb new inventory on an annual basis.

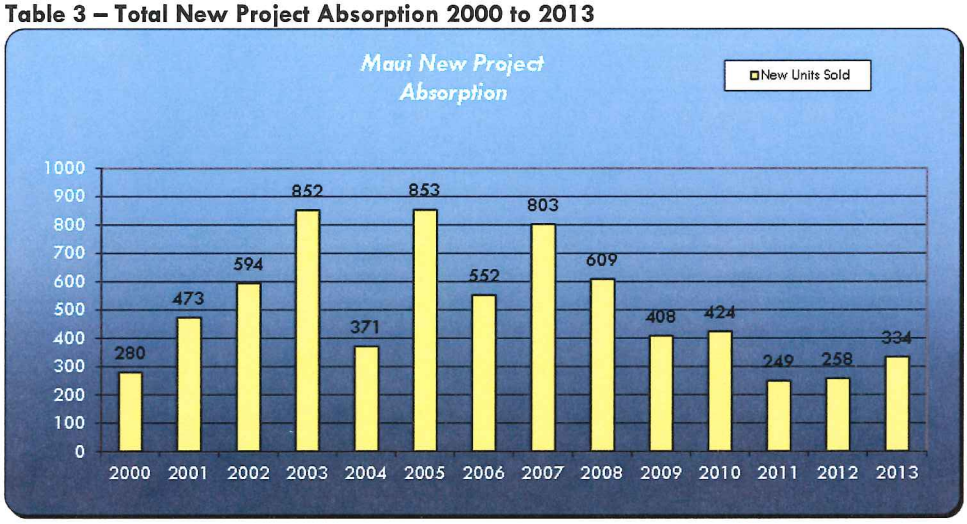
From 1995 to mid-2006, the real estate market showed an overall upward trend, in terms of sales volume as well as sales prices. In 1999, 671 new units were purchased. This number dropped to 280 in 2000 and had a steady climb up to 2003. In 2003 year, the real estate market absorbed a total of 849 new housing units. In 2004, this number dropped again to 370 units. However, this drop proved to be temporary as numerous projects in Central and South Maui were completed and a total of 839 units closed. These projects included Ohia, Maunaleo, Iliahi, and Kehalani Gardens within the Kehalani Project District as well as the Sand Hills Estates and Legends in the Maui Lani Project District. In addition, Hale Kanani and Wailea Beach Villas were completed in South Maui. There were a few projects in West Maui that were completed in 2005 and included Mahanalua Nui Phase IV, Honolua Ridge and the Villas at Kahana Ridge. Lanikeha in Kaanapali closed two-thirds of their lots in 2005 and 2006. For 2006 overall, the number of units dropped significantly to 538 units. In 2007, the Central and South Maui regions saw another large injection of new inventory, which catapulted sales upwards to 813 units. Leading the way was the Waikapu Gardens subdivision, featuring affordably priced units. Over 20 percent of the total closings for 2007 were from this single-family subdivision. In 2008, project sales were primarily from the same subdivisions that started in 2007. Total units absorbed amounted to 609. Again leading the way was Waikapu Gardens with 30 percent of all project sales. This survey only included the original sales of units within new projects.

During the ten year period between 2000 and 2013, there has been an average of approximately 528 new units sold each year. By dividing the supply available in the market by this average, an estimate of the remaining years of current supply can be determined. Due to the recent recession and current recovery/expansion of the real estate market, it should be expected that sales may not be as brisk as in the past. As previously noted, during the peak of the real estate market, projects were often sold out prior to construction completion. From

2006 to about 2010-11 the market downshifted and developers had to hold on to completed inventory. However, the recent upward shift in the economy and real estate market is now seeing brisk sales activity in new projects.

In Central Maui, there are still developer units available in ongoing Kehalani projects such as Hoolea Terrace, Milo Court and Villas at Kehalani, and in Maui Lani at New Traditions and now Parkways at Maui Lani.

Table 3 – Total New Project Absorption 2000 to 2013



A breakdown of the absorption of single family, condominium and residential vacant land is included on the following pages.

Table 4 – Units Absorbed Per Year (Central Maui)

	Type	Units	Year 2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
KAIMANA	S	179	1	1				2								
GREENS	L	217	8													
IAO PARKSIDE IV-B	C	52	5	6	1	1										
IAO PARKSIDE IV-C	C	52	3	5	41											
NANEA	S	90														
GRAND FAIRWAYS	L	36	5													
IAO PARKSIDE IV-A	C	13	7	2												
GRAND FAIRWAYS NORTH	L	79	57	22												
WAILUKU PARKSIDE	S	119	31	87	1											
THE ISLAND SCHULER PHASE I	S	55	1	24	30											
THE ISLANDMAUI LANI PHASE I	L	44	10	23	10	1										
OLENA	S	31		7	24											
THE ISLAND MAUI LANI PH II	L	35			35											
THE ISLAND SCHULER PH II	S	53			9	44										
WAILUKU COUNTRY EST	L	184				177	7									
WAIOLANI ELUA	L	25				22	2									
BLUFFS - Maui Lani	L	15				6	9									
- Schuler	S	21					7	14								
OLENA II	S	32					32									
LEGENDS	S	143					47	90	3	2						
OHIA AT KEHALANI	S	140						135	5							
MAUNALEO AT KEHALANI	S	82						55	27							
OHIA AT KEHALANI PH II	S	44							44							
ILIAHI AT KEHALANI	C	92						61	31							
KEHALANI GARDENS	C	132						83	49							
LEGENDS PHASE II	S	134							33	99	2					
WAIOLANI PIKAKE	L/S	36									36					
WAIKAPU GARDENS	S	411							62	162	180	7				
KOA AT KEHALANI	L/S	72						16	33	15	5	2	1			
AKOLEA AT KEHALANI	L/S	97								25	45	21	6			
COTTAGES AT KEHALANI	S	114								6	51	37	20			
NA HOKU	S	162								22	53	28	40	19		
TRADITIONS AT MAUI LANI (Maui Lani)	S	9												2	7	
SAND HILLS ESTATES	L	108						80	16	1						
NA MALA O WAIHEE	L	7				1				3			1			1
WAIOLANI MAUKA	L	105								92			1			4
VILLAS AT KEHALANI	C	103									1	13	10	11	4	
MILO COURT AT KEHALANI	C	94											22	20	21	10
HO'OLEA TERRACE	C	174											4	19	27	89
NEW TRADITIONS AT MAUI LANI (Schuler)	S	144													7	48
WAI'OLU ESTATES	L	60														
PARKWAYS AT MAUI LANI	L/S	210														
Total			**128**	**177**	**151**	**252**	**104**	**536**	**303**	**427**	**373**	**108**	**105**	**71**	**66**	**152**

Table 5 – Units Absorbed Per Year (West Maui)

	Type	Units	Year 2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
KAUHALE MAHINAHINA	S	19														
MAHANALUA NUI (I to III)	L	104	10	19		41	1									
VINTAGE	C	73	3	70												
KE ALII SUB'D III	L	12	7	1	4											
PINEAPPLE HILL II	L	30	12	8	9	1										
MAKILA I	L	19			19											
OLOWALU MAKAI	L	5		1	4											
OLOWALU MAUKA	L	14			8	6										
COCONUT GROVE AT KAPALUA	C	36		36												
PUUNOA SUBDIVISION	L	14		14												
KAHANA NUI SUB'D (HUA NUI)	L	17		16	1											
PINNACLE	C	33		5	8	8	12									
SUMMIT																
Phase I	C	18		5	11	2										
Phase II (Pulled off Market)	C	17					17									
Phase III	C	19				19										
NAPILI VILLAS PH I	C	100			100											
NAPILI VILLAS PH II	C	44			44											
KE ALII SUB'D I	L	15			12	3										
KAPUA VILLAGE	L	45			10	35										
NAPILI VILLAS PHIII	C	40				40										
MAKILA II	L	24					24									
HONOLUA RIDGE PH I	L	25					17	8								
HONOLUA RIDGE PH II	L	25						6	10	8		1				
VILLAS AT KAHANA RIDGE	C	117						83	34							
MAHANALUA NUI IV	L	36				1		31	4							
LANIKEHA	L	132						61	40	2	2	1				
KAANAPALI COFFEE ESTATES	L	52							3	3			1	2	2	7
OPUKEA	C	114										37	22	1		
HONUA KAI	C	700									1	166	180	65	81	81
THE BREAKERS	C	114											16	17	19	5
HO'ONANEA	C	100											7	30	36	27
Total			**32**	**175**	**231**	**156**	**71**	**189**	**91**	**13**	**3**	**205**	**226**	**115**	**138**	**120**

Table 6 – Units Absorbed Per Year (South Maui)

	Type	Units	Year 2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
MAKENA PLACE	C	10	2	2	2	1										
KAMAOLE HEIGHTS	L	40														
MEADOWLANDS II	L	88	25													
WAILEA FAIRWAY VILLAS	C	118	62													
PIILANI VILLAGE PHASE II	S	114		113	1											
MALUHIA AT WAILEA	C	14		5		1	3	2	2							
KE ALII KAI	S	96			61	35										
KENOLIO (KAONOULU) ESTATES	S	51			45	6										
NA HALE O MAKENA	C	40			13	24	3									
KEAHOU AT MAKENA	L	7			6		1									
PIILANI VILLAGE III	S	117				117										
HONU ALAHELE	L	64				64										
KILOHANA RIDGE	S	73				69	4									
KILOHANA HEMA	L	29				28	1									
VILLAS AT KENOLIO	C	140				61	78	1								
ONE PALAUEA	L	17				1	8	8								
ALII VILLAGE	L	27					27									
KENOLIO MAUKA		12					12									
HALE KANANI	C	72						70	2							
WAILEA BEACH VILLAS	C	98						34	63		1					
WALAKA MAUI (112 WALAKA)	C	18							18							
KIHEI KAUHALE	L	23							23							
KAI MAKANI	C	112								96	16					
HOOLEI	C	120								25	66	13	7	5	4	
KE ALII OCEAN VILLAS	C	144								36	34	31	9	12	19	3
KAMALI'I ALAYNA	S	92								44	19	14	12	3		
MALUAKA	LC	13										5		8		
KANANI WAILEA	SC	38							9	25						
KAI MALU	C	150							22	86	27		3		2	4
KILOHANA WAENA	L	30								6	3		3			9
PAPALI	C	24									15	1	3	4		
MOANA ESTATES	S	90							18	39	20	2			1	4
HOKULANI GOLF VILLAS	SC	152									24	10	5	6	11	11
KAI ANI VILLAGE	C	99										1	16	17	17	30
KENOLIO MAKAI	S	18											16	1		
BLUFFS AT WAILEA	L	12														
Total			**117**	**120**	**128**	**407**	**137**	**115**	**157**	**357**	**225**	**77**	**74**	**56**	**54**	**61**

Table 7 – Units Absorbed Per Year (Upcountry/East Maui)

	Type	Units	Year 2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
HAIKU MAKAI	L	27	3													
MAUNAOLU PLANTATIONS	L	39			27	12										
RESIDENCES AT KULAMALU	L	57			56	1										
NORTH SHORE VILLAGE	S	23				22	1									
RIDGE AT KULAMANU	L	57					57									
KULAMALU HILLTOP (DOWLING)	L	11						11								
COTTAGES AT KULAMALU	C	40									3	15	17	5		
E PAEPAE PUKOA	L	16								6	4	2	1			
OMAOPIO RIDGE	L	18		1	1	2	1	2	1					1		1
PIIHOLO SOUTH	L	11									1		1			
MAKANI O KULA	L	10										1		1		
OMAOPIO ESTATES	L	20														
KULA 'I'O	L	35														
Total			**3**	**1**	**84**	**37**	**59**	**13**	**1**	**6**	**8**	**18**	**19**	**7**	**0**	**1**
GRAND TOTAL			**280**	**473**	**594**	**852**	**371**	**853**	**552**	**803**	**609**	**408**	**424**	**249**	**258**	**334**

1-ACRE TO 6-ACRE LISTINGS AND SALES

The number of active resale listings provides a good indication of real estate market conditions. This market evidence is generally viewed as a "counter-cyclical" indicator, which means that it is typically lower in strong markets and higher in weak ones.

Since the subject is comprised primarily of 1-acre and 5-acre rural lots. The Appraiser researched rural and agricultural lots in the size of 1- to 6- acres in the areas of East/Upcountry Maui (except Hana), Central Maui, South Maui and West Maui.

1- to 6-Acre Lots

According to the Maui MLS System, there are currently only 75 listings of 1- to 6-acre lots in the areas of East/Upcountry Maui (excluding Hana), Central Maui and West Maui. Asking prices range from $205,000 to $6,500,000 with an average and median price of $1,202,124 and $849,000, respectively. Central Maui only contains 10 listings with an average lot size of 2.603 acres and an average asking price of $484,700, or $186,237 per acre. West Maui contains 26 1-acre to 6-acre lots with an average lot size of 3.824 acres. The average asking price in West Maui is $1,595,842, or $417,281 per acre. The area of East/Upcountry Maui has the most listings (39) of 1- to 6-acre lots. The average asking price in East/Upcountry Maui is $1,123,600, with an average price per acre of $306,793. (Refer to table below) Only two lots of approximately 2 acres were available in Kihei located at One Palauea Bay with asking prices of $2,500,000 and $3,300,000.

Active Land Listings 1- to 6-Acres				
Area	No. Lots	Avg Lot Size (Acs)	Avg Asking $	Avg $/Acre
East/Upcountry Maui	39	3.66	$1,123,600	$306,793
Central Maui	10	2.60	$484,700	$186,237
West Maui	26	3.82	$1,595,842	$417,281

Since January 2013, statistics from the Maui MLS indicates that there were 101 lots between 1- and 6-acres that sold within the East/Upcountry Maui (excluding Hana), Central Maui and West Maui areas. Fifty eight (58) lots sold within the East/Upcountry region with an average lot size of 2.77 acres and an average lot price of $456,759, or $164,926 per acre. Thirty-one (31) lots sold in West Maui with an average lot size of 3.87 acres and an average lot price of $984,897, or $254,486 per acre. And, there were only 12 lot sales since January 2013 in Central Maui with an average lot size of 2.43 acres and an average lot price of $318,667, or $131,310 per acre. (Refer to the following table)

Land Sales 1- to 6-Acres Since January 2013				
Area	No. Lots	Avg Lot Size (Acs)	Avg Sale $	Avg $/Acre
East/Upcountry Maui	58	2.77	$456,759	$164,926
Central Maui	12	2.43	$318,667	$131,310
West Maui	31	3.87	$984,897	$254,486

Based on the foregoing, it is obvious that vacant agricultural/rural land between 1- and 6- acres in Central Maui is the most affordable, in comparison to East/Upcountry Maui and West Maui, as well as South Maui. There were only two land sales in Kihei between 1- and 6- acres, but both were zoned Residential District.

COMPARABLE PROJECT SALES

The success of projects can be attributed to its location with respect to governmental agencies, transportation facilities, and commercial and professional services. New developments like the proposed subject often create excitement in the market, especially when the product is perceived to offer a particular value to the buyer. Sales in comparable rural/agricultural subdivisions on Maui, at all price levels, have generally met good demand from the market up to mid-2006, when the market crumbled. As shown on the following page, absorption rates in selected agricultural projects were brisk during that time period. A 16-lot agricultural subdivision, known as Peahui Hui Subdivision in Haiku, sold 15 lots within a period of two months, or at a rate of 7 lots per month.

Table 8 – LOT ABSORPTION IN SELECTED PROJECTS

No.	Project Name Location	No. of Lots	Lot Size	Price Range	Marketing Period in Months	Units Sold	Units Sold Per Month
1	Wailuku Country Estates Wailuku	183 Ag Lots	2-Acres	$128,400 to $464,350	12 (3/03 - 3/04)	183	15.25
2	Mahanaluanui Ph I Lahaina	32 Ag Lots	2.2-Acre Average	$225,000 to $500,000	37 (7/99 - 8/02)	32	0.86
3	Mahanaluanui Ph II Lahaina	39 Ag Lots	2.4-Acre Average	$270,000 to $400,000	28.6 (1/01 - 5/03)	39	1.36
4	Mahanaluanui Ph IV Lahaina	22 Ag Lots	3.3-Acre Average	$250,000 to $1,300,000	15.6 (3/05 - 7/06)	22	1.41
5	Peahi Hui Subdivision Haiku	16 Ag Lots	2.1-Acre Average	$325,000 to $400,000	2.1 (11/13 - 1/14)	15	7.14

Hawaii Housing Planning Study Update 2011

This study, by SMS Research & Marketing Services, Inc., provided evidence of the need for additional housing in Maui County. According to the report, nearly 47 percent of all Maui County households expressed a desire to move to a new home in the near future, up from 45 percent in 2006. Approximately 15 percent stated they wanted to move out of state. As such, effective demand was said to be 33 percent of all Maui County households in 2011, down from 40 percent from the previous 2006 survey.

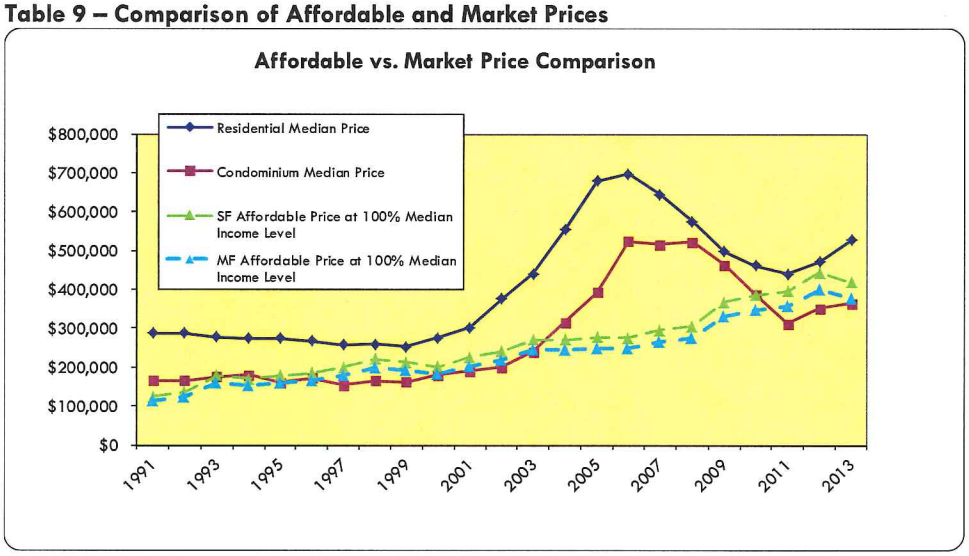
Not surprisingly, the report indicated that over 15 percent of those who expect to move outside of Hawaii made it known that one of their main reasons for leaving was the high price of housing, down significantly from 40 percent in 2006. The 2011 study listed the average monthly mortgage payment for the County of Maui to be $1,461. Approximately 30 percent were said to be spending more than 40 percent of their income on housing, which is up slightly from 27 percent in 2006. Although the study was done during a time of recovering market conditions, prices still appear to be out of reach for many Maui County residents, resulting in pent-up demand for affordable housing.

According to the 2011 Study, 61 percent of all households on Maui fell into the 80% or less of median income category, while 9 percent of households fell into the 80% to 120% of median income category. Furthermore, the largest percentage of respondents (18.4 percent) to a Housing Demand Survey in 2011 indicated Kihei-Makena as the preferred location for new housing unit. Central Maui came in second with 18.2 percent and Makawao-Pukalani-Kula came in third with 16.9 percent.

Comparison of Affordable And Market Prices

An analysis was done to compare the increase in affordable prices to median prices for residential and condominium units. The affordable price is based on the median income level for the County of Maui and typical mortgage interest rates and loan requirements. This calculation assumed a 95 percent loan-to-value ratio and a 30 percent debt to income level, similar to the assumptions utilized by DHHC. Since 1990, interest rates have dropped from 6.25% in 1991 to a low of 3.98 as of 2013. As shown in **Table 9**, the single-family and condominium prices which are affordable to earners of the median household income was compared to the median prices of residential and condominium prices in the market.

Table 9 – Comparison of Affordable and Market Prices



As income levels rose from 1990 to 2000, residential properties became more affordable to those earning the County's median income level. Although the disparity significantly narrowed by 1998 and 1999, the median price for a single-family residential property has always been higher than the price that can be afforded by a household earning the County's median income. During this period, the only option was to purchase a condominium unit, which for larger families can be less accommodating. In 2001, the nation's economy hit a recession, which was followed by the lowering of short term interest rates by the government. Consumer money flowed out of the stock market and into bonds and treasuries, which pushed long term interest rates lower. This caused a surge in demand for real estate, which sent prices skyrocketing within a few years.

By 2002, the soaring prices outpaced the County's median income level despite steadily falling interest rates. At the same time, condominium units were found to be a more feasible alternative and sales in this category started to pick up their pace.

By 2004, median sales prices for residential and condominium properties were both higher than what could be afforded by households earning the County's median income level. In 2006, this situation reached critical levels, as prices for both residential and condominium units reached their peak. It did not help that mortgage rates also trended slightly upwards, which lowered the affordability to buyers needing to finance their purchase.

Since 2006, the softening of the real estate market has brought median prices closer to affordable pricing levels, while condominium median prices has even dropped below affordable levels since 2011. However, the median single-family prices and

affordable prices are now diverging, while median condominium prices has converged with affordable condominium prices while still trending upward. To help keep housing price levels relatively affordable, more housing units should be brought to the market, especially those geared toward Maui's workforce.

CONCLUSION

In light of active listings and sales currently shown for agricultural lots on Maui, and the very limited number of 1- to 6- acre lots available in Central Maui, it appears that the subject's rural 1- and 5-acre lots should meet with strong demand, if priced appropriately. There are currently only 10 lots within 1- to 6-acres available in Central Maui with an average asking price of $484,700, and there are only six (6) lots available in all of East/Upcountry Maui, Central Maui, South Maui and West Maui that are between 1- and 2-acres in size.

A good indication of demand for rural/agricultural lots in Central Maui is from Wailuku Country Estates. Although this project was brought onto the market in 2003, all 183 lots sold within 12 months at a rate of approximately 15 lots per month. It was at a time when there were no other agricultural subdivisions available in Central Maui. Another recent project that is a good indication of demand for 2-acre agricultural lots on Maui is Peahi Hui Subdivision in Haiku. This 16-lot 2-acre subdivision sold 15 lots within a period of 2 months from November 2013 through December 2013 at a rate of about 7 lots per month.

The impact from a lack available inventory, coupled with an absense of new housing starts over the past few years, is once again starting to affect the real estate climate on Maui. The following points summarize the supply of real estate in Maui at this time.

- As of April 2014, there are approximately 1,999 active listings in the Realtors Association of Maui Multiple Listing Service for all types of residential properties (single-family, multi-family, and residential house lots) on Maui. By comparison, active listings of residential properties peaked at 3,467 in April 2009.

- There are approximately 1,017 new housing units currently available in the market on Maui. This was determined to be the short term supply of new housing units or vacant lots available for purchase in the market. Of this total, approximately 499 units are located in Central Maui while South Maui has a total of 138 units. West Maui has 297 of the total short term supply while Upcountry Maui has 83 units.

- Based on historical annual absorption rates of the real estate markets, the current short term supply of units is expected to last

approximately 1.9 years (1,017 units of supply ÷ 528 units of average absorption over 10 years).

Over the next decade, Wai'ale, Maalaea Plantation, and Pu'unani make up the larger projects planned for Central Maui. With the gradually recovering state of the local economy, there seems to be less uncertainty as to whether these projects will be carried out. The developers of these projects are still continuing to pursue entitlements. Maui's land use controls, such as the Workforce Housing Ordinance, Water Availability Ordinance and the Urban Growth Boundary will continue to be barriers to entry for many developers.

The following points summarize the demand for real estate in Maui at this time.

- Population on Maui between 2000 and 2010 grew by 20.1 percent. Population is expected to increase by 35.7 percent from 2000 to 2035. From 1990 to 2000, Central Maui had a growth rate of 26.5 percent increase in population.

- Mortgage rates remain at historical lows. As of April 2014, the average interest rate on 30-year, fixed-rate mortgages was at 4.33 percent. These lower rates typically mean that real estate becomes more affordable to a larger segment of the population. At the same time, however, current economic conditions are impeding many potential buyers from purchasing real property.

- Real estate sales activity in vacant land, single-family, and condominium properties has been on an upward trend, in terms of sales volume, since 2009. However, median prices only recently hit bottom in 2011 and have been climbing since then.

- Central Maui remains the most active region on the island. This is a testament to the area's desirability and proximity to the primary financial, business, civic, transportation and shipping areas of Maui. From 2003 to 2013, there has been an average of 227 new housing units absorbed in Central Maui per year.

- The Hawaii Housing Planning Study 2011 shows that there will be a demand for 3,454 new housing units in Maui County, from 2012 to 2016.

On a long-term basis, from 5 to 20 years, it is difficult to reliably estimate the number of projects that will be actually brought to the

market. As mentioned before, many projects have been delayed or have met with resistance from the community for various reasons. Some face the lengthy and uncertain tasks of rezoning and Community Plan Amendments by the County, as well as District Boundary Amendments by the State of Hawaii. This would seem to indicate that of all the potential projects that have been identified, a significant number may never be realized.

Many developers feel that the most difficult barriers to entry, with regard to residential projects, are the Workforce Housing Ordinance and Water Availability Ordinance. In their opinion, these County laws have increased an already time consuming and costly entitlement process, to the point where feasibility becomes questionable. Faced with this higher risk in the entitlement process, it is highly likely that they will put their money elsewhere, instead of constructing homes for Maui's residents. As such, in the next upswing in the market, the number of housing units that will become available is expected to be suppressed, as evidenced now by a current tight supply of new homes.

Prices had increased significantly during the early 2000's and made home ownership extremely difficult for residents of Maui, especially for those near the median income levels. The decline of the market between 2006 and 2011 has done little to resolve this affordability issue. Most of the development focus, both current and past, has been on market level, upper income brackets or the luxury resort market. There is a strong need for development to serve the general population and ultimately rebalance the supply and demand factors for residential properties.

The demand for housing continues to grow as the local and national economies continue to expand. The return of the visitor industry in 2011 has provided a significant boost to Maui's recovery. The increase of large projects on the island in 2012 has put many in the construction industry back to work; however, there is still an absence of residential project development, keeping some tradesmen on the bench.

As these backbones of the island's economy continue to strengthen, so will consumer confidence. Prior to this, even though property values had fallen to a level that is within the affordable price guidelines, many potential homebuyers were reluctant to purchase property, due to unemployment or a lack of job security.

Many who are willing to buy in today's market are finding it easier to obtain financing, as compared to the late 2000's. Interest rates are still at near-record lows which increases the purchasing power for buyers in all market segments.

While being cognizant of the cyclical nature of the real estate market, many feel that there will be cautious growth the horizon,

followed by a more notable rebound. At that point in time, it is assumed that economic conditions will have improved and potential buyers will find themselves in more opportune financial circumstances.

However, if history holds true, property appreciation may once again outpace household income and prevent many from being able to afford a home. Offering more housing at affordable and entry level price points would provide much relief from this situation.

Maalaea Plantation is conveniently located within easy driving distance of Central Maui and South Maui. It also provides a shorter trip to West Maui, than from Wailuku, Kahului, or Kihei. Release of more supply into the market, such as those offered by the subject, should be adequately received based on historical information of similar agricultural projects.

Currently, the ability of qualified buyers to purchase real estate is starting to ease compared to financing difficulties several years ago; however, it is fairly safe to assume that as economic conditions improve, housing units within this market segment will continue to be sought after. Economists have varied opinions as to the timing of the economic recovery, but many have pointed to 2011 for this turnaround.

Should Maalaea Plantation come online today, it would likely face growing demand that other ongoing housing projects are witnessing. However, the subject will still need to go through entitlement, engineering and construction processes before sales can occur. As such, release of the subject's 108 rural lots may be very well timed with the economic recovery. If so, significant demand can be expected for this project.

In addition, Maalaea Plantation will supply Maui with 108 rural lots which will provide a low-density development in an area desired for rural residential use.

The subject will be the newest rural/agricultural subdivision to be developed in Central Maui in the past decade at a time when there are no other similar projects available. History has typically shown that new product tends to generate excitement and good demand in moderately robust economic conditions. In conclusion, as market conditions continue to improve, the project can expect to see heightened demand, due to its central island location. Statistical evidence has clearly shown that this market segment has garnered strong demand by those desiring a rural lifestyle. After consideration of current economic and real estate market conditions, in addition to forecasts by Hawaii economists, it is our opinion that Maalaea Plantation should be well positioned to capitalize on the on-going market recovery.

EXHIBITS

EXHIBIT A

Maui County Demographic Snapshot, Claritas Inc.

Pop-Facts: Demographic Snapshot 2013 Report

County, (see appendix for geographies), aggregate

Description	Total County	%
Population		
2018 Projection	165,486	
2013 Estimate	158,805	
2010 Census	154,834	
2000 Census	128,094	
Growth 2013-2018	4.21%	
Growth 2010-2013	2.56%	
Growth 2000-2010	20.88%	
2013 Est. Pop by Single Race Class	158,805	
White Alone	55,173	34.74
Black or African American Alone	957	0.60
Amer. Indian and Alaska Native Alone	622	0.39
Asian Alone	44,593	28.08
Native Hawaiian and Other Pac. Isl. Alone	16,308	10.27
Some Other Race Alone	3,288	2.07
Two or More Races	37,864	23.84
2013 Est. Pop Hisp or Latino by Origin	158,805	
Not Hispanic or Latino	141,788	89.28
Hispanic or Latino:	17,017	10.72
Mexican	6,745	39.64
Puerto Rican	6,294	36.99
Cuban	28	0.16
All Other Hispanic or Latino	3,950	23.21
2013 Est. Hisp or Latino by Single Race Class	17,017	
White Alone	4,485	26.36
Black or African American Alone	57	0.33
American Indian and Alaska Native Alone	242	1.42
Asian Alone	1,310	7.70
Native Hawaiian and Other Pacific Islander Alone	862	5.07
Some Other Race Alone	3,038	17.85
Two or More Races	7,023	41.27

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Pop-Facts: Demographic Snapshot 2013 Report

County, (see appendix for geographies), aggregate

Description	Total County	%
2013 Est. Pop. Asian Alone Race by Cat	44,593	
Chinese, except Taiwanese	1,649	3.70
Filipino	25,866	58.00
Japanese	12,352	27.70
Asian Indian	153	0.34
Korean	1,103	2.47
Vietnamese	494	1.11
Cambodian	64	0.14
Hmong	0	0.00
Laotian	15	0.03
Thai	66	0.15
All Other Asian Races Including 2+ Category	2,831	6.35
2013 Est. Population by Ancestry	158,805	
Pop, Arab	85	0.05
Pop, Czech	186	0.12
Pop, Danish	435	0.27
Pop, Dutch	776	0.49
Pop, English	5,906	3.72
Pop, French (except Basque)	1,975	1.24
Pop, French Canadian	252	0.16
Pop, German	7,803	4.91
Pop, Greek	228	0.14
Pop, Hungarian	434	0.27
Pop, Irish	4,051	2.55
Pop, Italian	5,579	3.51
Pop, Lithuanian	21	0.01
Pop, United States or American	1,101	0.69
Pop, Norwegian	1,035	0.65
Pop, Polish	1,156	0.73
Pop, Portuguese	6,285	3.96
Pop, Russian	191	0.12
Pop, Scottish	1,340	0.84
Pop, Scotch-Irish	678	0.43
Pop, Slovak	79	0.05
Pop, Subsaharan African	111	0.07
Pop, Swedish	1,221	0.77
Pop, Swiss	624	0.39
Pop, Ukrainian	28	0.02
Pop, Welsh	453	0.29
Pop, West Indian (exc Hisp groups)	191	0.12
Pop, Other ancestries	107,167	67.48

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Pop-Facts: Demographic Snapshot 2013 Report

County, (see appendix for geographies), aggregate

Description	Total County	%
2013 Est. Population by Ancestry		
Pop, Ancestry Unclassified	9,414	5.93
2013 Est. Pop Age 5+ by Language Spoken At Home	148,498	
Speak Only English at Home	119,636	80.56
Speak Asian/Pac. Isl. Lang. at Home	22,842	15.38
Speak IndoEuropean Language at Home	3,110	2.09
Speak Spanish at Home	2,741	1.85
Speak Other Language at Home	169	0.11
2013 Est. Population by Sex	158,805	
Male	79,464	50.04
Female	79,341	49.96
2013 Est. Population by Age	158,805	
Age 0 - 4	10,307	6.49
Age 5 - 9	10,085	6.35
Age 10 - 14	10,008	6.30
Age 15 - 17	6,219	3.92
Age 18 - 20	5,003	3.15
Age 21 - 24	7,496	4.72
Age 25 - 34	19,608	12.35
Age 35 - 44	21,198	13.35
Age 45 - 54	23,690	14.92
Age 55 - 64	22,668	14.27
Age 65 - 74	13,597	8.56
Age 75 - 84	6,112	3.85
Age 85 and over	2,814	1.77
Age 16 and over	126,438	79.62
Age 18 and over	122,186	76.94
Age 21 and over	117,183	73.79
Age 65 and over	22,523	14.18
2013 Est. Median Age	40.0	
2013 Est. Average Age	39.40	

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County, (see appendix for geographies), aggregate

Description	Total County	%
2013 Est. Male Population by Age	79,464	
Age 0 - 4	5,287	6.65
Age 5 - 9	5,186	6.53
Age 10 - 14	5,079	6.39
Age 15 - 17	3,164	3.98
Age 18 - 20	2,605	3.28
Age 21 - 24	3,884	4.89
Age 25 - 34	9,895	12.45
Age 35 - 44	10,840	13.64
Age 45 - 54	11,865	14.93
Age 55 - 64	11,376	14.32
Age 65 - 74	6,626	8.34
Age 75 - 84	2,650	3.33
Age 85 and over	1,007	1.27
2013 Est. Median Age, Male	39.3	
2013 Est. Average Age, Male	38.70	
2013 Est. Female Population by Age	79,341	
Age 0 - 4	5,020	6.33
Age 5 - 9	4,899	6.17
Age 10 - 14	4,929	6.21
Age 15 - 17	3,055	3.85
Age 18 - 20	2,398	3.02
Age 21 - 24	3,612	4.55
Age 25 - 34	9,713	12.24
Age 35 - 44	10,358	13.06
Age 45 - 54	11,825	14.90
Age 55 - 64	11,292	14.23
Age 65 - 74	6,971	8.79
Age 75 - 84	3,462	4.36
Age 85 and over	1,807	2.28
2013 Est. Median Age, Female	40.8	
2013 Est. Average Age, Female	40.20	

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County, (see appendix for geographies), aggregate

Description	Total County	%
2013 Est. Pop Age 15+ by Marital Status	128,405	
Total, Never Married	41,713	32.49
Males, Never Married	24,123	18.79
Females, Never Married	17,590	13.70
Married, Spouse present	58,545	45.59
Married, Spouse absent	6,482	5.05
Widowed	6,769	5.27
Males Widowed	1,298	1.01
Females Widowed	5,471	4.26
Divorced	14,896	11.60
Males Divorced	6,938	5.40
Females Divorced	7,958	6.20
2013 Est. Pop. Age 25+ by Edu. Attainment	109,687	
Less than 9th grade	4,778	4.36
Some High School, no diploma	6,999	6.38
High School Graduate (or GED)	35,133	32.03
Some College, no degree	27,206	24.80
Associate Degree	8,496	7.75
Bachelor's Degree	19,027	17.35
Master's Degree	5,178	4.72
Professional School Degree	2,020	1.84
Doctorate Degree	850	0.77
2013 Est Pop Age 25+ by Edu. Attain, Hisp. or Lat	8,931	
CY Pop 25+, Hisp/Lat, < High School Diploma	1,534	17.18
CY Pop 25+, Hisp/Lat, High School Graduate	4,085	45.74
CY Pop 25+, Hisp/Lat, Some College or Associate's Deg	2,187	24.49
CY Pop 25+, Hisp/Lat, Bachelor's Degree or Higher	1,125	12.60
Households		
2018 Projection	58,390	
2013 Estimate	55,624	
2010 Census	53,886	
2000 Census	43,510	
Growth 2013-2018	4.97%	
Growth 2010-2013	3.23%	
Growth 2000-2010	23.85%	

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Pop-Facts: Demographic Snapshot 2013 Report

County, (see appendix for geographies), aggregate

Description	Total *County*	%
2013 Est. Households by Household Type	55,624	
Family Households	36,621	65.84
Nonfamily Households	19,003	34.16
2013 Est. Group Quarters Population	2,771	
2013 HHs by Ethnicity, Hispanic/Latino	4,475	8.05
2013 Est. HHs by HH Income	55,624	
CY HHs, Inc < $15,000	4,937	8.88
CY HHs, Inc $15,000 - $24,999	4,836	8.69
CY HHs, Inc $25,000 - $34,999	5,318	9.56
CY HHs, Inc $35,000 - $49,999	7,827	14.07
CY HHs, Inc $50,000 - $74,999	10,968	19.72
CY HHs, Inc $75,000 - $99,999	7,899	14.20
CY HHs, Inc $100,000 - $124,999	5,370	9.65
CY HHs, Inc $125,000 - $149,999	2,951	5.31
CY HHs, Inc $150,000 - $199,999	2,800	5.03
CY HHs, Inc $200,000 - $249,999	971	1.75
CY HHs, Inc $250,000 - $499,999	1,298	2.33
CY HHs, Inc $500,000+	449	0.81
2013 Est. Average Household Income	$80,649	
2013 Est. Median Household Income	$61,155	
2013 Median HH Inc by Single Race Class. or Ethn		
White Alone	63,076	
Black or African American Alone	48,269	
American Indian and Alaska Native Alone	33,525	
Asian Alone	67,647	
Native Hawaiian and Other Pacific Islander Alone	48,272	
Some Other Race Alone	45,375	
Two or More Races	54,664	
Hispanic or Latino	51,125	
Not Hispanic or Latino	61,980	
2013 Est. Family HH Type, Presence Own Children	36,621	
Married-Couple Family, own children	10,166	27.76

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Pop-Facts: Demographic Snapshot 2013 Report

County, (see appendix for geographies), aggregate

Description	Total County	%
Married-Couple Family, no own children	17,644	48.18
Male Householder, own children	1,552	4.24
Male Householder, no own children	1,219	3.33
Female Householder, own children	3,158	8.62
Female Householder, no own children	2,882	7.87
2013 Est. Households by Household Size	55,624	
1-person household	13,756	24.73
2-person household	17,590	31.62
3-person household	9,035	16.24
4-person household	6,953	12.50
5-person household	3,847	6.92
6-person household	2,054	3.69
7 or more person household	2,389	4.29
2013 Est. Average Household Size	2.81	
2013 Est. Households by Presence of People	55,624	
Households with 1 or more People under Age 18:	18,376	33.04
Married-Couple Family	12,169	66.22
Other Family, Male Householder	1,798	9.78
Other Family, Female Householder	4,212	22.92
Nonfamily, Male Householder	31	0.17
Nonfamily, Female Householder	166	0.90
Households no People under Age 18:	37,248	66.96
Married-Couple Family	16,342	43.87
Other Family, Male Householder	1,055	2.83
Other Family, Female Householder	1,994	5.35
Nonfamily, Male Householder	8,863	23.79
Nonfamily, Female Householder	8,994	24.15
2013 Est. Households by Number of Vehicles	55,624	
No Vehicles	3,555	6.39
1 Vehicle	16,623	29.88
2 Vehicles	22,187	39.89
3 Vehicles	8,299	14.92
4 Vehicles	3,316	5.96
5 or more Vehicles	1,644	2.96
2013 Est. Average Number of Vehicles	1.96	

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Pop-Facts: Demographic Snapshot 2013 Report

County, (see appendix for geographies), aggregate

Description	Total County	%
Family Households		
2018 Projection	38,409	
2013 Estimate	36,621	
2010 Census	35,498	
2000 Census	29,902	
Growth 2013-2018	4.88%	
Growth 2010-2013	3.16%	
Growth 2000-2010	18.71%	
2013 Est. Families by Poverty Status	36,621	
2013 Families at or Above Poverty	34,108	93.14
2013 Families at or Above Poverty with Children	15,427	42.13
2013 Families Below Poverty	2,513	6.86
2013 Families Below Poverty with Children	2,057	5.62
2013 Est. Pop Age 16+ by Employment Status	126,438	
In Armed Forces	340	0.27
Civilian - Employed	78,664	62.22
Civilian - Unemployed	9,693	7.67
Not in Labor Force	37,741	29.85
2013 Est. Civ Employed Pop 16+ Class of Worker	82,714	
For-Profit Private Workers	51,059	61.73
Non-Profit Private Workers	4,754	5.75
Local Government Workers	3,296	3.98
State Government Workers	7,518	9.09
Federal Government Workers	1,412	1.71
Self-Emp Workers	14,325	17.32
Unpaid Family Workers	350	0.42
2013 Est. Civ Employed Pop 16+ by Occupation	82,714	
Architect/Engineer	966	1.17
Arts/Entertain/Sports	2,348	2.84
Building Grounds Maint	5,693	6.88
Business/Financial Ops	2,150	2.60
Community/Soc Svcs	1,662	2.01
Computer/Mathematical	343	0.41
Construction/Extraction	4,817	5.82
Edu/Training/Library	4,566	5.52

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Pop-Facts: Demographic Snapshot 2013 Report

County, (see appendix for geographies), aggregate

Description	Total County	%
Farm/Fish/Forestry	1,251	1.51
Food Prep/Serving	8,688	10.50
Health Practitioner/Tec	2,261	2.73
Healthcare Support	1,883	2.28
Maintenance Repair	2,467	2.98
Legal	567	0.69
Life/Phys/Soc Science	685	0.83
Management	7,397	8.94
Office/Admin Support	11,423	13.81
Production	2,292	2.77
Protective Svcs	2,465	2.98
Sales/Related	10,171	12.30
Personal Care/Svc	4,695	5.68
Transportation/Moving	3,924	4.74
2013 Est. Pop 16+ by Occupation Classification	82,714	
Blue Collar	13,500	16.32
White Collar	44,539	53.85
Service and Farm	24,675	29.83
2013 Est. Workers Age 16+, Transp. To Work	80,097	
Drove Alone	57,172	71.38
Car Pooled	10,455	13.05
Public Transportation	1,723	2.15
Walked	2,609	3.26
Bicycle	627	0.78
Other Means	1,165	1.45
Worked at Home	6,346	7.92
2013 Est. Workers Age 16+ by Travel Time to Work *		
Less than 15 Minutes	29,982	
15 - 29 Minutes	24,531	
30 - 44 Minutes	11,968	
45 - 59 Minutes	4,389	
60 or more Minutes	3,114	
2013 Est. Avg Travel Time to Work in Minutes	22.82	
2013 Est. Tenure of Occupied Housing Units	55,624	
Owner Occupied	31,049	55.82
Renter Occupied	24,575	44.18

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Pop-Facts: Demographic Snapshot 2013 Report

County, (see appendix for geographies), aggregate

Description	Total County	%
2013 Owner Occ. HUs: Avg. Length of Residence	18.7	
2013 Renter Occ. HUs: Avg. Length of Residence	7.9	
2013 Est. All Owner-Occupied Housing Values	31,049	
Value Less than $20,000	50	0.16
Value $20,000 - $39,999	108	0.35
Value $40,000 - $59,999	192	0.62
Value $60,000 - $79,999	194	0.62
Value $80,000 - $99,999	183	0.59
Value $100,000 - $149,999	1,186	3.82
Value $150,000 - $199,999	1,013	3.26
Value $200,000 - $299,999	2,990	9.63
Value $300,000 - $399,999	4,374	14.09
Value $400,000 - $499,999	5,059	16.29
Value $500,000 - $749,999	9,514	30.64
Value $750,000 - $999,999	2,056	6.62
Value $1,000,000 or more	4,130	13.30
2013 Est. Median All Owner-Occupied Housing Value	$504,612	
2013 Est. Housing Units by Units in Structure	72,932	
1 Unit Attached	3,307	4.53
1 Unit Detached	40,651	55.74
2 Units	4,659	6.39
3 or 4 Units	3,353	4.60
5 to 19 Units	9,803	13.44
20 to 49 Units	5,157	7.07
50 or More Units	5,961	8.17
Mobile Home or Trailer	16	0.02
Boat, RV, Van, etc.	25	0.03
2013 Est. Housing Units by Year Structure Built	72,932	
Housing Unit Built 2005 or later	4,579	6.28
Housing Unit Built 2000 to 2004	7,028	9.64
Housing Unit Built 1990 to 1999	13,476	18.48
Housing Unit Built 1980 to 1989	15,207	20.85
Housing Unit Built 1970 to 1979	17,941	24.60
Housing Unit Built 1960 to 1969	6,625	9.08
Housing Unit Built 1950 to 1959	4,014	5.50

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Pop-Facts: Demographic Snapshot 2013 Report

County, (see appendix for geographies), aggregate

Description	Total *County*	*%*
Housing Unit Built 1940 to 1949	1,523	2.09
Housing Unit Built 1939 or Earlier	2,539	3.48
2013 Est. Median Year Structure Built **	1983	

*This row intentionally left blank. No total category data is available.

**1939 will appear when at least half of the Housing Units in this reports area were built in 1939 or earlier.

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Appendix: Area Listing

Area Name:

Type: List - County Reporting Detail: Aggregate Reporting Level: County

Geography Code	Geography Name	Geography Code	Geography Name
15009	Maui County, HI		

Project Information:

Site: 1

Order Number: 972098436

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EXHIBIT B

Maui County Agricultural District and Rural District Zoning Ordinances

Chapter 19.30A

AGRICULTURAL DISTRICT

Sections:

19.30A.010 Purpose and intent
19.30A.020 District criteria
19.30A.030 District standards
19.30A.040 Limitations on resubdivision
19.30A.050 Permitted uses
19.30A.060 Special uses
19.30A.070 Private agricultural parks
19.30A.080 Agricultural leases
19.30A.090 Substandard agricultural lots
19.30A.100 Exemptions pursuant to state law
19.30A.110 Permits issued prior to the enactment of this ordinance
19.30A.120 Rule-making authority

19.30A.010 Purpose and intent.

A. Purpose. The purpose of the agricultural district is to:

1. Implement chapter 205, Hawai'i Revised Statutes, and the goals and policies of the Maui County general plan and community plans;
2. Promote agricultural development;
3. Preserve and protect agricultural resources; and
4. Support the agricultural character and components of the County's economy and lifestyle.

B. Intent. It is the intent of this chapter to:

1. Reduce the land use conflicts arising from encroachment of nonagricultural uses into agricultural areas;
2. Mitigate rising property values of farm lands to make agricultural use more economically feasible;
3. Discourage developing or subdividing lands within the agricultural district for residential uses, thereby preserving agricultural lands and allowing proper planning of land use and infrastructure development;
4. Discourage establishment of nonagricultural subdivisions;
5. Ensure that the rezoning of land from the agricultural district shall be open for public debate and in the overall public interest, as evidenced by conformance with the Maui County general plan and community plan land use designations and policies, State land use law, this chapter and good planning practices; and
6. Notify the public that lands within the agricultural district are used for agricultural purposes. Owners, residents, and other users of such property or neighboring properties may be subjected to inconvenience, discomfort, and the possibility of injury to property and health arising from normal and accepted agricultural practices and operations. Such normal and accepted agricultural practices and operations include but are not limited to noise, odors, dust, smoke, the operation of machinery of any kind, including aircraft, and the storage and disposal of manure. Owners, occupants, and users of such property or neighboring properties shall be prepared to accept such inconveniences, discomfort, and possibility of injury from normal agricultural operations. (Ord. 2749 § 3 (part),1998)

19.30A.020 District criteria.

Agricultural lands that meet at least two of the following criteria should be given the highest priority for retention in the agricultural district:

A. Agricultural Lands of Importance to the State of Hawai'i (ALISH);

B. Lands not classified by the ALISH system whose agricultural land suitability, based on soil, topographic, and climatic conditions, supports the production of agricultural commodities, including

but not limited to coffee, taro, watercress, ginger, orchard and flower crops and nonirrigated pineapple. In addition, these lands shall include lands used for intensive animal husbandry, and lands in agricultural cultivation in five of the ten years immediately preceding the date of approval of this chapter; and

C. Lands which have seventy-five percent or more of their boundaries contiguous to lands within the agricultural district. (Ord. 2749 § 3 (part), 1998)

19.30A.030 District standards.

Except as otherwise provided in this chapter, the following district standards shall apply for uses, facilities and structures in the agricultural district:

A. Minimum lot area: two acres;

B. Minimum lot width: two hundred feet;

C. Minimum yard setbacks: front yards, twenty-five feet; side and rear yards, fifteen feet;

D. Maximum developable area: ten percent of the total lot area. This restriction shall apply to farm dwellings, but shall not apply to any structure or portion thereof which is used to support agriculture, including but not limited to storage facilities, barns, silos, greenhouses, farm labor dwellings, and stables, and shall not apply to utility facilities as permitted by this chapter;

E. Maximum height limit: Unless otherwise provided for in this chapter, the maximum height of any dwelling shall be thirty feet, except that vent pipes, fans, chimneys, antennae and solar collectors on roofs shall not exceed forty feet. Any non-dwelling structure such as a barn or silo that is over thirty-five feet in height shall be set back one additional foot for each foot in structure height;

F. Maximum wall height: Walls shall not exceed four feet within the yard setback area as measured from the finished or existing grade, whichever is lower, to the top of the wall as defined herein. This does not preclude constructing fences on the top of the wall for safety purposes. The director of public works and waste management may permit greater heights of walls as needed to retain earth, water or both for health and safety purposes;

G. The maximum number of lots that may be created from a lot, or portion there of, that is in the agricultural district shall be based on the gross area of the subject lot, which for the purposes of this subsection shall be the tax map key parcel as certified by the real property tax division on March 1998, as follows:

Area of lot (in acres)	Maximum number of permitted lots: 2-acre minimum lot size	Maximum number of permitted lots: 15-acre minimum lot size	Maximum number of permitted lots: 25-acre minimum lot size	Maximum number of permitted lots: 40-acre minimum lot size
Area of lot (in acres)	7			
At least 31 but less than 61	7, plus one additional lot for each 10 acres above 31 acres			
At least 61 but less than 92	10, plus one additional lot for each 15 acres; plus	1		
92+	12, plus one additional lot for each 40 acres above 92 acres (not to exceed 14 lots); plus	2, plus one additional lot for each 60 acres above 92 acres; plus	1, plus one additional lot for each 100 acres above 92 acres; plus	one for each 160 acres above 92 acres

For the purposes of this subsection, any lot(s) or portions(s) thereof that is contained entirely within the subject lot, and that is owned by the same persons or related corporate entities as the subject lot, shall be considered a part of the subject lot and shall count towards the maximum number of permitted lots that may be created from the subject lot.

This subsection shall not apply to any lot which received preliminary subdivision approval prior to the effective date of the ordinance codified in this chapter and which receives final subdivision approval after the effective date of said ordinance. The subsequent lots resulting from such subdivision shall be subject to this subsection. (Ord. 2749 § 3 (part), 1998)

19.30A.040 Limitations on resubdivision.

A. Following the effective date of this the ordinance codified in this chapter:

1. At the time of subdivision, the director of public works and waste management shall determine the maximum number of lots that can be created based upon the provisions and standards set forth in section 19.30A.030;
2. The subdivider shall allocate the maximum number of lots that can be created between the original lot and any new lot created as a result of the subdivision;
3. The allocation of lots shall be recorded with the bureau of conveyances; and
4. No lot, or portion thereof, which is in the agricultural district shall be further subdivided beyond the maximum number of lots permitted pursuant to this chapter and as recorded with the bureau of conveyances, except as provided by subsection 19.30A.040.C.

B. The following subdivisions shall not reduce the gross "area of lot" nor the "maximum number of permitted lots" as provided by subsection 19.30A.030.G:

1. Any subdivision requested by a public agency or public utility company for a public purpose;
2. Any consolidation and resubdivision in which no additional developable lots, as defined by section 18.04.123, Maui County Code, are created, provided that this would not result in the potential to create any additional lots than could have been created prior to consolidation and resubdivision;
3. Any subdivision for purposes of providing an easement exclusively for the protection of sites of cultural and historic significance; greenways; protection of sensitive environmental areas such as wetlands, streams, and endangered species habitat; and easements for public access to shoreline and mountain areas; or
4. Any subdivision for purposes of providing a roadway easement or lot.

C. If the original lot has been subdivided into the maximum number of lots permitted pursuant to this chapter, additional lots may be created for family members as described in subsections 18.20.280.B.1 and 18.20.280.B.2, Maui County Code, whether or not a deferral of improvements is intended, with the approval of the council; the application for such additional lots shall be processed in the same manner as applications for conditional permits, as provided by chapter 19.40, Maui County Code.

D. No deed, lease, agreement of sale, mortgage or other instrument of conveyance shall contain any covenant or clause which restricts, directly or indirectly, the operation of agricultural activities on lands within the agricultural district. This subsection shall not apply to any covenant or clause existing prior to the effective date of the ordinance codified in this chapter. (Ord. 2749 § 3 (part), 1998)

19.30A.050 Permitted uses.

The following uses and structures shall be permitted in the agricultural district provided they also comply with all other applicable laws:

A. Principal Uses.

1. Agriculture;
2. Agricultural land conservation;
3. Agricultural parks, pursuant to chapter 171, Hawai'i Revised Statutes;
4. Animal and livestock raising, including animal feed lots and sales yards;
5. Private agricultural parks as defined herein;
6. Minor utility facilities as defined in section 19.04.040, Maui County Code; and
7. Retention, restoration, rehabilitation, or improvement of buildings, sites or cultural landscapes of historical or archaeological significance.

B. Accessory Uses. Uses which are incidental or subordinate to, or customarily used in conjunction with a permitted principal use, as follows:

1. Two farm dwellings per lot, one of which shall not exceed one thousand square feet of developable area;
2. One farm labor dwelling per five acres of lot area. On the island of Maui, the owner or lessee of the lot shall meet two of the following three criteria:
    a. Provide proof of at least $35,000 of gross sales of agricultural product(s) per year, for

the preceding two consecutive years, for each farm labor dwelling on the lot, as shown by State general excise tax forms and federal Schedule F forms;

b. Provide certification by the Maui board of water supply that agricultural water rates are being paid if the subject lot is served by the County water system; or

c. Provide a farm plan that demonstrates the feasibility of commercial agricultural production.

On the islands of Moloka'i and Lana'i, the owner or lessee of the lot shall meet both of the criteria provided by subsections 19.30A.050.B.2.a and 19.30A.050.B.2.b;

3. One agricultural products stand per lot, for the purpose of displaying and selling agricultural products grown and processed on the premises or grown in the County, provided that said stand shall not exceed three hundred square feet, shall be set back at least fifteen feet from roadways, shall have a wall area which is at least fifty percent open, and shall meet the off-street parking requirements for roadside stands provided by section 19.36.010, Maui County Code, except that paved parking shall not be required; stands which display or sell agricultural products which are not grown on the premises shall be required to obtain a special permit pursuant to chapter 205, Hawai'i Revised Statutes;

4. Farmer's markets, for the growers and producers of agricultural products to display and sell agricultural products grown and processed in the County; structures shall have a wall area which is at least fifty percent open; markets shall operate only during daylight hours and shall not operate on parcels less than ten acres; the director of public works and waste management may impose additional requirements if a building permit is required for any structures; markets which display or sell agricultural products which are not grown on the premises shall be required to obtain a special permit pursuant to chapter 205, Hawai'i Revised Statutes;

5. Storage, wholesale and distribution, including barns; greenhouses; storage facilities for agricultural supplies, products and irrigation water; farmer's cooperatives; and similar structures that are customarily associated with one or more of the permitted principal uses or, for the purpose of this section, are associated with agriculture in the County;

6. Processing of agricultural products, the majority of which are grown in the County; this includes the burning of bagasse as part of an agricultural operation;

7. Energy systems, small-scale;

8. Small-scale animal-keeping;

9. Animal hospitals and animal board facilities; if conducted on the island of Moloka'i, such uses shall have been approved by the Moloka'i planning commission as conforming to the intent of this chapter;

10. Riding academies; if conducted on the island of Moloka'i, such uses shall have been approved by the Moloka'i planning commission as conforming to the intent of this chapter;

11. Open land recreation as follows: hiking; noncommercial camping; fishing; hunting; equestrian activities; rodeo arenas; arboretums; greenways; botanical gardens; guided tours which are accessory to principal uses, such as farm or plantation tours, petting zoos, and garden tours; hang gliding; paragliding; mountain biking; and accessory restroom facilities. If hiking, fishing, hunting, equestrian activities, rodeo arenas, hang gliding, paragliding or mountain biking and conducted for commercial purposes on the island of Moloka'i, such uses shall have been approved by the Moloka'i planning commission as conforming to the intent of this chapter. Open land recreation uses or structures not specifically permitted by this subsection or by subsection 19.30A.060.H shall be prohibited; certain open land recreation uses or structures may also be required to obtain a special permit pursuant to chapter 205, Hawai'i Revised Statutes;

12. Parks for public use, not including golf courses and not including commercial uses except when under the supervision of a government agency in charge of parks and playgrounds; and

13. Other uses which primarily support a permitted principal use; however, such uses shall be approved by the appropriate planning commission as conforming to the intent of this chapter. (Ord. 2749 § 3 (part), 1998)

19.30A.060 Special uses.

The following uses and structures shall be permitted in the agricultural district if a special use

permit, pursuant to section 19.510.070, Maui County Code, has been obtained; except that if a use described in this section also requires a special permit pursuant to chapter 205, Hawai'i Revised Statutes, and if the land area of the subject parcel is fifteen acres or less, the State special permit shall fulfill the requirements of this section:

A. Additional farm dwellings beyond those permitted by subsection 19.30A.050.B.1;

B. Farm labor dwellings that do not meet the criteria of subsection 19.30A.050.B.2;

C. Agricultural products stands that do not meet the standards of subsection 19.30A.050.B.3;

D. Farmer's markets that do not meet the standards of subsection 19.30A.050.B.4;

E. Public and quasipublic institutions which are necessary for agricultural practices;

F. Major utility facilities as defined in section 19.04.040, Maui County Code;

G. Telecommunications and broadcasting antenna;

H. Open land recreation uses, structures or facilities which do not meet the criteria of subsection 19.30A.050.B. 11, including commercial camping; gun or firing ranges; archery ranges; skeet shooting; paint ball; bungee jumping; skateboarding; roller blading; playing fields; accessory buildings and structures. Certain open land recreation uses or structures may also be required to obtain a special permit pursuant to chapter 205, Hawai'i Revised Statutes. The following uses or structures shall be prohibited: airports, heliports, drive-in theaters, country clubs, drag strips; motor sports facilities; golf courses and golf driving ranges;

I. Cemeteries, crematories, and mausoleums;

J. Churches and religious institutions;

K. Mining and resource extraction; and

L. Landfills. (Ord. 2749 § 3 (part), 1998)

19.30A.070 Private agricultural parks.

Private agricultural parks provide for appropriately sized, functionally configured, and affordable agricultural parcels to support diversified agricultural development. Lots created for the purposes of establishing or expanding a private agricultural park shall not be counted in or as part of the number of lots permitted by subsection 19.30A.030.G. Except as otherwise provided in this chapter, the following requirements and standards shall apply for uses, facilities, and structures in areas designated as private agricultural parks;

A. Individual lot leases or deeds shall provide that the lots is restricted to agricultural purposes;

B. Lots within private agricultural parks shall be made available for lease or sale;

C. No permanent or temporary dwellings or farm dwellings, including trailers and campers, shall be permitted within a private agricultural park, unless the following requirements are met:

1. A special use permit, pursuant to section 19.510.070, Maui County Code, has been obtained;
2. The lot on which the dwelling is located is used principally for agriculture, and the occupant of the dwelling provides security or caretaker services for the private agricultural park;
3. A maximum of one dwelling per lot;
4. The private agricultural park shall be subject to a maximum density of one dwelling per twenty-five acres of private agricultural park area; and
5. The dwelling shall be subject to a maximum developable area of seven hundred square feet.

D. A restrictive covenant excluding dwellings that do not meet the criteria of subsection 19.30A.070.C shall be included in the deed of the lot and run with said lot as long as said lot is within the agricultural district. This restriction shall not prohibit the construction of storage sheds, equipment sheds or other structures appropriate to the agricultural activity carried on within the lot;

E. Agricultural parks shall not be less than twenty-five acres in size;

F. Minimum lot area: five acres;

G. Subdivision requirements, as set forth in the following provisions of Title 18, Maui County Code, shall not apply to private agricultural parks and the lots therein:

1. 18.16.010 to 18.16.180;
2. 18.16.270 to 18.16.310B;
3. 18.16.320;
4. 18.20 to 18.20.090;

5. 18.20.140; and
6. 18.28; and

H. All requirements set forth herein shall terminate if an area designated as an agricultural park is rezoned to a nonagricultural zoning district. (Ord. 2749 § 3 (part), 1998)

19.30A.080 Agricultural leases.

A. Any landowner may enter into an agricultural lease provided that the following conditions are met:

1. The principal use of the leased land is agriculture; and
2. No permanent or temporary dwellings or farm dwellings, including trailers and campers, are constructed on the leased area. This restriction shall not prohibit the construction of storage sheds, equipment sheds or other structures appropriate to the agricultural activity carried on within the lot.

B. Subdivision requirements, as set forth in Title 18, Maui County Code, shall not apply to agricultural leases. (Ord. 2749 § 3 (part), 1998)

19.30A.090 Substandard agricultural lots.

Substandard agricultural lots existing prior to the enactment of the ordinance codified in this chapter shall be subject to the following standards:

A. Lots less than two acres but equal to or greater than one-half acre shall be subject to the yard and building height standards as set forth for lots of such area in section 19.29.020, Maui County Code, and shall be exempt from the maximum developable area restriction of subsection 19.30A.030.D; and

B. Lots less than one-half acre shall be subject to the yard and building height standards as set forth for lots of such area in sections 19.08.050 and 19.08.060, Maui County Code, and shall be exempt from the maximum developable area restriction of subsection 19.30A.030.D. (Ord. 2749 § 3 (part), 1998)

19.30A.100 Exemptions pursuant to state law.

A. If provided by Hawai'i Revised Statutes, for lands legally defined and recognized as kuleana or similar type of land ownership, such as land commission awards or royal patents, the district standards of section 19.30A.030, and the density restriction of subsection 19.30A.050.B.1, shall not apply.

B. Affordable housing projects as set forth in chapter 201E, Hawai'i Revised Statutes, shall be exempt from the requirements of this chapter. (Ord. 2749 § 3 (part), 1998)

19.30A.110 Permits issued prior to the enactment of this ordinance.

State or County special permits, special use permits, conditional permits and variances issued prior to the enactment of the ordinance codified in this chapter shall remain in full force and effect for their duration, and their renewal shall be subject to the provisions of this chapter. Any dwelling or structure that was constructed with a building permit that was approved prior to the enactment of said ordinance need not acquire a County special use permit, conditional permit or variance and may be reconstructed as permitted by the original building permit(s), and such dwellings or structures may be expanded or modified with a building permit, subject to the other provisions of this chapter and this title. (Ord. 2749 § 3 (part), 1998)

19.30A.120 Rule-making authority.

The planning director and the director of public works and waste management shall have the authority to adopt rules regarding the administration of this chapter. (Ord. 2749 § 3 (part), 1998)

Chapter 19.29 - RURAL DISTRICTS

Sections:

19.29.010 - Purpose and intent.
19.29.020 - District standards.
19.29.030 - Permitted uses.
19.29.040 - Uses permitted with a County special use permit.
19.29.050 - Exemptions pursuant to state law.
19.29.060 - Rule making authority.

19.29.010 - Purpose and intent.

A. Purpose. The purpose of the rural districts is to implement the goals and policies of the Maui County general plan and community plans; to provide low density development which preserves the rural character of certain areas; to allow small-scale agricultural uses and the keeping of animals; and to serve as a transition between standard residential or other urban density development and agricultural lands.

B. Intent. It is the intent of this chapter to promote proper planning of land use and infrastructure development. Any zoning of lands to a rural zoning district shall be consistent with the rural and open space character of the area; shall have adequate infrastructure and public facilities; and shall be in conformance with Maui County general plan and community plan land use designations.
(Ord. 2583 § 4 (part), 1997)

19.29.020 - District standards.

Except as otherwise provided in this chapter, the following district standards shall apply for uses, facilities, and structures in the rural districts:

DEVELOPMENT STANDARDS

	County Rural	RU-0.5	RU-1	RU-2	RU-5	RU-10	Notes
Minimum Lot Area	½ acre	½ acre	1 acre	2 acres	5 acres	10 acres	
Minimum Lot Width	100 feet	100 feet	150 feet	200 feet	250 feet	300 feet	
Maximum Building Height	30 feet	30 feet	30 feet	30 feet	30 feet	30 feet	Except that vent pipes, fans, chimneys, antennae, and solar collectors on roofs shall not exceed forty feet.
Minimum Yard Setback	Front 25 feet	Front 25 feet	Front 35 feet	Front 25 feet	Front 25 feet	Front 25 feet	
	Side 15 feet	Side 15 feet	Side 20 feet	Side 15 feet	Side 15 feet	Side 15 feet	
	Rear 15 feet	Rear 15 feet	Rear 20 feet	Rear 15 feet	Rear 15 feet	Rear 15 feet	
Walls Within Setback Area	4 feet maximum	4 feet maximum	4 feet maximum	4 feet maximum	4 feet maximum	4 feet maximum	This does not preclude constructing fences on the top of the wall for safety purposes. The director may permit greater heights of walls as needed to retain earth, water, or both, for health and

							safety reasons.

(Ord. No. 3849, § 1, 2011; Ord. 3524 § 1, 2008: Ord. 2583 § 4 (part), 1997)

19.29.030 - Permitted uses.

The following uses and structures shall be permitted in the RU-0.5, RU-1, RU-2, RU-5, RU-10, and County rural districts provided they also conform with all other applicable laws:

A. Principal Uses.

1. One single-family dwelling per one-half acre in the RU-0.5 and County rural districts; one single-family dwelling per one acre in the RU-1 district; one single-family dwelling per two acres in the RU-2 district; one single-family dwelling per five acres in the RU-5 district; and one single-family dwelling per ten acres in the RU-10 district;
2. Growing and harvesting of any agricultural or agricultural crop or product, subject to restrictions set forth in this chapter;
3. Minor utility facilities as defined in section 19.04.040 of this code;
4. Parks for public use; but not including commercial: camping, campgrounds, campsites, overnight camps, and other similar uses;
5. Day care nurseries, kindergartens, nursery schools, child care homes, day care homes, adult day care homes, day care centers, nurseries, preschool kindergartens, babysitting services, and other like facilities located in dwelling units used for child care services. These facilities shall serve six or fewer clients at any one time on lot sizes of less than seven thousand five hundred square feet, serving eight or fewer clients at any one time on lot sizes of seven thousand five hundred or more square feet but less than ten thousand square feet, or serving twelve or fewer clients at any one time on lot sizes of ten thousand or more square feet; and
6. Home occupations.

B. Accessory Uses.

1. Accessory uses such as garages, carports, barns, greenhouses, gardening sheds, and similar structures that are customarily used in conjunction with and incidental and subordinate to a principal use or structure;
2. The keeping of livestock, hogs, poultry, and fowl and game birds;
3. One accessory dwelling per lot, in accordance with the provisions of chapter 19.35 of this code;
4. Small-scale energy systems that are incidental and subordinate to principal uses;
5. Stands for the purpose of displaying and selling agricultural, floriculture or fanning products, if such products have been produced or grown on the premises, subject to standards in section 19.29.020 of this code. Goods produced off-premises are expressly prohibited; and
6. Bed and breakfast homes, subject to chapter 19.64 of this code.

(Ord. No. 3849, § 2, 2011; Ord. No. 3622, § 6, 2009; Ord. No. 3611, § 2, 2008; Ord. 3524 § 2, 2008: Ord. 2648 § 3, 1998; Ord. 2583 § 4 (part), 1997)

19.29.040 - Uses permitted with a County special use permit.

The following uses and structures shall be permitted in the RU-0.5, RU-1, RU-2, RU-5, RU-10, and County rural districts provided a County special use permit, pursuant to section 19.510.070, Maui County Code, has first been obtained:

A. Commercial stables, riding academies;

B. Schools, churches and religious institutions, and private clubs and lodges; but not including commercial: camping, campgrounds, campsites, overnight camps and other similar uses;

C. Cemeteries, crematories, and mausoleums;

D. Major utility facilities as defined in section 19.04.040, Maui County Code; and

E. Day care nurseries, kindergartens, nursery schools, child care homes, day care homes, adult day care homes, day care centers, nurseries, preschool kindergartens, babysitting services, and other like facilities located in dwelling units used for child care services serving more than the number of children defined in section 19.29.030

(Ord. No. 3849, § 3, 2011; Ord. 3524 § 3, 2008: Ord. 2648 § 4, 1998; Ord. 2583 § 4 (part), 1997)

19.29.050 - Exemptions pursuant to state law.

The following shall be exempt from the requirements of this chapter if, or as, provided by Hawaii Revised Statutes:

A. If provided by statute, for lands legally defined and recognized as hui, kuleana, or similar type of land ownership:

1. The density restrictions of sections 19.29.030.A.1 and B.3 shall not apply; and
2. The district standards set forth in section 19.29.020 pertaining to minimum lot area, minimum lot width and minimum yards shall not apply.

B. As provided by section 205-2(4)(c), Hawaii Revised Statutes, one lot of less than one-half acre, but not less than eighteen thousand five hundred square feet, resulting from a subdivision.

(Ord. 2583 § 4 (part), 1997)

19.29.060 - Rule making authority.

The director may adopt administrative rules to clarify and implement this chapter.

(Ord. 3524 § 4, 2008)

EXHIBIT C

1- to 6-Acre Active Land Listings

MLS #	Status	LT	Zone	Sec	Plat	Par	Sq Ft	Acres	Address	List Date	Original $	List Price	City	Subdivision	DOM
357117	ACTIVE	Fee Simple	2	1	4	131	87,120	2.000	10 Kanaio Kalama Park RD	7/31/2013	$450,000	$450,000	Kula	Palisades Pointe Estates	265
359875	ACTIVE	Fee Simple	2	1	5	49	91,912	2.110	1521 Kanaio-Kalama Park Rd	3/10/2014	$650,000	$650,000	Kula	Ulupalakua	43
357727	ACTIVE	Fee Simple	2	1	23	31	74,488	1.710	10 Ualei Pl	9/24/2013	$3,600,000	$3,300,000	Kihei	One Palauea Bay	210
360357	ACTIVE	Fee Simple	2	2	4	40	119,790	2.750	0 Cross Rd	4/19/2014	$2,500,000	$2,500,000			3
356639	ACTIVE	Fee Simple	2	2	6	75	121,532	2.790	105 Mauds Pl	6/17/2013	$599,000	$575,000	Kula	Mauds Place	309
356848	ACTIVE	Fee Simple	2	3	1	29	166,399	3.820	0 Kamehameiki RD	7/5/2013	$888,000	$795,000	Kula	Kula	291
357527	ACTIVE	Fee Simple	2	3	3	231	233,090	5.351	147 Ikena Kai PL	9/6/2013	$1,095,000	$1,095,000	Kula	Omaopio Ridge II	228
357528	ACTIVE	Fee Simple	2	3	3	232	231,783	5.321	161 Ikena Kai PL	9/6/2013	$895,000	$895,000	Kula	Omaopio Ridge II	228
357529	ACTIVE	Fee Simple	2	3	3	233	251,254	5.768	160 Ikena Kai PL	9/6/2013	$1,295,000	$1,295,000	Kula	Omaopio Ridge II	228
357530	ACTIVE	Fee Simple	2	3	3	235	234,396	5.381	148 Ikena Kai PL	9/6/2013	$715,000	$715,000	Kula	Omaopio Ridge II	228
357525	ACTIVE	Fee Simple	2	3	3	237	225,859	5.185	130 Ikena Kai PL	9/6/2013	$695,000	$695,000	Kula	Omaopio Ridge II	228
359949	ACTIVE	Fee Simple	2	3	3	248	220,414	5.060	0 Hoomaikai Pl	3/17/2014	$825,000	$825,000	Kula	Makani 'O Kula	36
352873	ACTIVE	Fee Simple	2	3	12	63	104,108	2.390	1318 KAMEHAMEIKI RD	7/17/2012	$510,000	$510,000	Kula		644
357218	ACTIVE	Fee Simple	2	3	13	43	68,825	1.580	0 Haleakala Hwy (Crater Rd)	8/5/2013	$799,000	$699,000	Kula	Haleakala Acres	260
358980	ACTIVE	Fee Simple	2	3	39	8	226,948	5.210	0 Hapapa Rd	1/2/2014	$750,000	$750,000	Kula		110
358018	ACTIVE	Fee Simple	2	4	12	58	110,773	2.543	0 PIIHOLO RD	10/16/2013	$528,000	$528,000	Makawao		188
358398	ACTIVE	Fee Simple	2	4	13	207	95,832	2.200	43 Naniuka PL	11/14/2013	$550,000	$550,000	Makawao	Olinda Ranch Estates	159
354945	ACTIVE	Fee Simple	2	4	13	214	95,832	2.200	30 Naniuka PL	1/21/2013	$515,000	$515,000	Makawao	Olinda Ranch Estates	456
358463	ACTIVE	Fee Simple	2	7	2	157	95,745	2.198	0 Kauhikoa Rd	11/18/2013	$499,000	$499,000	Haiku		155
358165	ACTIVE	Fee Simple	2	7	4	PO7	260,924	5.990	LOT 7 NALU OLA	10/28/2013	$1,895,000	$1,895,000			176
357294	ACTIVE	Fee Simple	2	7	13	176	174,240	4.000	1440 Kaupakalua Rd	8/14/2013	$649,500	$649,500	Haiku		251
356748	ACTIVE	Fee Simple	2	8	3	44	215,753	4.953	425 Manawai PL	6/15/2013	$1,674,000	$1,699,000	Haiku		311
358616	ACTIVE	Fee Simple	2	8	3	49	158,558	3.640	1060 Kai Huki CIR	12/2/2013	$1,000,000	$1,000,000	Haiku	Peahi Farms	141
358630	ACTIVE	Fee Simple	2	8	3	76	170,755	3.920	890 Kai Huki CIR	12/2/2013	$1,500,000	$1,500,000	Haiku	Peahi Farms	141
358619	ACTIVE	Fee Simple	2	8	3	79	188,615	4.330	836 Kai Huki CIR	12/2/2013	$2,995,000	$2,995,000	Haiku	Peahi Farms	141
358620	ACTIVE	Fee Simple	2	8	3	80	149,846	3.440	810 Kai Huki CIR	12/2/2013	$1,750,000	$1,750,000	Haiku	Peahi Farms	141
358622	ACTIVE	Fee Simple	2	8	3	82	190,357	4.370	770 Kai Huki CIR	12/2/2013	$2,100,000	$2,100,000	Haiku	Peahi Farms	141
358623	ACTIVE	Fee Simple	2	8	3	83	248,292	5.700	744 Kai Huki CIR	12/2/2013	$2,250,000	$2,250,000	Haiku	Peahi Farms	141
358624	ACTIVE	Fee Simple	2	8	3	84	231,304	5.310	726 Kai Huki CIR	12/2/2013	$1,750,000	$1,750,000	Haiku	Pe'ahi Farms	141
358625	ACTIVE	Fee Simple	2	8	3	85	223,898	5.140	690 Kai Huki CIR	12/2/2013	$1,500,000	$1,500,000	Haiku	Pe'ahi Farms	141
358626	ACTIVE	Fee Simple	2	8	3	86	154,638	3.550	660 Kai Huki CIR	12/2/2013	$1,000,000	$1,000,000	Haiku	Pe'ahi Farms	141
357897	ACTIVE	Fee Simple	2	8	4	115	182,952	4.200	0 N HOLOKAI RD	10/7/2013	$565,000	$565,000	Haiku	Uaoa Bridge	197
360220	ACTIVE	Fee Simple	2	8	5	114	95,091	2.183	0 Kekoanui Pl	4/9/2014	$599,000	$599,000	Haiku	Peahi Hui Subdivision	13
359722	ACTIVE	Fee Simple	2	8	6	72	87,120	2.000	90 Kaupakalua Rd	2/28/2014	$450,000	$450,000	Haiku		53
358663	ACTIVE	Fee Simple	2	8	9	106	108,421	2.489	40 Waipulani Rd	12/4/2013	$395,000	$314,900	Haiku	Takitani Farms lots	139
359710	ACTIVE	Fee Simple	2	8	11	14	89,734	2.060	30 Hale Pili Way	2/28/2014	$1,697,000	$1,697,000	Haiku	Aina O Ka Hale Pili	53
359596	ACTIVE	Fee Simple	2	9	2	51	100,188	2.300	460 HOOLAWA RD	2/18/2014	$1,495,000	$1,495,000	Haiku	Hoolawa Point	63
360284	ACTIVE	Fee Simple	2	9	4	56	177,551	4.076	6170 Hana HWY	4/11/2014	$205,000	$205,000	Haiku		11
355051	ACTIVE	Fee Simple	2	9	12	44	157,513	3.616	0 Hanauana RD	1/30/2013	$565,000	$565,000	Haiku	Kahui Pono No. II	447
359678	ACTIVE	Fee Simple	3	1	7	6	178,944	4.108	145 Kaukini LP	2/25/2014	$550,000	$550,000	Wailuku	Maluhia Country Ranches	56
359385	ACTIVE	Fee Simple	3	1	7	46	132,858	3.050	18 Lahaole Pl	2/4/2014	$385,000	$385,000	Wailuku	Maluhia Country Ranches	77
357587	ACTIVE	Fee Simple	3	2	3	11	108,900	2.500	000 Kahekili Hwy	9/12/2013	$435,000	$399,000	Wailuku		222
355563	ACTIVE	Fee Simple	3	2	8	13	87,120	2.000	0 Kuhinia ST	3/16/2013	$520,000	$520,000	Wailuku	Na Mele O Waihee	402
348991	ACTIVE	Fee Simple	3	2	8	13	92,217	2.117	32 Heahea Pl	8/2/2011	$450,000	$450,000	Wailuku	Na Mala O Waihee	994
356023	ACTIVE	Fee Simple	3	3	17	49	87,512	2.009	2004 Puuohala Rd	4/28/2013	$529,000	$529,000	Wailuku	Wailuku Country Estates	359
353997	ACTIVE	Fee Simple	3	3	17	52	147,668	3.390	2011 Puuohala RD	11/4/2012	$625,000	$625,000	Wailuku	Wailuku Country Estates	534
359716	ACTIVE	Fee Simple	3	3	17	155	88,427	2.030	2330 Kamaile St	2/28/2014	$649,000	$649,000	Wailuku	Wailuku Country Estates	53
359357	ACTIVE	Fee Simple	3	3	18	1	98,402	2.259	0 Mokuhau Rd	2/2/2014	$370,000	$370,000	Wailuku	Iao Valley Homesteads	79
359356	ACTIVE	Fee Simple	3	3	18	1	111,644	2.563	0 MOKUHAU RD	2/2/2014	$370,000	$370,000	Wailuku	Iao Valley Homesteads	79
356840	ACTIVE	Fee Simple	4	2	5	3	94,961	2.180	104 HONOLUA PL	6/27/2013	$1,495,000	$1,495,000	Lahaina	Plantation Estates	299
333864	ACTIVE	Fee Simple	4	2	5	61	191,228	4.390	710 MOKULEIA PL	10/8/2008	$3,500,000	$2,950,000	Lahaina	Plantation Estates II	2022
351352	ACTIVE	Fee Simple	4	2	8	15	188,920	4.337	110 Keoawa ST	2/24/2012	$1,250,000	$975,000	Lahaina	Honolua Ridge Phase One	788
358795	ACTIVE	Fee Simple	4	4	8	16	69,783	1.602	2495 Kekaa Dr	12/17/2013	$2,990,000	$2,990,000	Lahaina	KAANAPALI	126
359069	ACTIVE	Fee Simple	4	4	14	1	50,530	1.160	10 Kai Ala Dr	1/9/2014	$6,500,000	$6,500,000	Lahaina	Kai Ala Beach	103
349520	ACTIVE	Fee Simple	4	4	19	123	43,560	1.000	564 Anapuni LOOP	9/20/2011	$1,288,800	$1,188,888	Lahaina	LANIKEHA	945
355307	ACTIVE	Fee Simple	4	4	20	5	243,021	5.579	Lot 5 Kaanapali Coffee Farms	2/22/2013	$495,000	$560,000	Lahaina	Kaanapali Coffee Farms	424
359546	ACTIVE	Fee Simple	4	4	20	13	204,296	4.690	Mokka Point Kaanapali Coffee	2/17/2014	$795,000	$849,000	Lahaina	Kaanapali Coffee Farms	64

351408	ACTIVE	Fee Simple	4	4	20	29	180,121	4.135	Lot 29 Kaanapali Coffee Farms	2/29/2012	$835,000	$985,000	Lahaina	Kaanapali Coffee Farms	783
359702	ACTIVE	Fee Simple	4	4	20	31	214,751	4.930	Lot 31 Kaanapali Coffee Farms	2/27/2014	$855,000	$855,000	Lahaina	Kaanapali Coffee Farms	54
351526	ACTIVE	Fee Simple	4	4	20	33	175,808	4.036	Lot 33 Kaanapali Coffe Farms	3/12/2012	$735,000	$915,000	Lahaina	Kaanapali Coffee Farms	771
357656	ACTIVE	Fee Simple	4	4	20	42	237,228	5.446	Lot 42 Kaanapali Coffee Farms	9/15/2013	$935,000	$1,000,000	Lahaina	Kaanapali Coffee Farms	219
359856	ACTIVE	Fee Simple	4	4	20	45	242,716	5.572	Lot 45 Kaanapali Coffee Farms	3/10/2014	$785,000	$785,000	Lahaina	Kaanapali Coffee Farms	43
359700	ACTIVE	Fee Simple	4	4	20	50	222,156	5.100	Lot 50 Kaanapali Coffee Farms	2/27/2014	$925,000	$925,000	Lahaina	Kaanapali Coffee Farms	54
358958	ACTIVE	Fee Simple	4	7	3	8	217,800	5.000	lot 5 Hokiokio RD	1/2/2014	$2,185,000	$2,185,000	Lahaina	PUUNOA PHASE 1	110
358957	ACTIVE	Fee Simple	4	7	3	9	217,800	5.000	0 WILIOKAI WAY	1/2/2014	$2,185,000	$2,185,000	Lahaina	PUUNOA PHASE 1	110
359932	ACTIVE	Fee Simple	4	7	3	20	219,107	5.030	147 Mele Komo PL	3/13/2014	$1,695,000	$1,695,000	Lahaina	Puunoa II	40
352038	ACTIVE	Fee Simple	4	7	3	27	242,629	5.570	HOKIOKIO PL	4/25/2012	$1,250,000	$1,198,000	Lahaina	PUUNOA SUBD. PHASE 2	727
355439	ACTIVE	Fee Simple	4	7	9	69	107,158	2.460	11 Pua Niu WAY	3/5/2013	$675,000	$675,000	Lahaina	Mahanalua Nui IV	413
358694	ACTIVE	Fee Simple	4	7	10	69	43,604	1.001	31 Iliahi Way	12/6/2013	$525,000	$525,000	Lahaina	Mahanalua Nui	137
359256	ACTIVE	Fee Simple	4	8	2	69	178,160	4.090	80 Kalai Pl	1/22/2014	$975,000	$925,000	Lahaina	Olowalu Mauka	90
358897	ACTIVE	Fee Simple	4	8	3	85	150,282	3.450	282 Luawai ST	12/26/2013	$609,000	$609,000	Lahaina	Olowalu	117
354888	ACTIVE	Fee Simple	4	8	3	85	87,730	2.014	282 Luawai ST	1/15/2013	$699,000	$697,000	Lahaina	Olowalu	462
360240	ACTIVE	Fee Simple	4	8	3	88	166,312	3.818	40 Kalai Pl	4/10/2014	$875,000	$875,000	Lahaina	Olowalu Mauka	12
355913	ACTIVE	Fee Simple	4	8	3	92	254,565	5.844	0 Luawai ST	4/19/2013	$1,150,000	$1,150,000	Lahaina	Olowalu Mauka	368
357782	ACTIVE	Fee Simple	4	8	3	122	87,120	2.000	45 Kuahulu Pl	9/27/2013	$5,800,000	$5,800,000	Lahaina	Olowalu Makai - Komohar	207

EXHIBIT D

1- to 6-Acre Land Sales since January 2013

MLS #	Status	Zone	Sec	Plat	Par	Sq Ft	Acres	Sold Price	Closing Date	Address	List Date	Original $	List Price	City	Subdivision	DOM
356709	SOLD	2	1	23	22	43,560	1.00	$2,950,000	6/21/2013	34 Ualei Pl	1/11/2013	$3,000,000	$3,000,000	Kihei	One Palauea Bay	161
358012	SOLD	2	1	23	24	43,996	1.01	$1,750,000	4/21/2014	26 Ualei Pl	10/15/2013	$2,850,000	$2,000,000	Kihei	One Palauea	188
354168	SOLD	2	2	9	71	93,523	2.15	$360,000	9/27/2013	686 WAIAKOA RD	11/16/2012	$376,000	$376,000	Kula	Waiakoa Estates	315
353998	SOLD	2	2	12	74	95,396	2.19	$500,000	12/12/2013	0 Malia-Iopeka PL	11/4/2012	$695,000	$695,000	Kula	Kula	403
357709	SOLD	2	2	16	13	87,120	2.00	$850,000	3/10/2014	1050 Polipoli Rd	9/23/2013	$1,100,000	$900,000			168
355632	SOLD	2	3	1	114	87,120	2.00	$615,000	3/22/2013	0 KAMEHAMEIKI RD	2/4/2013	$615,000	$615,000	Kula		46
359575	SOLD	2	3	3	226	242,194	5.56	$698,000	3/19/2014	0 Off Omaopio Rd/Ho'oma	2/14/2014	$695,000	$695,000	Kula	Good Earth Farms	33
357523	SOLD	2	3	3	236	219,281	5.03	$525,000	12/23/2013	136 Ikena Kai PL	9/6/2013	$595,000	$595,000	Kula	Omaopio Ridge II	108
357526	SOLD	2	3	3	238	218,236	5.01	$549,000	1/24/2014	124 Ikena Kai PL	9/6/2013	$650,000	$650,000	Kula	Omaopio Ridge	140
355609	SOLD	2	3	3	244	152,460	3.50	$520,000	10/2/2013	0 Hoomaikai PL	3/21/2013	$600,000	$580,000	Kula	Makani O Kula	195
351167	SOLD	2	3	13	49	155,509	3.57	$895,000	3/24/2014	16251 Haleakala HWY	2/6/2012	$900,000	$900,000	Kula		777
354336	SOLD	2	3	14	84	51,183	1.18	$390,000	12/6/2013	101 MALANANI DR	11/29/2012	$395,000	$395,000	Kula		372
355399	SOLD	2	3	68	4	242,194	5.56	$540,000	6/6/2013	60 Opalipali	3/1/2013	$648,888	$599,888	Kula	Kula Meadows	97
340588	SOLD	2	3	68	6	225,205	5.17	$675,000	4/17/2014	80 Opalipali PL	12/9/2009	$939,000	$699,999	Kula		1590
356552	SOLD	2	4	12	73	257,004	5.90	$440,000	8/22/2013	1 piiholo	6/11/2013	$459,000	$459,000			72
358547	SOLD	2	4	13	40	218,018	5.01	$352,500	1/28/2014	1050 Piiholo Rd	11/26/2013	$470,000	$390,000	Makawao	Coryell-Hughes	63
355116	SOLD	2	4	13	70	261,360	6.00	$575,000	8/30/2013	290 EHU RD	2/4/2013	$600,000	$600,000	Makawao		207
356163	SOLD	2	4	13	218	48,352	1.11	$181,500	7/3/2013	83 Ehu Rd	5/13/2013	$195,000	$195,000	Makawao		51
358954	SOLD	2	4	13	226	49,702	1.14	$200,000	3/11/2014	59 Ehu Rd	1/2/2014	$235,000	$235,000	Makawao	Kahakapao Homestead	68
354209	SOLD	2	4	32	6	95,396	2.19	$450,000	2/12/2013	130 AHUWALE PL	11/19/2012	$499,000	$499,000	Makawao		85
343593	SOLD	2	4	32	67	94,525	2.17	$400,000	2/3/2014	150 Apau PL	6/9/2010	$495,000	$425,000	Makawao	Pau Hana Estates	1335
347571	SOLD	2	6	13	13	43,560	1.00	$345,000	1/18/2013	39 Ulumaika PL	4/1/2011	$350,000	$350,000	Paia		658
356808	SOLD	2	7	4	44	113,692	2.61	$1,000,000	6/28/2013	000 Hana HWY	5/22/2013	$1,000,000	$1,000,000	Haiku	Maliko Cliffs	37
347421	SOLD	2	7	7	76	113,256	2.60	$399,000	2/8/2013	0 HAIKU RD	3/21/2011	$399,000	$460,000	Haiku	Dolder Subdivision	690
350687	SOLD	2	7	8	184	202,902	4.66	$510,000	4/26/2013	0 Mauu PL	1/3/2012	$599,000	$539,000	Haiku	West Kuiaha Meadows	479
356940	SOLD	2	7	11	85	44,475	1.02	$110,000	9/27/2013	0 Haiku	7/12/2013	$199,000	$199,000	Haiku		77
355839	SOLD	2	7	12	177	87,120	2.00	$350,000	11/29/2013	0 E Kuiaha RD	4/12/2013	$399,000	$399,000	Haiku		231
355412	SOLD	2	7	12	207	94,961	2.18	$495,000	7/29/2013	1419 HOG BACK RD	3/4/2013	$495,000	$495,000	Haiku	P-6 Ranch	147
356362	SOLD	2	7	12	213	104,108	2.39	$475,000	8/21/2013	0 Hog Back Rd	5/28/2013	$485,000	$485,000	Haiku	P-6 Ranch	85
353316	SOLD	2	7	12	233	112,908	2.59	$585,000	3/14/2013	0 LAA KEA PL	8/29/2012	$649,000	$649,000	Haiku	Laa Kea	197
348645	SOLD	2	7	12	234	121,750	2.80	$400,000	5/31/2013	0 Laa Kea PL	7/3/2011	$595,000	$525,000	Haiku	Laa Kea	698
357266	SOLD	2	7	12	235	127,195	2.92	$600,000	8/6/2013	Laa Kea PL	8/6/2013	$600,000	$600,000	Haiku		0
352704	SOLD	2	7	12	252	194,408	4.46	$235,000	3/19/2013	734 E KUIAHA RD	6/29/2012	$420,000	$391,000	Haiku	Kaupakalua	263
355259	SOLD	2	7	13	210	88,427	2.03	$585,000	6/3/2013	0 Oili Rd	2/18/2013	$650,000	$650,000	Haiku	Kuiaha-Kaupakukua Hi	105
351464	SOLD	2	7	36	33	92,783	2.13	$509,000	4/30/2013	41 Ulua PL	3/5/2012	$525,000	$525,000	Haiku		421
353903	SOLD	2	7	36	37	51,357	1.18	$335,000	9/13/2013	0 Ulua PL	10/27/2012	$345,000	$345,000	Haiku		321
350443	SOLD	2	7	37	12	64,469	1.48	$262,000	1/31/2013	748 AWALAU RD	12/12/2011	$295,000	$295,000	Haiku		416
357612	SOLD	2	8	2	254	136,604	3.14	$470,000	9/13/2013	61 Kealamauola Pl	8/6/2013	$470,000	$470,000	Haiku	Alo'alii	38
358191	SOLD	2	8	5	114	87,164	2.00	$355,000	11/22/2013	0 KEKOANUI PL	10/28/2013	$355,000	$355,000	Haiku	Peahi Hui Subdivision	25
357979	SOLD	2	8	5	114	87,294	2.00	$370,000	1/3/2014	0 KEKOANUI PL	10/11/2013	$365,000	$370,000	Haiku	Peahi Hui Subdivision	84
357926	SOLD	2	8	5	114	87,294	2.00	$360,000	11/15/2013	0 KEKOANUI PL	10/7/2013	$360,000	$360,000	Haiku	Peahi Hui Subdivision	39
357925	SOLD	2	8	5	114	88,688	2.04	$350,000	12/13/2013	0 KEKOANUI PL	10/7/2013	$350,000	$350,000	Haiku	Peahi Hui Subdivision	67
357924	SOLD	2	8	5	114	87,164	2.00	$330,000	11/27/2013	0 KEKOANUI PL	10/7/2013	$315,000	$330,000	Haiku	Peahi Hui Subdivision	51
357923	SOLD	2	8	5	114	87,164	2.00	$325,000	12/24/2013	0 KEKOANUI PL	10/7/2013	$315,000	$325,000	Haiku	Peahi Hui Subdivision	78
357921	SOLD	2	8	5	114	87,381	2.01	$335,000	10/30/2013	0 KEKOANUI PL	10/7/2013	$335,000	$335,000	Haiku	Peahi Hui Subdivision	23
357920	SOLD	2	8	5	114	87,207	2.00	$355,000	10/30/2013	0 KEKOANUI PL	10/7/2013	$355,000	$355,000	Haiku	Peahi Hui Subdivision	23
357919	SOLD	2	8	5	114	87,207	2.00	$370,000	11/1/2013	0 KEKOANUI PL	10/8/2013	$370,000	$370,000	Haiku	Peahi Hui Subdivision	24
357918	SOLD	2	8	5	114	96,573	2.22	$370,000	10/30/2013	0 KEKOANUI PL	10/7/2013	$370,000	$370,000	Haiku	Peahi Hui Subdivision	23
357917	SOLD	2	8	5	114	88,340	2.03	$385,000	10/30/2013	0 KEKOANUI PL	10/7/2013	$385,000	$385,000	Haiku	Peahi Hui Subdivision	23
357916	SOLD	2	8	5	114	89,167	2.05	$395,000	10/30/2013	0 KEKOANUI PL	10/7/2013	$395,000	$395,000	Haiku	Peahi Hui Subdivision	23
357915	SOLD	2	8	5	114	119,529	2.74	$400,000	10/30/2013	0 KEKOANUI PL	10/7/2013	$400,000	$400,000	Haiku	Peahi Hui Subdivision	23
357914	SOLD	2	8	5	114	95,091	2.18	$385,000	10/30/2013	0 KEKOANUI PL	10/7/2013	$385,000	$385,000	Haiku	Peahi Hui Subdivision	23
357913	SOLD	2	8	5	114	89,342	2.05	$370,000	11/1/2013	0 KEKOANUI PL	10/7/2013	$370,000	$370,000	Haiku	Peahi Hui Subdivision	25
355515	SOLD	2	9	2	48	224,770	5.16	$700,000	8/9/2013	0 N HONOKALA RD	3/12/2013	$750,000	$750,000	Haiku	Huelo Hillside	150

343253	SOLD	2	9	4	91	175,677	4.03	$300,000	8/2/2013	6200 HANA HWY	5/18/2010	$295,000	$250,000	Haiku	Baker	1172
356780	SOLD	2	9	4	95	136,996	3.14	$376,000	10/15/2013	0 S Honokala RD	6/27/2013	$394,000	$387,000	Haiku	Honokala Farm	110
356779	SOLD	2	9	4	96	184,869	4.24	$450,000	11/6/2013	0 S Honokala RD	6/27/2013	$450,000	$450,000	Haiku	Honokala Farm	132
355918	SOLD	2	9	7	49	87,120	2.00	$750,000	8/21/2013	328 DOOR OF FAITH CHUR(	4/19/2013	$780,000	$780,000	Haiku		124
358119	SOLD	2	9	7	81	43,560	1.00	$750,000	4/11/2014	664 Huelo Rd	10/24/2013	$795,000	$795,000	Haiku		169
355052	SOLD	2	9	12	28	91,694	2.11	$330,000	3/7/2014	0 Hanauana RD	1/30/2013	$345,000	$345,000	Haiku	Kahui Pono No. II	401
342089	SOLD	3	1	1	5	123,710	2.84	$235,000	5/3/2013	445 KAUKINI LOOP	3/8/2010	$375,000	$245,000	Wailuku	The Cliffs at Kahakuloa	1152
358099	SOLD	3	1	1	57	105,502	2.42	$285,000	12/26/2013	0 Kaukini Loop	10/23/2013	$315,000	$315,000	Wailuku	The Cliffs at Kahakuloa	64
356185	SOLD	3	1	1	59	110,207	2.53	$210,000	6/17/2013	0 Kaukini Loop	5/13/2013	$240,000	$240,000	Wailuku		35
353720	SOLD	3	1	7	8	166,922	3.83	$240,000	3/7/2013	11 Lahaole PL	10/10/2012	$269,900	$269,900	Wailuku	Maluhia Country Ranch	148
348119	SOLD	3	1	7	21	119,834	2.75	$224,999	4/19/2013	93 Lahaole PL	5/17/2011	$272,500	$238,900	Wailuku	Maluhia Country Ranch	703
348989	SOLD	3	2	8	62	103,847	2.38	$395,000	3/11/2013	28 Heahea Pl	8/2/2011	$450,000	$450,000	Wailuku	Na Mala O Waihee	587
352289	SOLD	3	2	13	42	65,340	1.50	$300,000	9/11/2013	788 MALAIHI RD	5/17/2012	$349,000	$349,000	Wailuku	Wailuku Ag	482
354806	SOLD	3	2	16	13	51,706	1.19	$249,000	5/17/2013	993-C Malaihi RD	1/9/2013	$289,000	$249,000	Wailuku	Malaihi Mauka Subdiv	128
357303	SOLD	3	2	17	18	120,226	2.76	$290,000	10/9/2013	0 Malaihi Rd	8/14/2013	$339,000	$339,000	Wailuku		56
357578	SOLD	3	3	17	40	87,512	2.01	$500,000	3/4/2014	581 Luahoana Pl	4/28/2013	$549,000	$549,000	Wailuku	Wailuku Country Estate	310
355637	SOLD	3	3	17	68	114,563	2.63	$370,000	6/7/2013	148 Maika ST	3/25/2013	$385,000	$385,000	Wailuku	Wailuku Country Estate	74
353840	SOLD	3	3	17	81	99,186	2.28	$525,000	6/14/2013	2832 Kamaile PL	10/20/2012	$569,000	$569,000	Wailuku	Wailuku Country Estate	237
352699	SOLD	3	9	3	3	65,340	1.50	$700,000	2/1/2013	30 ALAHELE PL	6/27/2012	$1,445,000	$1,445,000	Kihei		219
357663	SOLD	3	9	17	23	141,134	3.24	$1,200,000	9/19/2013	55 Auhana Rd	8/27/2013	$1,200,000	$1,200,000	Kihei		23
344671	SOLD	4	2	5	15	91,912	2.11	$2,750,000	2/22/2013	224 PLANTATION CLUB DR	8/17/2010	$3,950,000	$3,300,000	Lahaina	Plantation Estates I	920
343783	SOLD	4	2	5	36	93,218	2.14	$1,100,000	3/28/2013	309 PLANTATION ESTATES [	6/22/2010	$2,200,000	$1,650,000	Lahaina	Plantation Estates	1010
353423	SOLD	4	2	5	64	91,040	2.09	$850,000	8/30/2013	705 Mokuleia PL	9/7/2012	$1,200,000	$1,099,000	Lahaina	Plantation Estates	357
355974	SOLD	4	2	5	66	92,217	2.12	$1,075,000	3/21/2014	701 Mokuleia PL	4/22/2013	$1,500,000	$1,350,000	Lahaina	Plantation Estates	333
353555	SOLD	4	2	8	6	196,891	4.52	$775,000	3/11/2013	93 Keoawa ST	9/21/2012	$865,000	$815,000	Lahaina	Honolua Ridge	171
351461	SOLD	4	2	8	8	186,437	4.28	$650,000	3/5/2013	98 Keoawa PL	3/5/2012	$895,000	$740,000	Lahaina	Honolua Ridge	365
356740	SOLD	4	4	2	25	237,750	5.46	$895,000	2/28/2014	Lot 25 Aina Mahi'ai St	6/25/2013	$990,000	$895,000	Lahaina	Kaanapali Coffee Farm	248
354698	SOLD	4	4	19	2	43,560	1.00	$775,000	11/7/2013	24 Anapuni LOOP	12/27/2012	$900,000	$900,000	Lahaina	Lanikeha Phase 1	315
359801	SOLD	4	4	20	2	220,414	5.06	$576,000	4/3/2014	Lot 2 Kaanapali Coffee Fa	2/25/2014	$576,000	$576,000	Lahaina		37
351032	SOLD	4	4	20	4	222,809	5.11	$557,750	3/28/2014	Lot 4 Kaanapali Coffee Fa	1/30/2012	$645,000	$575,000	Lahaina	Kaanapali Coffee Farm	788
358816	SOLD	4	4	20	8	249,250	5.72	$495,000	2/10/2014	Lot 8 Kaanapali Coffee Fa	12/18/2013	$520,000	$520,000	Lahaina	Kaanapali Coffee Farm	54
359805	SOLD	4	4	20	10	192,622	4.42	$622,500	4/17/2014	Lot 10 Kaanapali Coffee F	2/27/2014	$655,000	$655,000	Lahaina	Kaanapali Coffee Farm	49
351030	SOLD	4	4	20	12	221,720	5.09	$522,500	10/21/2013	Lot 12 Kaanapali Coffee F	1/30/2012	$555,000	$550,000	Lahaina	Kaanapali Coffee Farm	630
351029	SOLD	4	4	20	13	204,296	4.69	$547,371	11/19/2013	Lot 13 Kaanapali Coffee F	1/30/2012	$525,000	$540,000	Lahaina	Kaanapali Coffee Farm	659
354591	SOLD	4	4	20	17	186,306	4.28	$715,000	1/25/2013	Lot 17 Kaanapali Coffee F	12/20/2012	$715,000	$715,000	Lahaina	Kaanapali Coffee Farm	36
359807	SOLD	4	4	20	19	232,001	5.33	$921,500	3/19/2014	Lot 19 Kaanapali Coffee F	3/3/2014	$970,000	$970,000	Lahaina		16
357788	SOLD	4	4	20	23	219,542	5.04	$940,000	11/27/2013	Lot 23 Kaanapali Coffee F	9/25/2013	$940,000	$940,000	Lahaina	Kaanpali Coffee Farms	63
355007	SOLD	4	4	20	38	175,547	4.03	$718,862	4/17/2013	Lot 38 Kaanapali Coffee F	1/25/2013	$695,000	$695,000	Lahaina	Kaanapali Coffee Farm	82
357655	SOLD	4	4	20	40	207,738	4.77	$740,000	12/12/2013	Lot 40 Kaanapali Coffee F	9/15/2013	$755,000	$755,000	Lahaina		88
354056	SOLD	4	4	20	41	243,152	5.58	$906,525	5/1/2013	Lot 41 Kaanapali Coffee F	11/8/2012	$855,000	$950,000	Lahaina		174
356007	SOLD	4	7	3	7	219,542	5.04	$1,110,000	8/23/2013	0 Hokiokio Pl	4/29/2013	$1,295,000	$1,295,000	Lahaina	Puunoa	116
354391	SOLD	4	7	3	20	219,107	5.03	$1,125,000	4/17/2013	147 Mele Komo PL	12/1/2012	$1,525,000	$1,295,000	Lahaina	Puunoa II	137
351292	SOLD	4	7	9	70	104,108	2.39	$730,000	2/18/2014	25 Pua Nui WAY	2/15/2012	$795,000	$745,000	Lahaina	Mahanalua Nui	734
359628	SOLD	4	7	9	80	84,724	1.94	$1,224,000	4/16/2014	108 Pua Niu Way	2/19/2014	$1,350,000	$1,350,000	Lahaina	Mahanalua Nui	56
356672	SOLD	4	7	10	42	89,298	2.05	$895,000	8/22/2013	17 Kumu Niu ST	6/18/2013	$895,000	$895,000	Lahaina	Mahanalua Nui Phase	65
358067	SOLD	4	7	10	74	83,635	1.92	$575,000	4/17/2014	46 Iliahi WAY	10/21/2013	$550,000	$550,000	Lahaina	Mahanalua Nui Phase	178
353239	SOLD	4	7	10	79	56,192	1.29	$525,000	4/5/2013	83 Lau Niu WAY	8/20/2012	$555,000	$525,000	Lahaina	Mahana Lua Nui Ph IV	228
355363	SOLD	4	8	3	93	230,040	5.28	$870,000	2/24/2013	0 Luawai ST	2/1/2013	$870,000	$870,000	Lahaina		23
347837	SOLD	4	8	3	120	87,120	2.00	$3,775,000	5/20/2013	0 Kuahulu PL	4/25/2011	$4,999,000	$4,250,000	Lahaina		756

ADDENDA

DEFINITIONS

The purpose of this Glossary is to assist the reader in understanding specific terminology used in this report.

Appraisal (noun) the act or process of developing an opinion of value; an opinion of value (adjective) of or pertaining to appraising and related functions such as appraisal practice or appraisal services.

Cash Equivalent A price expressed in terms of cash, as distinguished from a price expressed totally or partly in terms of the face amounts of notes or other securities that cannot be sold at their face amounts.

Counseling Providing competent, disinterested, and unbiased advice and guidance on diverse problems in the broad field of real estate; may involve any or all aspects of the business such as merchandising, leasing, management, acquisition/disposition planning, financing, development, cost-benefit studies, feasibility analysis, and similar services. Counseling services are often associated with evaluation, but they are beyond the scope of appraisal.

Discounting A procedure used to convert periodic incomes, cash flows, and reversions into present value; based on the assumption that benefits received in the future are worth less than the same benefits received now.

Extraordinary Assumption An assumption, directly related to a specific assignment, as of the effective date, which, if found to be false, could alter the appraiser's opinions or conclusions. Extraordinary assumptions presume as fact otherwise uncertain information about physical, legal, or economic characteristics of the subject property; or about conditions external to the property such as market conditions or trends; or about the integrity of data used in an analysis. An extraordinary assumption may be used in an assignment only if:

- It is required to properly develop credible opinions and conclusions;
- The appraiser has a reasonable basis for the extraordinary assumption;
- Use of the extraordinary assumption results in a credible analysis; and
- The appraiser complies with the disclosure requirements set forth in USPAP for extraordinary assumptions.

Fair Value The cash price that might reasonably be anticipated in a current sale under all conditions requisite to a fair sale. A fair sale means that buyer and seller are each acting prudently, knowledgeably, and under no necessity to buy or sell-, i.e., other than in a forced or liquidation sale. The appraiser should estimate the cash price that might be received upon exposure to the open market for a reasonable time, considering the property type and local market conditions. ***When a current sale is unlikely-i.e., when it is unlikely that the sale can be completed within 12 months-the appraiser must discount all cash flows generated by the property to obtain the estimate of fair value.*** These cash flows include, but are not limited to, those arising from ownership, development, operating, and sale of the property. The discount applied shall reflect the appraiser's judgment of what a prudent, knowledgeable purchase under o necessity to buy would be willing to pay to purchase the property in a current sale.

Fee Simple Estate

Absolute ownership encumbered by any other interest or estate, subject only to the limitations imposed by the governmental powers of taxation, eminent domain, police power, and escheat.

Hawaiian Terms

The Hawaiian words "mauka" and "makai" are commonly used in the islands as indicators of direction. The word "mauka" means toward the mountain, and "makai" means toward the ocean.

Highest and Best Use

The reasonably probable and legal use of vacant land or an improved property, which is physically possible, appropriately supported, financially feasible, and that results in the highest value. The four criteria the highest and best use must meet are legal permissibility, physical possibility, financial feasibility, and maximum profitability.

Highest and Best Use of Land or a Site as Though Vacant

Among all reasonable, alternative uses, the use that yields the highest present land value, after payments are made for labor, capital, and coordination. The use of a property based on the assumption that the parcel of land is vacant or can be made vacant by demolishing any improvements.

Highest and Best Use of Property as Improved

The use that should be made of a property as it exists. An existing improvement should be renovated or retained as is so long as it continues to contribute to the total market value of the property, or until the return from a new improvement would more than offset the cost of demolishing the existing building and constructing a new one.

Hypothetical Condition

A condition, directly related to a specific assignment, which is contrary to what is known by the appraiser to exist on the effective date of the assignment results, but is used for the purpose of analysis. Hypothetical conditions are contrary to known facts about physical, legal, or economic characteristics of the subject property; or about conditions external to the property, such as market conditions or trends; or about the integrity of data used in an analysis. A hypothetical condition may be used in an assignment only if:

- Use of the hypothetical condition is clearly required for legal purposes, for purposes of reasonable analysis, or for purposes of comparison;
- Use of the hypothetical condition results in a credible analysis; and
- The appraiser complies with the disclosure requirements set forth in USPAP for hypothetical conditions

Leased Fee Interest

An ownership interest held by a landlord with the rights of use and occupancy conveyed by lease to others. The rights of the lessor (the leased fee owner) and the lessee are specified by contract terms contained within the lease.

Leasehold Interest

The interest held by the lessee (the tenant or renter) through a lease transferring the rights of use and occupancy for a stated term under certain conditions.

Market Rent

The most probable rent that a property should bring in a competitive and open market reflecting all conditions and restrictions of the specified lease agreement including term, rental adjustment and revaluation,

permitted uses, use restrictions, and expense obligations; the lessee and lessor each acting prudently and knowledgeably, and assuming consummation of a lease contract as of a specified date and the passing of the leasehold from lessor to lessee under conditions whereby:

- Lessee and lessor are typically motivated.
- Both parties are well informed or well advised, and acting in what they consider their best interests.
- A reasonable time is allowed for exposure in the open market.
- The rent payment is made in terms of cash in United States dollars, and is expressed as an amount per time period consistent with the payment schedule of the lease contract.
- The rental amount represents the normal consideration for the property leased unaffected by special fees or concessions granted by anyone associated with the transaction.

Market Value

The major focus of most real property appraisal assignments. Both economic and legal definitions of market value have been developed and refined. Continual refinement is essential to the growth of the appraisal profession.

The most widely accepted components of market value are incorporated in the following definition:

"The most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeably, and for self-interest, and assuming that neither is under undue duress."

Market value is defined in the Uniform Standards of Professional Appraisal Practice (USPAP) as follows:

"A type of value, stated as an opinion, that presumes the transfer of a property (i.e., a right of ownership or a bundle of such rights), as of a certain date, under specific conditions set forth in the definition of the term identified by the appraiser as applicable in an appraisal."

The following definition of market value is used by agencies that regulate federally insured financial institutions in the United States:

"The most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeably, and assuming the price is not affected by undue stimulus. Implicit in this definition is the consummation of a sale as of a specified date and the passing of title from seller to buyer under conditions whereby:"

- Buyer and seller are typically motivated;
- Both parties are well informed or well advised, and acting in what they consider their best interests;
- A reasonable time is allowed for exposure in the open market;
- Payment is made in terms of cash in U.S. dollars or in terms of financial arrangements comparable thereto; and

- The price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale.

Prospective Market Value Upon Completion of Construction The prospective future value of a property on the date that construction is completed, based upon market conditions forecast to exist as of the completion date.

Prospective Value Opinion A forecast of the value expected at a specified future date. A prospective value opinion is most frequently sought in connection with real estate projects that are proposed, under construction, or under conversion to a new use, or those that have not achieved sellout or a stabilized level of long-term occupancy at the time the appraisal report is written.

Report Any communication, written or oral, of an appraisal, appraisal review, or appraisal consulting service that is transmitted to the client upon completion of an assignment. The types of written reports listed below apply to real property appraisals:

Appraisal Report: A written appraisal report prepared under Standards Rule 2-2(a) of the Uniform Standards of Professional Appraisal Practice. An appraisal report sets forth the data considered, the appraisal procedures followed, and the reasoning employed in the appraisal, addressing each item in the depth and detail required by its significance to the appraisal and providing sufficient information so that the client and the intended users of the report will understand the appraisal and not be misled or confused.

Restricted Appraisal Report: A written report prepared under Standards Rule 2-2(b), 8-2(c), or 10-2(b). A restricted use appraisal report is for client use only. The restricted use appraisal report should contain a brief statement of information significant to the solution of the appraisal problem. It should be understood that the rationale for how the appraiser arrived at the opinions and conclusions in the report may not be understood properly without additional information in the appraiser's workfile.

Uniform Standards of Professional Appraisal Practice Current standards of the appraisal profession, developed for appraisers and the users of appraisal services by the Appraisal Standards Board of The Appraisal Foundation. The Uniform Standards set forth the procedures to be followed in developing an appraisal, analysis, or opinion and the manner in which an appraisal, analysis, or opinion is communicated. They are endorsed by the Appraisal Institute and by other professional appraisal organizations.

LIMITING AND CONTINGENT CONDITIONS
ACM Consultants, Inc.

1. The property is appraised as though free and clear of any or all liens and encumbrances unless otherwise stated in this report. The Consultant will not be responsible for matters of a legal nature that affect either the property being appraised or the title to it. The Consultant assumes that the title is good and marketable, and therefore, will not render any opinions about the title.

2. Legal descriptions referenced in the report were obtained from public documents from the State of Hawaii, Bureau of Conveyances, or were furnished by the client, and were assumed to be correct.

3. It is assumed that all applicable zoning and use regulations and restrictions have been complied with, unless a nonconformity has been stated, defined, and considered in this appraisal report.

4. It is assumed that all required licenses, certificates of occupancy or other legislative or administrative authority from any local, state, or national governmental or private entity or organization have been or can be obtained or renewed for any use on which the value estimates contained in this report are based.

5. It is assumed that the utilization of the land and improvements is within the boundaries or property lines of the property described and that there is no encroachment or trespass unless otherwise stated in this report. Responsible ownership and competent property management are assumed unless otherwise stated in this report.

6. The Consultant has inspected as far as possible, by observation, the land and the improvements; however, it was not possible to personally observe conditions beneath the soil or hidden structurally or by other components. The appraisal assumes that there are no hidden, unapparent, or apparent conditions of the property site, subsoil, or structures or toxic material which would render it more or less valuable. The Consultant and firm have no responsibility for any such conditions or for any expertise or engineering to discover them. All mechanical components are assumed to be in operable condition and status standard for properties of the subject type. Conditions of heating, cooling, ventilation, electrical and plumbing equipment is considered to be commensurate with the conditions of the balance of the improvements unless otherwise stated. No judgment may be made by us as to adequacy of insulation, type of insulation, or energy efficiency of the improvements or equipment, and no representations are made herein as to these matters unless specifically stated and considered in the report.

7. Information provided by third parties including government agencies, financial institutions, realtors, buyers, sellers, property owners and others and contained in this report were obtained from sources considered reliable and believed to be true and correct. However, no warranty is assumed for possible misinformation.

8. All engineering is assumed to be correct. Any plot plans and illustrative material in this report are included only to assist the reader in visualizing the property. Any sketch in this report may show approximate dimensions and is included to assist the reader in visualizing the property. Maps and exhibits found in this report are provided for reader reference purposes only. No guarantee as to accuracy is expressed or implied unless otherwise stated in this report. No survey has been made for the purpose of this report.

9. The Consultant is not qualified to detect hazardous waste and/or toxic materials. Any comment by the Consultant that might suggest the possibility of the presence of such substances should not be taken as confirmation of the presence of hazardous waste and/or toxic materials. Such determination would require investigation by a qualified expert in the field of environmental assessment. The presence of substances such as asbestos, urea-formaldehyde foam insulation, or other potentially hazardous materials may affect the value of the property. The Consultant's value estimate is predicated on the assumption that there is no such material on or in the property that would cause a loss in value unless otherwise stated in this report. No responsibility is assumed for any environmental conditions, or for any expertise or engineering knowledge required to discover them. The Consultant's descriptions and resulting comments are the result of the routine observations made during the appraisal process.

10. If analysis contained in this appraisal involves partial interests in real estate, the value of the fractional interest plus the value of all other fractional interests may or may not equal the value of the entire fee simple estate considered as a whole.

11. Unless otherwise stated in this report, the subject property is appraised without a specific compliance survey having been conducted to determine if the property is or is not in conformance with the requirements of the Americans with Disabilities Act. The presence of architectural and communications barriers that are structural in nature that would restrict access by disabled individuals may adversely affect the property's value, marketability, or utility.

12. Possession of this report, or a copy thereof, does not carry with it the right of publication. It may not be used for any purposed by any person other than the party to whom it is addressed without the written consent of the Consultant, and in any event, only with proper written qualification and only in its entirety.

13. The Consultant(s) or those assisting in preparation of the report will not be asked or required to give testimony in court or hearing because of having made the appraisal, in full or in part, nor engage in post appraisal consultation with client or third parties except under separate and special arrangement and at additional fee. If testimony or deposition is required because of subpoena, the client shall be responsible for any additional time, fees, and charges regardless of issuing party.

14. Neither all nor any part of the contents of this report (especially any conclusions as to value, the identity of the Consultant, or the firm with which the Consultant is connected) shall be disseminated to the public through advertising, public relations, news sales, or other media without prior written consent and approval of the Consultant.

ACCEPTANCE OF, AND/OR USE OF THIS APPRAISAL REPORT BY CLIENT OR ANY THIRD PARTY CONSTITUTES ACCEPTANCE OF THE ACM CONSULTANTS, INC., CERTIFICATION, LIMITING AND CONTINGENT CONDITIONS. CONSULTANT LIABILITY EXTENDS ONLY TO STATED CLIENT, NOT SUBSEQUENT PARTIES OR USERS OF ANY TYPE, and the total liability of Consultant(s) and firm is limited to the amount of fee received by Consultant.

PROFESSIONAL QUALIFICATIONS
of
Dominic J. Suguitan

STATE LICENSING

State Certified General Appraiser,
State of Hawaii, License No. CGA-576, April 17, 1995
Expiration: December 31, 2015

ASSOCIATION MEMBERSHIPS

Candidate for Designation - Appraisal Institute

Associate Member, Realtors Association of Maui

EXPERIENCE AND EDUCATION

Employment

Vice President, Commercial Division
ACM Consultants, Inc. (formerly ACM, Real Estate Appraisers, Inc.)
April, 1991 to present

Previously associated with the following:

Yamaguchi & Yamaguchi, Inc.
Real Estate Appraisers and Consultants

General Education

University of Hawaii at Manoa
Bachelor of Arts Degree, Communications, 1990

Maui Community College, 1985-86

Baldwin High School, 1985

Appraisal Education

Appraisal Institute Courses

"Appraising the Single Family Residence"
Honolulu, Hawaii - January, 1991

"Foundations of Real Estate Appraisal"
Honolulu, Hawaii - February, 1991

Course 1BA – "Capitalization Theory & Techniques, Part A"
San Jose, California - July, 1992.

Course 1BB – "Capitalization Theory & Techniques, Part B"
San Jose, California - July, 1992.

Course I410 – "Standards of Professional Practice, Part A (USPAP)"
Honolulu, Hawaii - April, 1993

Course II420 – "Standards of Professional Practice, Part B (USPAP)"
Honolulu, Hawaii - April, 1993.

Course II430 – "Standards of Professional Practice, Part C (USPAP)"
Honolulu, Hawaii - September, 1999.

Course I400 – "7-Hour National USPAP Update Course"
Honolulu, Hawaii - May, 2003.

Course II420 – "Business Practices and Ethics"
Honolulu, Hawaii - May, 2003

"Online 7-Hour National USPAP Equivalent Course" – Online Course
Chicago, Illinois – November, 2005

Course 520 – "Highest & Best Use and Market Analysis"
Seattle, Washington – September 2006

"Online 7-Hour National USPAP Equivalent Course" – Online Course
Chicago, Illinois – November, 2007

"Online 7-Hour National USPAP Equivalent Course" – Online Course
Chicago, Illinois – September, 2009

"Online Business Practices and Ethics" – Online Course
Chicago, Illinois – November, 2009

"Online 7-Hour National USPAP Equivalent Course" – Online Course
Chicago, Illinois – December, 2011

Course 844 – "Residential & Commercial Valuation of Solar"
Albuquerque, New Mexico – February, 2013

"Online General Appraiser Report Writing and Case Studies" – Online Course
Appraisal Institute, October, 2013

"7-Hour National USPAP Update Course" – Online Course
McKissock, December, 2013

<u>Appraisal Institute Seminars</u>

"Data Confirmation and Verification Methods" - Seminar
Honolulu, Hawaii - October, 1995

"Residential Property Construction and Inspection" - Seminar
Honolulu, Hawaii - October, 1995

"Appraisal of Retail Properties" - Seminar
Honolulu, Hawaii - May, 1996

"Detrimental Conditions in Hawaii" - Seminar
Honolulu, Hawaii - July, 1997

"Special Purpose Properties" - Seminar
Honolulu, Hawaii - September, 1997

"Highest and Best Use Applications" - Seminar
Honolulu, Hawaii - September, 1997

"Appraising From Blueprints and Specs" - Seminar
Honolulu, Hawaii - May, 1998

"New Industrial Valuation" - Seminar
Honolulu, Hawaii - October, 1998

"Eminent Domain & Condemnation Appraising" - Seminar
Honolulu, Hawaii - October, 1998

"Online Analyzing Operating Expenses" – Online Seminar
Chicago, Illinois - September, 2001

"Real Estate Disclosure" - Seminar
Honolulu, Hawaii - October, 2001

"Online Internet Search Strategies for R.E. Appraisers" – Online Seminar
Chicago, Illinois - October, 2001

"Online Valuation of Detrimental Conditions in Real Estate" – Online Seminar
Chicago, Illinois - December, 2001

"The Appraisal Institute Commercial Database & AppraiserLoop, Part I" - Seminar
Honolulu, Hawaii - July, 2002

"Statistical Analysis Using the Database, Part I" - Seminar
Honolulu, Hawaii - July, 2002

"The Aftermath: Our World Post-Sept 11" - Seminar
Honolulu, Hawaii - July, 2002

"Statistical Modeling & GIS: Applications for Income Properties" - Seminar
Honolulu, Hawaii - July, 2002

"Real Estate Finance, Value and Investment Performance" – Seminar
Honolulu, Hawaii – February, 2005

"Introduction to GIS Applications for Real Estate Appraisal" – Online Seminar
Chicago, Illinois – August, 2005

"Online Small Hotel/Motel Valuation" – Online Seminar
Chicago, Illinois – October, 2005

"Hawaii Lands, Historical Review"
Kahului, Hawaii – September, 2009

"Online Real Estate Finance Statistics and Valuation Modeling" – Online Seminar
Chicago, Illinois – October, 2009

"Online An Introduction to Valuing Commercial Green Buildings" – Online Seminar
Chicago, Illinois – August 2011

"Online Rates and Ratios: Making sense of GIMs, OARs, and DCF" – Online Seminar
Chicago, Illinois – August 2011

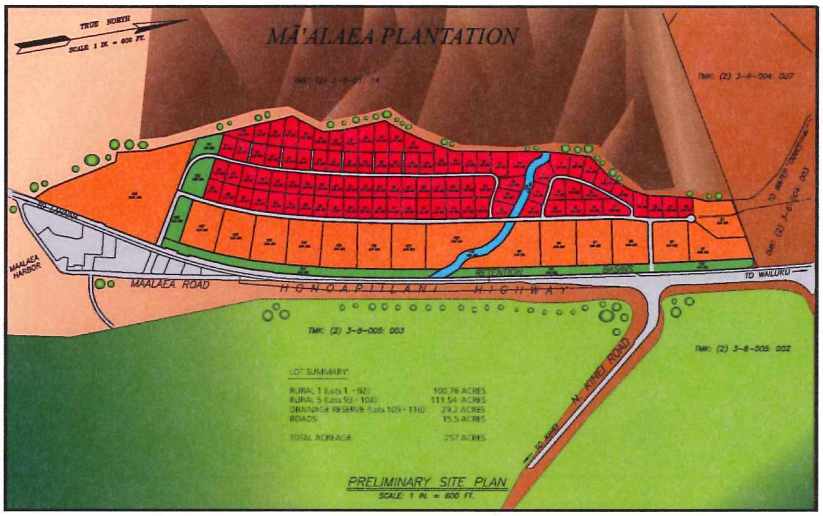
"Online Forecasting Revenue" – Online Seminar
Chicago, Illinois – August 2011

Society of Real Estate Appraisers

Course 101 – "Introduction to Appraising Real Property"
Tempe, Arizona - June, 1991

Appendix R

Assessment of Economic And Fiscal Impacts



PREPARED FOR: **MVI LLC**
c/o Mr. Doug Spencer
P.O. Box 97
Kihei, Hawaii 96753

EFFECTIVE DATE: **August 1, 2014**

ASSESSMENT OF ECONOMIC AND FISCAL IMPACTS, MAALAEA PLANTATION SUBDIVISION, MAALAEA, ISLAND OF MAUI, HAWAII

ACM CONSULTANTS, INC.

ACM
CONSULTANTS, INC.

A Real Estate Appraisal, Research & Advisory Group

August 22, 2014 14-9048

MVI LLC
c/o Mr. Doug Spencer
P.O. Box 97
Kihei, Hawaii 96753

Re: An Assessment of Economic and Fiscal Impacts for the proposed Maalaea Plantation Subdivision in Wailuku, Island and County of Maui

Dear Mr. Spencer:

In accordance with your request, we have analyzed the proposed Maalaea Plantation Subdivision, in Maalaea, District of Wailuku, Island and County of Maui, in order to provide a study of its potential economic and fiscal impacts. This *counseling report* and the conclusions herein, are based on the on-site inspection of the property, a study of current political and economic conditions, and a historical review of the real estate market in the Central Maui and South Maui regions.

The subject consists of approximately 257 acres of land and is currently zoned Agricultural District. The project, which is still in its preliminary planning stage, is identified as the Maalaea Plantation Subdivision, and will be located mauka of the Honoapiilani Highway. It will possess views of the ocean and mountains.

The focus of this assignment essentially has three parts: (1) to define and delineate the subject and its market area; (2) to identify and analyze potential economic impacts with regard to the project; and (3) identify and analyze potential fiscal impacts with regard to the project.

The following report presents a narrative review of the assessment and our analysis of data along with other pertinent materials on which this report is predicated. It contains data and exhibits gathered in our investigations, and will include a description of the analytical process and our conclusions, as of August 1, 2014.

2073 Wells Street, Suite 100 ◆ Wailuku, Maui, HI 96793 ◆ Telephone: (808) 242-6481 ◆ Fax: (808) 242-1852

Thank you for allowing us the opportunity to work on this interesting assignment.

Respectfully submitted,
ACM Consultants, Inc.

Dominic Suguitan
Certified General Appraiser,
State of Hawaii, CGA-576
Expiration: December 31, 2015

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PART I – INTRODUCTION

A. EXECUTIVE SUMMARY

Background

The proposed 108-lot rural subdivision project will be located on a single parcel identified as TMK (2) 3-6-01-018 containing a total of approximately 257.78 acres along Honoapiilani Highway in Maalaea. This project will be known as Maalaea Plantation, and will include 92 1-acre rural lots, 15 5-acre rural lots and a 27.50-acre rural lot. The developer has decided to develop a rural subdivision in Maalaea in order to provide the community a low density development which will preserve the rural character of the area and allow small-scale agricultural uses as intended by State Land Use and County zoning.

Study Objectives

ACM Consultants, Inc. has been retained by Mr. Doug Spencer of MVI LLC to assess the potential economic and fiscal impacts related to this proposed project. In particular, we studied economic trends and demographics, in addition to supply and demand factors for residential property, which includes rural house lots and residences.

The objectives of the economic and fiscal impact assessment were as follows: (1) to define and delineate the subject and its market area; (2) to identify and analyze potential economic impacts with regard to the project; and (3) identify and analyze potential fiscal impacts with regard to the project.

Conclusion

The development of this project will generate noteworthy expenditures by the developer of this subdivision, in addition to the eventual homeowners. These investments are expected to favorably impact the Maui economy on a broad scale, and in a multitude of ways.

- ❑ Site work and infrastructure construction for this subdivision will immediately infuse capital into the Maui economy. Various consultants will be involved in the initial planning stages, and the construction trades will benefit from the job creation of this project.

- ❑ Advertising for the project and marketing of the units will benefit graphic artists, advertising companies, newspapers, real estate sales agents, escrow companies, etc.

- ❑ Individual site development will again result in additional work for engineers, architects, material suppliers, equipment rentals and sales, landscaping companies, and other related industries.

- ❑ The potential new homes will have an indirect effect on retail businesses, restaurants and service establishments as the expanded work force purchases goods and services.

This should pass through the entire community, causing a ripple effect and increase the amount of capital flowing through Maui.

- Upkeep of the subdivision will also translate into work for maintenance companies, etc.

- Fiscal benefits of this development will include increases in real estate taxes collected by the County of Maui, and additional income tax and general excise tax inflow for the State of Hawaii.

SUMMARY OF ECONOMIC IMPACTS

Total Construction Expenditures	$32,600,000
Annual Indirect Sales from Project Development	$10,253,000
Revenue from Lot Sales	$46,400,000
Property Values at Full Build-Out	$78,800,000
Annual Taxable Expenditures and Sales	$37,381,000
Annual Profits from Taxable Expenditures and Sales	$3,738,000
Employment from Project Development	167 jobs
Payroll from Project Development	$2,068,000
Residents Supported by Project Development	354 residents
Housing Supported by Project Development	120 homes

SUMMARY OF FISCAL IMPACTS, COUNTY OF MAUI

Cumulative Net Revenues from Development	Not available
Net Annual Revenues at Full Build-Out	$102,000

SUMMARY OF FISCAL IMPACTS, STATE OF HAWAII

Cumulative Net Revenues from Development	$3,612,000
Net Annual Revenues at Full Build-Out	$64,000

B. PURPOSE OF THE REPORT

The purpose of this report, as of August 1, 2014, is to generate an economic and fiscal impact assessment with respect to the proposed Maalaea Plantation subdivision.

C. INTENDED USE OF THE REPORT

The intended use or function of this report is to provide potential economic and fiscal information and real estate market data to our client to be used in the entitlement process for Maalaea Plantation.

D. SCOPE OF THE REPORT

The Consultant has agreed to provide a current economic and fiscal impact assessment of this project by (1) defining and delineating the market area; (2) identifying and analyzing potential economic impacts with regard to the project; and (3) identifying and analyzing potential fiscal impacts with regard to the project. The assessment will be developed and prepared in conformity with, and subject to, the requirements of the Code of Professional Ethics and the Standards of Appraisal Practice of the Appraisal Institute, and the Uniform Standards of Professional Appraisal Practice.

E. STATEMENT OF COMPETENCY

ACM Consultants, Inc. (formerly ACM Real Estate Appraisers, Inc.) has been actively involved in the real estate appraisal and consulting business since 1982. Our business emphasis has focused mainly on the research, consultation and valuation of residential and commercial properties located within the State of Hawaii. The company considers itself competent to conduct an economic and fiscal impact assessment for a proposed subdivision in Wailuku, Island and County of Maui.

F. EXTRAORDINARY ASSUMPTIONS AND HYPOTHETICAL CONDITIONS

As of August 2014, the subject was still in the preliminary stages of planning. A land use map from the Developer provided a visual indication of the proposed layout of the project district. Several discussions were held with the Developer to better understand the housing products and complementary land uses planned for the subject. The Consultant is not liable for any changes in the project plan past this date, nor for information that has not been released or communicated to the Consultant.

The Consultant has no control over economic conditions and other international events that could have an effect upon Hawaii's economy and the Maui real estate market. As a result, this report has not made any assumptions regarding potential conflicts with other nations, or global external factors affecting economic conditions here.

Estimated construction costs, multipliers, tax rates, interest rates, earnings estimates, demographic information and per capita government expenditures were utilized by the Consultant in determining the economic and fiscal impacts of this proposed residential subdivision. These figures and statistics were obtained through conversations with those active in the construction industry, in addition to the review of various construction budgets, demographic and governmental reports. This consulting report has

been based on the assumption that all information gleaned from third party sources is accurate for analytical purposes.

All conclusions in this counseling report have been stated in 2014 dollars, rounded to the nearest $1,000. In doing so, the Consultant has assumed that all construction costs, multipliers, tax rates, interest rates, earnings estimates, demographic information and per capita government expenditures will remain constant throughout the 4-year build-out of infrastructure and homes forecasted by the Appraiser. Although the cyclical nature of the real estate market would undoubtedly produce varied annual assessments and impacts, for the purposes of this report, they have been reported as unweighted averages.

The counseling report is also subject to standard "Limiting and Contingent Conditions" located in the pages following.

G. CONFIDENTIALITY PROVISION

The contents of this economic and fiscal impact assessment are confidential. Release of this counseling report by ACM Consultants, Inc. is limited to you and for your preparation and submission of an Environmental Impact Statement for the proposed Ohana Kai Village subdivision. The intended users of this report are MVI LLC, Vince Bagoyo, planning consultant, and the appropriate government agencies to which this report will be submitted. Any further release of this report, or portions herein, is strictly prohibited and you shall accept the risk and liability for any such release without the previous written consent of ACM Consultants, Inc. Further, you shall indemnify and defend ACM Consultants, Inc., and its individual consultants/appraisers, from any claims arising out of any such unauthorized disclosure.

H. CERTIFICATION

The undersigned does hereby certify that except as otherwise noted in this appraisal report:

1. The Consultants' compensation is not contingent upon the reporting of a predetermined value or direction in value that favors the cause of the client, the amount of the value estimate, the attainment of a stipulated result, or the occurrence of a subsequent event.

2. The Consultants have no present or prospective interest in the property that is the subject of this report, and no personal interest or bias with respect to the parties involved. Any "Estimate(s) of Market Value" in the consulting report is not based in whole or in part upon the race, color, or national origin of the prospective owners or occupants of the properties in the vicinity of the property appraised.

3. The Consultant has personally inspected the property, and is a signatory of this Certification.

4. To the best of the Consultants' knowledge and belief, all statements of fact and information in this report are true and correct, and the Consultants have not knowingly withheld any significant information.

5. No other person provided significant professional assistance to the person(s) signing this report.

6. The reported analyses, opinions and conclusions are limited only by the reported assumptions and limiting conditions, and are the Consultants' personal unbiased professional analyses, opinions and conclusions.

7. All analyses, opinions and conclusions were developed, and this report has been prepared, in conformity with the Uniform Standards of Appraisal Practice.

8. This counseling report is subject to and in conformance with the Code of Professional Ethics and Standards of Professional Conduct of the Appraisal Institute.

9. This counseling report is to be used only in its entirety and no part is to be used without the whole report. All conclusions and opinions concerning the real estate are set forth in the counseling report were prepared by the Consultants whose signatures appears on the counseling report. No change of any item in the counseling report shall be made by anyone other than the Consultants, and the Consultants shall have no responsibility for any such unauthorized change.

10. The Appraisal Institute, of which the Consultant is a candidate, has a legal right to review this report.

11. The qualifications of the Consultants, including completed educational requirements of their candidacy are located in the Addendum to this report. Any member signing the report has completed the requirements of the Appraisal Institute's continuing education program.

ACM Consultants, Inc.

Dominic Suguitan
Certified General Appraiser,
State of Hawaii, CGA-576
Expiration: December 31, 2015

I. LIMITING AND CONTINGENT CONDITIONS

1) This is a Counseling Report which is intended to comply with the reporting requirements set forth under Standards Rule 5 of the Uniform Standards of Professional Appraisal Practice for a Counseling Report. The information contained in this report is specific to the needs of the client and for the intended use stated in this report. The Consultant is not responsible for unauthorized use of this report.

   This report has not been prepared for federally-related mortgage financing purposes, and has not been prepared in compliance with the requirements of Title XI of the Federal Financial Institutions Reform, Recovery, and Enforcement Act of 1989.

2) No responsibility is assumed for legal or title considerations. Title to the property is assumed to be good and marketable unless otherwise stated in this report.

3) The property analyzed is free and clear of any or all liens and encumbrances unless otherwise stated in this report.

4) Responsible ownership and competent property management are assumed unless otherwise stated in this report.

5) The information furnished by others is believed to be reliable. However, no warranty is given for its accuracy.

6) All engineering is assumed to be correct. Any plot plans and illustrative material in this report are included only to assist the reader in visualizing the property.

7) It is assumed that there are no hidden or unapparent conditions of the property, subsoil, or structures that render it more or less valuable. No responsibility is assumed for such conditions or for arranging for engineering studies that may be required to discover them.

8) It is assumed that there is full compliance with all applicable federal, state, and local environmental regulations and laws unless otherwise stated in this report.

9) It is assumed that all applicable zoning and use regulations and restrictions have been complied with, unless a nonconformity has been stated, defined, and considered in this counseling report.

10) It is assumed that all required licenses, certificates of occupancy or other legislative or administrative authority from any local, state, or national governmental or private entity or

organization have been or can be obtained or renewed for any use on which the value estimates contained in this report are based.

11) Any sketch in this report may show approximate dimensions and is included to assist the reader in visualizing the property. Maps and exhibits found in this report are provided for reader reference purposes only. No guarantee as to accuracy is expressed or implied unless otherwise stated in this report. No survey has been made for the purpose of this report.

12) It is assumed that the utilization of the land and improvements is within the boundaries or property lines of the property described and that there is no encroachment or trespass unless otherwise stated in this report.

13) The Consultant is not qualified to detect hazardous waste and/or toxic materials. Any comment by the Consultant that might suggest the possibility of the presence of such substances should not be taken as confirmation of the presence of hazardous waste and/or toxic materials. Such determination would require investigation by a qualified expert in the field of environmental assessment. The presence of substances such as asbestos, urea-formaldehyde foam insulation, or other potentially hazardous materials may affect the value of the property. The Consultant's value estimate is predicated on the assumption that there is no such material on or in the property that would cause a loss in value unless otherwise stated in this report. No responsibility is assumed for any environmental conditions, or for any expertise or engineering knowledge required to discover them. The Consultant's descriptions and resulting comments are the result of the routine observations made during the analysis process.

14) Unless otherwise stated in this report, the subject property is evaluated without a specific compliance survey having been conducted to determine if the property is or is not in conformance with the requirements of the Americans with Disabilities Act. The presence of architectural and communications barriers that are structural in nature that would restrict access by disabled individuals may adversely affect the property's value, marketability, or utility.

15) Any proposed improvements are assumed to be completed in a good workmanlike manner in accordance with the submitted plans and specification.

16) The distribution, if any, of the total valuation in this report between land and improvements applies only under the

stated program of utilization. The separate allocations for land and buildings must not be used in conjunction with any other appraisal and are invalid if so used.

17) Possession of this report, or a copy thereof, does not carry with it the right of publication. It may not be used for any purpose by any person other than the party to whom it is addressed without the written consent of the consultant, and in any event, only with property written qualification and only in its entirety.

18) Neither all nor any part of the contents of this report (especially any conclusions as to value, the identity of the Consultant, or the firm with which the Consultant is connected) shall be disseminated to the public through advertising, public relations, news sales, or other media without prior written consent and approval of the Consultant.

PART II – DESCRIPTION OF THE PROPOSED DEVELOPMENT

A. LAND USE

The proposed Maalaea Plantation Subdivision will be located west of and bordering Honoapiilani Highway in Maalaea. The subject consists of approximately 257 acres of land that is currently zoned Agricultural District but is designated as Project District 12 within the Kihei-Community Plan. The project, which is still in its preliminary planning stage, will possess views of Mt. Haleakala, the West Maui Mountains, the southern coastline and the islands offshore.

The Consultant has gleaned project information from a preliminary site map, as well as through discussions with the Developer. Maalaea Plantation will consist of 92 1-acre rural lots, 15 5-acre rural lots and a single 27.50-acre rural lot. Potable and non-potable water for the project will be provided by three water wells and associated infrastructure.

According to the Developer, the proposed land use is as follows:

Proposed Land Use	Acreage
Rural 1 (Lots 1 – 92)	100.76 acres
Rural 5 (Lots 93 – 108)	111.54 acres
Drainage Reserve (Lots 109 – 116)	29.2 acres
Roads	15.5 acres
	Total: ± 257 acres

The developer has decided to develop a rural subdivision in Maalaea in order to provide the community a low density development which will preserve the rural character of the area and allow small-scale agricultural uses as intended by State Land Use and County zoning.

PART III – ECONOMIC IMPACTS OF THE PROPOSED DEVELOPMENT

A. ECONOMIC IMPACTS RELATED TO DEVELOPMENT ACTIVITIES

Construction of the Subdivision Improvements

Site work for the project was estimated by the Developer to be about $5,000,000, which includes infrastructure, as well as three wells and a 750,000 gallon water storage tank.

Although the Developer intends to sell lots only, it is assumed that potential buyers will build a home on each lot. In this case, the Consultant forecasted an average size dwelling of 1,900 square feet would be built on each lot at an average cost of about $300,000 per home, or about $155 per square foot. Based on this assumption, vertical construction expenditures for 108 homes totaled $27,600,000. The consultant forecasts a period of 4 years to construct all 108 homes.

The above construction expenditures totaled $32,600,000, with an average of $8,150,000 per year, based on a 4-year infrastructure and home construction period.

Indirect Costs

The Developer had not yet determined indirect costs, as Maalaea Plantation is still in the initial design stage. These expenditures typically involve project design, planning, permitting, governmental fees, and construction bond, among others.

Indirect Sales

Development activities will also generate indirect sales, through the supply of goods and services to the various construction companies, in addition to the families of their employees. By the same token, these suppliers and their families will purchase goods and services from other companies. This chain reaction continues over and over, with some of the revenues leaking out of Hawaii's economy with each cycle. Based on State economic multipliers, off-island indirect sales were estimated at $6,031,000 per year. Meanwhile, Maui indirect sales were at $4,222,000 per year.

Sales of Rural Lots

Based on current evidence, the market price of a 1-acre lot will average approximately $400,000. Meanwhile, a 5-acre lot will have an average price of around $600,000.

Based on the preceding figures, the aggregate retail sales revenue of the 108 lots in the proposed Maalaea Plantation subdivision was forecasted to be $46,400,000, with an average of $23,200,000 per year, over a span of about 2 years.

Home Values at Full Build-Out

It was estimated that the average home on each lot will be a 3-bedroom dwelling with approximately 1,900 square feet of gross

living area. The average **market price** for a 3-bedroom home on the 1-acre lots (92 lots) was estimated to be $700,000, while the average **market price** of a home on the 5-acre lots (16 lots) was estimated to be $900,000. Based on the unit breakdown provided by the Developer, the property values of the 108 lots/homes, as of the effective date, calculated to be $78,800,000.

Taxable Expenditures and Sales

Final sales generated by the development of the project totaled $24,337,000 per year and were considered to be from sales of the rural lots, in addition to the personal consumption expenditures of the construction workers and indirect employees. These are sales that are subject to the State of Hawaii General Excise Tax of 4.166 percent.

Intermediate sales, taxed at 0.5 percent, were determined to be from construction expenditures and indirect sales related to construction. After deducting the personal consumption expenditures from the previous section, the intermediate sales were forecasted to be $13,044,000 per year. When added to the final sales, the taxable expenditures and sales amounted to $37,381,000.

Profits Realized from Project Development

The Consultant has forecast profit and risk premium from the construction of the project to be $4,146,000 per year, over the 4-year project build-out. It should be noted that this figure considers both direct and indirect sales at all levels of business. For example, in addition to the profit to the Developer, there will be profit expectancies by subcontractors, service vendors, supply companies, and supportive goods and services providers.

Direct and Indirect Employment

New job opportunities created by this development will start with the design and entitlement process, employing architects, engineers, surveyors, and land use planners. Site work, road work and the installation of utility and drainage lines typically utilize heavy equipment operators, tractor-trailer drivers and utility personnel. Vertical construction of the homes will employ masons, carpenters, sheet metal workers, roofers, drywall installers, plumbers, electricians and painters. Finish work will require cabinet makers, carpet and tile installers, interior decorators, and landscapers. Application of State economic multipliers resulted in a forecasted 59 jobs directly related to the construction of this subdivision.

The increase in construction will also create the need for supplementary companies to strengthen their labor force. These jobs may be from building supply companies, hardware stores, equipment rental companies, and shipping/warehousing companies. In addition, the construction laborers and their families will patronize local goods and services providers. Grocers, restaurants, service stations, auto repair shops, financial institutions, recreational venues, medical facilities and personal care businesses could be considered potential companies that would need to bolster their employee count. Based on State economic multipliers, indirect jobs on Maui were forecasted to be 79 jobs, resulting in a total of 138 Maui jobs directly and indirectly tied to the development of the project. Meanwhile, indirect employment on Oahu could possibly add 29 jobs, for an overall tally of 167 jobs during the 4-year project build out.

Direct and Indirect Payroll

Payroll directly related to the development of the project was estimated to be $860,000 per annum, based on statistics gleaned from the State of Hawaii Department of Labor and Industrial Relations (DLIR) and job counts determined in the previous section. It should be noted that most construction positions are expected to be filled by Maui laborers.

Indirect Maui payroll came out to $901,000 per year, while indirect Oahu payroll was $307,000 annually. Total direct and indirect payroll attributed to the development of the subject was forecasted to be $2,068,000 per year.

Population Supported by Project Development

Statistical information obtained from the DLIR indicated Maui residents supported by construction jobs attributed to this development are expected to be 124 residents, while residents supported by indirect jobs amounted to 166 residents.

Oahu residents supported by indirect jobs created by this development were estimated to be 64 residents. In all, 354

residents on Maui and Oahu will potentially be supported by the development of this project.

Housing for Supported Population

Statistical information obtained from the DLIR indicated Maui homes supported by construction jobs attributed to this development are expected to be 42 homes, while homes supported through indirect jobs amounted to 56 homes.

Oahu homes supported through indirect jobs created by this development were estimated to be 22. In all, 120 homes on Maui and Oahu will potentially be supported by the development of this project. It should be noted that this category does not necessarily represent additional housing units needed for direct and indirect employees, but indicates the potential number of households that would be financially linked to monies earned by such workers.

B. ECONOMIC IMPACTS AT FULL BUILD-OUT

Housing Characteristics and Assumptions

Assuming one home on each lot, there would be a total of 108 **market price homes**. It was concluded that 100 percent of these homes would be owner-occupied, with an average of 3.2 residents per household. Average household income for 1-acre and 5-acre properties was estimated to be $105,000 and $130,000 per year, respectively. As previously stated, the average market value for a home on a 1-acre lot was estimated to be $700,000 and the average market value of a home on a 5-acre lot was estimated to be $900,000.

Project Demographics and Related Economic Activities

At full build-out, project demographics and related economic activities for Maalaea Plantation are as follows:

Residents	345 residents
Student Population	62 students
Workforce Residents	207 workers
Annual Aggregate Household Income	$11,740,000
Annual Sales Revenues, Consumption Expenditures	$5,870,000
Annual Profit Generation, Consumption Expenditures	$587,000
Property Values	$78,800,000

PART IV – FISCAL IMPACTS, COUNTY OF MAUI

A. FISCAL IMPACTS RELATED TO DEVELOPMENT ACTIVITIES

Net Taxable Value, Project Homes

Maalaea Plantation will feature 108 rural lots with at least one single-family assumed to be built on each lot over a period of 4-years. In the previous section, it was assumed that 100 percent of the homes will be owner-occupied. As such, all 108 homeowners would qualify for the County of Maui homeowner exemption, which currently stands at $400,000 per qualified home. After deduction of this exemption, the net taxable value of the homes amounted to $35,600,000.

Development Activities

Typically, the County accumulates revenue from developments in the form of fees, such as for building permits and impacts attributed to the development. As of the effective date, the Developer did not have an estimate of these indirect costs to analyze their fiscal impact.

Cumulative expenditures typically include the County's share of infrastructure and facility improvements, which may include interior roads, water sources, drainage and sewer systems, and recreational areas. In the case of the subject, the Developer will bear the majority of these improvement costs.

B. FISCAL IMPACTS AT FULL BUILD-OUT

At full build-out, County revenue would primarily be generated in the form of real property taxes. As previously discussed, the net taxable value of the homes was determined to be $35,600,000. Residential owner-occupants who qualify for the County homeowner exemption are assessed at PITT Code 900 (Homeowner). Currently, this tax class has a mill rate of $2.87 per $1,000 of assessed value. Therefore, the tax burden for the project homes equated to $102,000 per year. However, to determine the net impact to the County, the current property tax of $250 per year must be deducted.

There are no annual County expenditures expected for this project; therefore, the net annual revenue to the County at full build-out was $102,000.

PART V – FISCAL IMPACTS, STATE OF HAWAII

A. FISCAL IMPACTS RELATED TO DEVELOPMENT ACTIVITIES

The majority of the revenues to the State of Hawaii will be recognized through various taxes, including Conveyance Tax, Excise Tax, Corporate Income Tax, and Personal Income Tax. Currently, the conveyance tax on owner-occupied homes below $600,000 is 0.1 percent of sales. Based on the aggregate retail revenue expected for this project, the conveyance tax due to development is $46,000.

Excise tax is based on two rates, 4.166 percent for final sales and 0.5 percent for intermediate sales. The cumulative tax expectancy for final sales amounted to $2,032,000, while intermediate sales should equal $130,000.

Corporate Income Tax is realized on 6.4% of profits gained through the development of this project, which was estimated to be $1,061,000. Meanwhile, personal income tax, based on 4.2% of payroll, was forecasted to be $363,000. As such, cumulative revenues related to development activities were $3,632,000.

Lacking any cumulative expenses, the total net revenue to the State from development of this project amounted to $3,632,000, or an average of $908,000 per year, over the 4-year build out.

B. FISCAL IMPACTS AT FULL BUILD-OUT

At full build-out, State revenue was estimated to be from Personal Income Tax, Excise Tax, and Other Revenues. On an annual basis, personal income tax amounted to $493,000, while excise tax on consumption expenditures was estimated to be $215,000 per year. Other revenue expectancy was forecasted to be $1,346,000 per year. These other revenues may come from fuel taxes, registration taxes, accommodations, tobacco and liquor, and rental vehicles, etc. Total annual revenues at full build-out amounted to $2,054,000.

Annual expenditures to the State were said to be from the ongoing operation of the charter school, in addition to other services to residents, and debt service attributed to general improvements. The educational expenditure was calculated to be $589,000 per year. At the same time, annual expenditure for services to residents was estimated to be $1,277,000 and debt service came out to $124,000. Examples of services to residents include operation of civic, health and social services; as well as maintenance to highways, parks and recreational areas. General improvement debt service was based on typical per-capita figures currently carried by residents in Hawaii. Total annual expenditure at full build-out was $1,990,000. When deducted from the total annual revenues from the previous paragraph, the net annual revenue at full build-out was forecasted to be $64,000.

PART VI – REFERENCES

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State of Hawaii, Department of Business, Economic Development and Tourism, Research and Economic Analysis Division, "Quarterly Statistical & Economic Report", 2nd Quarter 2014

Realtors Association of Maui, Inc., "Maui Sales Statistics", 2013 through 2014

County Of Maui, Department of Housing and Human Concerns, Housing Division, "2014 Affordable Sales Price Guidelines", February 2014

State of Hawaii, Department of Labor and Industrial Relations, "2012 Employment and Payrolls in Hawaii", October 2013

Claritas, Inc., "Demographic Snapshot Comparison Reports- Maui County, Central Maui", August 2013

County of Maui, Department of Finance, Real Property Tax Division, 2014

Tax Foundation, "Hawaii's Tax Climate", 2014

County of Maui, Office of Economic Development, "Maui County Data Book 2012", March 2013

State of Hawaii, Department of Business, Economic Development and Tourism, Research and Economic Analysis Division, "2012 The State of Hawaii Data Book", August 2013

ADDENDA

DEFINITIONS

The purpose of this Glossary is to assist the reader in understanding specific terminology used in this report.

Appraisal (noun) the act or process of developing an opinion of value; an opinion of value (adjective) of or pertaining to appraising and related functions such as appraisal practice or appraisal services.

Cash Equivalent A price expressed in terms of cash, as distinguished from a price expressed totally or partly in terms of the face amounts of notes or other securities that cannot be sold at their face amounts.

Counseling Providing competent, disinterested, and unbiased advice and guidance on diverse problems in the broad field of real estate; may involve any or all aspects of the business such as merchandising, leasing, management, acquisition/disposition planning, financing, development, cost-benefit studies, feasibility analysis, and similar services. Counseling services are often associated with evaluation, but they are beyond the scope of appraisal.

Discounting A procedure used to convert periodic incomes, cash flows, and reversions into present value; based on the assumption that benefits received in the future are worth less than the same benefits received now.

Extraordinary Assumption An assumption, directly related to a specific assignment, as of the effective date, which, if found to be false, could alter the appraiser's opinions or conclusions. Extraordinary assumptions presume as fact otherwise uncertain information about physical, legal, or economic characteristics of the subject property; or about conditions external to the property such as market conditions or trends; or about the integrity of data used in an analysis. An extraordinary assumption may be used in an assignment only if:

- It is required to properly develop credible opinions and conclusions;
- The appraiser has a reasonable basis for the extraordinary assumption;
- Use of the extraordinary assumption results in a credible analysis; and
- The appraiser complies with the disclosure requirements set forth in USPAP for extraordinary assumptions.

Fair Value The cash price that might reasonably be anticipated in a current sale under all conditions requisite to a fair sale. A fair sale means that buyer and seller are each acting prudently, knowledgeably, and under no necessity to buy or sell-, i.e., other than in a forced or liquidation sale. The appraiser should estimate the cash price that might be received upon exposure to the open market for a reasonable time, considering the property type and local market conditions. ***When a current sale is unlikely-i.e., when it is unlikely that the sale can be completed within 12 months-the appraiser must discount all cash flows generated by the property to obtain the estimate of fair value.*** These cash flows include, but are not limited to, those arising from ownership, development, operating, and sale of the property. The discount applied shall reflect the appraiser's judgment of

what a prudent, knowledgeable purchase under o necessity to buy would be willing to pay to purchase the property in a current sale.

Fee Simple Estate

Absolute ownership encumbered by any other interest or estate, subject only to the limitations imposed by the governmental powers of taxation, eminent domain, police power, and escheat.

Hawaiian Terms

The Hawaiian words "mauka" and "makai" are commonly used in the islands as indicators of direction. The word "mauka" means toward the mountain, and "makai" means toward the ocean.

Highest and Best Use

The reasonably probable and legal use of vacant land or an improved property, which is physically possible, appropriately supported, financially feasible, and that results in the highest value. The four criteria the highest and best use must meet are legal permissibility, physical possibility, financial feasibility, and maximum profitability.

Highest and Best Use of Land or a Site as Though Vacant

Among all reasonable, alternative uses, the use that yields the highest present land value, after payments are made for labor, capital, and coordination. The use of a property based on the assumption that the parcel of land is vacant or can be made vacant by demolishing any improvements.

Highest and Best Use of Property as Improved

The use that should be made of a property as it exists. An existing improvement should be renovated or retained as is so long as it continues to contribute to the total market value of the property, or until the return from a new improvement would more than offset the cost of demolishing the existing building and constructing a new one.

Hypothetical Condition

A condition, directly related to a specific assignment, which is contrary to what is known by the appraiser to exist on the effective date of the assignment results, but is used for the purpose of analysis. Hypothetical conditions are contrary to known facts about physical, legal, or economic characteristics of the subject property; or about conditions external to the property, such as market conditions or trends; or about the integrity of data used in an analysis. A hypothetical condition may be used in an assignment only if:

- Use of the hypothetical condition is clearly required for legal purposes, for purposes of reasonable analysis, or for purposes of comparison;
- Use of the hypothetical condition results in a credible analysis; and
- The appraiser complies with the disclosure requirements set forth in USPAP for hypothetical conditions

Leased Fee Interest

An ownership interest held by a landlord with the rights of use and occupancy conveyed by lease to others. The rights of the lessor (the leased fee owner) and the lessee are specified by contract terms contained within the lease.

Leasehold Interest

The interest held by the lessee (the tenant or renter) through a lease transferring the rights of use and occupancy for a stated term under certain conditions.

Market Rent

The most probable rent that a property should bring in a competitive and open market reflecting all conditions and restrictions of the specified lease agreement including term, rental adjustment and revaluation, permitted uses, use restrictions, and expense obligations; the lessee and lessor each acting prudently and knowledgeably, and assuming consummation of a lease contract as of a specified date and the passing of the leasehold from lessor to lessee under conditions whereby:

- Lessee and lessor are typically motivated.
- Both parties are well informed or well advised, and acting in what they consider their best interests.
- A reasonable time is allowed for exposure in the open market.
- The rent payment is made in terms of cash in United States dollars, and is expressed as an amount per time period consistent with the payment schedule of the lease contract.
- The rental amount represents the normal consideration for the property leased unaffected by special fees or concessions granted by anyone associated with the transaction.

Market Value

The major focus of most real property appraisal assignments. Both economic and legal definitions of market value have been developed and refined. Continual refinement is essential to the growth of the appraisal profession.

The most widely accepted components of market value are incorporated in the following definition:

"The most probable price, as of a specified date, in cash, or in terms equivalent to cash, or in other precisely revealed terms, for which the specified property rights should sell after reasonable exposure in a competitive market under all conditions requisite to a fair sale, with the buyer and seller each acting prudently, knowledgeably, and for self-interest, and assuming that neither is under undue duress."

Market value is defined in the Uniform Standards of Professional Appraisal Practice (USPAP) as follows:

"A type of value, stated as an opinion, that presumes the transfer of a property (i.e., a right of ownership or a bundle of such rights), as of a certain date, under specific conditions set forth in the definition of the term identified by the appraiser as applicable in an appraisal."

The following definition of market value is used by agencies that regulate federally insured financial institutions in the United States:

"The most probable price which a property should bring in a competitive and open market under all conditions requisite to a fair sale, the buyer and seller each acting prudently and knowledgeably, and assuming the price is not affected by undue stimulus. Implicit in this definition is the consummation of a sale as of a specified date and the passing of title from seller to buyer under conditions whereby:"

- Buyer and seller are typically motivated;
- Both parties are well informed or well advised, and acting in what they consider their best interests;

- A reasonable time is allowed for exposure in the open market;
- Payment is made in terms of cash in U.S. dollars or in terms of financial arrangements comparable thereto; and
- The price represents the normal consideration for the property sold unaffected by special or creative financing or sales concessions granted by anyone associated with the sale.

Prospective Market Value Upon Completion of Construction

The prospective future value of a property on the date that construction is completed, based upon market conditions forecast to exist as of the completion date.

Prospective Value Opinion

A forecast of the value expected at a specified future date. A prospective value opinion is most frequently sought in connection with real estate projects that are proposed, under construction, or under conversion to a new use, or those that have not achieved sellout or a stabilized level of long-term occupancy at the time the appraisal report is written.

Report

Any communication, written or oral, of an appraisal, appraisal review, or appraisal consulting service that is transmitted to the client upon completion of an assignment. The types of written reports listed below apply to real property appraisals:

Appraisal Report: A written appraisal report prepared under Standards Rule 2-2(a) of the Uniform Standards of Professional Appraisal Practice. An appraisal report sets forth the data considered, the appraisal procedures followed, and the reasoning employed in the appraisal, addressing each item in the depth and detail required by its significance to the appraisal and providing sufficient information so that the client and the intended users of the report will understand the appraisal and not be misled or confused.

Restricted Appraisal Report: A written report prepared under Standards Rule 2-2(b), 8-2(c), or 10-2(b). A restricted use appraisal report is for client use only. The restricted use appraisal report should contain a brief statement of information significant to the solution of the appraisal problem. It should be understood that the rationale for how the appraiser arrived at the opinions and conclusions in the report may not be understood properly without additional information in the appraiser's workfile.

Uniform Standards of Professional Appraisal Practice

Current standards of the appraisal profession, developed for appraisers and the users of appraisal services by the Appraisal Standards Board of The Appraisal Foundation. The Uniform Standards set forth the procedures to be followed in developing an appraisal, analysis, or opinion and the manner in which an appraisal, analysis, or opinion is communicated. They are endorsed by the Appraisal Institute and by other professional appraisal organizations.

LIMITING AND CONTINGENT CONDITIONS
ACM Consultants, Inc.

1. The property is appraised as though free and clear of any or all liens and encumbrances unless otherwise stated in this report. The Consultant will not be responsible for matters of a legal nature that affect either the property being appraised or the title to it. The Consultant assumes that the title is good and marketable, and therefore, will not render any opinions about the title.

2. Legal descriptions referenced in the report were obtained from public documents from the State of Hawaii, Bureau of Conveyances, or were furnished by the client, and were assumed to be correct.

3. It is assumed that all applicable zoning and use regulations and restrictions have been complied with, unless a nonconformity has been stated, defined, and considered in this appraisal report.

4. It is assumed that all required licenses, certificates of occupancy or other legislative or administrative authority from any local, state, or national governmental or private entity or organization have been or can be obtained or renewed for any use on which the value estimates contained in this report are based.

5. It is assumed that the utilization of the land and improvements is within the boundaries or property lines of the property described and that there is no encroachment or trespass unless otherwise stated in this report. Responsible ownership and competent property management are assumed unless otherwise stated in this report.

6. The Consultant has inspected as far as possible, by observation, the land and the improvements; however, it was not possible to personally observe conditions beneath the soil or hidden structurally or by other components. The appraisal assumes that there are no hidden, unapparent, or apparent conditions of the property site, subsoil, or structures or toxic material which would render it more or less valuable. The Consultant and firm have no responsibility for any such conditions or for any expertise or engineering to discover them. All mechanical components are assumed to be in operable condition and status standard for properties of the subject type. Conditions of heating, cooling, ventilation, electrical and plumbing equipment is considered to be commensurate with the conditions of the balance of the improvements unless otherwise stated. No judgment may be made by us as to adequacy of insulation, type of insulation, or energy efficiency of the improvements or equipment, and no representations are made herein as to these matters unless specifically stated and considered in the report.

7. Information provided by third parties including government agencies, financial institutions, realtors, buyers, sellers, property owners and others and contained in this report were obtained from sources considered reliable and believed to be true and correct. However, no warranty is assumed for possible misinformation.

8. All engineering is assumed to be correct. Any plot plans and illustrative material in this report are included only to assist the reader in visualizing the property. Any sketch in this report may show approximate dimensions and is included to assist the reader in visualizing the property. Maps and exhibits found in this report are provided for reader reference purposes only. No guarantee as to accuracy is expressed or implied unless otherwise stated in this report. No survey has been made for the purpose of this report.

9. The Consultant is not qualified to detect hazardous waste and/or toxic materials. Any comment by the Consultant that might suggest the possibility of the presence of such substances should not be taken as confirmation of the presence of hazardous waste and/or toxic materials. Such determination would require investigation by a qualified expert in the field of environmental assessment. The presence of substances such as asbestos, urea-formaldehyde foam insulation, or other potentially hazardous materials may affect the value of the property. The Consultant's value estimate is predicated on the assumption that there is no such material on or in the property that would cause a loss in value unless otherwise stated in this report. No responsibility is assumed for any environmental conditions, or for any expertise or engineering knowledge required to discover them. The Consultant's descriptions and resulting comments are the result of the routine observations made during the appraisal process.

10. If analysis contained in this appraisal involves partial interests in real estate, the value of the fractional interest plus the value of all other fractional interests may or may not equal the value of the entire fee simple estate considered as a whole.

11. Unless otherwise stated in this report, the subject property is appraised without a specific compliance survey having been conducted to determine if the property is or is not in conformance with the requirements of the Americans with Disabilities Act. The presence of architectural and communications barriers that are structural in nature that would restrict access by disabled individuals may adversely affect the property's value, marketability, or utility.

12. Possession of this report, or a copy thereof, does not carry with it the right of publication. It may not be used for any purposed by any person other than the party to whom it is addressed without the written consent of the Consultant, and in any event, only with proper written qualification and only in its entirety.

13. The Consultant(s) or those assisting in preparation of the report will not be asked or required to give testimony in court or hearing because of having made the appraisal, in full or in part, nor engage in post appraisal consultation with client or third parties except under separate and special arrangement and at additional fee. If testimony or deposition is required because of subpoena, the client shall be responsible for any additional time, fees, and charges regardless of issuing party.

14. Neither all nor any part of the contents of this report (especially any conclusions as to value, the identity of the Consultant, or the firm with which the Consultant is connected) shall be disseminated to the public through advertising, public relations, news sales, or other media without prior written consent and approval of the Consultant.

ACCEPTANCE OF, AND/OR USE OF THIS APPRAISAL REPORT BY CLIENT OR ANY THIRD PARTY CONSTITUTES ACCEPTANCE OF THE ACM CONSULTANTS, INC., CERTIFICATION, LIMITING AND CONTINGENT CONDITIONS. CONSULTANT LIABILITY EXTENDS ONLY TO STATED CLIENT, NOT SUBSEQUENT PARTIES OR USERS OF ANY TYPE, and the total liability of Consultant(s) and firm is limited to the amount of fee received by Consultant.

PROFESSIONAL QUALIFICATIONS
of
Dominic J. Suguitan

STATE LICENSING

State Certified General Appraiser,
State of Hawaii, License No. CGA-576, April 17, 1995
Expiration: December 31, 2015

ASSOCIATION MEMBERSHIPS

Candidate for Designation - Appraisal Institute

Associate Member, Realtors Association of Maui

EXPERIENCE AND EDUCATION

Employment

Vice President, Commercial Division
ACM Consultants, Inc. (formerly ACM, Real Estate Appraisers, Inc.)
April, 1991 to present

Previously associated with the following:

Yamaguchi & Yamaguchi, Inc.
Real Estate Appraisers and Consultants

General Education

University of Hawaii at Manoa
Bachelor of Arts Degree, Communications, 1990

Maui Community College, 1985-86

Baldwin High School, 1985

Appraisal Education

Appraisal Institute Courses

"Appraising the Single Family Residence"
Honolulu, Hawaii - January, 1991

"Foundations of Real Estate Appraisal"
Honolulu, Hawaii - February, 1991

Course 1BA – "Capitalization Theory & Techniques, Part A"
San Jose, California - July, 1992.

Course 1BB – "Capitalization Theory & Techniques, Part B"
San Jose, California - July, 1992.

Course I410 – "Standards of Professional Practice, Part A (USPAP)"
Honolulu, Hawaii - April, 1993

Course II420 – "Standards of Professional Practice, Part B (USPAP)"
Honolulu, Hawaii - April, 1993.

Course II430 – "Standards of Professional Practice, Part C (USPAP)"
Honolulu, Hawaii - September, 1999.

Course I400 – "7-Hour National USPAP Update Course"
Honolulu, Hawaii - May, 2003.

Course II420 – "Business Practices and Ethics"
Honolulu, Hawaii - May, 2003

"Online 7-Hour National USPAP Equivalent Course" – Online Course
Chicago, Illinois – November, 2005

Course 520 – "Highest & Best Use and Market Analysis"
Seattle, Washington – September 2006

"Online 7-Hour National USPAP Equivalent Course" – Online Course
Chicago, Illinois – November, 2007

"Online 7-Hour National USPAP Equivalent Course" – Online Course
Chicago, Illinois – September, 2009

"Online Business Practices and Ethics" – Online Course
Chicago, Illinois – November, 2009

"Online 7-Hour National USPAP Equivalent Course" – Online Course
Chicago, Illinois – December, 2011

Course 844 – "Residential & Commercial Valuation of Solar"
Albuquerque, New Mexico – February, 2013

"Online General Appraiser Report Writing and Case Studies" – Online Course
Appraisal Institute, October, 2013

"7-Hour National USPAP Update Course" – Online Course
McKissock, December, 2013

"Advanced Concepts & Case Studies"
San Diego, California – May, 2014

<u>Appraisal Institute Seminars</u>

"Data Confirmation and Verification Methods" - Seminar
Honolulu, Hawaii - October, 1995

"Residential Property Construction and Inspection" - Seminar
Honolulu, Hawaii - October, 1995

"Appraisal of Retail Properties" - Seminar
Honolulu, Hawaii - May, 1996

"Detrimental Conditions in Hawaii" - Seminar
Honolulu, Hawaii - July, 1997

"Special Purpose Properties" - Seminar
Honolulu, Hawaii - September, 1997

"Highest and Best Use Applications" - Seminar
Honolulu, Hawaii - September, 1997

"Appraising From Blueprints and Specs" - Seminar
Honolulu, Hawaii - May, 1998

"New Industrial Valuation" - Seminar
Honolulu, Hawaii - October, 1998

"Eminent Domain & Condemnation Appraising" - Seminar
Honolulu, Hawaii - October, 1998

"Online Analyzing Operating Expenses" – Online Seminar
Chicago, Illinois - September, 2001

"Real Estate Disclosure" - Seminar
Honolulu, Hawaii - October, 2001

"Online Internet Search Strategies for R.E. Appraisers" – Online Seminar
Chicago, Illinois - October, 2001

"Online Valuation of Detrimental Conditions in Real Estate" – Online Seminar
Chicago, Illinois - December, 2001

"The Appraisal Institute Commercial Database & AppraiserLoop, Part I" - Seminar
Honolulu, Hawaii - July, 2002

"Statistical Analysis Using the Database, Part I" - Seminar
Honolulu, Hawaii - July, 2002

"The Aftermath: Our World Post-Sept 11" - Seminar
Honolulu, Hawaii - July, 2002

"Statistical Modeling & GIS: Applications for Income Properties" - Seminar
Honolulu, Hawaii - July, 2002

"Real Estate Finance, Value and Investment Performance" – Seminar
Honolulu, Hawaii – February, 2005

"Introduction to GIS Applications for Real Estate Appraisal" – Online Seminar
Chicago, Illinois – August, 2005

"Online Small Hotel/Motel Valuation" – Online Seminar
Chicago, Illinois – October, 2005

"Hawaii Lands, Historical Review"
Kahului, Hawaii – September, 2009

"Online Real Estate Finance Statistics and Valuation Modeling" – Online Seminar
Chicago, Illinois – October, 2009

"Online An Introduction to Valuing Commercial Green Buildings" – Online Seminar
Chicago, Illinois – August 2011

"Online Rates and Ratios: Making sense of GIMs, OARs, and DCF" – Online Seminar
Chicago, Illinois – August 2011

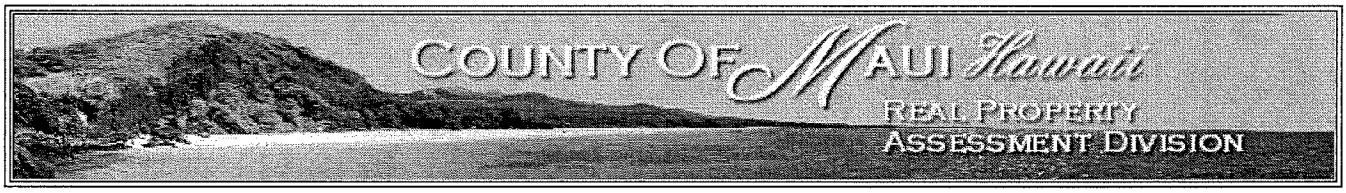
"Online Forecasting Revenue" – Online Seminar
Chicago, Illinois – August 2011

Society of Real Estate Appraisers

Course 101 – "Introduction to Appraising Real Property"
Tempe, Arizona - June, 1991

Appendix S

TMK Of Project Site Identifying Property Owners Within 500-Foot Radius



500 Feet Refresh With New Distance

Print Mailing Labels at 500 Feet

Count	Parcel #	Owner	Address
1	360080020000	MAUI OCEAN CENTER INC	BENJAMIN KAHN 192 MAALAEA ROAD WAILUKU HI 96793
2	360080070000	MID PAC PETROLEUM LLC	1100 ALAKEA ST 8TH FL HONOLULU HI 96813
3	360080090000	PACIFIC ISLE GROUP LLC	P O BOX 790040 PAIA HI 96779
4	380940360000	CONSOLIDATED BASEYARDS LLC	2073 WELLS ST, SUITE 101 WAILUKU HI 96793
5	380140080000	NELLIE'S ON MAUI, LTD	1816 MILL ST #101 WAILUKU HI 96793
6	380140220001	MILOWAI 101 LLC	8580 LA MESA BLVD #105 LA MESA CA 91941
7	380140220002	WOOD,ROBERT J	50 HAUOLI ST APT 211 WAILUKU HI 96793
8	380140220003	FISH,GARY R	597 BIG BASIN DR BRENTWOOD CA 94513
9	380140220004	BERNAL,JERRY	1358 OAKLAND RD #8 SAN JOSE CA 95112
10	380140220005	NORMAN,JOHN HILDING	PO BOX 210144 AUKE BAY AK 99821
11	380140220006	ZEITHAMMEL,GRETCHEN G	2219 S KIHEI RD UNIT B403 KIHEI HI 96753
12	380140220007	SCOTT, BRIAN C ETAL	80 MALTA DR SAN FRANCISCO CA 94131
13	380140220008	HEISTER,LORA	9621 LILLY CT NORTHRIDGE CA 91325
14	380140220008	MELLO,JAMES S	570 E SPRING ST NAPA CA 94559
15	380140220009	ZINTER,DANIEL LAWRENCE	COCHRANE PLUMBING CENTER BOX 1497 COCHRANE, ALBERTA T4C 1B4
16	380140220010	SMITH'S OF MAUI INC	MAALAEA WATERFRONT RESTAURANT 125 HOOWAIWAI LP APT 1903 WAILUKU HI 96793
17	380140220010	HUNTE,LORRAINE A	19910 NE BRIDLEWOOD BATTLE GROUND WA 98604
18	380140220011	WESTCOTT,WAYNE ANTHONY	50 HAUOLI ST APT 201 WAILUKU HI 96793
19	380140220012	AOAO MILOWAI-MAALAEA	C/O HAWAIIANA MANAGEMENT - MAUI 140 HOOHANA ST STE 208 KAHULUI HI 96732
20	380140220013	GESS,RONALD TRUST	439 KAMALEI CIR KAHULUI HI 96732
21	380140220014	OREN,STEVEN A & EMILY P TRUST	7072 CATLEN WAY SACRAMENTO CA 95831
22	380140220015	KOSLOSKEY,CHRISTIAN	50 HAUOLI ST #205 WAILUKU HI 96793
23	380140220016	KOSLOSKEY,CHRISTIAN	50 HAUOLI RD #206 WAILUKU HI 96793
			C/O CGP

24	380140220017	MINTZ,ROBERT ALAN	935 W 3RD AVE ANCHORAGE AK 99501
25	380140220018	ARMACOST,RONALD R	1222 S STARR LANE LIBERTY LAKE WA 99019
26	380140220019	MOORE,WILLIAM G REVOC TRUST DTD 6/1/94	TERI MOORE RAM,TTEE 2305 WESTPAR DR CHESTERFIELD MO 63017
27	380140220020	VAUGHAN,JOHN	4309 NE 60TH ST VANCOUVER WA 98661
28	380140220021	WOOD,ROBERT JOSEPH	50 HAUOLI ST APT 211 WAILUKU HI 96793
29	380140220022	OLSON,LAWRENCE M	9000 GLACIER HWY STE 204 JUNEAU AK 99801
30	380140220023	VACCARO,WILLIAM V	234 REGENCY DR FISHKILL NY 12524
31	380140220024	BENGTSSON FAMILY TRUST	P O BOX 7434 CARMEL CA 93921
32	380140220025	KOSLOSKEY,CHRISTIAN	37 BOSTON POST RD WATERFORD CT 06385
33	380140220025	POTOPOWITZ,BARBARA	50 HAUOLI RD UNIT 304 WAILUKU HI 96793
34	380140220026	DUSCKETT FAMILY TRUST	3 MIRINO DR MISSION VIEJO CA 92692
35	380140220027	ATKINSON,DONALD	2251 STEPPING STONE LN LINCOLN CA 95648
36	380140220028	SLEMKO,MICHAEL JOHN	16024 AGINCOURT DR HUNTERSVILLE NC 28078
37	380140220029	RUBIN,ADRIAN STEVENS JR	20316 TULSA ST CHATSWORTH CA 91311
38	380140220030	CONLON-KEMP,CHRISTINE G	50 HAUOLI ST #310 WAILUKU HI 96793
39	380140220031	CONLON-KEMP,CHRISTINE G	50 HAUOLI ST #310 WAILUKU HI 96793
40	380140220032	BITONTI,MARIO/ANNE MARIE REV LIV TRUST	49 KUUALOHA ST KAHULUI HI 96732
41	380140220033	CONLON,TERESA M TRUST	50 HAUOLI ST APT 401 WAILUKU HI 96793
42	380140220034	ENEVOLD,ROSE TRUST	ENEVOLD,ROSE TRS 50 HAOULI RD #402 WAILUKU HI 96793
43	380140220035	FORNADLEY,CURTIS ALAN	337 CALLE MAYOR REDONDO BEACH CA 90277
44	380140220036	HAILEY,TIM	P O BOX 11468 ZEPHYR COVE NV 89448
45	380140220037	CLENCHY,CAREY QUINN	C/O CAREY CLENCHY, ET AL 2202 BROADVIEW RD N W CALGARY AB T2N 3J2
46	380140220038	ZARLEY,SANDRA SUE TRUST	70 HAUOLI ST, #402 WAILUKU HI 96793
47	380140220039	ROMER,ANDREAS	50 HAUOLI ST #407 WAILUKU HI 96793
48	380140220040	WASHINGTON TRUST BANK	HAMILTON, THOMAS D PO BOX 14686 SPOKANE WA 99214
49	380140220041	LFLP LLC	2265 HOONEE PL STE 110 HONOLULU HI 96819
50	380140220042	LFLP LLC	2265 HOONEE PL #110 HONOLULU HI 96819
51	380140220043	HEMBREE FAMILY TRUST	3753 MISSION AVE STE 111 OCEANSIDE CA 92058
52	360010180000	MVI LLC	ATTN: JESSE SPENCER PO BOX 97 KIHEI HI 96753
53	360010180000	WAILUKU AGRIBUSINESS CO INC	PO BOX 2790 WAILUKU HI 96793

54	360080010000	DMP MAUI, LLC	250 NEWPORT CENTER DR STE 300 NEWPORT BEACH CA 92660
55	360080010000	JARVIS MAUI LLC	3400 IRVINE AVE STE 212 NEWPORT BEACH CA 92660
56	380140090000	KAVANAUGH, R TRUST	16030 VENTURA BLVD #380 ENCINO CA 91436
57	360080100000	MAALAEA TRIANGLE ASSOCIATION	C/O PEAKE & LEVOY LLC PO BOX 218 KAHULUI HI 96733
58	380140260000	MAALAEA MERMAID - CONDO MASTER	CONDO MASTER 00000
59	380140260001	LUBNIK,MICHAEL WAYNE	20 HAUOLI ST #201 WAILUKU HI 96793
60	380140260002	STENSRUD,JOHN R	182 PALMERSTON RD ROCHESTER NY 14618
61	380140260003	WOLFORD,THOMAS C	630 NORTH 7TH ST ALLENTOWN PA 18102
62	380140260003	WOLFORD,JASON	PO BOX 10098 LAHAINA HI 96761
63	380140260004	BONNEY,ALLAN DOUGLAS	20 HAUOLI ST APT 204 WAILUKU HI 96793
64	380140260005	ENDO,DAVID	20 HAUOLI ST UNIT 205 WAILUKU HI 96793
65	380140260006	ULDRICKS,JEFFREY L	6445 BUCKEYE LN GRANITE BAY CA 95746
66	380140260007	SEEGER,SARA SUMIE	C/O SEEGER-NELSON,SARA 3274 WILSHIRE DR REDDING CA 96002
67	380140260008	TRUONG,LOC PHUC	275 W KAAHUMANU AVE 1010 KAHULUI HI 96732
68	380140260009	WILSON,DARRELL STEVEN	28 KAI MAKANI LOOP #201 KIHEI HI 96753
69	380140260010	YEE,DERON K S TRUST	2956 KALOALUIKI ST APT B HONOLULU HI 96822
70	380140260010	YEE WARREN Y J/PATRICIA A	2007 ROUND TOP DR HONOLULU HI 96822
71	380140260010	LONDON,JADINE Y C TRUST	1309 MCCULLY ST HONOLULU HI 96826
72	380140260011	MORRIS,BETTY J TRUST	20 HAUOLI ST #211 WAILUKU HI 96793
73	380140260012	POLYNESIAN INVESTMENT COMPANY LTD	2390 AINA LANI PL HONOLULU HI 96822
74	380140260013	WOOD,ROBERT ALEXANDER	92 NE ISLE DR NORTH EAST MD 21901
75	380140260014	WEBB,MICHAEL RICHARD	20 HAUOLI ST APT 301 WAILUKU HI 96793
76	380140260015	KNECHT,MARILYN REVOC TRUST	20 HAUOLI ST #302 WAILUKU HI 96793
77	380140260016	ING,PATRICK L/CINDY H TRUST	1721 WILI PA LOOP APT #103 WAILUKU HI 96793
78	380140260017	KIM,KYUNG-HO	210 IMI KALA ST #103 WAILUKU HI 96793
79	380140260018	ROBERTS,JERALD R.	20 HAUOLI ST 305 WAILUKU HI 96793
80	380140260019	JELIC,ELIZABETH	PO BOX 978 KIHEI HI 96753
81	380140260020	UEMATSU,BETTY ANN TRUST	32205 VIA BARRIDA SAN JUAN CAPISTRANO CA 92675
82	380140260021	BOYLE,PATRICK A	20 HAUOLI ST UNIT 308 WAILUKU HI 96793
83	380140260022	WILLIAMS,LORETTA M	20 HAUOLI RD UNIT 309 WAILUKU HI 96793
84	380140260023	LUNE,ALONN	20 HAUOLI ST #310 WAILUKU HI 96793
85	380140260024	CHAR,KENNETH F C MARITAL TR	656 ONAHA ST

			HONOLULU HI 96816
86	380140260025	A P KOBAYASHI FAMILY LIMITED PTNSHP	C/O PAUL KOBAYASHI 3532 LELEHUNE PL HONOLULU HI 96822
87	380140260026	VAN GENDEREN,WARREN	PO BOX 985 JACKSON WY 83001
88	380140260027	THOMPSON,GRETCHEN A	411 30TH ST #303 OAKLAND CA 94609
89	380140260028	ING,PATRICK L/CINDY H REVOC LIVING TRUST	527 IIWI WAY WAILUKU HI 96793
90	380140260029	KAWACHI,GUY ASAO	20 HAUOLI ST UNIT 316 WAILUKU HI 96793
91	380140260030	WENDT,STEPHEN MERLE	102 CANDLELIGHT DR KENAI AK 99611
92	380140260031	WOLOSHUK,MARTHA M	16330 CRESCENT SOUTHFIELD MI 48076
93	380140260031	WOLOSHUK,MARK R	18660 LAUREL DR LIVONIA MI 48152
94	380140260032	IWAMOTO,PATRICIA E TRUST	379 LIHOLIHO ST WAILUKU HI 96793
95	380140260032	YEE,STEVEN YET MUN	2833 MIDWICK DR ALHAMBRA CA 91803
96	380140260033	LUKE,HERBERT	810 MINERT RD WALNUT CREEK CA 94598
97	380140260034	SANDERSON,SANDRA L TRUST	PO BOX 562 PACIFICA CA 94044
98	380140260035	CHANG,RYAN	583 KAMOKU ST APT 2105 HONOLULU HI 96826
99	380140260036	ING,PATRICK & TASAKA-ING,CINDY TRUST	527 IIWI WAY WAILUKU HI 96793
100	380140260037	VISCONTI,JOSHUA C	20 HAUOLI RD #405 WAILUKU HI 96793
101	380140260038	WATANABE,MASAICHI TRUST	45-216 MOKULELE DR KANEOHE HI 96744
102	380140260039	BASTIAN,GEORGE GEOFFREY	1 SANDPIPER CT SEASIDE CA 93955
103	380140260040	LONDON,JADINE Y C TRUST	1309 MCCULLY ST HONOLULU HI 96826
104	380140260040	YEE,DERON K S TRUST	2956 KALOALUIKI ST APT B HONOLULU HI 96822
105	360080050000	HILL,LOUIS W TRUST	C/O US BANK NATIONAL ASSOC, TRS PO BOX 64142 SAINT PAUL MN 55164
106	360080080000	PACIFIC ISLE GROUP LLC	P O BOX 790040 PAIA HI 96779
107	360080040000	MAUI OCEAN CENTER	192 MAALAEA RD WAILUKU HI 96793
108	380050020000	ALEXANDER & BALDWIN INC	PO BOX 156 KAHULUI HI 96732
109	380140240000	MAALAEA YACHT MARINA - CONDO MASTER	CONDO MASTER 00000
110	380140240001	TING DAVID P & SONS INC	53 LUNALILO ST WAILUKU HI 96793
111	380140240002	DAVID P TING & SONS INC	600 PARKVIEW DR APT 230 HALLANDALE FL 33009
112	380140240002	SAEKS,JEFFREY	30 HAUOLI ST APT 102 WAILUKU HI 96793
113	380140240003	RIKARD,MICHAEL D	500 ROYALTON DR LAS VEGAS NV 89144
114	380140240004	FRIESEN,ALLAN/CAROLINE TRUST	6318 W BIG SKY DR POST FALLS ID 83854
115	380140240005	REYNOLDS,FAMILY TR OF 1992	ATTN: REYNOLDS,PAUL/DIANA TTEES 30 HAUOLI ST UNIT 106 WAILUKU HI 96793

116	380140240006	KOHLER,MEERA	12800 HUFFMAN CIR ANCHORAGE AK 99516
117	380140240007	CHRISTIAN FAMILY 2002 TRUST	CHRISTIAN,CHARLES & NORMA TTEES 2064 MAIDU WAY GOLD RIVER CA 95670
118	380140240008	MCKAY,JEANNE C	30 HAUOLI ST UNIT 109 WAILUKU HI 96793
119	380140240009	TING DAVID P & SONS INC	53 LUNALILO ST WAILUKU HI 96793
120	380140240010	VAUGHAN,JOHN WILLIAM	VAUGHAN,JOHN W/TRACI S P O BOX 1141 VANCOUVER WA 98666
121	380140240011	LYDIATT,BARRIE JAMES	#7 65 OAKMONT DR ST ALBERT, AB T8N 6S3
122	380140240012	JANIS,LOIS A TRUST	100 HAUOLI ST #404 WAILUKU HI 96793
123	380140240013	JANIS,LOIS A TRUST	100 HAUOLI ST #404 WAILUKU HI 96793
124	380140240013	WONG,ABBY JANIS	100 HAUOLI ST #401 WAILUKU HI 96793
125	380140240014	KERSHAW,JOHN W	31 W MAKAHAKAHA LOOP WAILUKU HI 96793
126	380140240015	KOZLOWSKI,PAMELA A	1022 PINSON FORK DR SPRING TX 77379
127	380140240016	HAWAII PREMIER INVESTMENTS, INC	150 HAUOLI ST APT #314 WAILUKU HI 96793
128	380140240017	GRIMES TRUST	1622 S CALIFORNIA AVE WEST COVINA CA 91790
129	380140240018	RUIZ,LARRY R	30 HAUOLI ST APT 209 WAILUKU HI 96793
130	380140240019	PARTNOFF,PETER	10829 OLD RIVER SCHOOL RD DOWNEY CA 90241
131	380140240020	DAVID P TING AND SONS INC	53 LUNALILO ST WAILUKU HI 96793
132	380140240021	PHILLIPS,THOMAS LESLIE	830 FIELD ST LAKEWOOD CO 80215
133	380140240022	SPRINGETT,ROBERT JAMES	BOX 12 GROUP 70 RR1 ANOLA MB R0E 0A0
134	380140240023	KAHALA VACATION RENTALS LLC	335 HOOHANA ST STE #B KAHULUI HI 96732
135	380140240024	KLINGLER,DONNA J TRUST	5199 PARKSIDE DR MASON OH 45040
136	380140240025	WUERCH,JAYNE LORRAINE	20818 SNAG ISLAND DR LAKE TAPPS WA 98391
137	380140240026	WOLF,WILLIAM GUNNER	PO BOX 2510 OLYMPIC VALLEY CA 96146
138	380140240027	JOHNSON,NORMAN	30 HAUOLI ST APT 407 WAILUKU HI 96793
139	380140240028	ISAACSON,TED R	PO BOX 66 KULA HI 96790
140	380140240029	ELDAM,JOSEPH	4082 PIER POINT DISCOVERY BAY CA 94505
141	380140240030	FAY,MEREDITH A	211 LAU OLIWA LOOP WAILUKU HI 96793
142	380140240031	RICHARDSON,FAMILY TRUST 1998	MR & MRS JAMES RICHARDSON 2075 MARLETTE AVE RENO NV 89503
143	380140240032	SCOTT,EDWIN LYNN	30 HAUOLI ST #311 WAILUKU HI 96793
144	380140240033	MAIER,TERRENCE JAMES	17 NEWBURY COURT ST ALBERT, AB T8N 7C1
145	380140240034	LEITH,LAWRENCE A	PO BOX 546 SHERIDAN OR 97378
146	380140240035	DAVID P TING & SONS INC	53 LUNALILO ST WAILUKU HI 96793

147	380140240036	M & W ASSOCIATES	1001 BISHOP ST STE 2450 HONOLULU HI 96813
148	380140240037	BUTLER,RUSSELL LLOYD	3723 E HAZELTINE WAY CHANDLER AZ 85249
149	380140240038	HAYMAN/STROHMEIER,JO-ANN	30 HAUOLI RD UNIT 405 WAILUKU HI 96793
150	380140240039	QUIGLEY,PATRICK AND REBECCA TRUST	68-713 FARRINGTON HWY WAIALUA HI 96791
151	380140240040	JOHNSON,NORMAN MARTIN	30 HAUOLI RD #407 WAILUKU HI 96793
152	380140240041	FOX,TED	30 HAUOLI ST UNIT 408 WAILUKU HI 96793
153	380140240042	GOLDMAN,JOEL	173 MINTUM ST PORT EWEN NY 12466
154	380140240043	FEREIRA TRUST	287 VIA CIMA CT DANVILLE CA 94526
155	380140240044	HUPP,NINA L	PO BOX 790335 PAIA HI 96779
156	380140240045	BENZIGER,JASON TODD	30 HAUOLI ST APT 412 WAILUKU HI 96793
157	380140150000	ISLAND SANDS- CONDO MASTER	00000
158	380140150001	CHUN-MING,SHIRLEY S TRUST	PO BOX 642 WAILUKU HI 96793
159	380140150002	HOPKINS,BETTE E TRUST	850 N EL CAMINO REAL APT 334 SAN MATEO CA 94401
160	380140150003	URBAN,RANDALL JAY	150 HAUOLI ST APT 102 WAILUKU HI 96793
161	380140150004	COHEN-HADRIA,TRUST	COHEN-HADRIA,MARCEL/PATRICIA TRS 8845 WINE VALLEY CIR SAN JOSE CA 95135
162	380140150005	SMITH,ADRIAN MARK	2107 GRAND BLVD, SUITE 1205 KANSAS CITY MO 64108
163	380140150006	MPT'S HALE LLC	7620 ELBOW DR SW, SUITE 1184 CALGARY, AB T2V 1K2
164	380140150007	PC CONN II FAMILY TRUST	PHILLIP CONN SR & CHRISTINE CONN, CO-TTEES 34520 DESANTE CT TEMECULA CA 92592
165	380140150008	ITO,YUTAKA REVOC LIVING TRUST	583 KAMOKU ST APT 2605 HONOLULU HI 96826
166	380140150009	MURPHY LIVING TRUST	MURPHY,DENNIS/LISA TTEES 3280 OLD COACH WAY RENO NV 89511
167	380140150010	WELLER,WENDY LOU	555 W MICHIGAN AVE SALINE MI 48176
168	380140150011	WINNIMAN INTERNATIONAL REAL ESTATE TRUST	399 E KAWILI ST UNIT 201 HILO HI 96720
169	380140150012	BYERS,KARL R/JOANNE TRUST	6243 CAMINO DEL LAGO RANCHO MURIETA CA 95683
170	380140150013	WHITCHER,GRANT	270 COPA DE ORO BREA CA 92823
171	380140150014	JOHNSON,DAVID W TRUST	225 NAPA RD SONOMA CA 94576
172	380140150015	MCMORRIS,DANIEL ALYN	980-164TH ST SURREY,BC V4A 4Y5
173	380140150016	MCGINNIS,MICHAEL P	19705 SEACLIFF LN HUNTINGTON BEACH CA 92648
174	380140150017	EVERY,DAVID V	P O BOX 66 BUCKLAND MA 01338
175	380140150018	HANSON,FRANCIS & JOAN TRUST	HANSON,FRANCIS W/JOAN F CO-TRS 150 HAUOLI RD APT #204 WAILUKU HI 96793
176	380140150019	AOAO OF THE ISLAND SANDS	C/O ASSET PROPERTY M 369 HUKU LII PL STE 202 KIHEI HI 96753
177	380140150020	MAHONEY,FAMILY SURVIVORS TR	ATTN: CAROLYN MAHONEY, TTEE 150 HAUOLI ST, #206

			WAILUKU HI 96793
178	380140150021	BROWN,WILLIAM CARL	BROWN, WILLIAM/JUDITH PO BOX 1245 GUNNISON CO 81230
179	380140150022	LEHET,KATHRYN SMITH	10215 SW 116TH VASHON WA 98070
180	380140150023	KAHOE,FAMILY IRREVOCABLE TRUST	358 PAPA PL STE F KAHULUI HI 96732
181	380140150024	RICHARDSON,LIS C TRUST	C/O WINNIMAN,JAMES M 399 E KAWILI ST,#201 HILO HI 96720
182	380140150025	211 ISLAND SANDS TRUST	C/O WALTER JOHN SCHIBLI, TTEE 304-1321 BLANSHARD STREET VICTORIA, B.C. V8W 0B6
183	380140150026	WOMACK FAMILY TRUST	C/O WOMACK,WAYNE,TTEE 150 HAUOLI ST,# 212 WAILUKU HI 96793
184	380140150026	MICHAELIS FAMILY TRUST	C/O MICHAEL W MICHAELIS,TTEE 16800 CYPRESS WAY LOS GATOS CA 95030
185	380140150027	DUFFY,THOMAS	6014 MAIRFIELD CT BANNING CA 92220
186	380140150028	JUNG,LAVERNE L/JOYCE M JT TR	JUNG, LAVERNE L N 3065 LAKE DR WAUTOMA WI 54982
187	380140150029	WEAVER,BARBARA W TRUST	WEAVER,BARBARA W TTEE 5775 LWR KULA RD KULA HI 96790
188	380140150030	BRANTNER,EUGENE M	9400 SHIPBOARD CT LAS VEGAS NV 89117
189	380140150031	HANSON,FRANCIS & JOAN TRUST	FRANCIS & JOAN HANSON TTEES 150 HAUOLI RD #303 WAILUKU HI 96793
190	380140150032	BOWERS,LIVING TRUST	DONNA M BOWERS, TTEE PO BOX 96 LADONIA TX 75449
191	380140150033	CZAJKA,DENNIS C FAMILY TRUST	CZAJKA,DARLENE K TTEE 4526 133RD AVE SE BELLEVUE WA 98006
192	380140150034	STOCKS,MACK CARLTON, II	150 HAUOLI ST #306 WAILUKU HI 96793
193	380140150035	DUNCAN,JOHN R	11348 SW LYNNVALE DR PORTLAND OR 97225
194	380140150035	MORTON,ARTHUR F/LEILA H TRUST	2635 SW 106TH AVE PORTLAND OR 97225
195	380140150036	308 ISLAND SANDS HOLDINGS	701-1803 DOUGLAS ST VICTORIA BC V8T 5C3
196	380140150037	FRITZ,ROBERT JOHN	11804 SE 204TH ST KENT WA 98031
197	380140150038	ROHR,KARIN M	PO BOX 880293 PUKALANI HI 96788
198	380140150039	VAN VALKENBURG,TRUST	VAN VALKENBURG,GILBERT L TTEE 1712 STONE HOUSE LN LINCOLN CA 95648
199	380140150040	CUMMINGS,EARLENE A TRUST	ATTN CUMMINGS,EARLENE A TRS 150 HAUOLI ST #312 WAILUKU HI 96793
200	380140150041	WOVERTONSLEIS LIVING TRUST	ATTN: OVERTON,R WAYNE/NANCY 150 HAUOLI ST UNIT 314 WAILUKU HI 96793
201	380140150042	MORRIS,JEANNE R	540 GILMER RD COATESVILLE PA 19320
202	380140150043	BRITTON,B LYNN	PO BOX 2241 WAILUKU HI 96793
203	380140150044	PORTER,TRUST	MR & MRS JOHN A PORTER 28 ALPEN ROSE LN SANDPOINT ID 83864
204	380140150045	TRUONG,LOC PHUC	275 W KAAHUMANU AVE #1010 KAHULUI HI 96732

205	380140150046	LOW,ANDREA MARIE	5095 NAPILIHAU ST, 109-B PMB 39 LAHAINA HI 96761
206	380140150047	MAYES,GORDON B	6018 MANOR PL EVERETT WA 98203
207	380140150048	HARBO,GAYLE/SAMUEL JR TR	BOX 10201 FAIRBANKS AK 99710
208	380140150049	HOUSTON,NIKTA V TRUST	190 HAUOLI ST #219 WAILUKU HI 96793
209	380140150050	ISLAND SANDS LLC	C/O KELLY ATWOOD, ETAL 581 2ND ST LAKE OSWEGO OR 97034
210	380140150051	BRAGG CREEK REALTY LTD	PO BOX 72 BRAGG CREEK, AB T0L 0K0
211	380140150052	BONGAARD,JAMES A	150 HAUOLI ST #410 WAILUKU HI 96793
212	380140150053	THWING,DAVID C	5446 HYADA BLVD NE TACOMA WA 98422
213	380140150054	FOERSTER TRUST	C/O FOERSTER,PAUL E TRS 1401 EMMONS CANYON DR ALAMO CA 94507
214	380140150055	FREITAS,BEN M TRUST	PO BOX 315 KIHEI HI 96753
215	380140150056	CHENG,I-MING & HSIU-LI TRUST	I-MING CHENG HSIU-LI CHENG PO BOX 722 DIABLO CA 94528
216	380140150057	GARCIA,ALEJANDRO M	ATTN: WESTWIND INVESTMENTS LLC PO BOX 791599 PAIA HI 96779
217	380140150058	SYTH,MARY E	19500 S SYTH RD OREGON CITY OR 97045
218	380140150058	HAGEN,ROBERT L	22678 S EADEN RD OREGON CITY OR 97045
219	380140150059	FREIDENBURG,LINDA L	150 HAUOLI ST APT 503 WAILUKU HI 96793
220	380140150060	SAUNDERS,MARK FREDERICK	8109 WILTSHIRE BLVD DELTA, BRITISH COLUMBIA V4C 4B5
221	380140150061	JOHNSON,CLAIR H REVOC LIVING TRUST	150 HAUOLI ST UNIT 505 WAILUKU HI 96793
222	380140150062	MERRIMAN,ELSIE M REV TRUST	150 HAUOLI ST APT 506 WAILUKU HI 96793
223	380140150063	SONNICHSEN,RICHARD & MARY TRUST	410 PONDER POINT DR SANDPOINT ID 83864
224	380140150064	MONTGOMERY,CHARLES SPENCER	15090 BUENA VISTA AVE WHITE ROCK,BC V4B 1X9
225	380140150065	MARTEL,BRIAN EDWARD JOHN	3906-40 AVE LEDUC, ALBERTA T9E 4W3
226	380140150066	SLUSSER,LISA MICHELE	P O BOX 785 LAHAINA HI 96761
227	380140150067	SCHWARZ,GEORGE	330 LAFAYETTE ST #7 NEW YORK NY 10012
228	380140150068	AKI,JO-ANN MASAKO TRUST	AKI,JO-ANN MASAKO TRS P O BOX 5059 KAHULUI HI 96732
229	380140150069	BALAI,NOELANI T TRUST	PO BOX 6276 KAHULUI HI 96732
230	380140150070	BILLINGTON,EVELYN BOWNE	150 HAUOLI ST #600 WAILUKU HI 96793
231	380140150071	HOWLETT,ROBERT L TRS	150 HAUOLI ST #601 WAILUKU HI 96793
232	380140150072	HADRIA,COHEN TRUST	8845 WINE VALLEY CIR SAN JOSE CA 95135
233	380140150073	CANAHI RECREATION INC	879 12TH ST E NORTH VANCOUVER, BC V7L 2L2

234	380140150074	STEWART,FAMILY TRUST	STEWART,JOHN TTEE ETA; 309 ACACIA AVE SAN BRUNO CA 94066
235	380140150075	HOUSTON,NIKTA V TRUST	190 HAUOLI ST #219 WAILUKU HI 96793
236	380140150076	WONG,LUCY S TRUST	WENDY YS THAYER, TTEE 8103 S SPRUCE CT ENGLEWOOD CO 80112
237	380140150077	ABE,FAMILY TRUST	1848 CONEJO LN FULLERTON CA 92833
238	380140150078	SMITH,LESLIE MACKENZIE TRUST	2394 PUU MALA PL KIHEI HI 96753
239	380140150079	LAWSON,ANTHONY	1184-7620 ELBOW DR S.W. CALGARY, ALBERTA T2V IK2
240	380140150080	MERRIMAN,LORNA JOAN	PO BOX 1941 MAMMOTH LAKES CA 93546
241	380140150081	HOILIEN,LAC T TRUST	LAC T HOILIEN TRS PO BOX 1821 WAILUKU HI 96793
242	380140150082	JARRETT,REX A JR	4150 WOODCREST RD LAS VEGAS NV 89121
243	380140150082	BUCKINGHAM,WILLIAM H JR TR	6241 ALEXANDER RD LAS VEGAS NV 89108
244	380140150083	FREITAS,BEN M TRUST	150 HAUOLI ST #614 WAILUKU HI 96793
245	360080060000	MAALAEA TRIANGLE PTNRHSP	75B NO CHURCH ST WAILUKU HI 96793
246	380050030000	ALEXANDER & BALDWIN, LLC	PO BOX 156 KAHULUI HI 96733
247	380140110000	MAALAEA BANYANS- CONDO MASTER	00000
248	380140110001	LINDSEY 2006 REVOC TRUST	C/O R. KIRK LINDSEY/CYNTHIA LINDSEY 3261 ESTA AVE MODESTO CA 95355
249	380140110002	HUKILL,CHRISTOPHER JAMES	1756 LILY POND CIR HENDERSON NV 89012
250	380140110003	CHESNE,CAROL J TRUST	C/O CAROL & EDWARD CHESNE 4389 MALIA ST, #423 HONOLULU HI 96821
251	380140110004	KNIGHT CK PROPERTIES LLC	16030 VENTURA BLVD #380 ENCINO CA 91436
252	380140110005	FOSS,DIANNA JEANNE DECD	C/O JEREMY FOSS 428 ALVARADO TER VISTA CA 92084
253	380140110006	BENJAMIN,RONALD D	415 DAIRY RD STE E-301 KAHULUI HI 96732
254	380140110007	BENJAMIN,RONALD D	415 DAIRY RD STE E-301 KAHULUI HI 96732
255	380140110008	DOTY,JEANNE TRUST	3988 BRIARWOOD ST NAPA CA 94558
256	380140110009	JORDING,RANDALL GREGORY	4832 EAGLEWOOD CT RENO NV 89502
257	380140110010	EYLANDER,RICHARD RUSSEL	190 HAUOLI ST 112 WAILUKU HI 96793
258	380140110011	HAMLIN,PAUL M	216 BRISA DEL MAR LOMPOC CA 93436
259	380140110012	BUE,BRIAN GERALD	PO BOX 641 PALMER AK 99645
260	380140110013	ALLEN-HUTCHERSON,CHERYL 1997 TRUST	C/O CHERYL HUTCHERSON-BIRGE TTEE P O BOX 293 SKYFOREST CA 92385
261	380140110014	ETZEL,PHILIP H	190 HAUOLI ST #116 WAILUKU HI 96793
262	380140110015	MADUCDOC,FE AMOR R	2108 WILLOWWOOD RD

			OAK HILL WV 25901
263	380140110016	LIBHART,DAVID LESTER	190 HAUOLI ST #118 WAILUKU HI 96793
264	380140110017	MCWILLIAMS,EDWARD L	3586 CAMINITO EL RINCON UNIT 114 SAN DIEGO CA 92130
265	380140110018	MALCOLM,MARGUERITE	8 BRANTWOOD COURT EAST BRUNSWICK NJ 08816
266	380140110019	GIARDINA,STEVEN M/CYNTHIA M TRUST	13056 SOMERSET DR GRASS VALLEY CA 95945
267	380140110020	EELLS,DAVID A	PO BOX 21 OAK HILL WV 25901
268	380140110021	REID,ELTON THOMAS	ATTN REID,ELTON/CHRISTINE PO BOX 1933 PARK CITY UT 84060
269	380140110022	VULLIET,PHILIP/JUDITH 2004 TR	3135 CHESAPEAKE BAY DAVIS CA 95616
270	380140110023	BRANDT TRUST	BRANDT,BRUCE & DONNA TTEES 22381 WALLINGFORD LN HUNTINGTON BEACH CA 92646
271	380140110024	JUDGE,LISA MARIA TRUST	2233 VINEYARD ST STE B WAILUKU HI 96793
272	380140110025	FOUNTAIN,TOM L FAMILY TRUST	TOM L FOUNTAIN PO BOX 51599 SPARKS NV 89435
273	380140110026	HOEHN,KENNETH WILLIAM	C/O HOEHN,KENNETH/LORI P O BOX 545 LAKELAND MI 48143
274	380140110027	ERB,HANK EDWARD	C/O HANK ERB, ETAL 2315 VISTA RODEO DR EL CAJON CA 92019
275	380140110028	KNIGHT CK PROPERTIES LLC	3000 31ST ST SANTA MONICA CA 90405
276	380140110029	GERMINO,JOHN & CHRISTINE TRUST	582 THAIN WAY PALO ALTO CA 94306
277	380140110030	SMITH,JAMES W & LINDA L S CAIRES FAM TR	190 HAUOLI ST #212 WAILUKU HI 96793
278	380140110031	HARA,PROPERTY TRUST	NOBORU & RITA HARA 3200 S MASSACHUSETTS SEATTLE WA 98144
279	380140110032	MONIZ,G & D TRUST	C/O MONIZ,GERALD/DIANA 190 HAUOLI ST, #214 WAILUKU HI 96793
280	380140110033	LARNTZ,KINLEY	11000 N 77TH PL UNIT 1013 SCOTTSDALE AZ 85260
281	380140110034	NICOLAS,VICTOR TIMOTHY	5105 LONG MEADOW DR FRANKLIN OH 45005
282	380140110035	CHING,LEILANI DOLLY TRUST	190 HAUOLI ST WAILUKU HI 96793
283	380140110036	CLARKSON,WENDALL	CLARKSON,WENDALL/SESTINI,SAL 540 S AVENIDA FARO ANAHEIM CA 92807
284	380140110037	HOUSTON,NIKTA V TRUST	190 HAUOLI ST #219 WAILUKU HI 96793
285	380140110038	MAALAEA-TAHOE	C/O MICHAEL ROBINSON 2340 DUNDE CT SOUTH LAKE TAHOE CA 96150
286	380140110039	BENJAMIN,RONALD DEAN, JR.	1500 ALBERTON CIR LINCOLN CA 95648
287	380140110040	ABELL,MICHELLE D	30 SADDLE LN NOVATO CA 94947
288	380140110041	UHL,JOHN AND GALE TRUST	17201 CRESCENT DR LOS GATOS CA 95032
289	380140110042	SONGSTAD,STEVEN BOOTH	190 HAUOLI ST APT 304 WAILUKU HI 96793
290	380140110043	DAOUST,MARY PAMELA TRUST	190 HAUOLI ST #305 WAILUKU HI 96793

291	380140110044	BENNETT,EDWARD H	5707 RIVER ST WEST LINN OR 97068
292	380140110045	HANSEN,RONALD E	2469 PORTERFIELD COURT MOUNTAIN VIEW CA 94040
293	380140110046	PYATT,J NOEL & CATHERINE PETERS 1998 TR	2979 GARFIELD AVE, SE PORT ORCHARD WA 98366
294	380140110047	EILERS,MIKE E	190 HAUOLI ST # 309 WAILUKU HI 96793
295	380140110048	MARTINELLI,GENE	4420 PESCADERO AVE SAN DIEGO CA 92107
296	380140110049	LYDON,FRANCIS MICHAEL	190 HAUOLI ST APT 311 WAILUKU HI 96793
297	380140110050	COLUSE,CLIFFORD J	945 BERKSHIRE COURT SAN DIMAS CA 91773
298	380140110051	DOMINSKI,TONY J	PO BOX 833 PACIFICA CA 94044
299	380140110052	OLSON,JAMES DWIGHT	SW 2746 HEADLANDS WAY PORT ORCHARD WA 98367
300	380140110053	PANG,VICTOR M	9351 TIDEWATER CIRCLE HUNTINGTON BEACH CA 92646
301	380140110054	MAREK,FAMILY TR	MAREK,DONALD C TRS ETAL 8843 HILLSIDE DR OAK LAWN IL 60457
302	380140110055	COVEY,JERRY R TRUST	PO BOX 10214 LAHAINA HI 96761
303	380140110056	HANSEN,RONALD EUGENE	2469 PORTERFIELD CT MOUNTAIN VIEW CA 94040
304	380140110057	FINNEGAN,JOHN/REGINA LIVING TRUST	190 HAUOLI ST #319 WAILUKU HI 96793
305	380140110058	TAHOE-HAWAIIAN LTD	ATTN DAUM,CAROL P O BOX 550160 SOUTH LAKE TAHOE CA 96155
306	380140110059	SCHMIEGE,MARJORIE TRUST	1800 EVERGREEN AVE JUNEAU AK 99801
307	380140110060	JELICH,JOYCE MARIE TRUST	330 PORTOLA RD PORTOLA VALLEY CA 94028
308	380140110061	KNIGHT CK PROPERTIES LLC	16030 VENTURA BLVD STE 308 ENCINO CA 91436
309	380140110062	PYATT,J NOEL & CATHERINE PETERS 1998 TR	2979 GARFIELD AVE SE PORT ORCHARD WA 98366
310	380140110063	HAWKINS,HUBERT W	190 HAUOLI ST 405 WAILUKU HI 96793
311	380140110063	HAWKINS,CHERYL V	190 HAUOLI ST APT 405 WAILUKU HI 96793
312	380140110064	KUNICHIKA,KENNETH	1291 ALA PILI LOOP HONOLULU HI 96818
313	380140110065	BENJAMIN,RONALD D	PMB #301 415 DAIRY RD STE E KAHULUI HI 96732
314	380140110066	KNIGHT CK PROPERTIES LLC	16030 VENTURA BLVD STE 380 ENCINO CA 91436
315	380140110067	SAPPINGTON,HARRY/BETTY MARITAL TR	1632 FRUITWOOD CT SAN JOSE CA 95125
316	380140110068	DORSEY,JOSEPH C	2136 SW 7TH COURT BOCA RATON FL 33486
317	380140110069	BENEPE,THOMAS S./BARBARA J. FAMILY TRUST	190 HAUOLI RD UNIT 411 WAILUKU HI 96793
318	380140110070	BENEPE,THOMAS & BARBARA FAMILY TR	190 HAUOLI ST UNIT 412 WAILUKU HI 96793
319	380140110071	FIELD,FRANK P TRUSTEE	2750 OREGON CT STE M8 TORRANCE CA 90503
320	380140110071	FIELD,KATARINA TRUSTEE	1179 DEBBIE HILL RD COTATI CA 94931
321	380140110072	BFS MAALAEA BANYANS #414	SEARS, GAYLE 31443 S.E. DIVISION DR TROUTDALE OR 97060
322	380140110073	LINDSEY 2006 REVOC TRUST	C/O R. KIRK LINDSEY 3261 ESTA AVE

			MODESTO CA 95355
323	380140110074	LINDSEY,ROBERT C TRUST	225 SW 331ST PL FEDERAL WAY WA 98023
324	380140110075	ENRIQUEZ,ANTONIO CABOT	3702 SW GRAYSON ST SEATTLE WA 98126
325	380140110076	CARLSON,FAMILY TR	868 NORTHRIDGE RD FARMINGTON UT 84025
326	380140110077	KNIGHT CK PROPERTIES LLC	16030 VENTURA BLVD STE 380 ENCINO CA 91436
327	380140110078	TOPHAM,EUGENE TRUSTEE	2342 E 3700 NORTH LAYTON UT 84040
328	380140160000	LAULOA MAALAEA - CONDO MASTER	CONDO MASTER
329	380140160001	SVENDSEN,SANDRA MARIE TRUST	100 HAUOLI ST APT #101 WAILUKU HI 96793
330	380140160002	MILLS,GLENFORD CHURCHILL	100 HAUOLI ST UNIT 102 WAILUKU HI 96793
331	380140160003	DOLBEARE,RICHARD THERON	100 HAUOLI ST UNIT 103 WAILUKU HI 96793
332	380140160004	KNIGHT CK PROPERTIES LLC	16030 VENTURA BLVD #380 ENCINO CA 91436
333	380140160005	CYBERVISION CO LTD	ATTN OKADA,JULIE 582 STABLE RD PAIA HI 96779
334	380140160006	EVERETT,BETTE G TRUST	100 HAUOLI ST #107 WAILUKU HI 96793
335	380140160007	ASTLEY,STEVEN A	140 GLACIER PEAK DR CAMANO ISLAND WA 98282
336	380140160008	BAKER,SHIRLEY SMITH	298 LAKESHORE DR MANISTEE MI 49660
337	380140160009	MORSE,BRUCE H	802 MAALAHI ST WAILUKU HI 96793
338	380140160009	MORSE,DOROTHY E	MAALAEA KAI ENTERPRISES INC BOX 15546562 SIOUX FALLS SD 57186
339	380140160010	BRAININ/MARTIN TRUST	14370 QUAKER HILL CROSS NEVADA CITY CA 95959
340	380140160011	NALUNALU LLC	ATTN: LARS BJORNSON 30510 IVYWOOD TRAIL STACY MN 55079
341	380140160012	WEEKE FAMILY TRUST	WAYNE & SHARON WEEKE, TTEES 1226 GREY FOX RUN SAINT CHARLES MO 63304
342	380140160013	LXS 22007-4N TRUST FUND	ATTN: NATIONSTAR MORTGAGE LLC 350 HIGHLAND DR LEWISVILLE TX 75067
343	380140160014	LEVERENZ,KEITH C	316 FARM HOUSE LN POB 56 NORTH HERO VT 05474
344	380140160015	MCMORROW,2000 FAMILY TRUST	4952 SWINDON PL NEWARK CA 94560
345	380140160016	LIEBHOLD,FAMILY TRUST	LIEBHOLD,MICHAEL N/BONITA L TRS 10 DURHAM RD WOODSIDE CA 94062
346	380140160017	ANDERSON,MERLE EDWARD TRUST	100 HAUOLI ST APT #206 WAILUKU HI 96793
347	380140160018	MARAN,GARY P	100 HAUOLI ST APT 207 WAILUKU HI 96793
348	380140160019	WINES,TIMOTHY J	335 HOOHANA #B KAHULUI HI 96732
349	380140160020	ROWE,J MICHAEL	7710 WOODMOUNT AVE APT 206 BETHESDA MD 20814
350	380140160021	HOUSTON,KEITH BRADLEY	CAMP 6 SITE 14 RR 8 CALGARY,AB T2J 2T9
351	380140160022	PROKUSKI,LEON AND ELNORA TRUST	100 HAUOLI ST #211 WAILUKU HI 96793
352	380140160023	FLYNN,MARYANNE	1250 ELDORA RD NEDERLAND CO 80466
353	380140160024	TRADEWINDS PARTNERSHIP	116 CANTERBURY DRIVE SW CALGARY, AB T2W 2G1

354	380140160025	HARR,RICHARD & DIANE TRUST	1288 N SHORE RD LAKE OSWEGO OR 97034
355	380140160026	CHOW,LEONARD Y T & BETTY TR	4517 S FENNY LN BOISE ID 83709
356	380140160027	MCMORROW FAMILY 2000 TRUST	MCMORROW,DONALD JR/JUDITH ANN TRS 4952 SWINDON PL NEWARK CA 94560
357	380140160028	ROSENBAUM,THOMAS C	PO BOX 571 CAPTAIN COOK HI 96704
358	380140160029	OGASAWARA,YASUHITO	100 HAUOLI ST APT #306 WAILUKU HI 96793
359	380140160030	DEPRIEST,SCOTT A	6041 44TH AVE SW SEATTLE WA 98136
360	380140160031	KOSLOSKEY,CHRISTIAN	100 HAUOLI ST UNIT #308 WAILUKU HI 96793
361	380140160032	VERMAITAI LLC	21 BATES FARM RD RICHMOND VT 05477
362	380140160033	SCHMIDT,JUDY LYN	100 HAUOLI ST 310 WAILUKU HI 96793
363	380140160034	RAFSON,GERALD JAMES	1912 GILMORE TRAIL FAIRBANKS AK 99712
364	380140160035	COOK,IRVIN PEHR JR	1414 WOLVERINE ST ANCHORAGE AK 99504
365	380140160036	JANIS,LOIS A REVOC TRUST	ATTN ABBY JANIS WONG 100 HAUOLI ST UNIT 401 WAILUKU HI 96793
366	380140160037	JOHNSON,BRUCE W	1135 N NIMITZ HWY HONOLULU HI 96817
367	380140160038	CLARKE,EDWIN S	151 CENTRAL ST FRAMINGHAM MA 01701
368	380140160039	JANIS,HARVEY S REVOC LIVING TRUST	100 HAUOLI RD #404 WAILUKU HI 96793
369	380140160040	JOHNSON,BRADLEY D TRUST	3061 LIVE OAK CT DANVILLE CA 94506
370	380140160041	SMITH,RICK M SR	1815 59TH AVE NW GIG HARBOR WA 98335
371	380140160042	BENATOVICH,DEANNA	105 EHIKU LOOP H-106 KIHEI HI 96753
372	380140160043	FEREIRA REVOCABLE LIVING TRUST	287 VIA CIMA CT DANVILLE CA 94526
373	380140160044	SADER NEVADA TRUST	ATTN: R SADER 8600 TECHNOLOGY WAY STE 101 RENO NV 89521
374	380140160045	CHENG,I-MING/HSIU-LI TRUST	PO BOX 722 DIABLO CA 94528
375	380140160046	FRITTS,R E	2222 ROCKWELL RIVERSIDE CA 92506
376	380140160047	ROYER,THOMAS C	100 HAUOLI ST APT 412 WAILUKU HI 96793
377	360080130000	DMP MAUI, LLC	250 NEWPORT CENTER DR STE 300 NEWPORT BEACH CA 92660
378	360080130000	JARVIS MAUI LLC	3400 IRVINE AVE STE 212 NEWPORT BEACH CA 92660
379	360010250000	D & P MARINO LLC	291 L KULA RD PUKALANI HI 96768
380	360040030000	WAIKAPU PROPERTIES, LLC	PO BOX 1870 MANTECA CA 95336
381	360080030000	MAUI OCEAN CENTER INC	192 MAALAEA RD WAILUKU HI 96793
382	360040070000	HAWAIIAN CEMENT	99-1300 HALAWA VALLEY ST AIEA HI 96701
383	380050170000	ALEXANDER & BALDWIN LLC	P O BOX 156 KAHULUI HI 96732
384	380140210000	MAALAEA KAI- CONDO MASTER	00000
385	380140210001	MCALEER,VERN L	70 HAUOLI ST APT 101 WAILUKU HI 96793
386	380140210002	WELAKAHAO PROPERTIES LLC	1699 ALANIU PL KIHEI HI 96753
387	380140210003	HOLLAND,DENNIS PATRICK	3933 MAALAEA BAY PL WAILUKU HI 96793

388	380140210004	DAVIS FAMILY TRUST	1440 S ORANGE SPC 57 EL CAJON CA 92020
389	380140210005	LOVING,SHERRY C	2900 S PARK AVE SPRINGFIELD IL 62704
390	380140210006	LYM,JOHN CORNELL	37 N 3202 E IDAHO FALLS ID 83401
391	380140210007	ROBCO ENTERPRISES LTD	LILY LEE 57-5221 OAKMOUNT CRES BURNABY, BC V5H 4R4
392	380140210008	LEI-Z-DAYS	LAGERBLADE,ROBERT L 218 - 3RD STREET PORT BYRON IL 61275
393	380140210009	RICHMOND,RICHARD & SANDRA TR	MR & MRS RICHARD L RICHMOND 16719 163RD PL SE RENTON WA 98058
394	380140210010	SMITH,RICHARD	456 YOKUTS DR LODI CA 95240
395	380140210011	FRITZ,ROBERT JOHN	11804 SE 204TH ST KENT WA 98031
396	380140210012	OLSON,BARBARA C	3499 ALPINE LILY DR LAS VEGAS NV 89141
397	380140210013	SWITZER,PHILIP J	1236 GLACIER VIEW LN ESTES PARK CO 80517
398	380140210014	MURRAY,PAUL/PATRICIA FAM TR	2810 THE STRAND HERMOSA BEACH CA 90254
399	380140210015	SINCLAIRE,LAURA	C/O LAURA SINCLAIRE ETAL 1547 PALOS VERDES MALL #128 WALNUT CREEK CA 94596
400	380140210016	MCCLURE,JAY WILLIAM TRUST	70 HAUOLI ST #117 WAILUKU HI 96793
401	380140210017	PAULOO,JOAN B	4067 HARDWICK ST #407 LAKEWOOD CA 90712
402	380140210018	HELLER,DONALD & JOYCE TR	1220 2ND ST COLUMBIA CITY OR 97018
403	380140210019	LAPINSKI,STEWART	70 HAUOLI ST 120 WAILUKU HI 96793
404	380140210020	LEI-Z-II	C/O R LAGERBLADE 218 3RD ST PORT BYRON IL 61275
405	380140210021	SUNSHINE INVESTMENTS	4377 RENDEZVOUS CIRCLE ANCHORAGE AK 99504
406	380140210022	HAMASAKI, EDWARD N TRS ETAL	777 MAKIKI ST WAILUKU HI 96793
407	380140210023	LISA,DANNY	16404 14TH ST NE SNOHOMISH WA 98290
408	380140210024	HOLLAND,DENNIS PATRICK	3933 MAALAEA BAY PL WAILUKU HI 96793
409	380140210025	DERNEHL,HOWARD J/MCCONNELL,KATHLEEN J TR	723 OREGON AVE PALO ALTO CA 94303
410	380140210026	BLUE ISLE GROUP LLC	ATTN JACK VAN BOENING 1102 N CHRISTA WAY TOLLESON AZ 85353
411	380140210027	LANGER FAMILY TRUST	C/O CHARLES LANGER 14795 SW BELL RD SHERWOOD OR 97140
412	380140210028	GREENE,ROGER N	70 HAUOLI RD #209 WAILUKU HI 96793
413	380140210029	TAKENAKA,SHOJI	70 HAUOLI RD APT #210 WAILUKU HI 96793
414	380140210030	STEHLE,FRED H	BOX 701 ARMSTRONG, BC V0E 1B0
415	380140210031	PROKUSKI, ELNORA SURVIVOR TR	100 HAUOLI ST UNIT 211 WAILUKU HI 96793
416	380140210032	REYNOLDS,BILLIE JEROME	REYNOLDS,BILLIE JEROME/NANCY ANN 1623 E GREENVILLE DR

			WEST COVINA CA 91791
417	380140210033	MEEKER,TODD ALLEN	1022 EL VAGO ST LA CANADA FLINTRIDGE CA 91011
418	380140210034	THEODORE,DEAN A/DAWN TRUST	462 COLD CANYON RD CALABASAS CA 91302
419	380140210035	RANDALL-YOUNG,GWEN M	439 VILLAGE DR ALBERTA T8A 4K1
420	380140210036	HASKINS,ROBERT L/LINDA N TRUST	70 HAUOLI RD UNIT 217 WAILUKU HI 96793
421	380140210036	WEST,COLLEEN S DECEDENT'S TR	ATTN: WEST,GEORGE LLOYD 1700 RIDGECREST DR LAKE OSWEGO OR 97034
422	380140210037	PENSCO TRUST COMPANY, CUSTODIAN	GREENE,PETER L/CHAN,LORI Y 1 BURNETT AVE NORTH UNIT 6 SAN FRANCISCO CA 94131
423	380140210038	DONALD,WILLIAM ALFRED	70 HAUOLI ST #219 WAILUKU HI 96793
424	380140210039	THEODORE,DEAN & DAWN TRUST	462 COLD CANYON RD CALABASAS CA 91302
425	380140210040	CARR FAMILY TRUST	C/O CARR,DUDLEY TRS 70 HAUOLI ST #301 WAILUKU HI 96793
426	380140210041	COMER,LISA A	70 HAUOLI ST APT #315 WAILUKU HI 96793
427	380140210042	SIECHEN,KAREN OLSON	70 HAUOLI ST #303 WAILUKU HI 96793
428	380140210043	FULTON,TERRY LEE	736 AULIKE ST KIHEI HI 96753
429	380140210044	GANN,CARL LEE	1214 PILCHUCK PL FOX ISLAND WA 98333
430	380140210045	COOPER,MICHAEL A	1541 N SINALOA AVE PASADENA CA 91104
431	380140210046	KNIGHT CK PROPERTIES LLC	16030 VENTURA BLVD STE 380 ENCINO CA 91436
432	380140210047	CEBO,TONKO	320 EAST PINE AVE WILDWOOD NJ 08260
433	380140210048	STOTKA, ROBERT D/LYNNETTE R	4983 MILDEN RD MARTINEZ CA 94553
434	380140210049	JOHNSON,CLARENCE A	5320 195TH AVE E BONNEY LAKE WA 98391
435	380140210050	HOFFMAN,DAVID	1312 KILOU ST WAILUKU HI 96793
436	380140210051	MCGRATH PROPERTIES VI LLC	PO BOX 2907 WAILUKU HI 96793
437	380140210052	MAUI OCEANFRONT CONDOS LLC	3499 ALPINE LILY DR LAS VEGAS NV 89141
438	380140210053	VANHOY, ROBERT JR/CHRISTINE	10556 LARRY WAY CUPERTINO CA 95014
439	380140210054	COMER,LISA ANN	70 HAUOLI ST APT 315 WAILUKU HI 96793
440	380140210055	OCTAGON ENTERPRISES	C/O THOMAS P. GASPAR 4542 TULLY ROAD HUGHSON CA 95326
441	380140210056	KLEIN,MURRAY DAVID	9716 141ST ST EDMONTON, ALBERTA T5N 2M7
442	380140210057	GRUBLER,EMMA SUE REVOC TRUST	P O BOX 12676 LAHAINA HI 96761
443	380140210058	VANTREASE,JEROLD LEE	PO BOX 1730 HOMER AK 99603
444	380140210058	CHULYAN CORPORATION	17200 NE 40TH ST VANCOUVER WA 98682
445	380140210059	FAGER,DANIEL NOFZIGER	PO BOX 323 MOSIER OR 97040

446	380140210060	UNDERWOOD,MARITAL TRUST	C/O CAROLYN KILLEEN 10765 HARBOTTLE DR RENO NV 89511
447	380140210061	ZARLEY,SANDRA SUE	70 HAUOLI ST #402 WAILUKU HI 96793
448	380140210062	BRENNAN,NANCY R TRUST	206 ROYCROFT AVE A LONG BEACH CA 90803
449	380140210063	CLARK,TODD WELLESLEY	19814 CANPOM CT REDDING CA 96003
450	380140210064	BRAUN,PATRICIA J	5360 OXFORD CT ATWATER CA 95301
451	380140210065	MACCOLL,MAURICE & ANNE TRUST	PO BOX 3661 NAPA CA 94558
452	380140210066	RIEBLING,ROBERT WILLIAM	70 HAUOLI ST #407 WAILUKU HI 96793
453	380140210067	CAVE,SONNY & WORKMAN,STEFANIE TRUST	4352 N DESERTS GATE CIR MESA AZ 85207
454	380140210068	PETERSON,BRIEN S	C/O M/M BRIEN PETERSON 85 WILDWOOD BEACH RD SAINT PAUL MN 55115
455	380140210069	DAVIS,FAMILY TRUST	1440 S ORANGE 57 EL CAJON CA 92020
456	380140210070	LOCKWOOD,MARA	2430 S KIHEI RD 319 KIHEI HI 96753
457	380140210071	SMITH,STEVEN RUSSELL	4725 MERLE HAY RD, STE 200 DES MOINES IA 50322
458	380140210072	SALSE,JOHN R TRUST	70 HAUOLI ST #413 WAILUKU HI 96793
459	380140210073	MAY,MICHAEL L	2210 B MAKAA ST LIHUE HI 96766
460	380140210074	BECK,HAROLD A	70 HAUOLI ST APT 415 WAILUKU HI 96793
461	380140210075	MADDEN,TODD M	PO BOX 454 LAHAINA HI 96767
462	380140210076	VADDE,KIRAN KUMAR	10868 NE 35TH PL APT 1 BELLEVUE WA 98004
463	380140210076	ALLURI,SATISH	9112 OLEANDER WAY IRVING TX 75063
464	380140210077	MODESTO HUI	604 COTTONWOOD DR MODESTO CA 95356
465	380140210078	HOFFMANN, EDWARD J TRS ETAL	2103 SHETLAND RD BARRINGTON IL 60010
466	380140210079	LEI-Z-MAUI LLC	STANLEY/WKARIN EGE P O BOX 847 BOTHELL WA 98041

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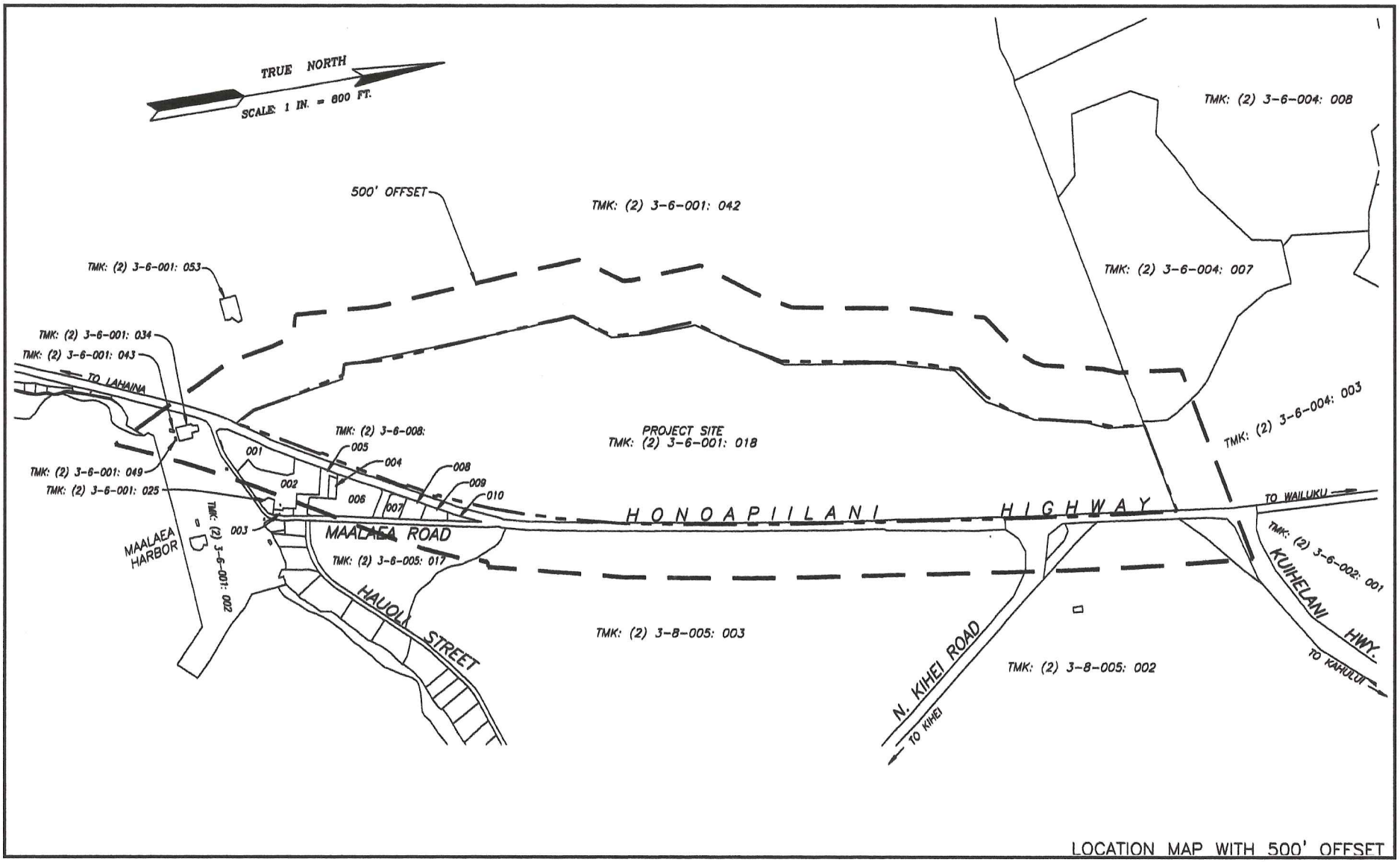


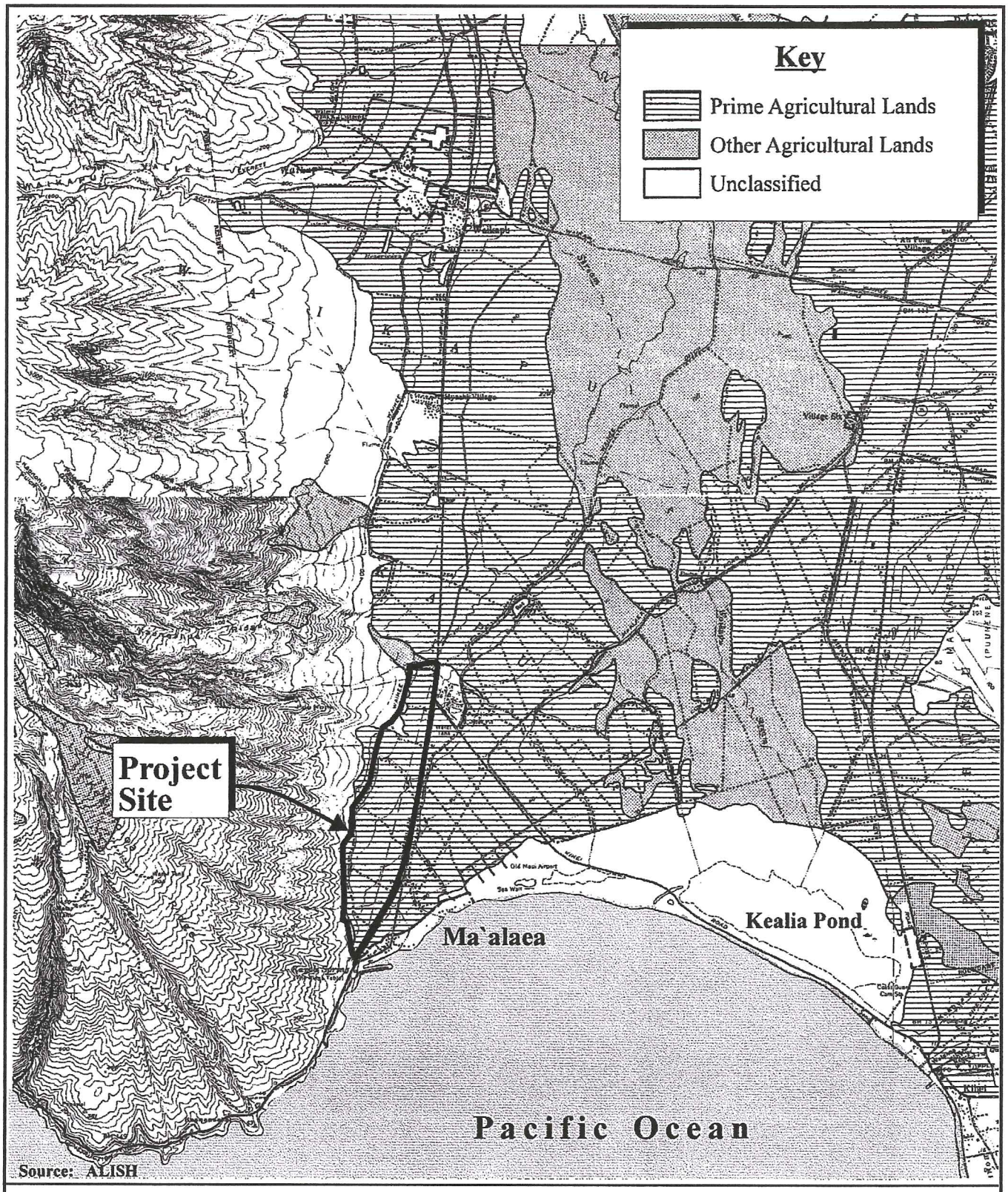
LOCATION MAP WITH 500' OFFSET

Proposed Mā'alaea Plantation Affordable Housing Project

BAGOYO
DEVELOPMENT CONSULTING GROUP

Appendix T

ALISH Map



NOT TO SCALE

Proposed Mā'alaea Plantation Affordable Housing Project

ALISH Classifications Map

BAGOYO
DEVELOPMENT CONSULTING GROUP

Appendix U

Zoning and Flood Confirmation Form

14 HW4-9

COUNTY OF MAUI
DEPARTMENT OF PLANNING
One Main Plaza Building
2200 Main Street, Suite 335
Wailuku, Hawaii 96793

Zoning Administration and Enforcement Division (ZAED)
Telephone: (808) 270-7253
Facsimile: (808) 270-7634
E-mail: planning@mauicounty.gov

DEPT OF PLANNING
COUNTY OF MAUI
SEP 2 2 2014
RECEIVED

ZONING AND FLOOD CONFIRMATION FORM

(This section to be completed by the Applicant)

APPLICANT NAME Vince Bagoyo (MVI, LLC) **TELEPHONE** (808) 357-3842

PROJECT NAME Ma`alaea Plantation Rural Subdivision **E-MAIL** vbagoyo-devgroup@hawaii.rr.com

PROPERTY ADDRESS Honoapiilani Highway, Ma`alaea **TAX MAP KEY** (2) 3-6-001:018

☐ Yes ■ No **Will this Zoning & Flood Confirmation Form be used with a Subdivision Application?**
IF YES, answer questions A and B below and comply with instructions 2 & 3 below:

A) ☐ Yes ■ No **Will it be processed under a consistency exemption from** Section 18.04.030(B), MCC?
IF YES, which exemption? (No. 1, 2, 3, 4 or 5) _____

B) State the purpose of subdivision and the proposed land uses (*ie 1-lot into 2-lots for all land uses allowed by law*):

INSTRUCTIONS:

1) **Please use a separate Zoning & Flood Confirmation Form for each Tax Map Key (TMK) number.**
2) **If this will be used with a subdivision application AND the subject property contains multiple districts/designations of (1) State Land Use Districts, (2) Maui Island Plan Growth Boundaries, (3) Community Plan Designations, or (4) County Zoning Districts; submit a signed and dated Land Use Designations Map, prepared by a licensed surveyor, showing the metes & bounds of the subject parcel and of each district/designation including any subdistricts.**
3) **If this will be used with a subdivision application AND the subject property contains multiple State Land Use Districts; submit an approved District Boundary Interpretation from the State Land Use Commission.**

(This section to be completed by ZAED)

LAND USE DISTRICTS/DESIGNATIONS (LUD) AND OTHER INFORMATION: [1]

☑ (SMA) Special Management Area (portion)

STATE DISTRICT: ☐ Urban ☐ Rural ☑ Agriculture ☐ Conservation

MAUI ISLAND PLAN Growth Boundary:[2] ☐ Urban ☐ Small Town ☐ Rural ☐ Planned Growth Area ☑ Outside Growth Boundaries

MAUI ISLAND PLAN Protected Area:[2] ☐ Preservation ☐ Park ☐ Greenbelt ☐ Greenway ☐ Sensitive Land ☑ Outside Protected Areas

COMMUNITY PLAN:[2] PD-12 - Wailuku District 12 (Ma'alaea Mauka)

COUNTY ZONING: AG-Agriculture, Open Zone, Road - Proposed Roland Street

OTHER/COMMENTS:

☐ (PD) Planned Development
☐ (PH) Project District
☐ See Additional Comments (Pg.2)
☐ See Attached LUD Map

FEMA FLOOD INFORMATION:

FLOOD HAZARD AREA ZONES[3] & BASE FLOOD ELEVATIONS: X + XS

☐ FEMA DESIGNATED FLOODWAY | For Flood Zone AO, FLOOD DEPTH:

☐ FLOOD DEVELOPMENT PERMIT REQUIRED (Zones V, VE, A, AO, AE, AH, D, & Floodways)

SUBDIVISION LAND USE CONSISTENCY: ☐ Not Consistent, (LUDs appear to have NO permitted uses in common).

_____ (Signature)
☐ Not Applicable, (Due to processing under consistency exemption No. ☐1, ☐2, ☐3, ☐4, ☐5).
☐ Interim Zoning, (The parcel or portion of the parcel that is zoned interim shall not be subdivided).

☐ [4] Consistent, (LUDs appear to have ALL permitted uses in common).

☐ [4] Consistent, upon obtaining an SMA, PD, or PH subdivision approval from Planning.

☐ [4] Consistent, upon recording a permissible uses unilateral agreement processed by Public Works (See Pg.2).

NOTES:

1 The conditions and/or representations made in the approval of a State District Boundary Amendment, Community Plan Amendment, County Change In Zoning, SMA Permit, Planned Development, Project District and/or a previous subdivision, may affect building permits, subdivisions, and uses on the land.
2 Please review the Maui Island Plan and the Community Plan document for any goals, objectives, policies or actions that may affect this parcel.
3 Flood development permits might be required in zones X and XS for any work done in streams, gulches, low-lying areas, or any type of drainageway; Flood development permits are required for work in all other zones. Subdivisions that include/adjoin streams, gulches, low-lying areas, or any type of drainageway might require the following designations to be shown on the subdivision map: 100-year flood inundation limits; base flood elevations; drainage reserves.
4 Subdivisions will be further reviewed during the subdivision application process to verify consistency, unilateral agreement requirements, and the conditions associated with a unilateral agreement [Section 18.04.030.D, Maui County Code].

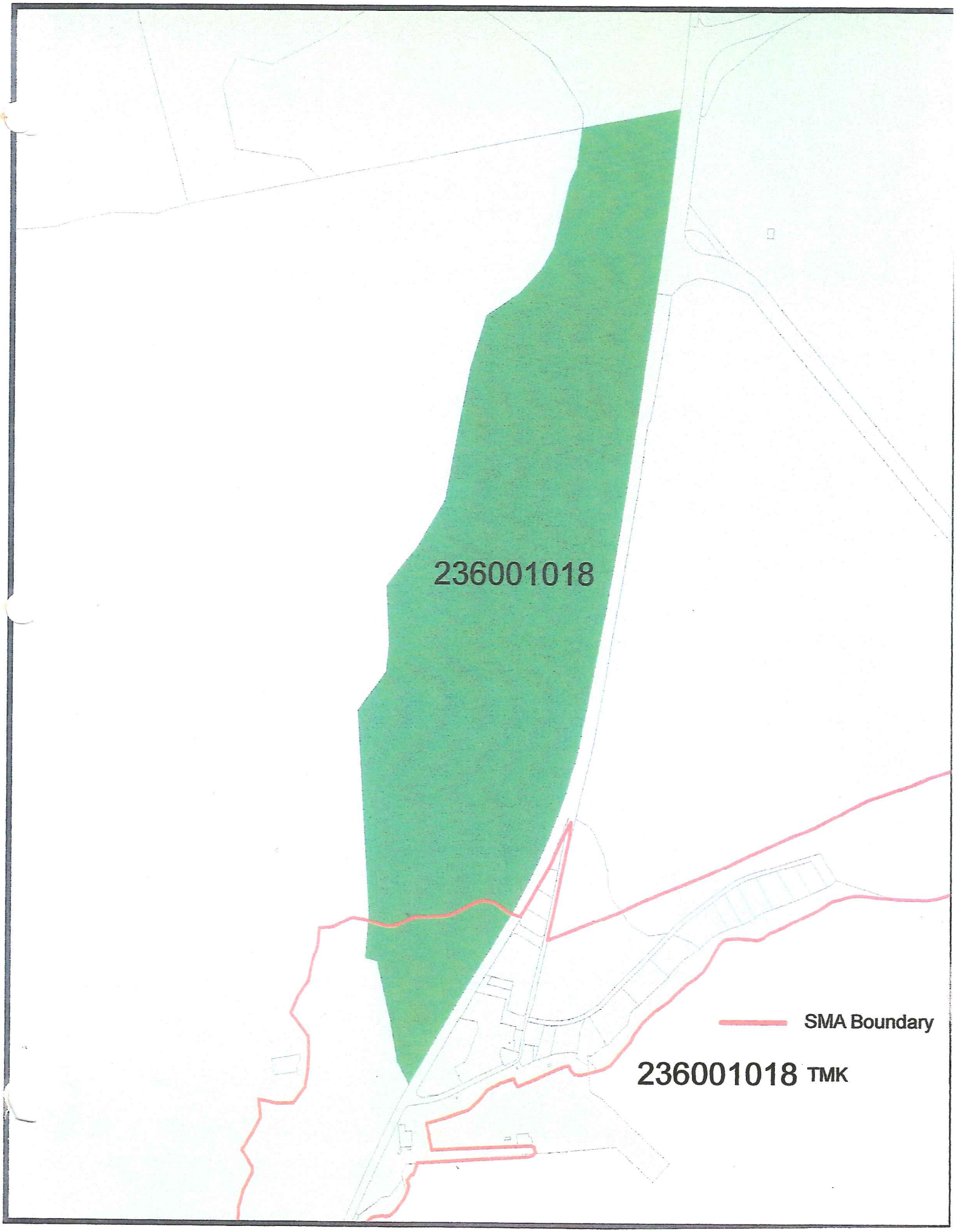
REVIEWED & CONFIRMED BY:

(SB) _____ (Signature) 10/2/14 _____ (Date)

For: John S. Rapacz, Planning Program Administrator, Zoning Administration and Enforcement Division

Appendix V

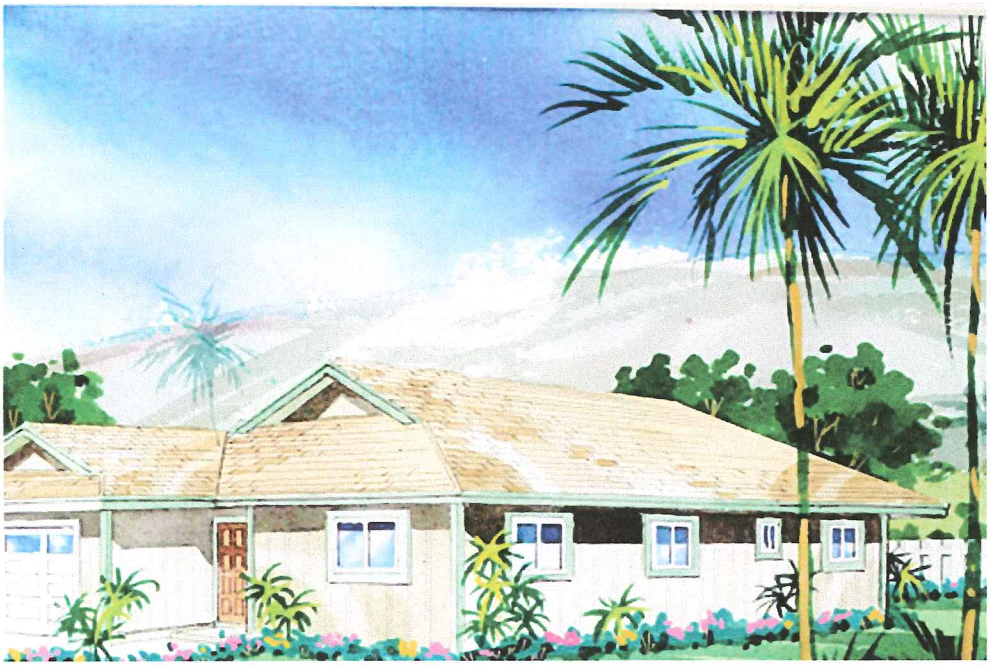
Special Management Area (SMA) Map

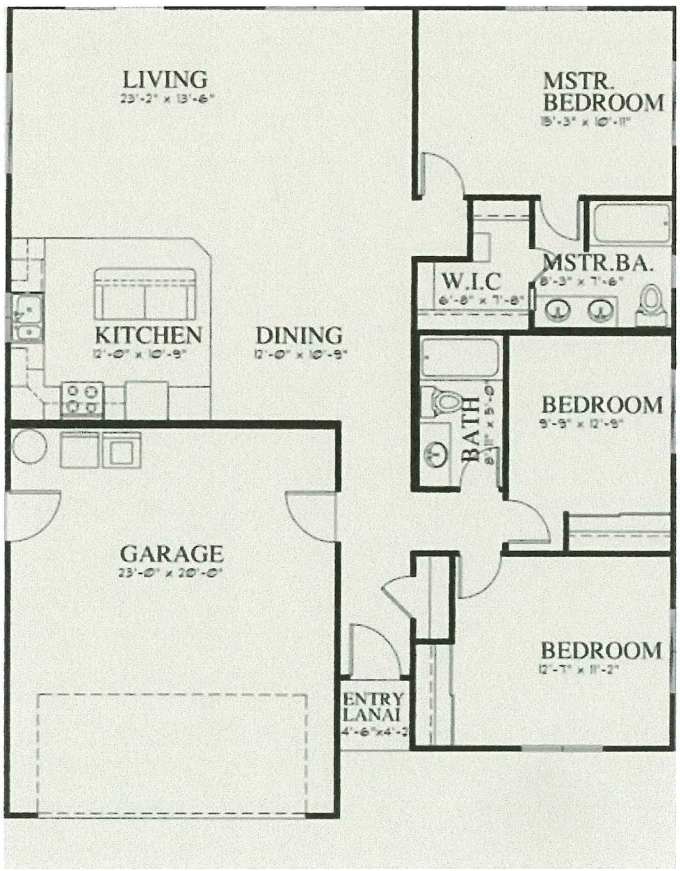

236001018
SMA Boundary
236001018 TMK

Appendix W

Ma`alaea Plantation Home Models

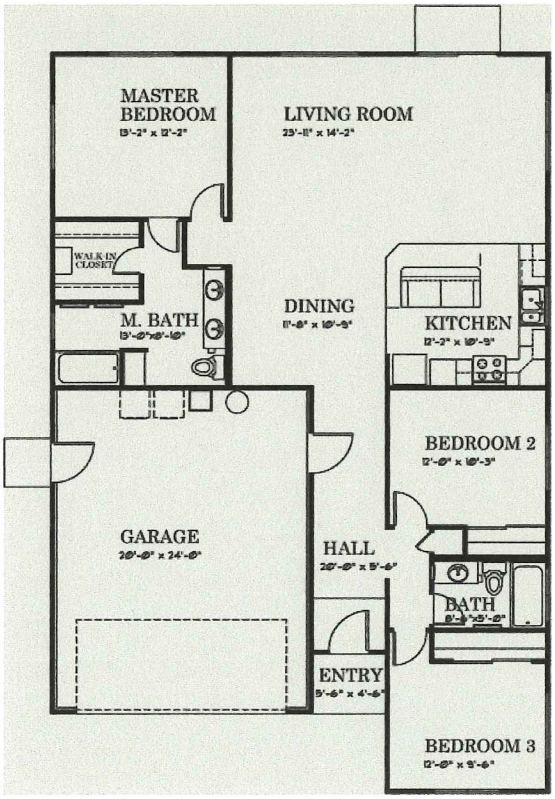
Ma`alaea Plantation – Model No. 1





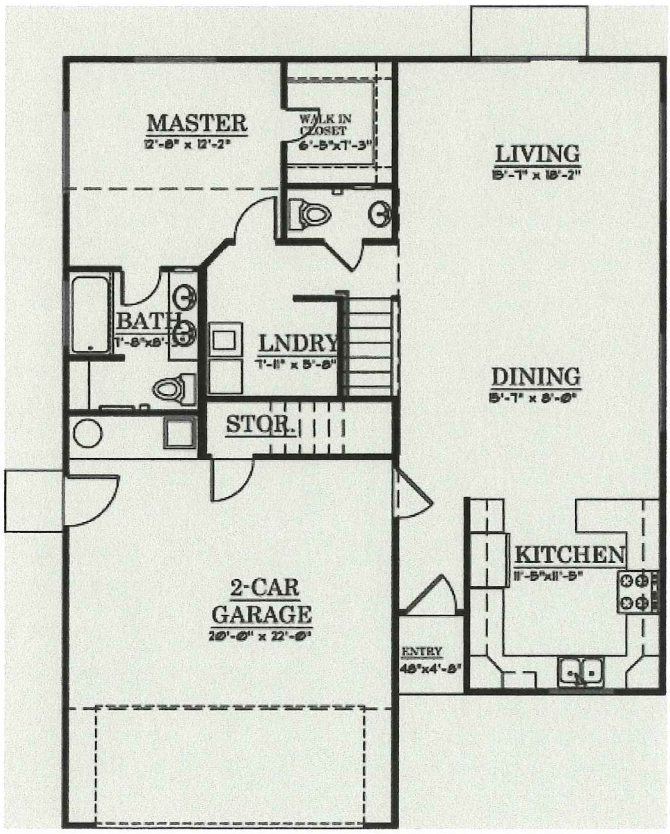
Dwelling: 1361 SF, Garage: 460 SF, Covered Entry: 19 SF TOTAL SF: 1840

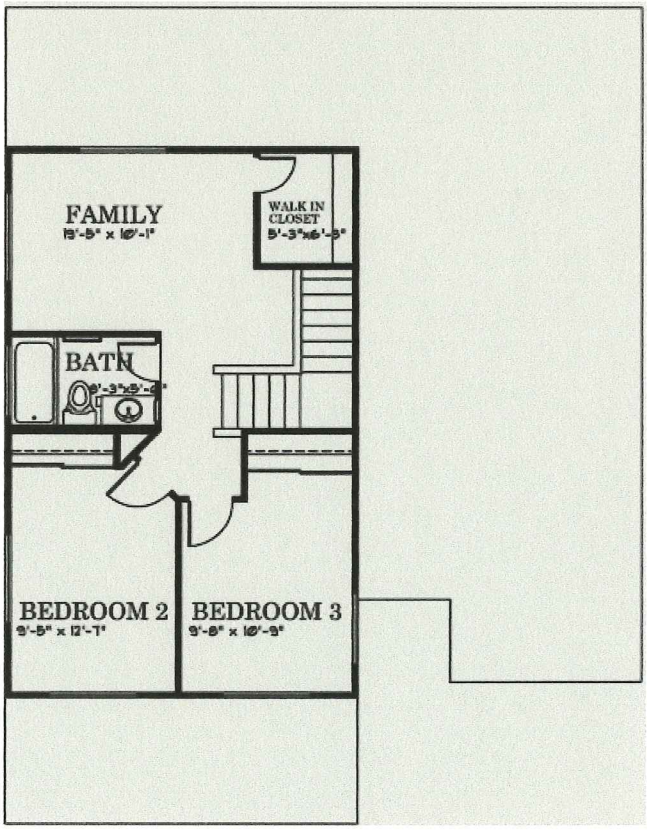
Ma`alaea Plantation – Model No. 2



Dwelling: 1454 SF, Garage: 496 SF, Covered Entry: 25 SF TOTAL SF: 1975

Ma`alaea Plantation – Model No. 3

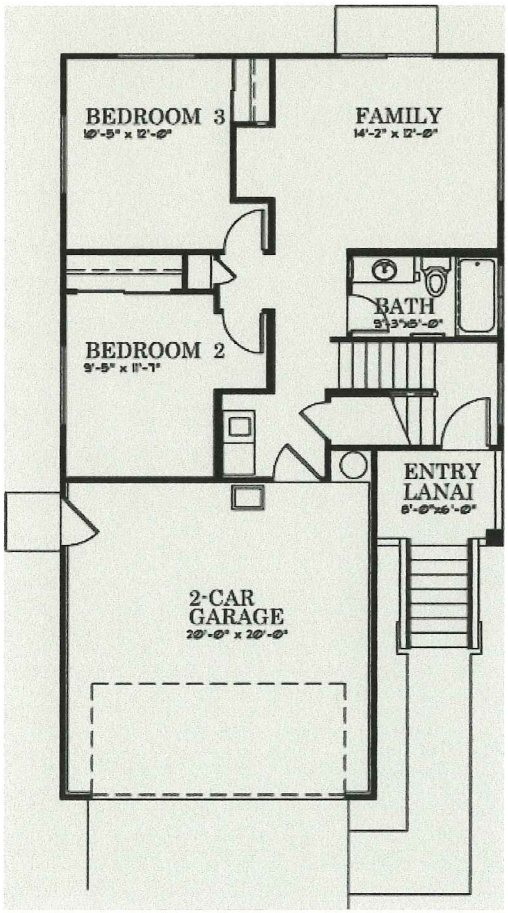




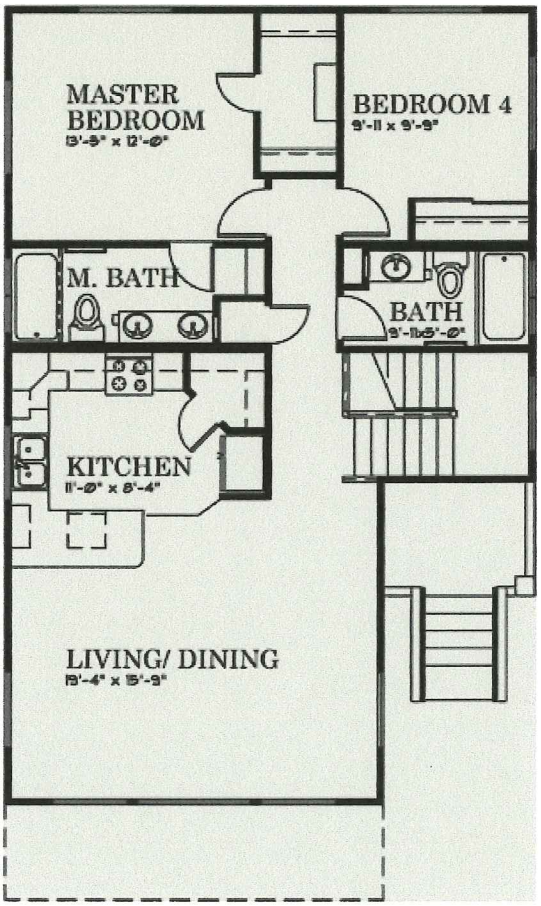
First Floor **Second Floor**

Dwelling: 1623 SF, Garage: 500 SF, Covered Entry: 19 SF TOTAL SF: 2184

Ma`alaea Plantation – Model No. 4



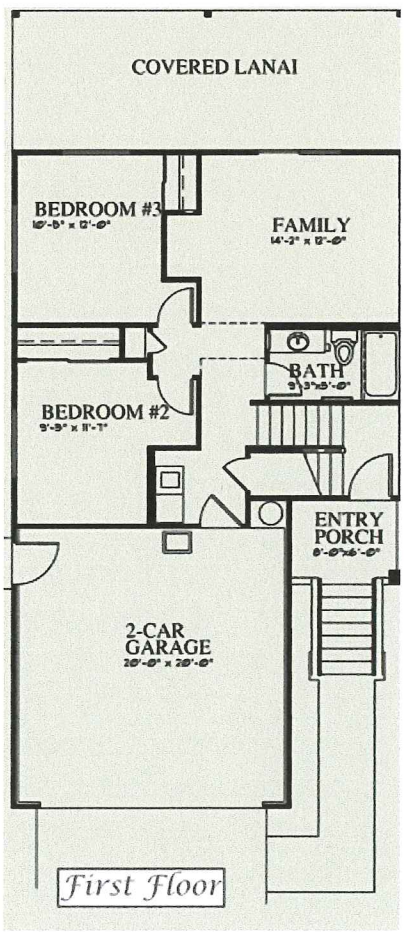
First Floor

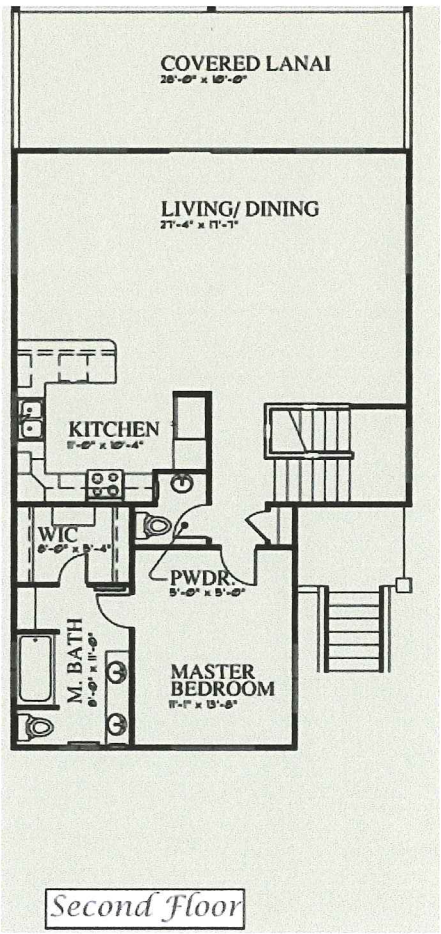


Second Floor

Dwelling: 1811 SF, Garage: 406 SF, Covered Entry: 46 SF TOTAL SF: 2263

Ma`alaea Plantation – Model No. 5





Dwelling: 1811 SF, Garage: 406 SF, Covered Entry: 46 SF, Covered Lanai: 560 SF TOTAL SF: 2823