JAMES "KIMO" APANA
Mayor

JOHN E. MIN
Director

CLAYTON I. YOSHIDA
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

July 10, 2000

Ms. Genevieve Salmonson, Director
Office of Environmental Quality Control (OEQC)
235 South Beretania Street, Suite 702
Honolulu, Hawaii 96813

Dear Ms. Salmonson:

RE: Final Environmental Assessment (EA) - Finding of No Significant Impact (FONSI) for Kealii Subdivision, Tax Map Key: 3-9-018:001, Kihei, Island of Maui, Hawaii (EA 2000/0004)

The Maui Planning Department (Department) has reviewed the comments received during the 30-day public comment period which began on March 23, 2000. The Department has determined that this project will not have any significant environmental effects and has issued a FONSI. Please publish this notice in the July 23, 2000 OEQC Environmental Bulletin.

The Department received one comment letter from the Environmental Center, University of Hawaii at Manoa. The Applicant has adequately addressed all of the issues raised by the Environmental Center and by the Planning Department in the Final EA.

The Department has enclosed a completed OEQC Publication Form and four copies of the Final EA. Please call Ms. Julie Higa, Staff Planner, of this office at 270-7814 if you have any questions.

Very truly yours,

JOHN E. MIN
Planning Director

250 SOUTH HIGH STREET, WAILUKU, MAUI, HAWAII 96793
PLANNING DIVISION (808) 270-7735; ZONING DIVISION (808) 270-7253; FACSIMILE (808) 270-7634

80

JEM:JH:cmb
Enclosures
c: Clayton Yoshida, AICP, Deputy Director of Planning
Alan Unemori, Warren S. Unemori Engineering, Inc.
Julie Higa, Staff Planner
Project File
General File
S:\ALL\JULIE\KEALII.SM1\OEQCFIN.EA.wpd

to keep the post development flow equal to or less than the current runoff from the project site. The park site will be bermed at the perimeter to serve as a detention basin. The release line from the subsurface facility will be sized to limit the release into the channel equal to or less than current runoff volumes from the entire project site. The park area itself will be fully grassed, provided with a sprinkler system to keep it usable as a mini-park, except during periods of heavy and prolonged rainstorms.

The existing drainage channel bisecting the project site will be retained and designed to accommodate 1082 cfs of flow from a 100-year storm. Side slopes outside the 100 year flood inundation limits will be reshaped utilizing rocky material from rock excavation on site. The existing 48-inch culvert on Kanakanui Road will be replaced with a larger culvert to handle the total offsite runoff for a 50-year recurrence storm, which is the same criteria used for Piilani Highway.

3.4 Roadway

The present 40-foot right-of-way for Ke Alii Alanui will be widened by 24 to 64 feet. The pavement along the project frontage will also be widened by 24 feet to provide three (3) 12-foot lanes (including a turn lane) and two 6-foot bike lanes (including gutter) and 8-foot shoulders. Curb, gutter, and a 4-foot sidewalk will also be added on the north side of Ke Alii Alanui.

Kanakanui Road will also be widened along the project frontage. Curb and gutter and a four-feet wide sidewalk will also be added along the project frontage.

In addition to the above the developer will be dedicating a 22-feet wide strip of land along the makai or westerly boundary of the project site for a future two lane road with bike lanes. None of the subdivision streets will be connected to this future road.

Access to the project site will be provided from Kanakanui Road and Ke Alii Alanui. Left turn storage lanes will be provided at these two access points. These two subdivision streets will be interconnected near the northwest corner of the project forming a continuous loop. Subdivision streets will have a right-of-way of 44 feet with a curb to curb travelway of 28 feet (including gutter) and eight (8) foot shoulders on both sides. A four feet wide sidewalk will be installed on one side.

3.5 Electricity/Telephone/CATV

These facilities will be installed underground and extended into the subdivision along the shoulders of the subdivision streets. Street lights will also be installed along the subdivision streets at intervals deemed appropriate by the electrical engineer and the County.

4.0 CONCLUSION

Based on the foregoing, it is our professional opinion that project-related impacts on existing infrastructure will be minimal and can be readily mitigated with the installation of improvements proposed.

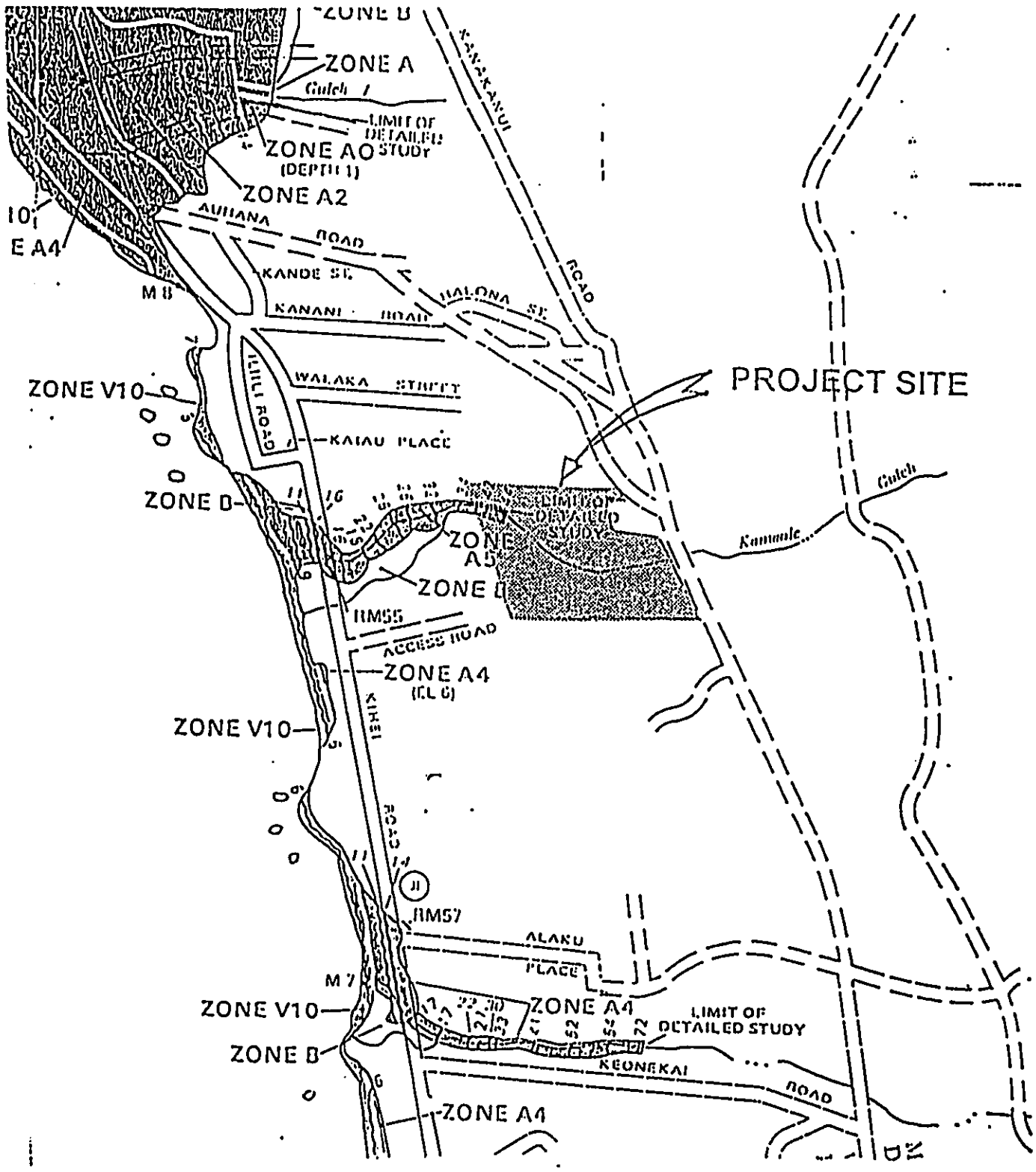


EXHIBIT "A"

FLOOD INSURANCE RATE MAP

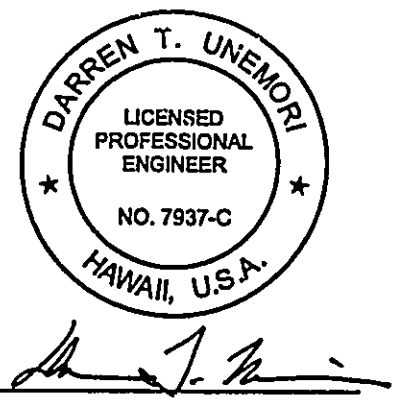
Established 1969

Drainage Report

KE ALI'I SUBDIVISION

Kihei, Maui, Hawaii
TMK: (2) 3-9-18: 01

Prepared For: Spencer Homes
4372 W. Waiola St.
Kihei, Maui, HI 96753



Date: April, 2000
Revised: June, 2000

WARREN S. UNEMORI ENGINEERING, INC.
Civil and Structural Engineers - Land Surveyors
Wells Street Professional Center - Suite 403
2145 Wells Street
Wailuku, Maui, Hawaii 96793

V:\99054\drain001\cover002.crd

TABLE OF CONTENTS

Drainage Report
for
Ke Ali'i Subdivsion

I. INTRODUCTION

This report has been prepared to examine both the existing drainage conditions and the proposed drainage plan for the subject development.

II. PROPOSED PROJECT

A. Site Location:

The project site is located in Kihei, on the island of Maui, and in the State of Hawaii. It is situated approximately 200 feet west of Piilani Highway and approximately 1200 feet east of Kihei Road. Kanakanui Road and Ke Ali'i Alanui borders its easterly and southerly boundary, respectively. (see Exhibit 1).

The project site encompasses an area of approximately 24.09 acres.

B. Project Description:

The proposed plan for Ke Ali'i Subdivision is to develop the project site into a single family residential subdivision consisting of ninety-five (95) house lots with a minimum lot size of 7,500 sq. ft. Proposed improvements include asphalt paved roadways, concrete curb and gutter, concrete sidewalks and landscaping. Utility improvements will consist of underground sewer, drainage and water distribution systems and underground electrical, telephone and cable-television distribution systems.

II. EXISTING CONDITIONS:

A. Topography and Soil Conditions:

The project site is undeveloped and not being used for any particular purpose. The project site generally slopes from an elevation of approximately (+) 112± feet M.S.L. to approximately (+) 56± feet M.S.L. in an easterly to westerly direction.

According to the *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* [1], prepared by the United States Department of Agriculture, Soil Conservation Service, the soil classification found on the project site is the Puuone sand, 7 to 30 percent slopes (PZUE). The Puuone sand is characterized as having rapid permeability and slow runoff. (see Exhibit 2).

B. Drainage:

According to our calculations, approximately 21 cfs of onsite surface runoff is currently being generated by the project site. This surface runoff sheet flows across the site in an easterly to westerly direction.

According to the "Hydrology Report for Piilani Highway" prepared by Trans-Meridian Engineers and Surveyors, Inc., three (3) offsite drainage basins (basins 21, 22 and 22A) flow into the project site by means of existing culverts crossing under Piilani Highway. This offsite runoff is conveyed to the project site by means of an existing 48-inch drainage culvert located along the easterly portion of the project site which crosses under Kanakanui Road. The offsite surface runoff is then discharged into an existing natural drainageway which bisects the project site in an easterly to westerly direction and conveys the offsite and onsite runoff downstream near the

Maui Coast Hotel. From there, existing drainage culverts direct the surface runoff to Kihei Road via an existing natural drainageway and eventually into the ocean.

According to the "Hydrology Report for Piilani Highway", the 100-year recurrence interval 6-hour duration storm runoff for the offsite drainage basins 21 and 22, was computed to be 624 cfs and 585 cfs, respectively, for a total runoff volume of 1,209 cfs. The 100-year recurrence interval 6-hour duration storm runoff for the offsite drainage basin 22A was computed to be 125 cfs. Using the NRCS (SCS) TR-20 Hydrograph Method for a 100 year-24 hour recurrence interval storm, our calculations indicate that for the same drainage basins, the total runoff was calculated to be approximately 1,082 cfs.

Presently, the existing drainage culverts which conveys offsite surface runoff under Piilani Highway has the required capacity to convey the designed surface runoff based on a 50-year 6-hour recurrence interval storm. However, the existing 48-inch drainage culvert crossing Kanakanui Road does not have adequate capacity for the total offsite surface runoff volume currently being conveyed to the existing natural drainageway.

C. Flood and Tsunami Zone:

According to Panel Number 150003 0265C of the Flood Insurance Rate Map [2], dated September 6, 1989, prepared by the United States Federal Emergency Management Agency, the majority of the project site is situated within Zone C, which is designated as an area subject to minimal flooding. A small portion of the project site located on the northwesterly boundary is situated in Zone A5, where

areas of 100-yr. flood, base flood elevations and flood hazard factors have been determined. All habitable structures within Zone A5 will be built above the designated flood elevation. (See Exhibit 3).

IV. DRAINAGE PLAN

A. General:

The design criteria that will be utilized to minimize the impact of increased surface runoff on the existing downstream properties are as follows:

a. There will be no significant change to the natural drainage pattern of the project site. The natural shape and slope of the location of the existing natural drainageway will be maintained and will continue to direct onsite and offsite surface runoff to the adjoining downstream properties, as it is presently doing.

b. It is expected that an increase in onsite surface runoff will be generated due to the proposed development. As part of our design criteria, a subsurface drainage system will be constructed which will allow for the control of the volume of discharged runoff such that the post-development surface runoff volume will not exceed the pre-development surface runoff volume.

According to our calculations, the post development runoff from the project site is expected to be approximately 44 cfs for a 50 year recurrence interval - 1 hour duration storm. Therefore, a net increase of approximately 23 cfs is expected to be generated by the development of the project site. The majority of the surface runoff

will be intercepted by new curb inlet type catch basins and then conveyed by means of an underground drainage system into a subsurface detention facility located within the proposed park site for the project. This subsurface system which consists of a large diameter perforated pipe, will be designed to accommodate the increase in surface runoff volume while allowing a small diameter pipe to release the pre-development surface runoff volume into the existing natural drainageway located within the project site. The park site which will be bermed at the perimeter and fully grassed with an irrigation system will also serve as a detention basin during periods of heavy and prolonged rainstorms. The remaining onsite surface runoff will be intercepted by new curb inlet type catch basins and conveyed by means of a new underground drainage system to an outlet located within the existing natural drainageway.

The existing natural drainageway bisecting the project site will be preserved as a drainageway. The approximate location of the 100-year flood inundation limits was determined by using the US Army Corps of Engineers HEC-RAS River Analysis System software while using the design flow as calculated in the "Hydrology Report for Piilani Highway". It is expected that fill material will be placed at or beyond the edge of the 100-year flood inundation limits so as not to disturb the natural stream bed. A drainage easement will be created to encompass the 100-year flood inundation limits based on the design flow of 1,334 cfs as calculated by the "Hydrology Report for Piilani Highway" and 3,200 cfs as calculated by the Federal Emergency Management Agency (FEMA). The parcels beyond the drainage

easement will be graded such that there will be adequate freeboard to keep the lot elevation above the 100-year flood elevation.

As requested by the County of Maui Planning Department, the drainage culvert within the proposed subdivision will be designed to accommodate the storm runoff flow as determined by FEMA. As stated above, the design flow as calculated by FEMA for the existing natural drainageway is 3,200 cfs.

The existing 48-inch culvert crossing under Kanakanui Road will be replaced with a new multi barrel 78-inch culvert which will convey the design flow into the existing natural drainageway as calculated by the "Hydrology Report for Piilani Highway". The multi barrel 78-inch drainage culvert under Kanakanui Road will be designed to convey a design flow of 1,334 cfs as calculated in the "Hydrology Report for Piilani Highway".

B. Hydrologic Calculations:

The onsite hydrologic calculations are based on the "Rules for the Design of Storm Drainage Facilities in the County of Maui", Title MC-15, Chapter 4 and the "Rainfall Frequency Atlas of the Hawaiian Islands", Technical Paper No. 43, U. S. Department of Commerce, Weather Bureau.

Rational Formula used:

$$Q = CIA$$

Where
- Q = Rate of Flow (cfs)
- C = Runoff Coefficient
- I = Rainfall Intensity (inches/hour)
- A = Area (Acres)

The offsite hydrologic calculations are based on procedures by the U.S. Department of Agriculture, Soil Conservation Service (SCS). This procedure is described in detail in the SCS National Engineering Handbook, Section 4, Hydrology (NEH-4). The 100-year inundation limits was determined by using the US Army Corps of Engineers HEC-RAS River Analysis System Version 2.2 software.

C. Conclusion:

The proposed development is not expected to have a significant adverse effect on the existing downstream properties. This is accomplished by maintaining the natural drainage pattern of the onsite drainage areas. The anticipated increase in surface runoff volume will be temporarily stored in the subsurface system located in the park site so no increase in surface runoff volume is expected to be released downstream of the project site.

VII. REFERENCES

1. *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii.* August 1972. United States Department of Agriculture, Soil Conservation Service.

2. *Flood Insurance Rate Map, Maui County, Hawaii.* Community-Panel Number 150003 0265C. September 6, 1989. Federal Emergency Management Agency, Federal Insurance Administration.

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

4. *Rules for the Design of Storm Drainage Facilities in the County of Maui.* July 1995. Department of Public Works and Waste Management, County of Maui.

5. *Drainage Master Plan for Kihei, Maui, Hawaii.* September 1994. Norman Saito Engineering Consultants, Inc.

6. *Hydrology Report for Piilani Highway.* Trans-Meridian Engineers & Surveyors, Inc

7. *Flood Insurance Study, County of Maui.* August 3, 1998. Federal Emergency Management Agency.

EXHIBITS

1 Location Map

2 Soil Survey Map

3 Flood Insurance Rate Map

4 Pre-Development Onsite Drainage Area Map

5 Post-Development Onsite Drainage Area Map

6 Offsite Drainage Area Map

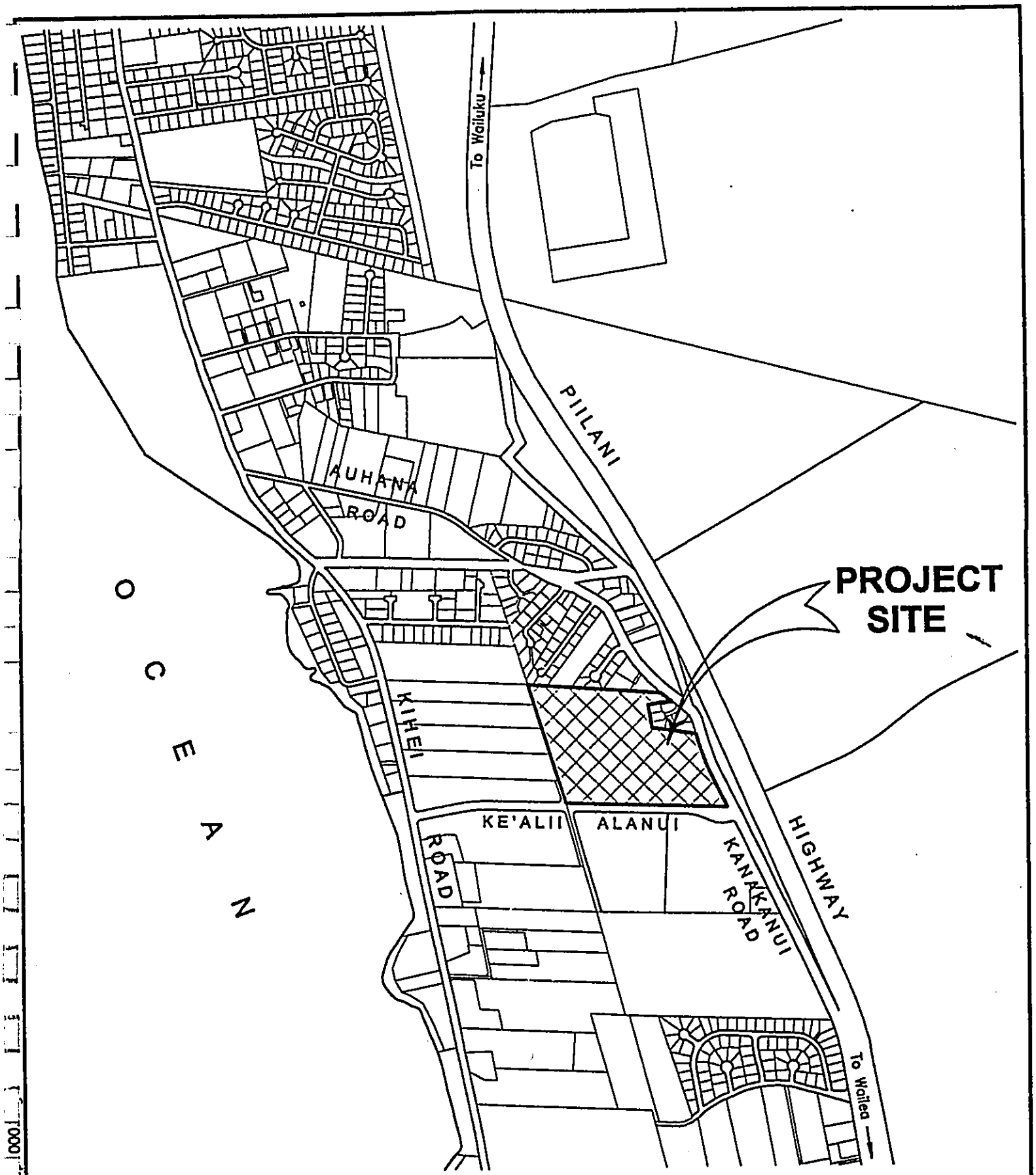


FIGURE 1
LOCATION MAP

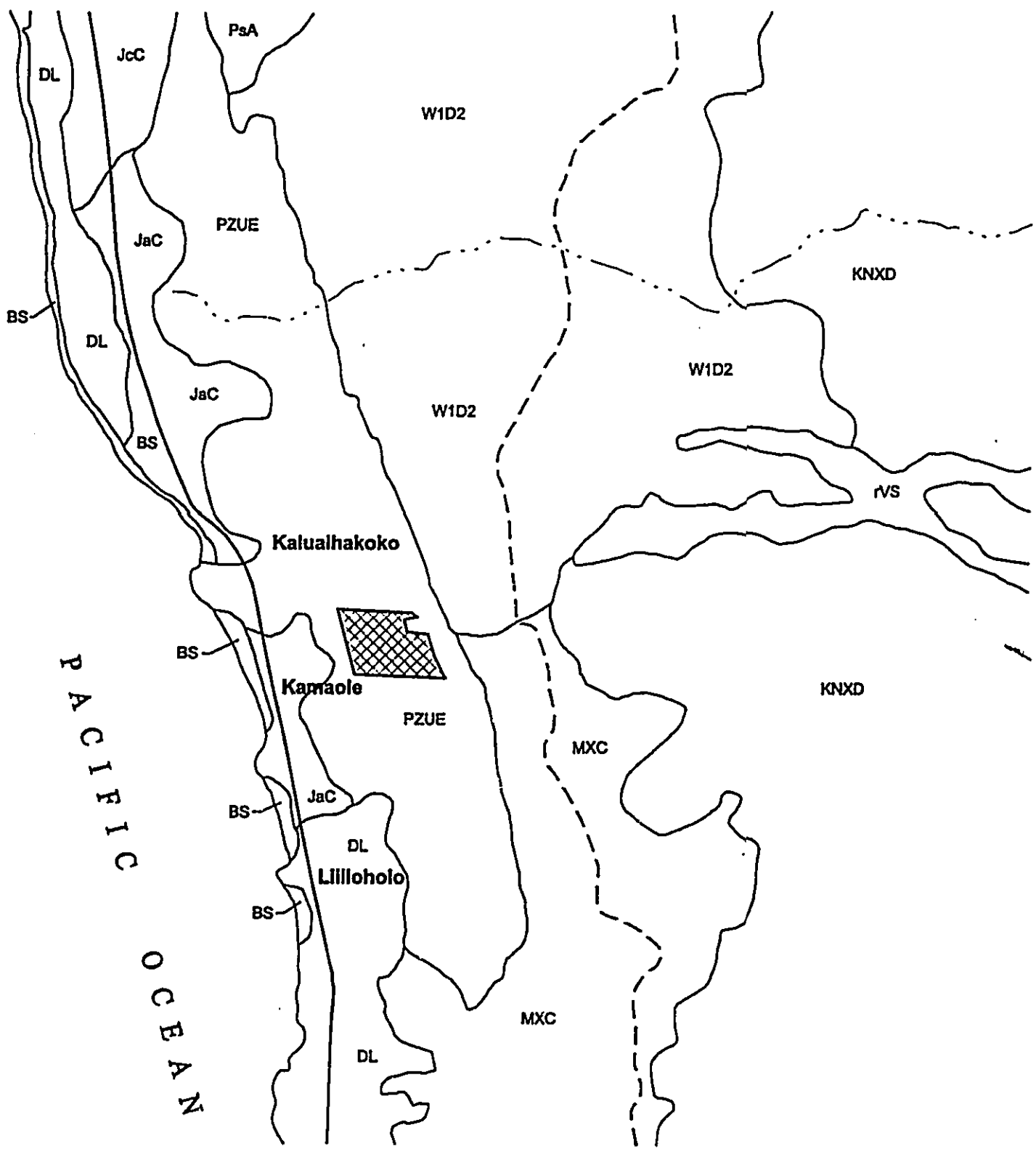
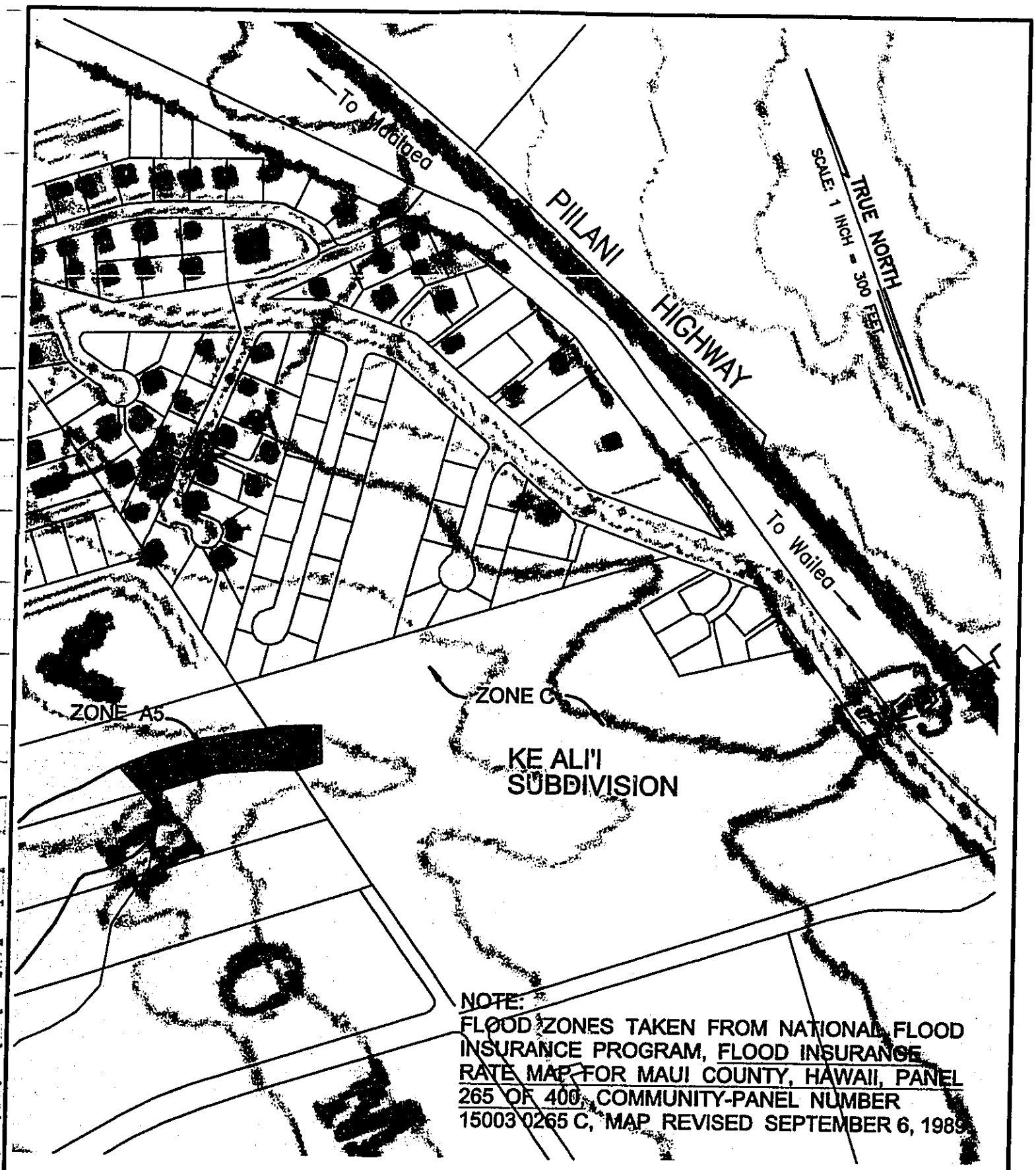


EXHIBIT 2

SITE SPECIFIC SOIL CLASSIFICATION MAP

WARREN S. UNEMORI ENGINEERING, INC.

February 29, 2000



NOTE:
FLOOD ZONES TAKEN FROM NATIONAL FLOOD INSURANCE PROGRAM, FLOOD INSURANCE RATE MAP FOR MAUI COUNTY, HAWAII, PANEL 265 OF 400, COMMUNITY-PANEL NUMBER 15003 0265 C, MAP REVISED SEPTEMBER 6, 1989.

EXHIBIT 3

FLOOD INSURANCE
RATE MAP

WARREN S. UNEMORI ENGINEERING, INC.

April 6, 2000

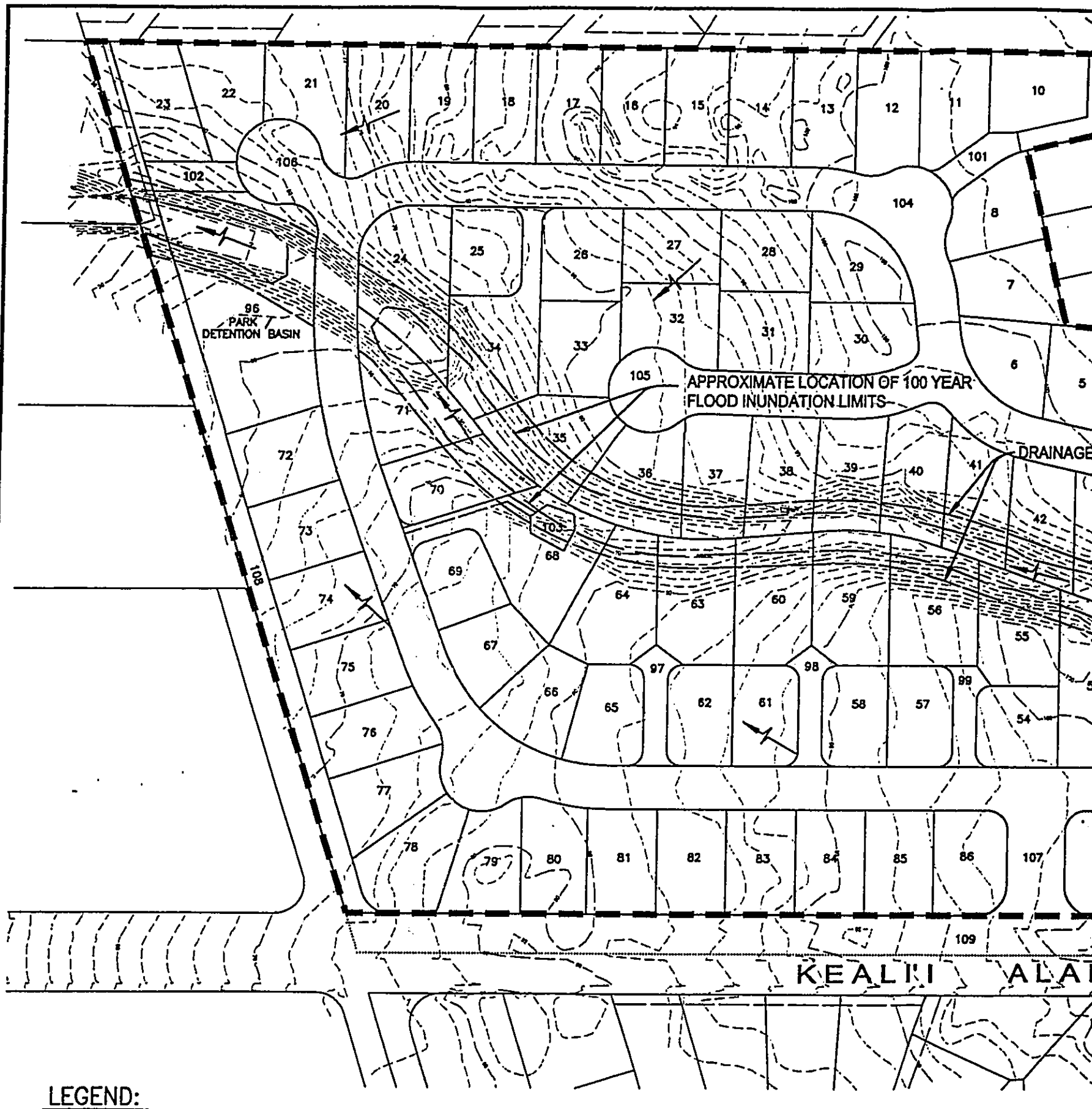


EXHIBIT 4

PRE - DEVELOPMENT ONSITE DRAINAGE

SCALE: 1 IN. = 120 FT.

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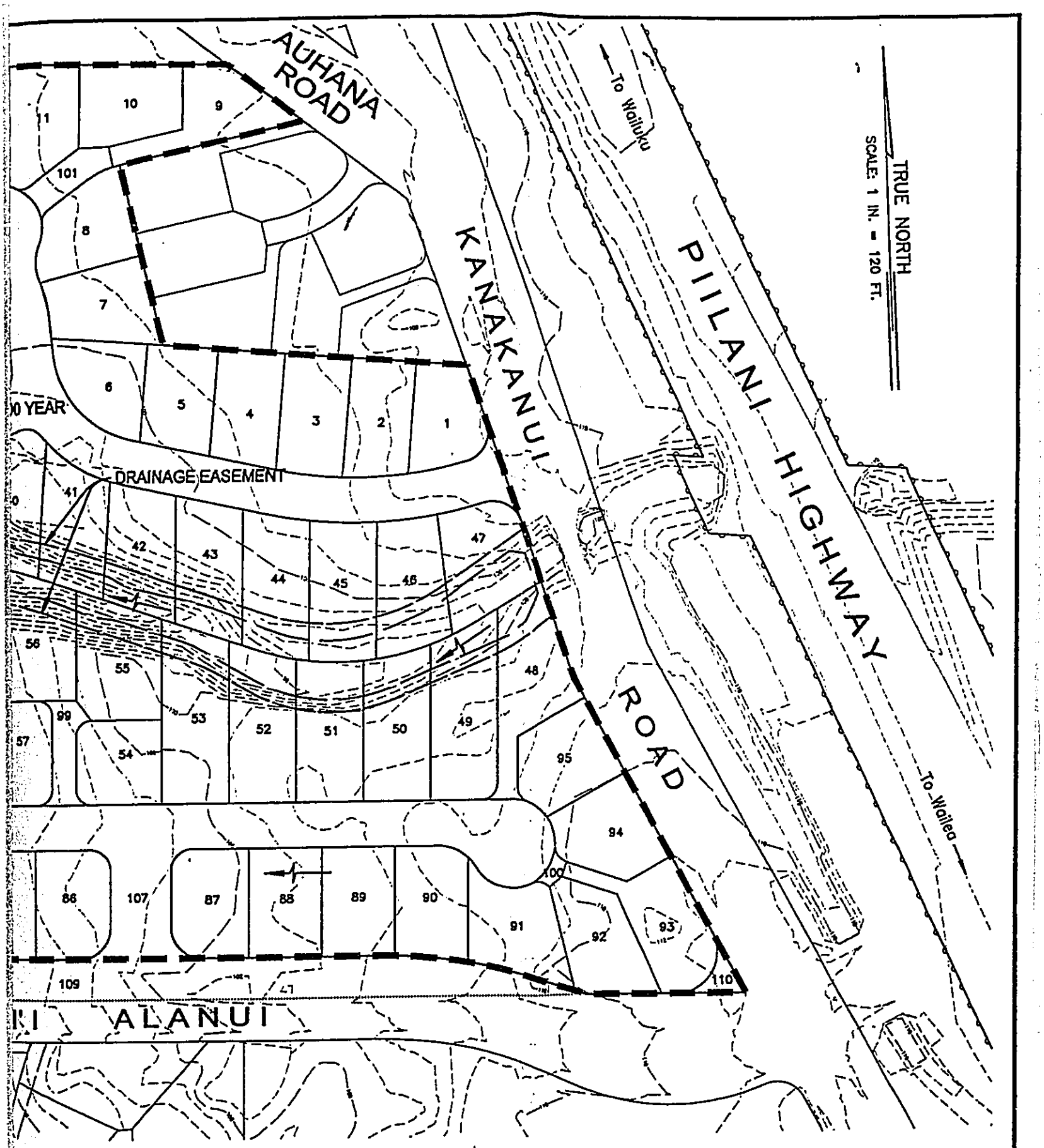

4

DRAINAGE AREA MAP

20 FT.

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

April 4, 2000

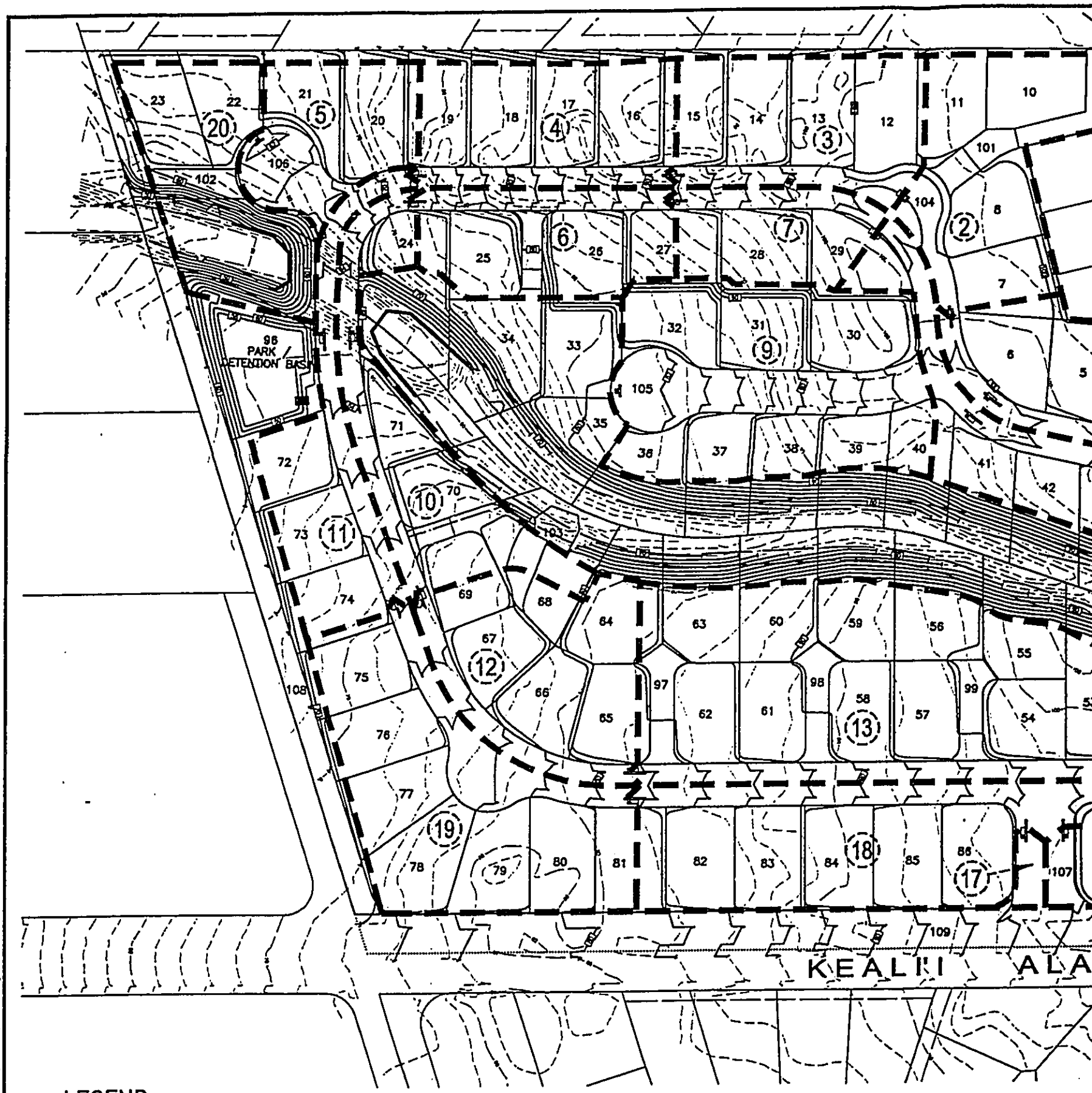

EXHIBIT 5

POST - DEVELOPMENT ONSITE DRAINAGE

SCALE: 1 IN. = 120 FT.

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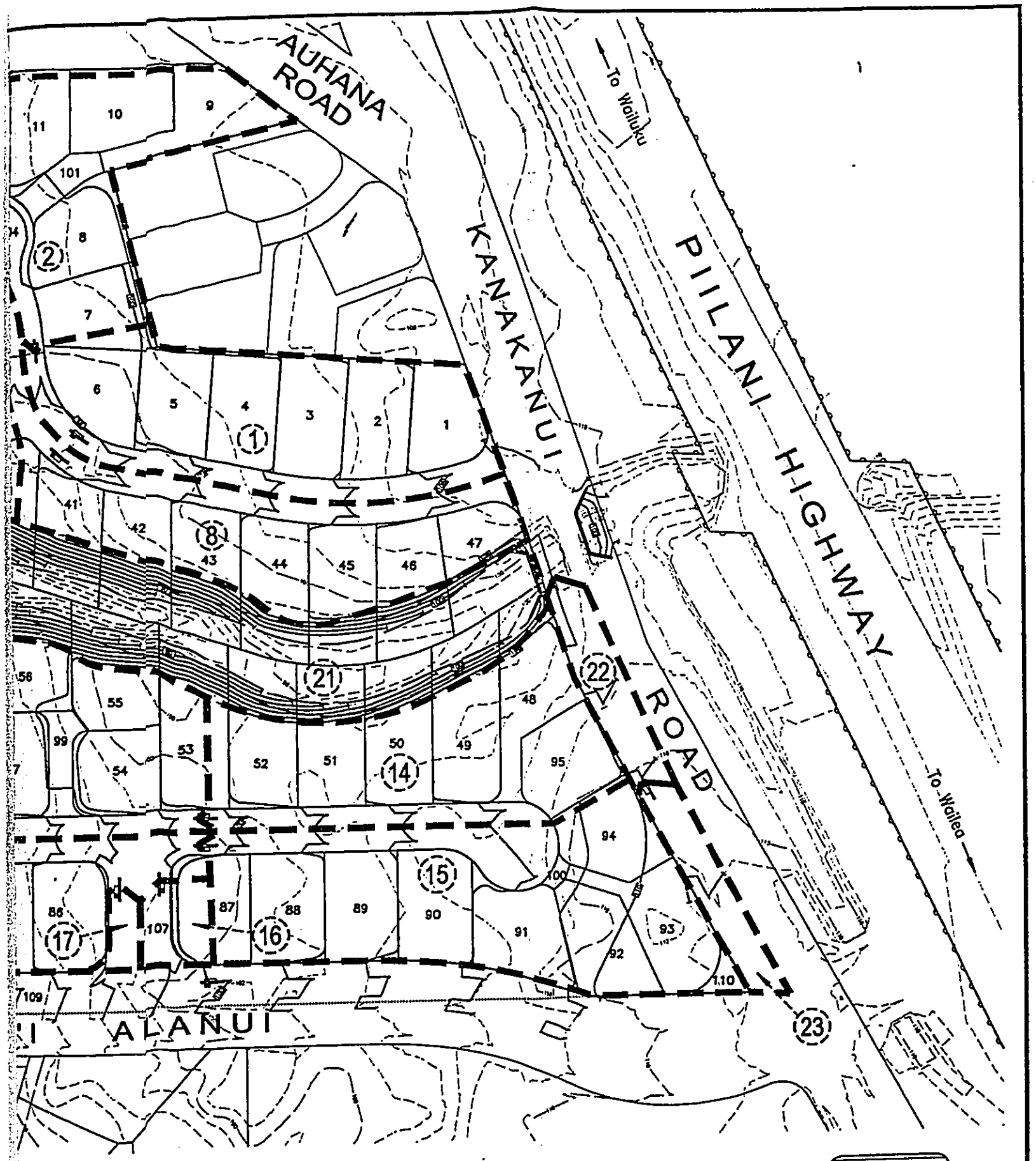


WARREN S. UNEMORI ENGINEERING, INC.

DRAINAGE AREA MAP

April 4, 2000

0 FT.

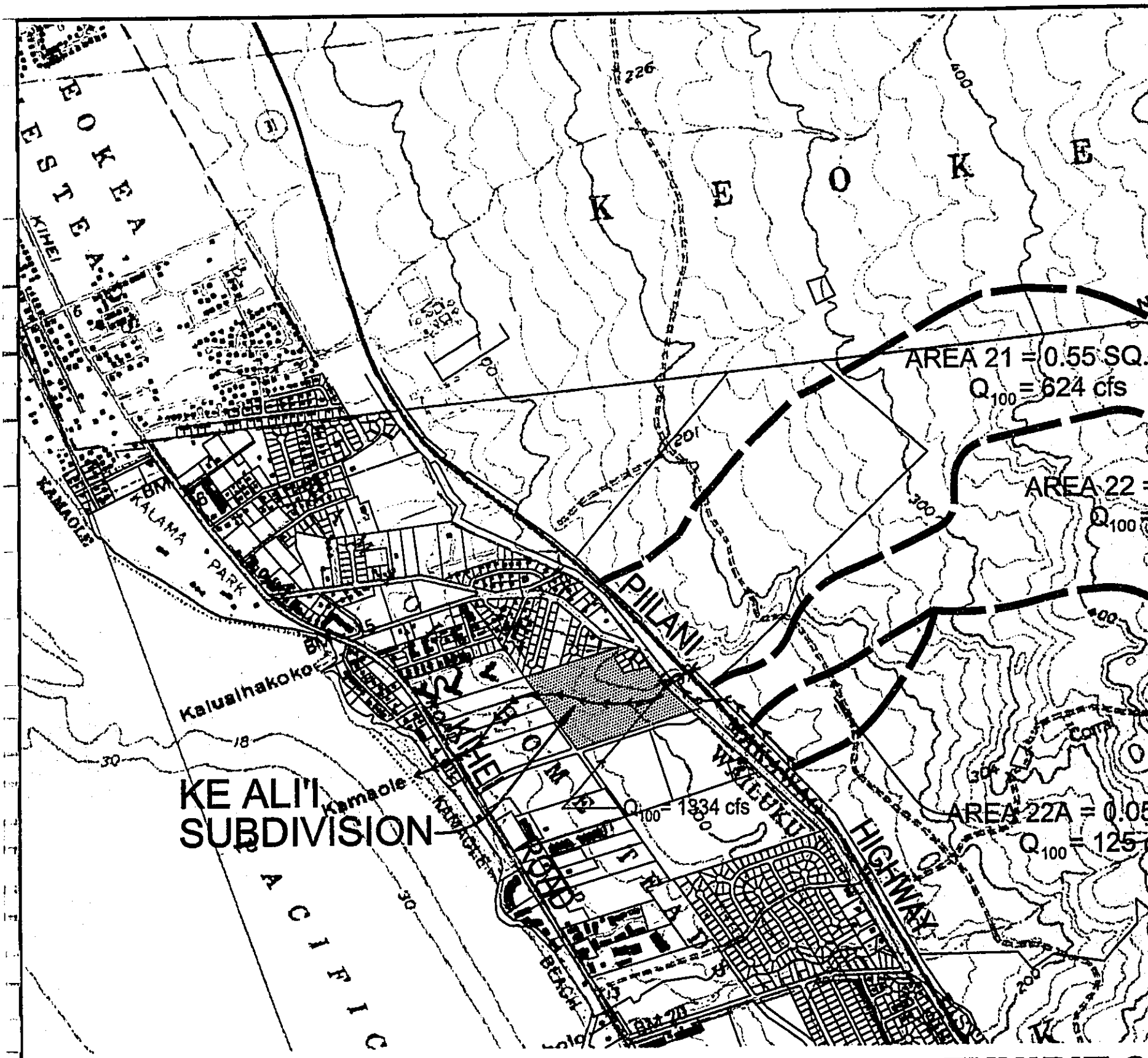


EXHIBIT 6

OFFSITE DRAINAGE AREAS ABOVE

SCALE: 1 IN. = 2500 F

LEGEND:

INFORMATION IN RED:

DRAINAGE INFORMATION TAKEN FROM HYDROLOGY REPORT FOR PIILANI HIGHWAY, ISLAND OF MAUI, PREPARED FOR THE STATE OF HAWAII DEPARTMENT OF TRANSPORTATION, HIGHWAYS DIVISION BY TRANSMERIDIAN ENGINEERS & SURVEYORS, INC., JANUARY 1978.

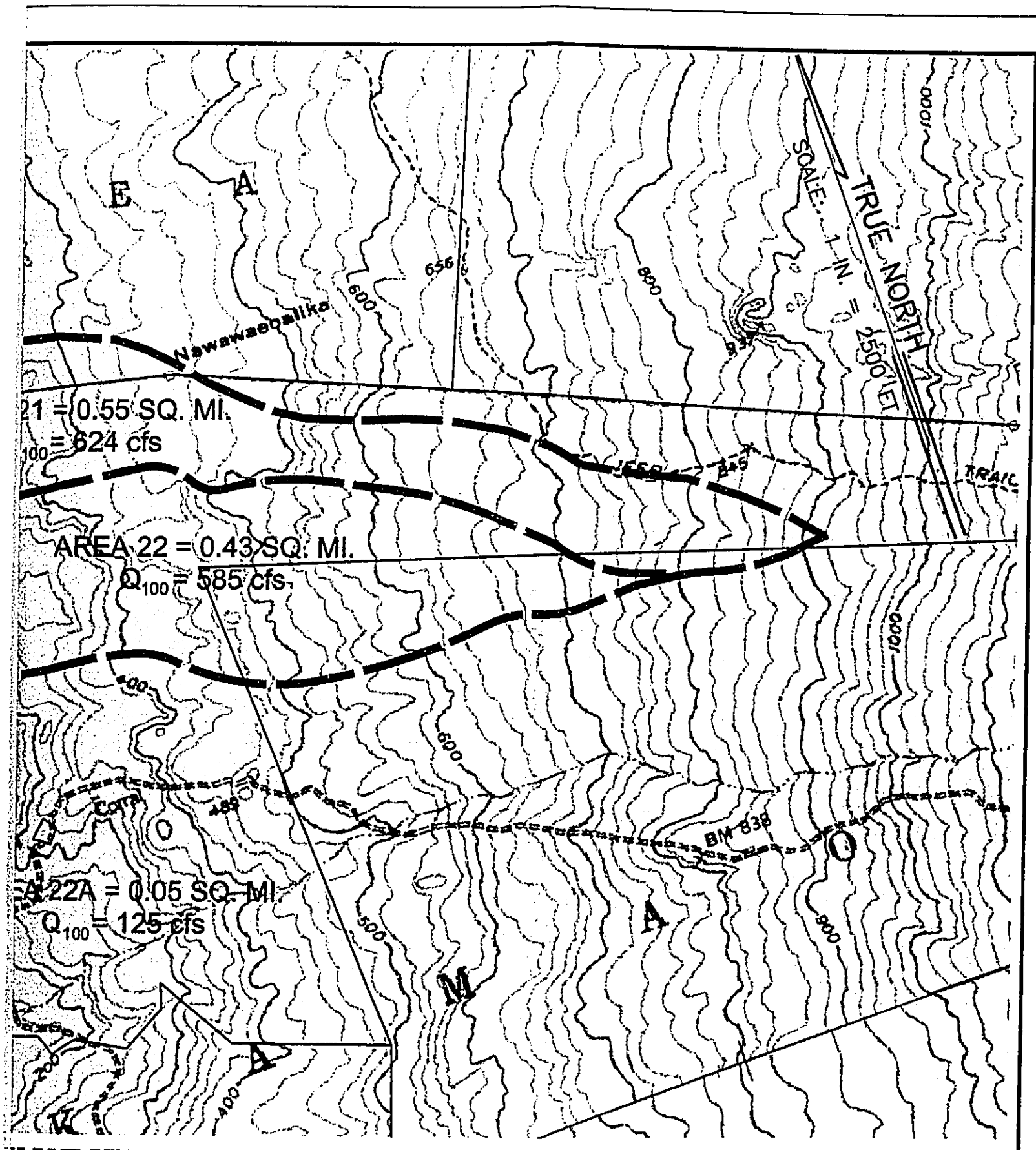


EXHIBIT 6

AREAS ABOVE KE ALI'I SUBDIVISION

SCALE: 1 IN. = 2500 FT.

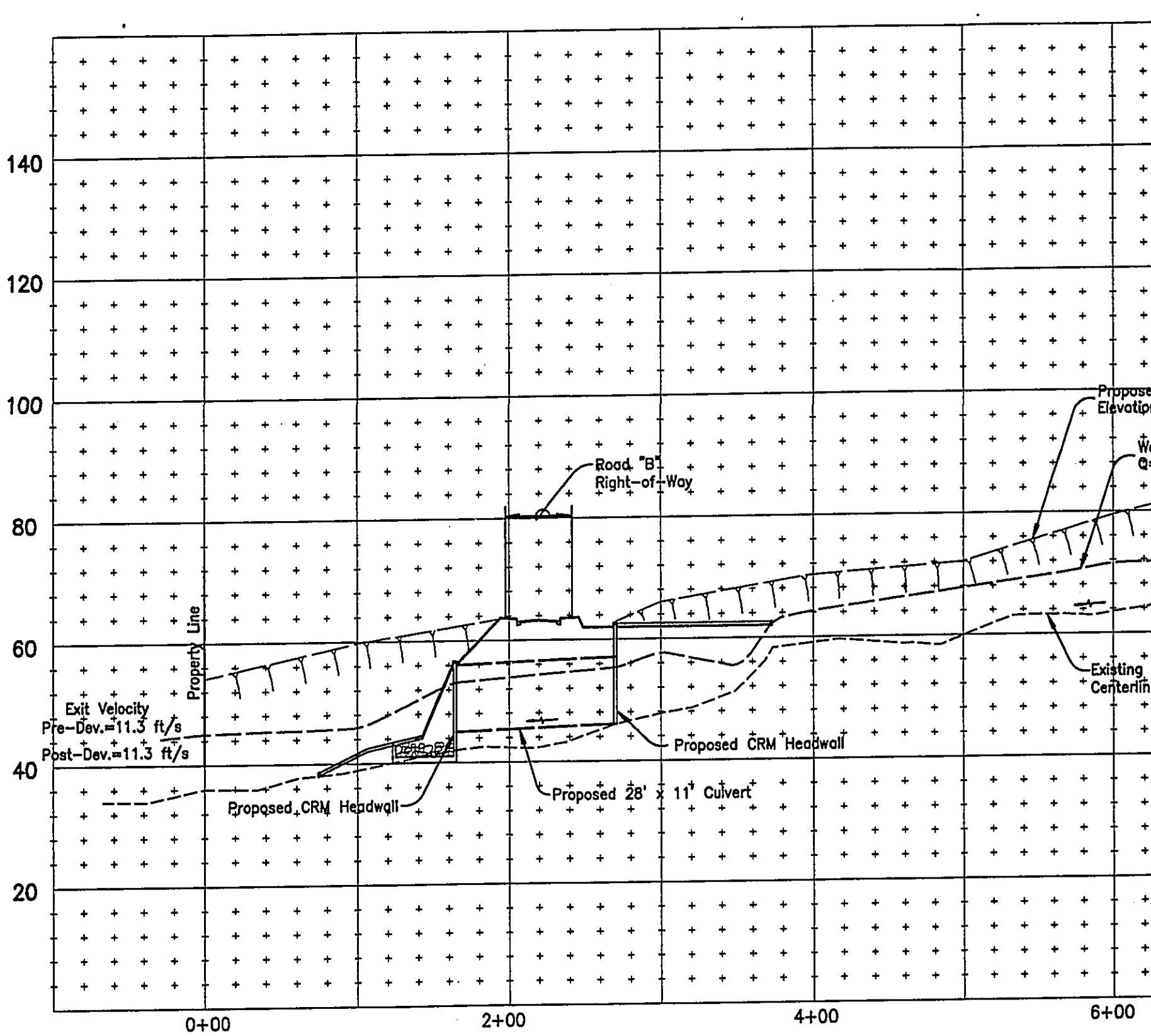
WAY,

TRANSPORTATION,

JANUARY 1978.

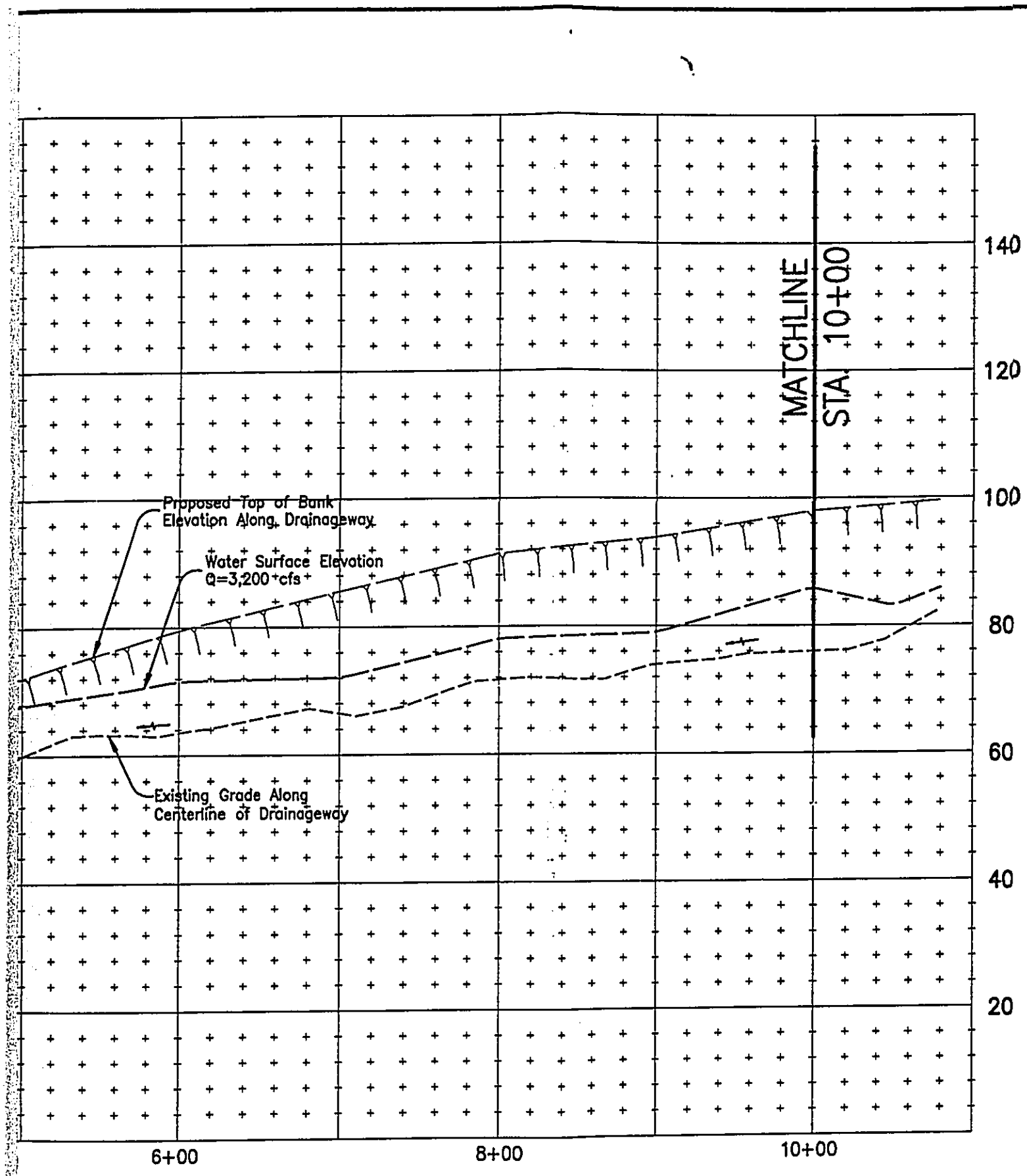
WARREN S. UNEMORI ENGINEERING, INC.

April 6, 2000



PROFILE – EXISTING DRAINAGE

Scale: Horiz. 1" = 80'
Vert. 1" = 20'



ING DRAINAGEWAY

1" = 80'
1" = 20'

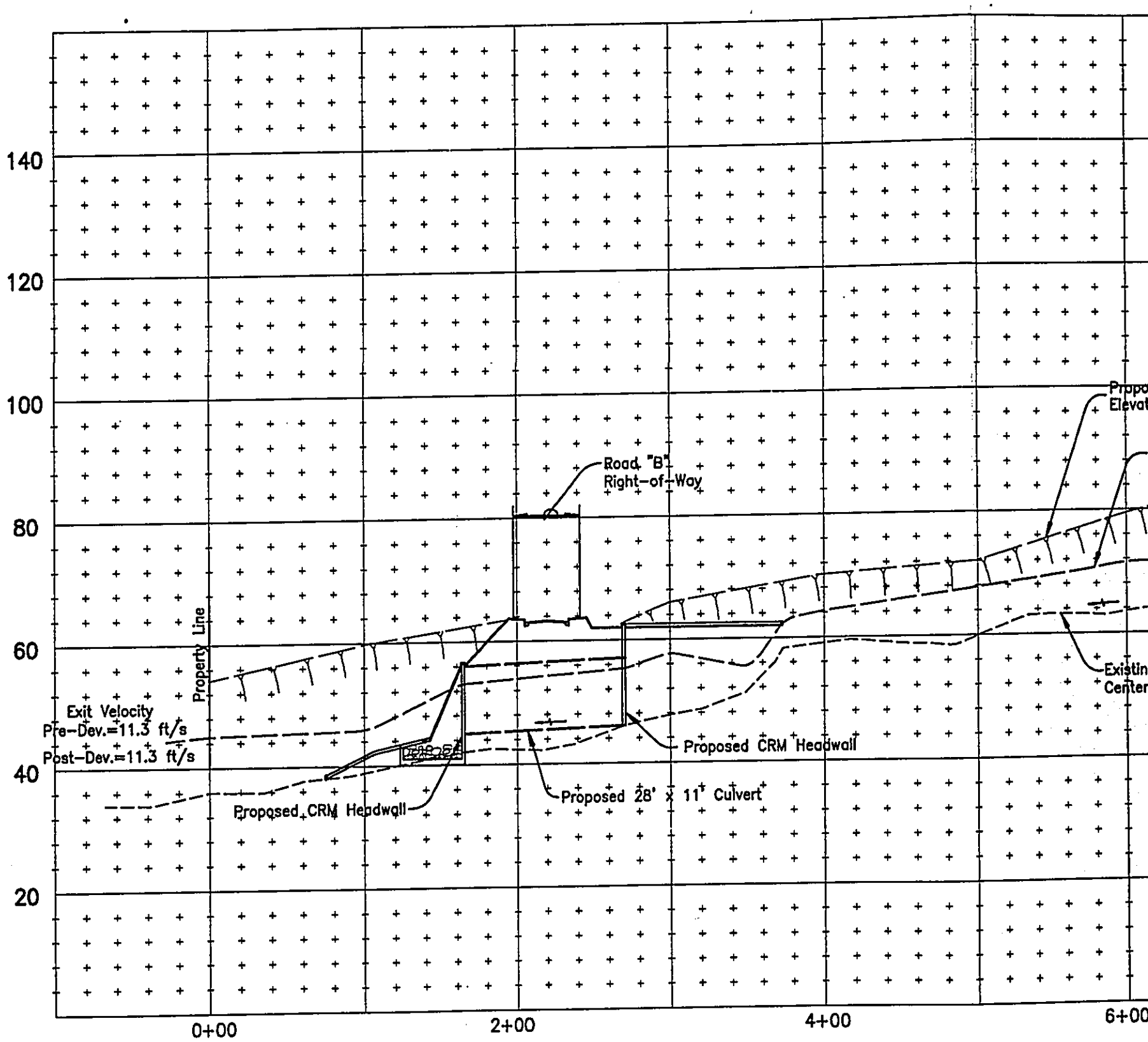
LEGEND:

Water Surface Elevation Q=3,200 cfs

Proposed Top of Bank Elevation Along Drainageway

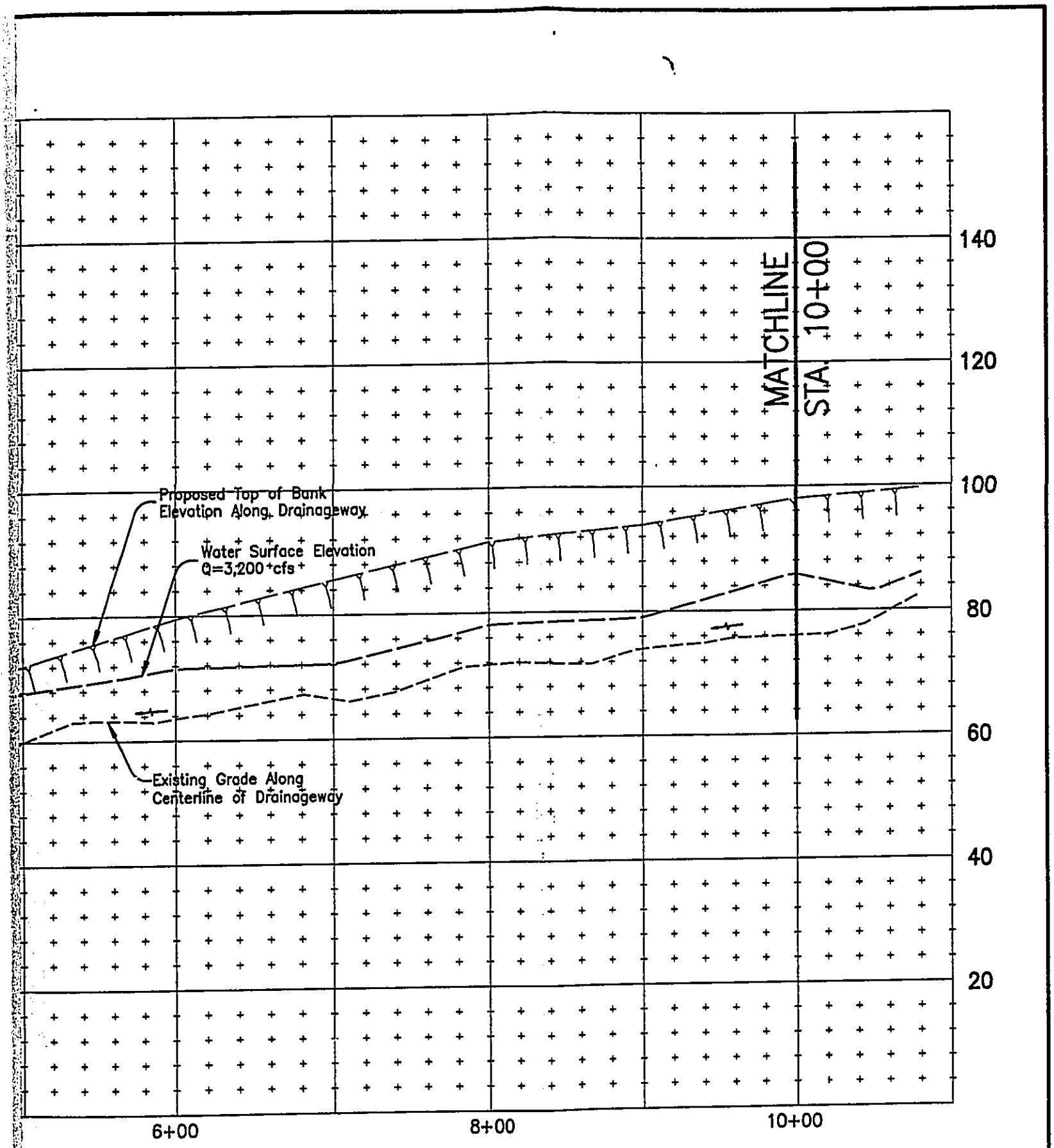
CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING



PROFILE – EXISTING DRAINA

Scale: Horiz. 1" = 80'
Vert. 1" = 20'



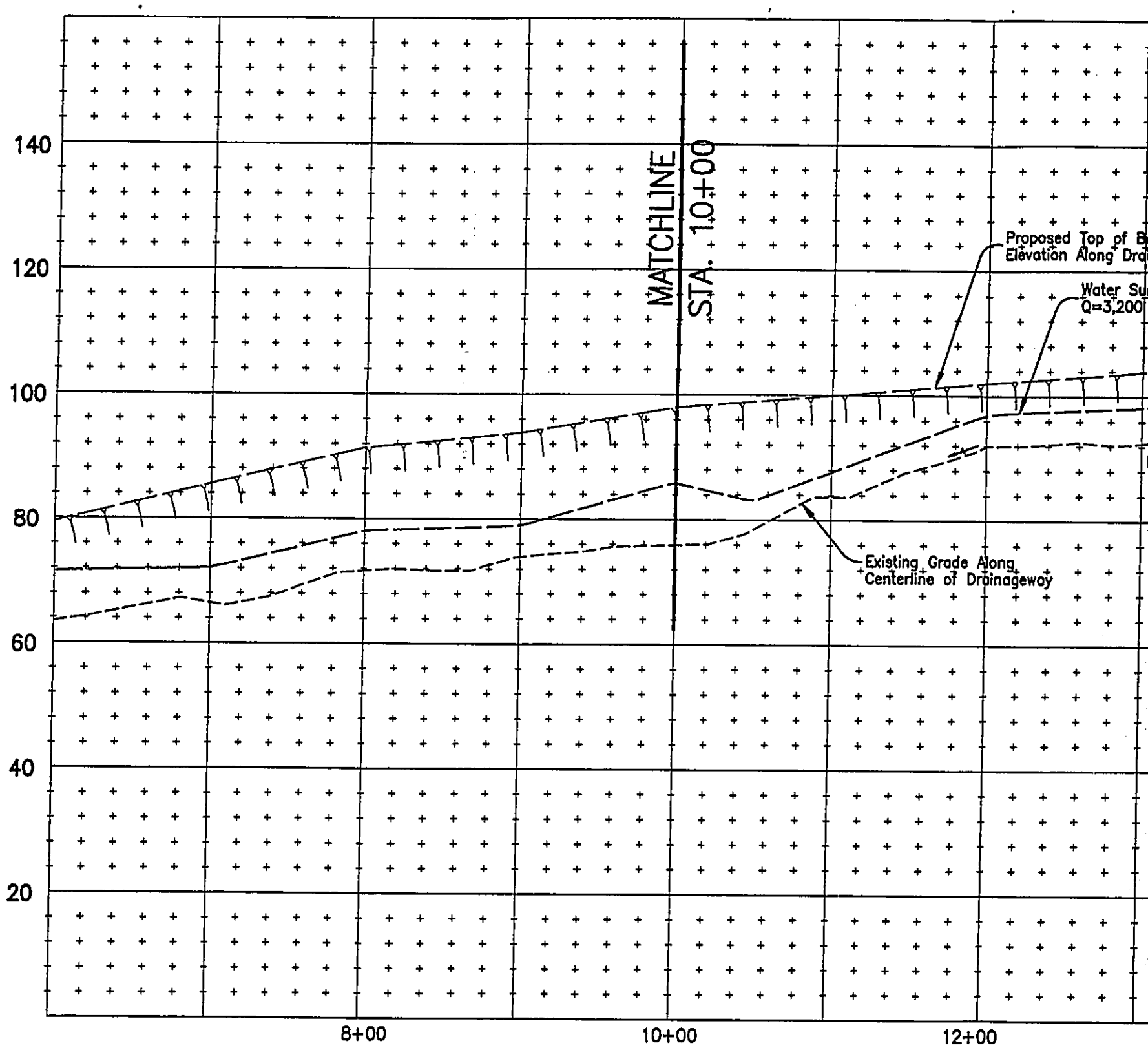
ING DRAINAGEWAY

1" = 80'
1" = 20'

LEGEND:

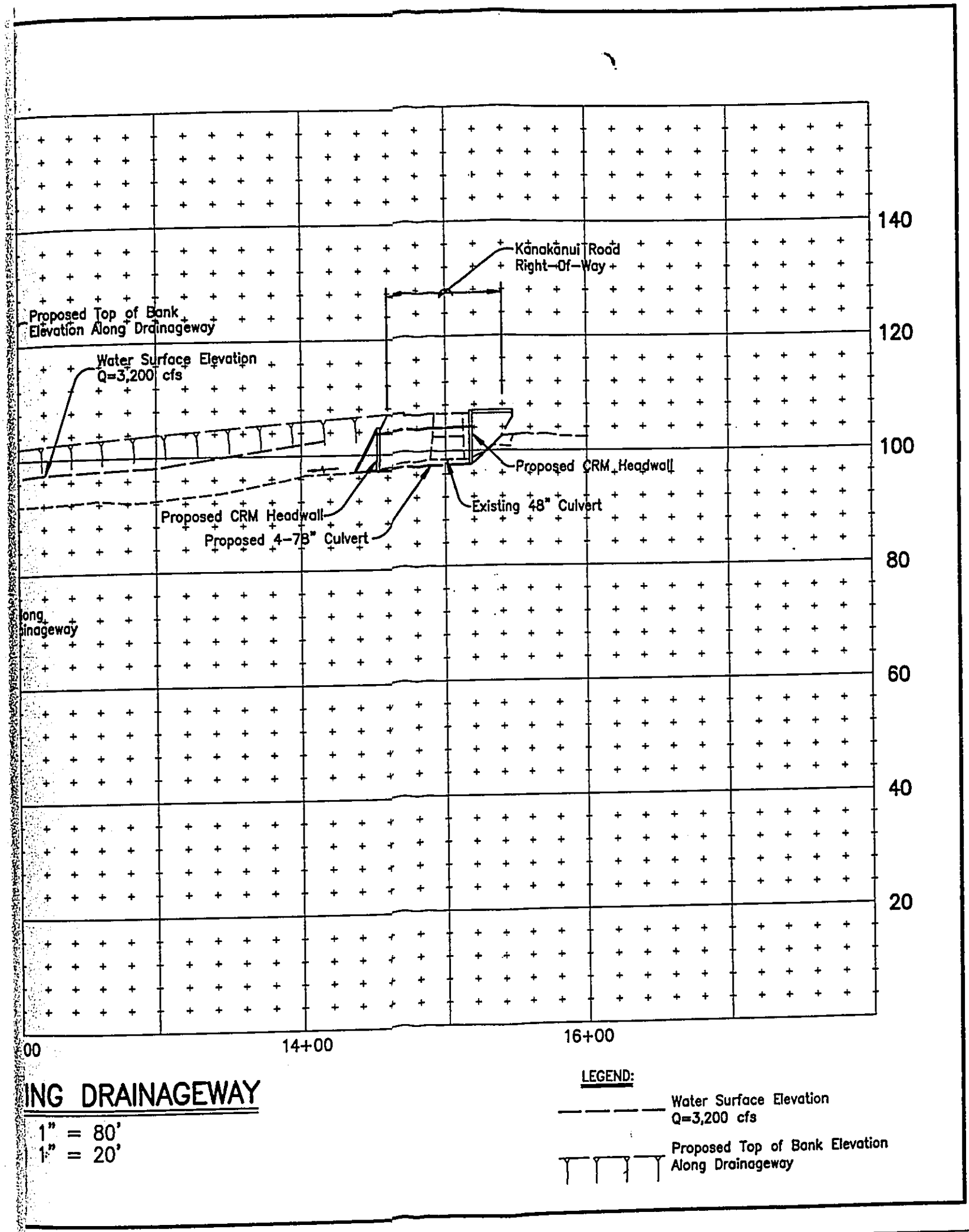
Water Surface Elevation Q=3,200 cfs

Proposed Top of Bank Elevation Along Drainageway



PROFILE – EXISTING DRAINA

Scale: Horiz. 1" = 80'
Vert. 1" = 20'



ING DRAINAGEWAY

1" = 80'
1" = 20'

APPENDIX A

HYDROLOGIC CALCULATIONS

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui, Hawaii 96793

Date: August 10, 1999

HYDROLOGIC CALCULATIONS: PRE-DEVELOPMENT

Objective: To determine the pre-development runoff of the project site

1. 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Kihei, Maui,
R(50 Yr.-1Hr.) = 2.30 inches

2. Total Area:

Area (Ac.):		24.09

3. Runoff Coefficents:

Infiltration:	Medium	0.07
Relief:	Rolling (5-15%)	0.03
Vegetal Cover:	Good (10-50%)	0.03
Development Type:	Agricultural	0.15
	Runoff Coeff't., C:	0.28

4. Time of Concentration:

Approx. Elev. Diff'l. (ft.)		56
Higher Elev. (ft.):	112	
Lower Elev. (ft.):	56	
Approx. Runoff Length (ft.):		1,100
Average Slope:		5.09%
Time of Concentration (min.):		31

5. Intensity:

Intensity (in./hr.):	3.2

6. Total Runoff:

Q = C x I x A (cfs):	21.58

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui, Hawaii 96793

Date: August 10, 1999

HYDROLOGIC CALCULATIONS: POST-DEVELOPMENT

Objective: To determine the post-development runoff of the project site

1. 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Kihei, Maui,
R(50 Yr.-1Hr.) = 2.30 inches

2. Total Area:

Area (Ac.):		24.09

3. Runoff Coefficents:

Infiltration:	Medium	0.07
Relief:	Rolling (5-15%)	0.03
Vegetal Cover:	Good (10-50%)	0.03
Development Type:	Residential	0.40
	Runoff Coeff't., C:	0.53

4. Time of Concentration:

Approx. Elev. Diff'l. (ft.)		56
Higher Elev. (ft.):	112	
Lower Elev. (ft.):	56	
Approx. Runoff Length (ft.):		1,700
Average Slope:		3.29%
Time of Concentration (min.):		23

5. Intensity:

Intensity (in./hr.):	3.5

6. Total Runoff:

Q = C x I x A (cfs):	44.69

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui , Hawaii 96793

Date: January 31, 2000 SRA

SUBSURFACE DRAINAGE SYSTEM ANALYSIS AND DESIGN

Project: Ke Ali'i Subdivision

Location: Kihei, Maui, Hawaii

Job Number: 99054

Objective: To determine the storage requirements for partial attenuation of the anticipated increase in onsite surface runoff attributable to the project development. A recurrence interval of fifty (50) years is used.

I. Determine 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Kihei, Maui,
R(50 Yr.-1Hr.) = 2.30 inches

II. Determine Pre-Development Runoff:

Pre-Development Component Areas:

Total Area (Ac.):		15.96

Pre-Development Runoff Coefficents:

Infiltration:	Medium	0.07
Relief:	Rolling (5-15%)	0.03
Vegetal Cover:	Good (10-50%)	0.03
Development Type:	Agricultural	0.15
	Composite Runoff Coeff't., C:	0.28

Pre-Development Time of Concentration:

Approx. Elev. Diff'l. (feet):		56.00
Higher Elev. (ft.):	112.0	
Lower Elev. (ft.):	56.0	
Approx. Runoff Length (ft.):		1,100
Average Slope:		5.1%
Ground Character:		rocky
Time of Concentration (min.):		31

Pre-Development Intensity:

Intensity (in./hr.):	3.2

Pre-Development Runoff:

Q (pre-dev.) = C x I x A (cfs):	**14.30**
Allowable Release Volume (cfs):	**9.33**

III. Determine Post-Development Runoff:

Total Area (Ac.):	15.96

Post-Development Runoff Coefficent:

Weighted Runoff Coeff't., *C:	0.54
C x A (post development):	**8.62**

IV. Establish Initial Trench Cross Section Parameters:

Cover Over Pipe (ft.):	1.00
Pipe Diameter (ft.):	6.00
Cradle Depth Below Pipe (ft.):	2.00
Cradle Thickness on Sides of Pipe (ft.):	2.00
Total Trench Depth (ft.):	9.0
Total Trench Width (ft.):	10.0
Gross Trench Cross Sectional Area (sf/lf):	90.0
Pipe Cross Sectional Area (sf/lf):	28.3
Trench Aggreg. Cross Sectional Area (sf/lf):	61.7

V. Determine Exfiltration:

Assume Exfiltration Limited to Sides of Trench Only:

Assumed Initial Length of Pipe / Trench (ft.):	70.00

VI. Determine Adequacy of Storage Volume Provided:

Determine Required Storage Volume:

Analytical procedures are based on methods prescribed in "Modern Sewer Design" (dated 1980, by the American Iron and Steel Institute).

Intensity values are obtained from the the Intensity-Duration Curves found page 122 of the "Drainage Master Plan for the County of Maui" (dated 1971, by R.M. Towill Corp.).

for the County of Maui" (dated 1971, by R.M. Towill Corp.).

Time (min.)	I (in/hr)	Post-Dev. C x A (ac)	Accum. Runoff Vol. (cf)	Allow. Release (cf)	Storage Required. (cf)	Comments
(1)	(2)	(3)	(4)	(5)	(6)	
5	5.90	8.62	15,255	2,799	12,456	
10	4.70	8.62	24,304	5,598	18,706	
15	4.20	8.62	32,578	8,397	24,181	
20	3.80	8.62	39,300	11,196	28,104	
30	3.20	8.62	49,642	16,794	32,848	
40	2.85	8.62	58,950	22,392	36,558	
60	2.30	8.62	71,360	33,588	37,772	
80	2.00	8.62	82,737	44,784	37,953	Peak Storage
100	1.80	8.62	93,079	55,980	37,099	
120	1.60	8.62	99,284	67,176	32,108	
180	1.20	8.62	111,694	100,764	10,930	

(COL 4) = (COL 1) x (COL 2) x (COL 3) x (60 sec./min.)
(COL 5) = Q(allowable) x (COL 1) x (60 sec./min.)
(COL 6) = (COL 4) - (COL 5)

Maximum Storage Required (cf): 37953

Determine Provided Storage Volume:

Pipe Storage Capacity (cf):	1,979.2
Net Aggregate Cradle Storage Capacity (cf):	6,300.0
Gross Aggregate Cradle Volume (40% void ratio) (cf):	1,728.3
50% of void volume (cf):	864.2
Total Storage Capacity Provided (cf):	2,843.4

{Storage Provided = 2,843 cf} > {Storage Required = 2,153 cf}; therefore initial assumptions based on 70 l.f. of 72-inch diameter pipe are acceptable.

```
**********                              * TR 20 S/N     :
*                                       * HMVersion     :  3.40
*                                       * Date          :  9/29/99
*                TR 20                  * Time          : 12:09:19
*
*
*    Project Formulation Hydrology      * Input file    :
V:\PROJDATA\99PROJ\9905*                * Output file   :
*
V:\PROJDATA\99PROJ\9905*                *
*
*                                       *
*
*********************************************************************
*********
```

```
xxxxxxx  xxxxxx     xxxxx     xxxxx
   x     x     x  x     x  x     xx
   x     x     x        x  x    x x
   x     xxxxxx        x     x  x  x
   x     x    x      x        x x   x
   x     x     x    x         xx    x
   x     x      x  xxxxxxx    xxxxx
```

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::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
:::                                        :::
:::   Full Microcomputer Implementation   :::
:::                  by                    :::
:::          Haestad Methods, Inc.         :::
:::                                        :::
::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

□□

```
********************80-80 LIST OF INPUT DATA FOR TR-20
HYDROLOGY*******************

JOB TR-20
TITLE 001 KEALII SUBDIVISION OFFSITE DRAINAGE AREAS 21, 22 & 22A (100-
YR.)
TITLE 002 FILE: V:/PROJDATA/99PROJ/99054/TR20/KEALII4.DAT
 6 RUNOFF 1 001        1 0.98         68.0         0.97         1 1   1   1
   ENDATA
 7 INCREM 6              0.10
 7 COMPUT 7 001   001    0.0          10.0          1.0         1 2  01  01
   ENDCMP 1
   ENDJOB 2

*********************************END OF 80-80
LIST*********************************
□□
```

```
TR20 XEQ  9/29/99              KEALII SUBDIVISION OFFSITE DRAINAGE AREAS
21, 22 & 22A (100-YR.)                    JOB  1   PASS   1
     REV 09/01/83              FILE:
V:/PROJDATA/99PROJ/99054/TR20/KEALII4.DAT
PAGE   1


FILE NO.  1

                                        COMPUTER PROGRAM FOR PROJECT
FORMULATION - HYDROLOGY    USER NOTES

                THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF
TR-20.  CHANGES FROM THE 2/14/74 VERSION INCLUDE:

                REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE
REPLACES THE CONVEX METHOD.  INPUT DATA PREPARED FOR
                PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING
COEFFICIENTS WILL NOT RUN ON THIS VERSION.

                THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA
REPRESENTATIVE OF A REACH.  IT IS RECOMMENDED THAT
                THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE
OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED.
                THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND
ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M"
                VALUES USED IN THE ROUTING PROCEDURE.

                GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS
AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS
                MANUAL.  SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS
AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

                HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE
INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT
                HYDROGRAPH HAVE BEEN IMPROVED.  PEAK DISCHARGES AND
TIMES MAY DIFFER FROM THE PREVIOUS VERSION.  OUTPUT
```

HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
5/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT
PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

EXECUTIVE CONTROL OPERATION INCREM
RECORD ID □ MAIN TIME
INCREMENT = .10 HOURS

EXECUTIVE CONTROL OPERATION COMPUT
RECORD ID □ FROM XSECTION
1□ TO XSECTION
1

STARTING TIME = .00 RAIN DEPTH = 10.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 1 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF CROSS SECTION 1

	PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
(RUNOFF)	10.45	1082.28	
(RUNOFF)	19.31	127.08	

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .98 SQ.MI.

4.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.01
5.00	DISCHG	.05	.15	.35	.71	1.25	1.99	2.93	4.06	5.35
6.00	DISCHG	6.78	8.32	9.94	11.61	13.32	15.05	16.79	18.56	20.39
7.00	DISCHG	22.33	24.40	26.61	28.95	31.40	34.00	36.75	39.62	42.58
8.00	DISCHG	45.64	48.83	52.16	55.61	59.23	63.15	67.50	72.46	77.89
9.00	DISCHG	83.93	90.79	98.76	108.04	118.49	130.07	142.98	157.56	174.01
10.00	DISCHG	193.29	221.90	268.70	347.81	466.79	616.16	773.65	916.14	1021.91
11.00	DISCHG	1077.97	1038.64	974.21	897.03	816.38	740.00	674.75	617.73	566.81
12.00	DISCHG	480.42	446.06	416.63	391.20	369.19	350.35	334.40	320.66	308.58
13.00	DISCHG	288.05	279.49	271.68	264.50	257.87	251.92	246.64	241.89	237.40
14.00	DISCHG	228.76	224.72	220.81	216.90	212.86	208.90	205.14	201.60	198.25
15.00	DISCHG	192.18	189.55	187.12	184.79	182.52	180.33	178.35	176.59	175.10
		172.96	172.19	171.44	170.57	169.51				

16.00	DISCHG	168.26	166.87	165.37	163.75	161.99
160.18	158.38	156.56	154.67	152.68		
17.00	DISCHG	150.70	148.85	147.17	145.72	144.51
143.55	142.75	141.96	141.05	139.93		
18.00	DISCHG	138.63	137.18	135.60	133.89	132.03
130.16	128.47	127.12	126.22	125.87		
19.00	DISCHG	126.01	126.43	126.86	127.08	126.92
126.35	125.45	124.30	122.91	121.30		
20.00	DISCHG	119.60	117.93	116.38	115.01	113.85
112.93	112.26	111.75	111.37	111.09		
21.00	DISCHG	110.88	110.73	110.62	110.55	110.51
110.46	110.33	110.04	109.50	108.65		
22.00	DISCHG	107.55	106.33	105.11	104.00	103.05
102.30	101.74	101.32	101.00	100.76		
23.00	DISCHG	100.57	100.44	100.35	100.28	100.24
100.21	100.10	99.82	99.27	98.37		
24.00	DISCHG	97.05	94.87	91.25	85.60	77.63
67.80	57.17	46.68	37.03	28.70		
25.00	DISCHG	22.06	17.13	13.33	10.37	8.04
6.23	4.81	3.71	2.85	2.19		
26.00	DISCHG	1.68	1.27	.96	.72	.53
.38	.27	.19	.12	.06		
27.00	DISCHG	.03	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 5.95 WATERSHED INCHES, 3765.76 CFS-HRS, 311.20 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP COMPUTATIONS
RECORD ID
COMPLETED FOR PASS 1

EXECUTIVE CONTROL OPERATION ENDJOB
RECORD ID

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL

INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE
(CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK
AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD PRECIPITATION OPERATION	DRAINAGE AREA (SQ MI)	TABLE #	RAIN MOIST COND RATE	ANTEC INCREM RATE (HR)	MAIN PEAK DISCHARGE TIME BEGIN RATE (HR)	AMOUNT (IN)
DURATION (HR)	AMOUNT (IN)	ELEVATION (FT)	TIME (HR)	(CFS)		(CSM)	
ALTERNATE 1 STORM 1[]							
XSECTION 1	RUNOFF	.98	1	2	.10	.0	10.00
24.00	5.95	---	10.45	1082.28		1104.4	

TR20 XEQ 9/29/99 KEALII SUBDIVISION OFFSITE DRAINAGE AREAS
21, 22 & 22A (100-YR.) JOB 1 SUMMARY
REV 09/01/83 FILE:
V:/PROJDATA/99PROJ/99054/TR20/KEALII4.DAT

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
XSECTION 1	.98	
ALTERNATE 1		1082.28

END OF 1 JOBS IN THIS RUN
Stop - Program terminated.

APPENDIX B

HYDRAULIC CALCULATIONS

POST-DEVELOPMENT ONSITE SURFACE RUNOFF
DRAINAGE AREAS FLOWING INTO CATCH BASINS
50 Year - 1 Hour Rainfall = 2.3 inches

Drainage Area No.	Area (acres)	Length (feet)	Slope (%)	Runoff Coeff. C	Time of Conc. Tc, (minutes)	Intensity i, (inches/hour)	Surface Runoff Q (cubic feet per second)
1	1.37	500	2.2	0.54	18	4	2.96
2	0.95	430	1.4	0.52	18	4	1.98
3	0.79	360	2.78	0.54	17	4.1	1.75
4	0.76	390	5.13	0.54	15	4.25	1.74
5	0.53	240	2.5	0.56	14	4.3	1.28
6	0.62	350	6	0.55	14	4.3	1.47
7	0.43	0.43	2.67	0.56	16	4.2	1.01
8	1.12	500	2	0.56	17	4.1	2.57
9	1.40	400	4.25	0.55	15	4.25	3.27
10	0.75	420	2.6	0.58	17	4.1	1.78
11	0.65	400	1.8	0.59	17	4.1	1.57
12	0.88	400	13	0.54	18	4	1.90
13	2.07	595	3.36	0.52	20	3.8	4.09
14	1.15	500	1.4	0.53	21	3.7	2.26
15	1.63	590	2.2	0.52	20	3.8	3.22
16	0.12	130	2.69	0.61	7	5.3	0.39
17	0.06	115	1	0.71	3	6.3	0.27
18	1.24	510	2.9	0.54	20	3.8	2.54
19	1.37	520	2.5	0.53	20	3.8	2.76
20	0.72	180	6.7	0.41	14	4.3	1.27
21	4.12	1260	3.5	0.35	31	3.2	4.61
22	0.22	210	1.85	0.67	5	6	0.88
23	0.23	220	1.5	0.68	5	6	0.94

CORRECTION

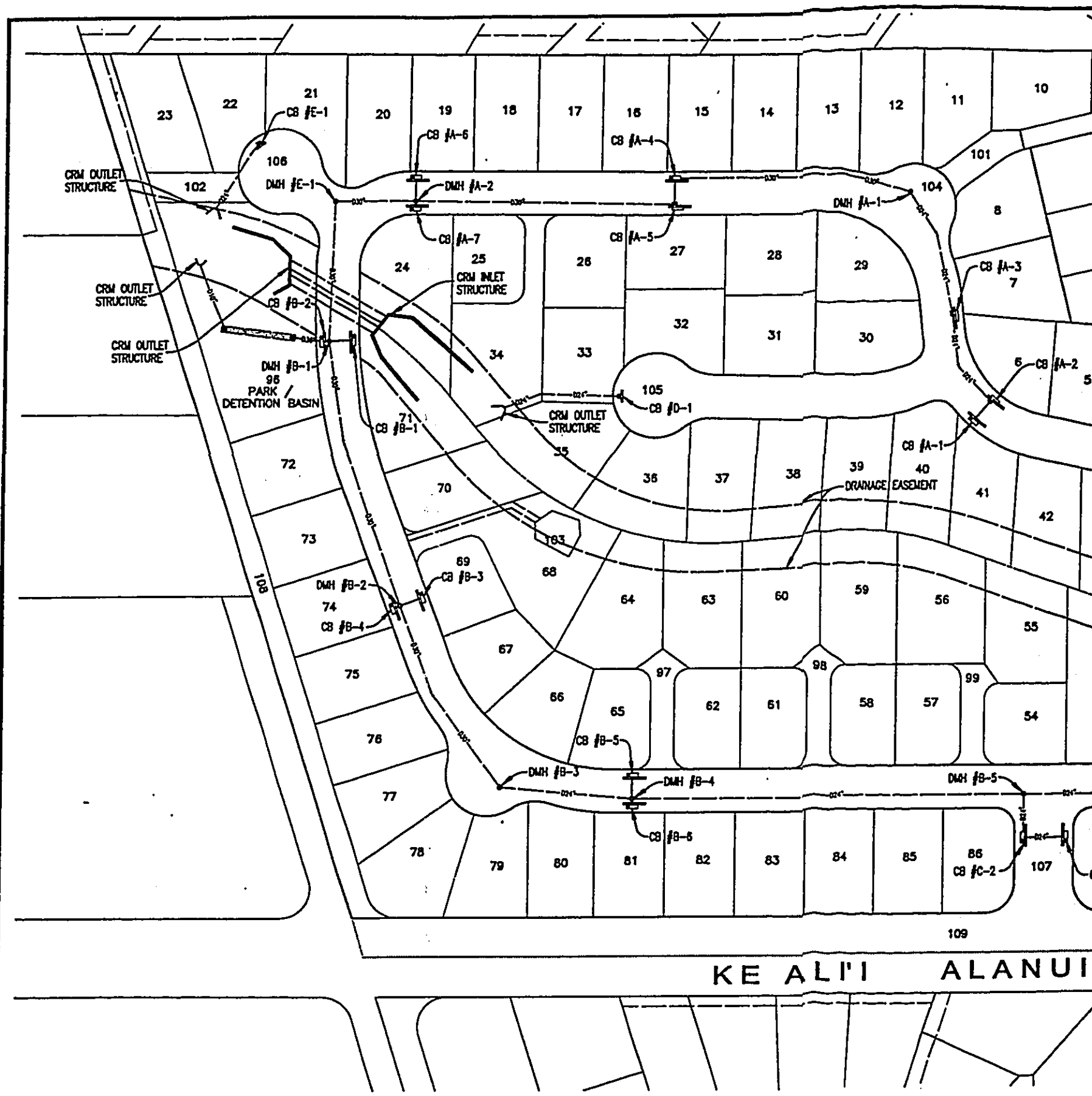
THE PRECEDING DOCUMENT(S) HAS BEEN REPHOTOGRAPHED TO ASSURE LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

POST-DEVELOPMENT ONSITE SURFACE RUNOFF
DRAINAGE AREAS FLOWING INTO CATCH BASINS
50 Year - 1 Hour Rainfall = 2.3 inches

Drainage Area No.	Area (acres)	Length (feet)	Slope (%)	Runoff Coeff. C	Time of Conc. Tc, (minutes)	Intensity i, (inches/hour)	Surface Runoff Q (cubic feet per second)
1	1.37	500	2.2	0.54	18	4	2.96
2	0.95	430	1.4	0.52	18	4	1.98
3	0.79	360	2.78	0.54	17	4.1	1.75
4	0.76	390	5.13	0.54	15	4.25	1.74
5	0.53	240	2.5	0.56	14	4.3	1.28
6	0.62	350	6	0.55	14	4.3	1.47
7	0.43	0.43	2.67	0.56	16	4.2	1.01
8	1.12	500	2	0.56	17	4.1	2.57
9	1.40	400	4.25	0.55	15	4.25	3.27
10	0.75	420	2.6	0.58	17	4.1	1.78
11	0.65	400	1.8	0.59	17	4.1	1.57
12	0.88	400	13	0.54	18	4	1.90
13	2.07	595	3.36	0.52	20	3.8	4.09
14	1.15	500	1.4	0.53	21	3.7	2.26
15	1.63	590	2.2	0.52	20	3.8	3.22
16	0.12	130	2.69	0.61	7	5.3	0.39
17	0.06	115	1	0.71	3	6.3	0.27
18	1.24	510	2.9	0.54	20	3.8	2.54
19	1.37	520	2.5	0.53	20	3.8	2.76
20	0.72	180	6.7	0.41	14	4.3	1.27
21	4.12	1260	3.5	0.35	31	3.2	4.61
22	0.22	210	1.85	0.67	5	6	0.88
23	0.23	220	1.5	0.68	5	6	0.94

Combined Pipe/Node Report

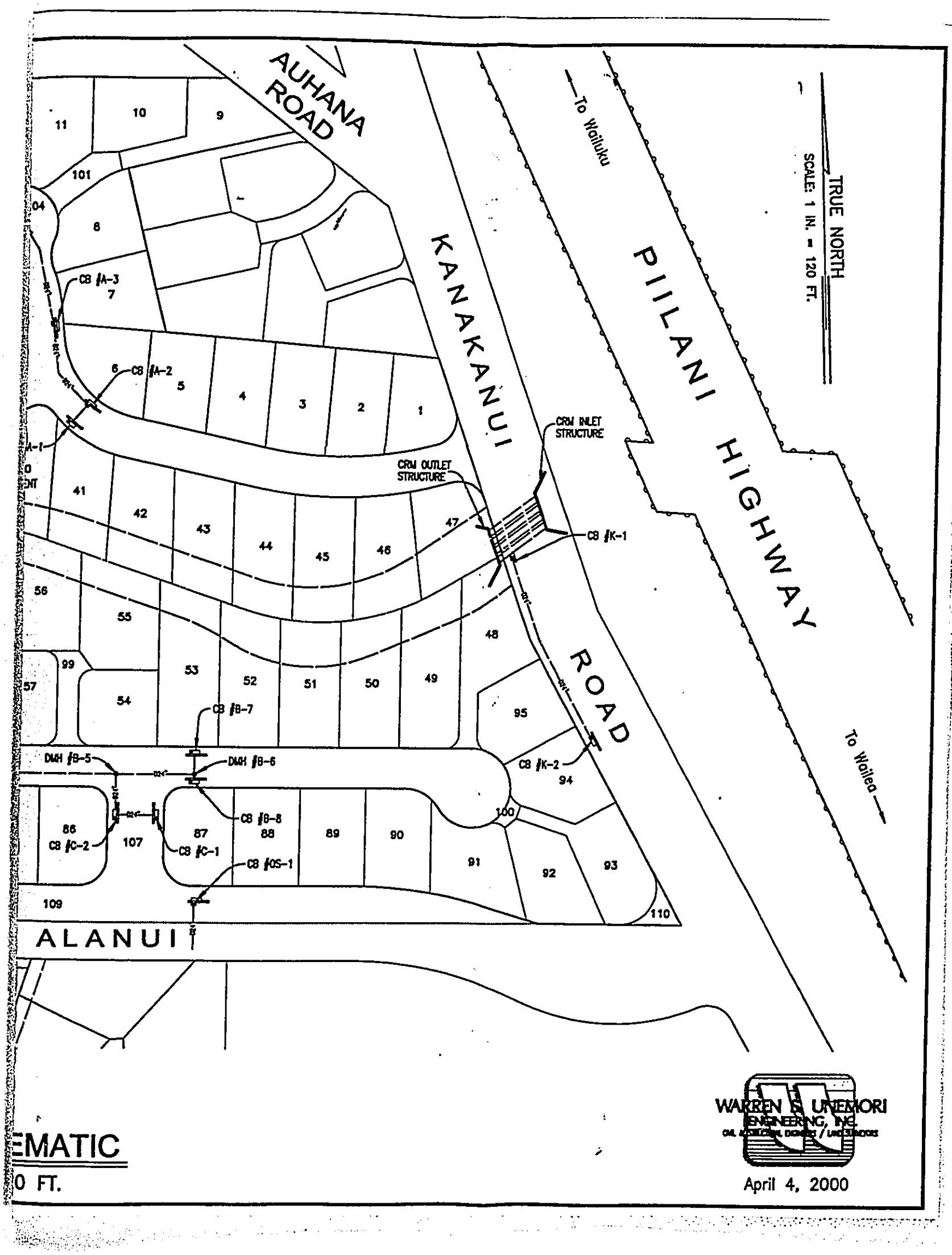
Upstream Node	Downstream Node	Length (ft)	Section Size	Constructed Slope (ft/ft)	Discharge (cfs)	Capacity (cfs)	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Upstream Ground Elevation (ft)	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Downstream Ground Elevation (ft)
CB A-1	CB A-2	23.00	24 inch	0.011304	2.57	18.39	1.64	92.95	93.84	96.95	92.69	93.84	96.95
CB A-2	24" FB1	51.00	24 inch	0.010000	5.53	17.30	4.03	92.70	93.53	96.95	92.19	93.18	97.80
24" FB1	CB A-3	61.00	24 inch	0.010000	5.53	17.30	3.46	92.19	93.02	97.80	91.58	92.93	98.85
CB A-3	24" FB2	82.00	24 inch	0.010000	7.51	17.30	4.62	91.58	92.55	98.85	90.76	91.85	99.80
CB B-8	DMH B-6	6.00	24 inch	0.040000	3.22	34.60	2.13	94.53	95.39	98.53	94.29	95.43	98.99
CB B-7	DMH B-6	24.00	24 inch	0.010000	2.26	17.30	1.44	94.53	95.42	98.53	94.29	95.43	98.99
CB C-1	CB C-2	41.00	24 inch	0.010488	0.37	17.72	0.42	91.48	91.99	95.48	91.05	91.99	95.48
24" FB2	DMH A-1	51.00	24 inch	0.010000	7.51	17.30	5.13	90.76	91.73	99.80	90.25	91.17	99.91
DMH B-6	DMH B-5	83.00	24 inch	0.044337	5.48	36.42	3.43	94.29	95.12	98.99	90.61	91.98	96.14
CB C-2	DMH B-5	44.00	24 inch	0.010000	0.63	17.30	0.36	91.05	91.98	95.48	90.61	91.98	96.14
DMH A-1	30" FB1	69.00	30 inch	0.010145	7.51	28.27	4.34	89.75	90.66	99.91	89.05	90.06	99.80
DMH B-5	DMH B-4	99.00	24 inch	0.035088	6.11	32.40	3.29	90.61	91.48	96.14	76.61	78.73	81.30
CB B-6	DMH B-4	7.00	24 inch	0.034286	2.54	32.03	0.82	76.85	78.73	80.85	76.61	78.73	81.30
CB B-5	DMH B-4	23.00	24 inch	0.010435	4.09	17.67	1.32	76.85	78.74	80.85	76.61	78.73	81.30
30" FB1	CB A-4	73.00	30 inch	0.014855	7.51	34.20	3.59	89.05	89.96	99.80	86.48	87.94	90.98
DMH B-4	DMH B-3	34.00	24 inch	0.032239	12.74	31.06	7.69	76.61	77.89	81.30	72.29	73.18	76.29
CB A-4	CB A-5	27.00	30 inch	0.009630	9.26	27.54	3.47	86.48	87.70	90.98	86.22	87.70	90.98
DMH B-3	30" FB3	19.00	30 inch	0.030504	12.74	49.01	5.12	71.79	72.99	76.29	68.16	69.50	72.80
CB A-7	DMH A-2	6.00	24 inch	0.040000	1.47	34.60	0.67	67.70	68.92	71.70	67.46	68.92	72.15
CB A-6	DMH A-2	23.00	24 inch	0.010435	1.74	17.67	0.79	67.70	68.92	71.70	67.46	68.92	72.15
CB A-5	DMH A-2	63.00	30 inch	0.073232	10.27	75.94	3.80	86.22	87.29	90.98	66.96	68.92	72.15
30" FB3	DMH B-2	96.00	30 inch	0.037396	12.74	54.27	4.10	68.16	69.36	72.80	64.57	66.85	69.76
CB B-4	DMH B-2	7.00	24 inch	0.034286	2.76	32.03	1.00	65.31	66.84	69.31	65.07	66.85	69.76
CB B-3	DMH B-2	21.00	24 inch	0.011429	1.90	18.49	0.69	65.31	66.85	69.31	65.07	66.85	69.76
DMH A-2	DMH E-1	79.00	30 inch	0.069241	13.48	73.84	8.51	66.96	68.19	72.15	61.49	62.21	65.99
DMH B-2	30" FB2	76.00	30 inch	0.024034	17.40	43.51	5.70	64.57	65.98	69.76	60.34	61.92	65.00
DMH E-1	DMH B-1	42.00	30 inch	0.021268	13.48	40.93	4.16	60.49	61.72	65.99	57.47	60.55	62.67
30" FB2	DMH B-1	04.00	30 inch	0.027596	17.40	46.62	4.82	60.34	61.75	65.00	57.47	60.55	62.67
CB B-1	DMH B-1	22.00	24 inch	0.010909	1.78	18.07	0.57	58.21	60.56	62.21	57.97	60.55	62.67
DMH B-1	CB B-2	7.00	36 inch	0.037143	32.66	83.55	5.10	57.47	59.88	62.67	57.21	59.93	62.21
CB B-2	Outlet	22.00	36 inch	0.373182	34.23	264.83	14.43	57.21	59.11	62.21	49.00	49.83	57.00



99proj/99054/dwg/exhibits/drn-schm.dwg

DRAINLINE SCHEMATIC

SCALE: 1 IN. = 120 FT.


AUHANA ROAD
KANAKANUI
PIILANI HIGHWAY
KILOHANA ROAD
To Wailuku
To Wailea
TRUE NORTH
SCALE: 1 IN. = 120 FT.
CRM INLET STRUCTURE
CRM OUTLET STRUCTURE
CB #A-3
CB #A-2
CB #A-1
CB #K-1
CB #K-2
CB #B-7
CB #B-8
CB #C-1
CB #C-2
CB #OS-1
DMH #B-5
DMH #B-6
ALANUI
EMATIC
0 FT.
WARREN S. UNEMORI ENGINEERING, INC.
April 4, 2000

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

March 30, 2000
KE ALI'I SUBDIVISION
4-78" CULVERT

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet)	6.50
FHWA Chart Number (1,2 or 3)	2
Scale Number on Chart (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.0210
Entrance Loss Coefficient of Culvert Opening	0.50
Culvert Length (feet)	66.0
Culvert Slope (feet per foot)	0.0075

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
333.5	6.50	8.37	9.05	6.50	4.90	6.50	10.05

Appendix C

Traffic Impact Assessment Study

TRAFFIC IMPACT ANALYSIS UPDATE

Ke Alii
Single-Family Units

KIHEI, MAUI, HAWAII

September 1999

PARSONS BRINCKERHOFF

Over a Century of Engineering Excellence

TRAFFIC IMPACT ANALYSIS UPDATE

Ke Alii
Single-Family Units
Kihei, Maui, Hawaii

September 1999

Prepared For:

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PBQD Reference Number:
16301A.01

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I. INTRODUCTION

Ke Alii Single Family Units development is located in Kihei, Maui, Hawaii. This proposed development is located between Piilani Highway and South Kihei Road on the north side of Alanui Ke Alii. Figure 1 shows the project location.

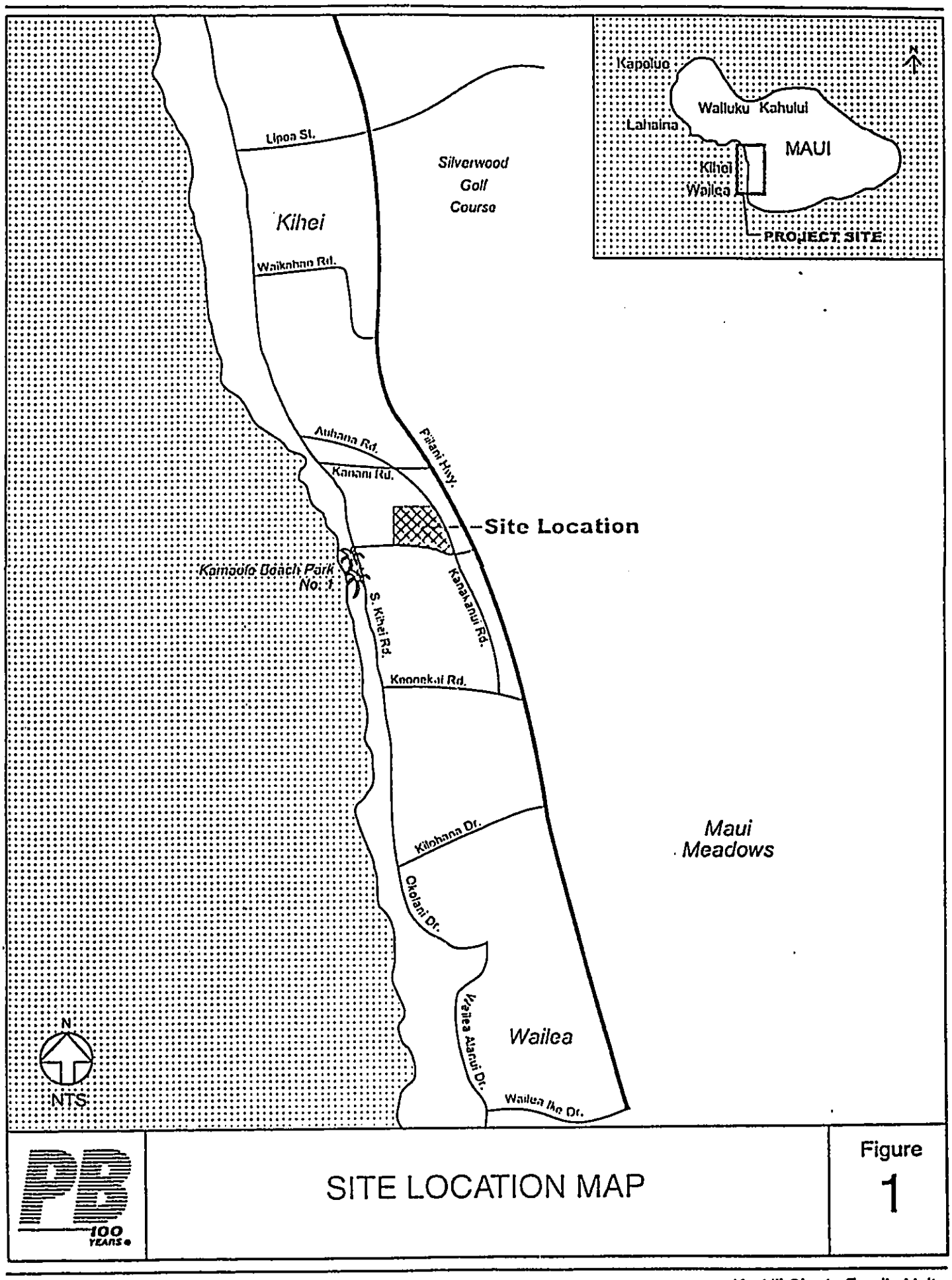
The parcel of land proposed for development is currently undeveloped and is bordered by Kanakanui Road to the east, the planned North-South Connector to the west, an existing residential community to the north and Alanui Ke Alii to the south. The site is proposed for 96 single-family units.

Both access points will form "T" intersections with the existing roadways. Figure 2 illustrates the proposed site plan for the single-family site.

Access to the proposed single-family development will be via driveways onto Alanui Ke Alii and Kanakanui Road. The driveway onto Alanui Ke Alii will be located approximately 700 feet makai of Kanakanui Road. The driveway onto Kanakanui Road will be located approximately 600 feet north of Alanui Ke Alii. It is currently proposed for both driveways to be unsignalized intersections with STOP-sign control on the driveway approach.

The study area will include four intersections on Alanui Ke Alii and two intersections on Kanani Road. The Kanani Road intersections are included to assess the traffic impacts of using these intersections to access points north on Piilani Highway and South Kihei Road.

This traffic analysis focuses on the future traffic impacts of the single-family development at its projected buildout. A two year implementation period corresponds to the Year 2001. Traffic conditions at key intersections along Alanui Ke Alii and along Kanani Road are evaluated. Based on the findings of the evaluation, recommendations are made on access design and intersection improvements that would benefit roadway operations in the study area.



PB 100 YEARS	SITE LOCATION MAP	Figure 1

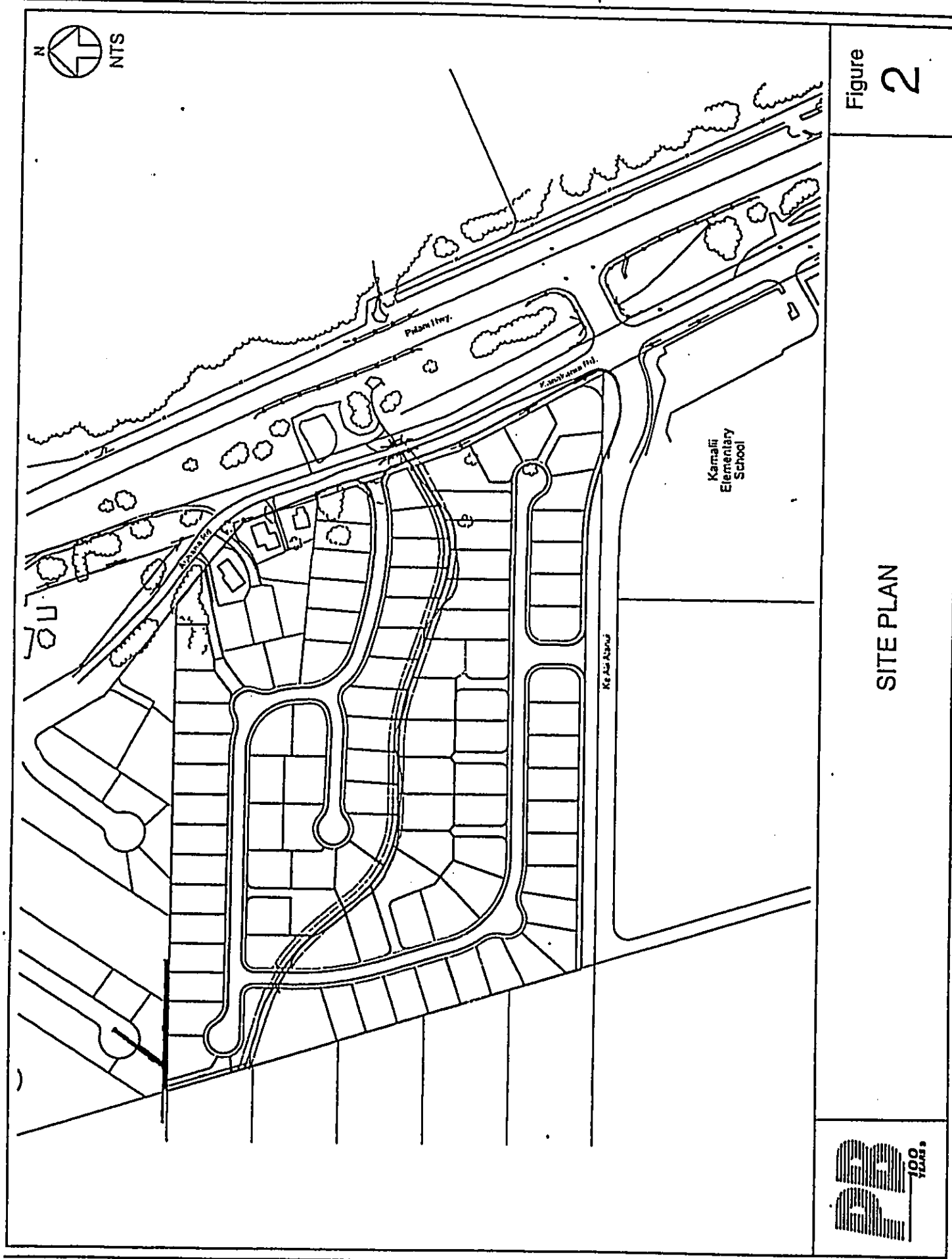


Figure 2

SITE PLAN

II. EXISTING CONDITIONS

A. EXISTING ROADWAY SYSTEM

1. Alanui Ke Alii

Alanui Ke Alii is a collector road oriented in the mauka-makai direction. It provides access to the adjacent residential community and the Kamalii Elementary School. The roadway runs from Piilani Highway to South Kihei Road and is part of the overall roadway network providing mobility in the Kihei area. The western segment of Alanui Ke Alii is configured as a divided roadway with 2 travel lanes, parking lanes and bike lanes. A portion of Alanui Ke Alii has an interim roadway cross-section consisting of two-lanes with no shoulders. This is the roadway configuration in the vicinity of the proposed site access. The posted speed limit is 30 miles per hour (mph).

All intersections on Alanui Ke Alii are unsignalized except at Piilani Highway, where a traffic signal controls traffic movement. All cross streets approaching Alanui Ke Alii are STOP-sign controlled and Alanui Ke Alii is STOP-sign controlled at South Kihei Road. A traffic signal is proposed for this intersection. At the Kanakanui Road intersection, separate left-turn lane channelization is provided in the mauka-bound direction, but left turns in the makai-bound direction are prohibited.

The Kamalii Elementary School has an entrance only driveway on Alanui Ke Alii just west of Kanakanui Road. A channelized left-turn lane is provided in the makai-bound direction. Access to the new Kamaole Heights residential community on the south side of Alanui Ke Alii is provided via the North-South Connector roadway. The future North-South Connector will be located at the western property line for the proposed Ke Alii Single Family Units.

The Worldmark, The Club development will also access Alanui Ke Alii at a point west of both the proposed Ke Alii Single Family Units and the North-South Connector.

2. Piilani Highway

Piilani Highway is a principal arterial roadway that runs parallel to the coastline of Maui and provides the primary north-south mobility for the Kihei area. It is a two-lane, undivided roadway with paved shoulders and turn lane channelization at most intersections. Piilani

Highway forms a signalized "T" intersection with Alanui Ke Alii. The Kanani Road intersection has four approaches and is unsignalized with STOP-sign control on Kanani Road. Exclusive left and right turn lanes are provided on Piilani Highway at both intersections. Piilani Highway has a posted speed limit of 45 mph.

3. South Kihei Road

South Kihei Road is a north-south two-lane roadway oriented parallel to Piilani Highway. It is a major collector roadway that provides access and traffic circulation to development within Kihei. The roadway forms an unsignalized "T" intersection with Alanui Ke Alii with STOP-sign control on Alanui Ke Alii. Its posted speed limit is 30 mph.

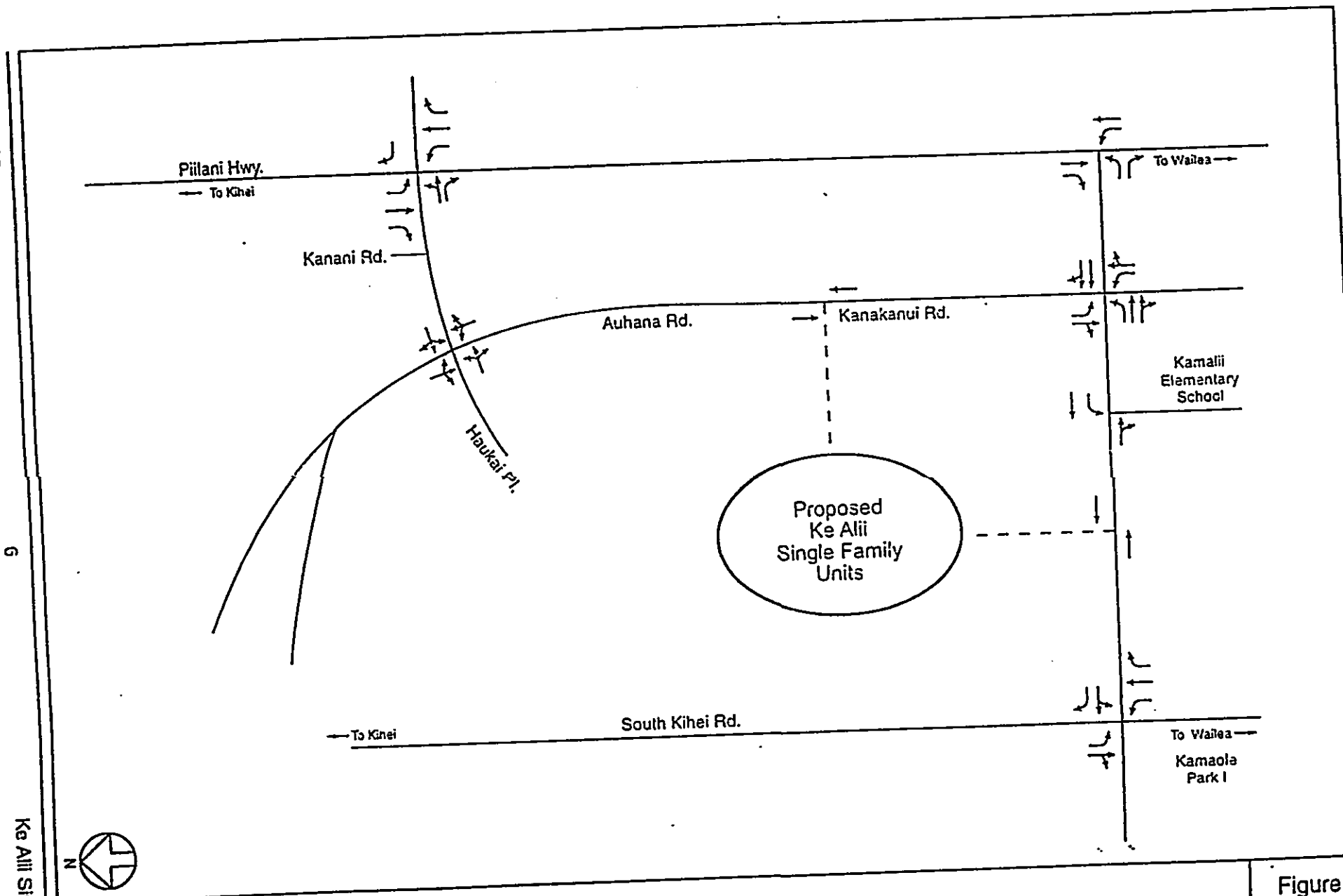
4. Kanakanui Road

Kanakanui Road is a two-lane collector roadway located between and oriented parallel to South Kihei Road and Piilani Highway. It currently begins at Keonekai Road to the south, continues north through Alanui Ke Alii, and transitions into Auhana Road north of Alanui Ke Alii. Kanakanui Road provides access and traffic circulation to development along its corridor. The intersection with Alanui Ke Alii is unsignalized with STOP-sign control on Kanakanui Road. Left-turn lane channelization is provided on Kanakanui Road approaches. The posted speed limit is 25 mph.

5. Kanani Road

Kanani Road is a two-lane local roadway north of Alanui Ke Alii that provides access to development located makai of Piilani Highway. It begins at Piilani Highway, east of Auhana Road and continues west, crossing Auhana Road and terminating at South Kihei Road. It intersects Auhana Road at an unsignalized "two-way stop" intersection with STOP-sign control on Kanani Road. The posted speed limit is 20 mph.

Figure 3 illustrates the existing lane configurations at the intersection of the roadways.



EXISTING INTERSECTION LANE CONFIGURATIONS

Figure 3

B. EXISTING TRAFFIC VOLUMES

Manual turning movement traffic counts were conducted during the afternoon peak periods on Wednesday, July 28, 1999, and during the morning peak periods on Thursday, July 29, 1999, at the following four intersections:

- Alanui Ke Alii and Piilani Highway,
- Alanui Ke Alii and Kanakanui Road,
- Kanani Road and Piilani Highway, and
- Kanani Road and Auhana Road

The morning and afternoon peak hours were found to occur from 7:30 to 8:30 AM and 3:45 to 4:45 PM.

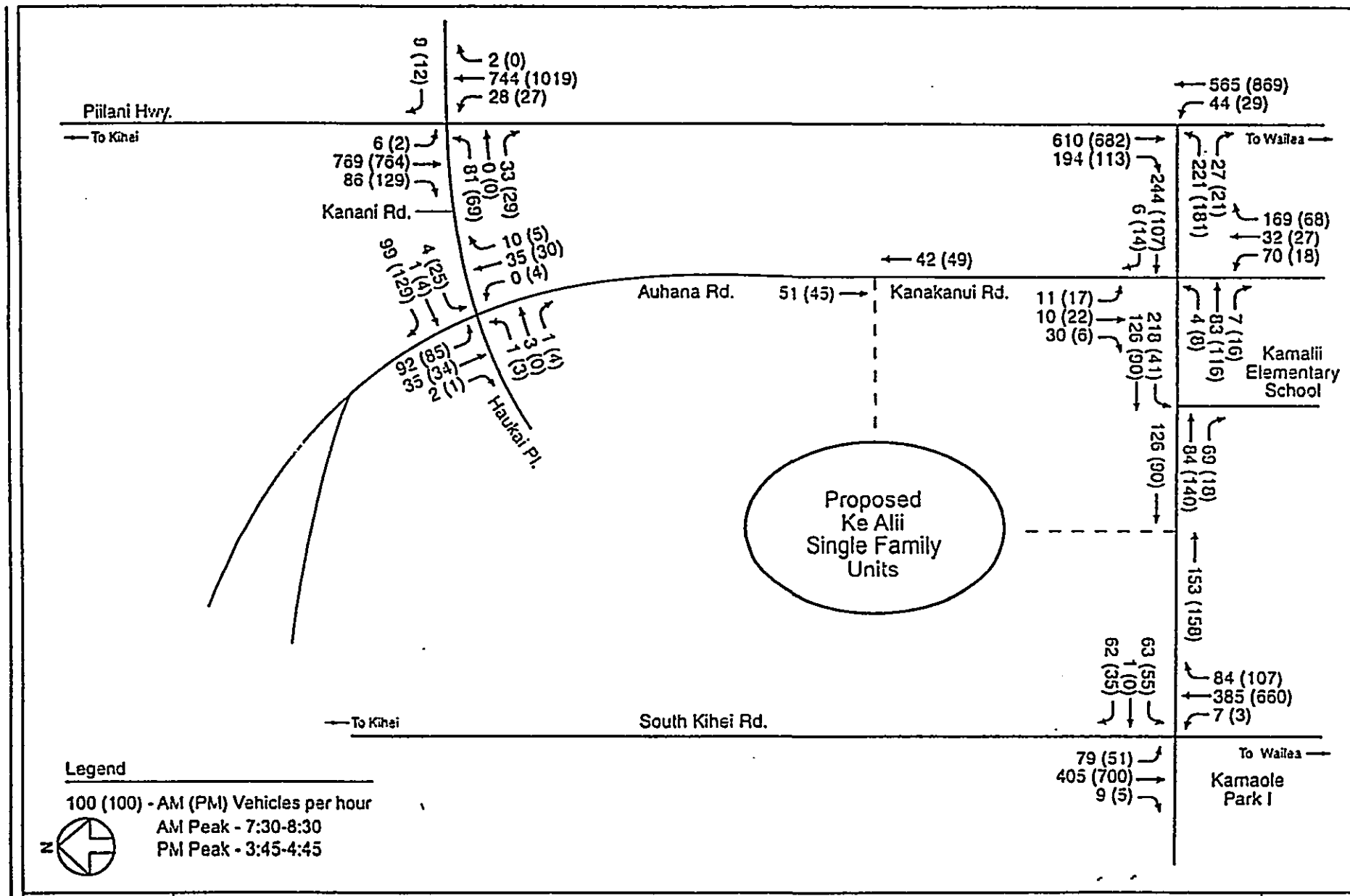
The traffic volumes for the entrance to the Kamalii Elementary School and the intersection with South Kihei Road were taken from the Traffic Impact Assessment Report (TIAR) for the Worldmark, The Club development. The traffic volumes entering the Kamalii Elementary School were held constant and the traffic volumes on Alanui Ke Alii were adjusted based on the intersection count with Kanakanui Road.

The intersection turning movement traffic volumes for the intersection with South Kihei Road were held constant with 3% growth added to through traffic on South Kihei Road to update the traffic volumes from 1997 to 1999. The 3% annual growth rate is based on a comparison of the 1997 and 1999 traffic counts.

The existing traffic volumes are shown in Figure 4, and the traffic data are included in Appendix A of this report.

C. EXISTING INTERSECTION OPERATIONS

Traffic operations at each intersection were evaluated based on the existing roadway conditions and traffic volumes. All intersections were analyzed using the 1994 Highway Capacity Manual methodology for unsignalized intersections. Intersection operating conditions are expressed as the qualitative measure Level-of-Service (LOS). LOS is represented by a letter designation ranging from A to F. LOS A represents free-flow



EXISTING AM/PM PEAK HOUR TRAFFIC VOLUMES

Figure 4

operating conditions, while LOS F represents congested conditions. More detailed LOS definitions are included in Appendix B.

Unsignalized Intersections

Table 1 summarizes the results of the analysis of existing unsignalized intersections.

As shown in Table 1, the overall intersection LOS at all unsignalized intersections operate acceptably in both peak hours, although the Alanui Ke Alii approach to South Kihei Road does experience notable delay in the PM peak hour. The notable delays along with the approved and unconstructed developments in the Alanui Ke Alii corridor are the reason for the ongoing design of a traffic signal at this intersection.

The other intersections on Alanui Ke Alii operate well in both peak hours. All intersection approaches experience minimal delays.

The overall intersections on Kanani Road operate well in both peak hours, although the Kanani Road approach onto Piilani Highway does experience some delay in both peak hours. The large traffic volumes on Piilani Highway does limit the number of acceptable gaps in traffic for vehicles entering from Kanani Road. The traffic signals at the adjacent intersections on Piilani Highway help to create more than acceptable gaps in Piilani Highway traffic flow allowing more than one vehicle to enter Piilani Highway traffic flow. This helps to reduce the delay experienced by Kanani Road traffic.

A check for traffic signal warrant using the left turn volume onto Piilani Highway from Kanani Road did not meet guidelines in the Manual on Uniform Traffic Control Devices, for Traffic Signal Warrant 11, Peak Hour Volume Warrant. Although the traffic volumes on Piilani Highway are large enough, the left turn traffic volumes for both peak hours do not meet the traffic signal warrant.

Signalized Intersections

Table 2 summarizes the results of the analysis of the existing signalized intersection. The results show that overall intersection operations are acceptable in both peak hours. The Alanui Ke Alii approach experiences some delay in both peak hours.

Copies of the intersection analysis worksheets for both unsignalized and signalized intersections are in Appendix C.

Table 1

Existing Conditions Level of Service
Unsignalized Intersections

Intersection	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Kanakanui Road	**A**	**3.0**	**A**	**1.7**
NB Kanakanui Road Approach	B	6.1	A	4.2
SB Kanakanui Road Approach	B	5.8	B	5.2
EB Alanui Ke Alii Approach	A	0.1	A	0.1
WB Alanui Ke Alii Approach	A	0.0	A	0.0
Alanui Ke Alii/Kamalii Elem. Sch.	**A**	**1.6**	**A**	**0.4**
WB Alanui Ke Alii Approach	A	2.4	A	0.9
Alanui Ke Alii/South Kihei Road	**A**	**1.6**	**A**	**1.9**
WB Alanui Ke'Alii Approach	C	11.5	E	30.7
NB South Kihei Road Approach	A	0.1	A	0.0
SB South Kihei Road Approach	A	0.6	A	0.3
Kanani Road/Piilani Highway	**A**	**1.3**	**A**	**1.1**
EB Kanani Road Approach	C	17.0	C	19.9
WB Approach	B	7.5	C	11.5
NB Piilani Highway Approach	A	0.3	A	0.2
SB Piilani Highway Approach	A	0.1	A	0.1
Auhana Road/Kanani Road	**A**	**2.1**	**A**	**2.6**
EB Haukai Road Approach	A	4.8	A	4.5
WB Kanani Road Approach	A	3.4	A	3.9
NB Auhana Road Approach	A	0.0	A	0.2
SB Auhana Road Approach	A	1.8	A	1.7

Note: NB= northbound, SB= southbound, EB= eastbound, WB= westbound

Table 2

Existing Conditions Level of Service
Signalized Intersections

Intersection	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Piilani Highway	**B**	**11.5**	**B**	**11.3**
EB Alanui Ke Alii Approach	D	26.6	D	25.6
NB Piilani Highway Approach	B	8.5	B	10.6
SB Piilani Highway Approach	B	8.5	B	8.3

Note: NB= northbound, SB= southbound, EB= eastbound, WB= westbound

The existing left turn storage length on Alanui Ke Alii between Piilani Highway and Kanakanui Road stores between 6 and 7 vehicles. In the 30 minutes prior to Kamalii Elementary School starting, the surge in traffic leaving the school increases the demand for the left turn from Alanui Ke Alii to Piilani Highway. Vehicle queues on Alanui Ke Alii seldom crossed the intersection, instead queues were observed extending on northbound Kanakanui Road while waiting for the green phase on Alanui Ke Alii. Sufficient green time is provided at the traffic signal to process the vehicles queued on both Alanui Ke Alii and Kanakanui Road.

D. SUMMARY

As shown in Table 1, all the unsignalized intersections in the study area operate well overall with only the South Kihei Road/Alanui Ke Alii intersection having an approach experiencing significant delays. The traffic signal prepared for this intersection will reduce the delay experienced by traffic on Alanui Ke Alii. The signalized intersection of Piilani Highway and Alanui Ke Alii operates well in both AM and PM peak hours. The Alanui Ke Alii approach experiences some delay due to signal phasing but has sufficient green time to clear queued vehicles.

III. FUTURE TRAFFIC CONDITIONS

This traffic impact analysis focuses on the projected Year 2001 buildout of the single-family residential development. The Year 2001 roadway conditions were assumed to be the same as the existing roadway conditions except for the installation of the traffic signal at the South Kihei Road/Alanui Ke Alii intersection and at the access driveways to the proposed site. Background traffic was factored to reflect this future time period. The single-family residential site will be accessed from both Alanui Ke Alii and Kanakanui Road.

Vehicular traffic generated by the proposed single-family residential development was based on the forecasting methodology of trip generation, trip distribution, and trip assignment.

A. TRIP GENERATION

Traffic generated by the multi-family development was estimated using trip generation rates documented in the Institute of Transportation Engineers (ITE) publication entitled, Trip Generation, 6th Edition. ITE Code 210 was utilized for the single-family trip generation rate.

The proposed development will consist of 96 single-family, residential units, and the projected trip generation from this development is summarized in Table 3.

Table 3

Trip Generation Summary

Land Use Type	No. of Units	Morning Peak Hour			Evening Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
Single-Family	96 sfdu	20	58	78	68	36	104

B. TRIP DISTRIBUTION

The traffic generated by the single-family development was directionally distributed and assigned to the surrounding roadway network. Trips were distributed 40 percent to the

north on Piilani Highway, 30 percent to the north on South Kihei Road, 15 percent to the south on Piilani Highway and 15 percent to the south on South Kihei Road.

Based on the site plan and the location of access driveways, a 50 percent split between driveways was assumed for all destinations except for the traffic to the north on Piilani Highway. It was assumed that half of the exiting traffic to the north on Piilani Highway would travel north using Auhana Road to Kanani Road and to Piilani Highway. This traffic volume was assumed to use the Kanakanui Road driveway. The remaining half would use the Alanui Ke Alii driveway to access Piilani Highway. The traffic entering from the north on Piilani Highway was assumed to use only Alanui Ke Alii as access is easier and quicker via Alanui Ke Alii.

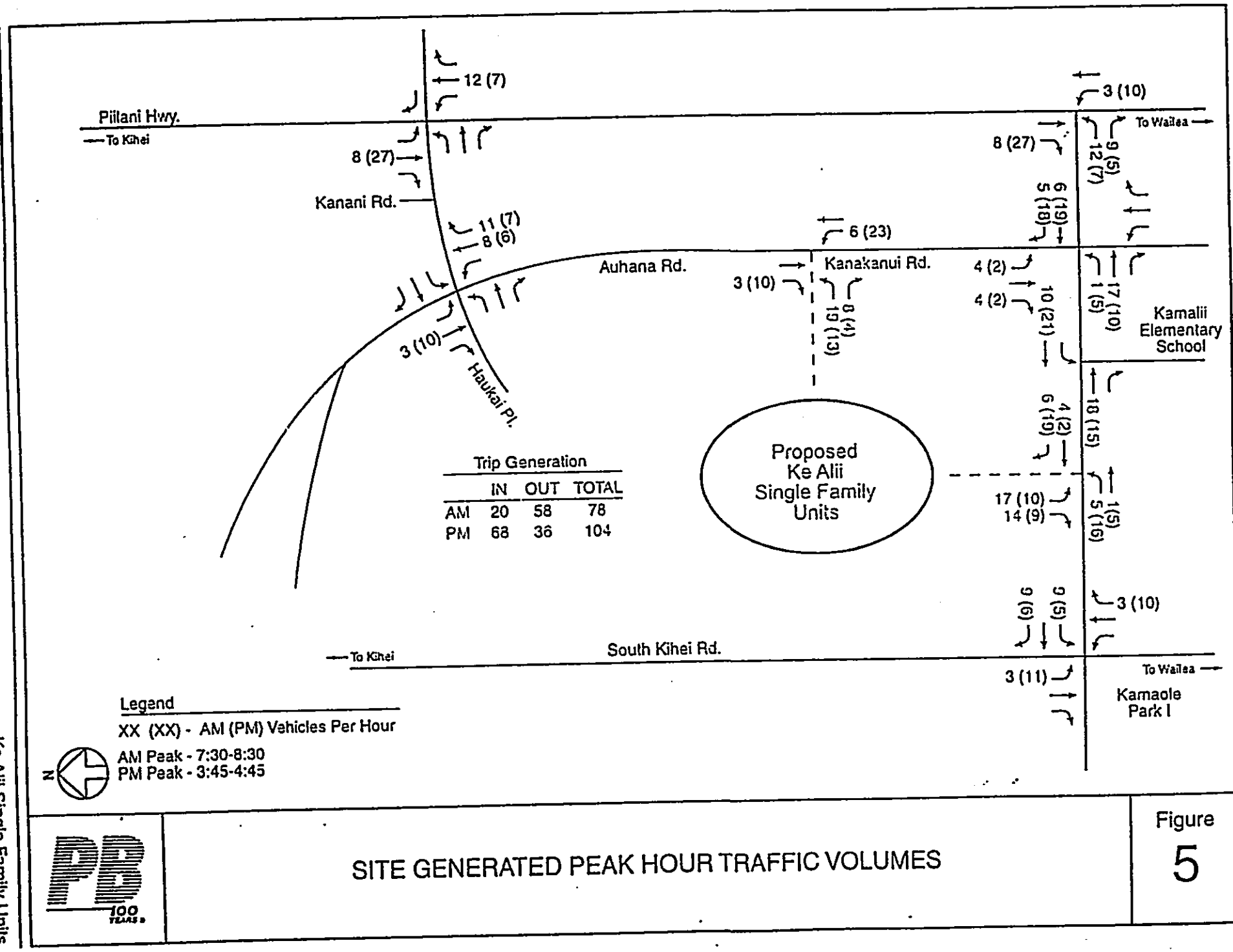
The same 50 percent split in traffic oriented to the north on South Kihei Road was assumed. Half of the traffic would use the Kanakanui Road driveway to Auhana Road to South Kihei Road and the other half would use the Alanui Ke Alii driveway to South Kihei Road.

Traffic oriented to the south was split even between both site access driveways. This trip distribution pattern was applied to the trips generated, and the resulting assignment is shown in Figure 5.

C. YEAR 2001 TRAFFIC VOLUMES WITHOUT PROJECT

The Year 2001 Without Project traffic volumes were estimated by factoring existing traffic by annual growth rates estimated from 1997 *Hawaii State Department of Transportation (SDOT) Traffic Counts* and comparisons between the 1997 traffic counts in the Worldmark, The Club TIAR and the 1999 counts performed for this study. A 3.0 percent annual growth rate was applied to through traffic volumes on Piilani Highway and South Kihei Road. No growth in through traffic volumes was assumed for all other roadways.

In addition to through traffic growth, additional traffic volumes were added for known approved developments within the study area. The developments include the Kamaole Heights single-family units and the Worldmark, The Club timeshare apartments.



SITE GENERATED PEAK HOUR TRAFFIC VOLUMES

Figure 5

The Kamaole Heights is currently under construction and the Worldmark, The Club was recently approved. Traffic volumes generated by both developments were also added to the background traffic volumes.

The traffic volumes for Kamaole Heights were generated and distributed in a similar procedure as the proposed development. The traffic volumes for the Worldmark, The Club were taken from the 1997 TIAR.

The resulting peak hour traffic volumes are shown in Figure 6. They represent Year 2001 Without Project peak hour traffic volumes.

D. YEAR 2001 WITH PROJECT

The site generated traffic (see Figure 5) was added to the Year 2001 Without Project traffic (see Figure 6) to obtain the Year 2001 With Project peak hour traffic volumes with the Ke Alii single-family residential site. Figure 7 presents the projected Year 2001 With Project AM and PM peak hour turning movement volumes.

E. INTERSECTION OPERATIONS ANALYSIS RESULTS

The study area intersections were analyzed using projected traffic volumes both with and without the project. The *1994 Highway Capacity Manual* methods for unsignalized and signalized intersections. Tables 4 and 5 show the results of the Year 2001 Without Project analyses, and the analysis worksheets are in Appendix C.

1. Year 2001 Without Project

The summary shows that all the intersections analyzed will operate well overall in both AM and PM peak hours in the Year 2001 Without Project condition. The additional traffic volumes generated by through traffic growth, the Kamaole Heights single-family units and the Worldmark, The Club timeshare apartments can be accommodated by the roadway network in the Year 2001 Without Project condition. The new traffic signal at the intersection of South Kihei Road and Alanui Ke Alii will help to reduce the delay experienced by the Alanui Ke Alii approach.

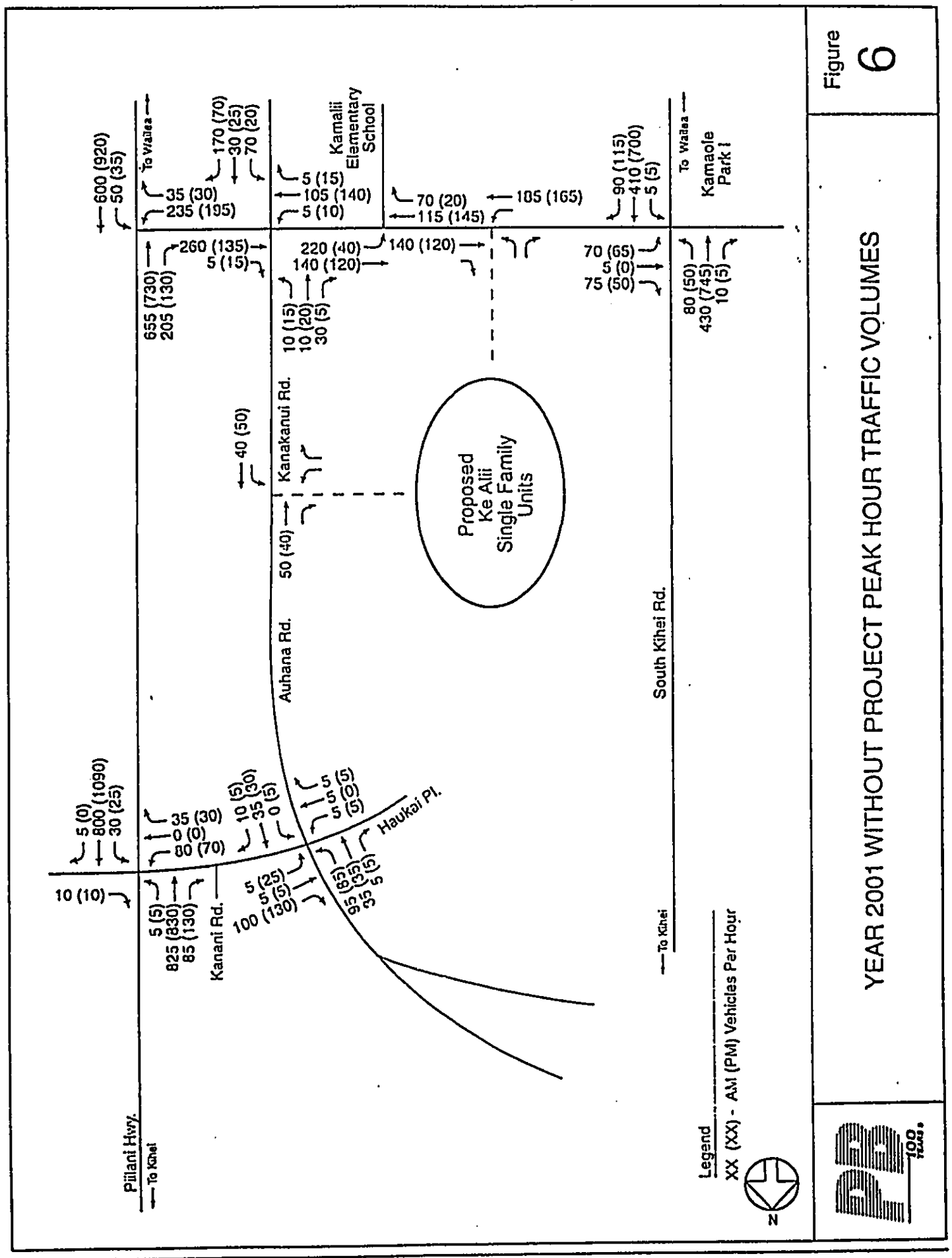


Figure 6

YEAR 2001 WITHOUT PROJECT PEAK HOUR TRAFFIC VOLUMES

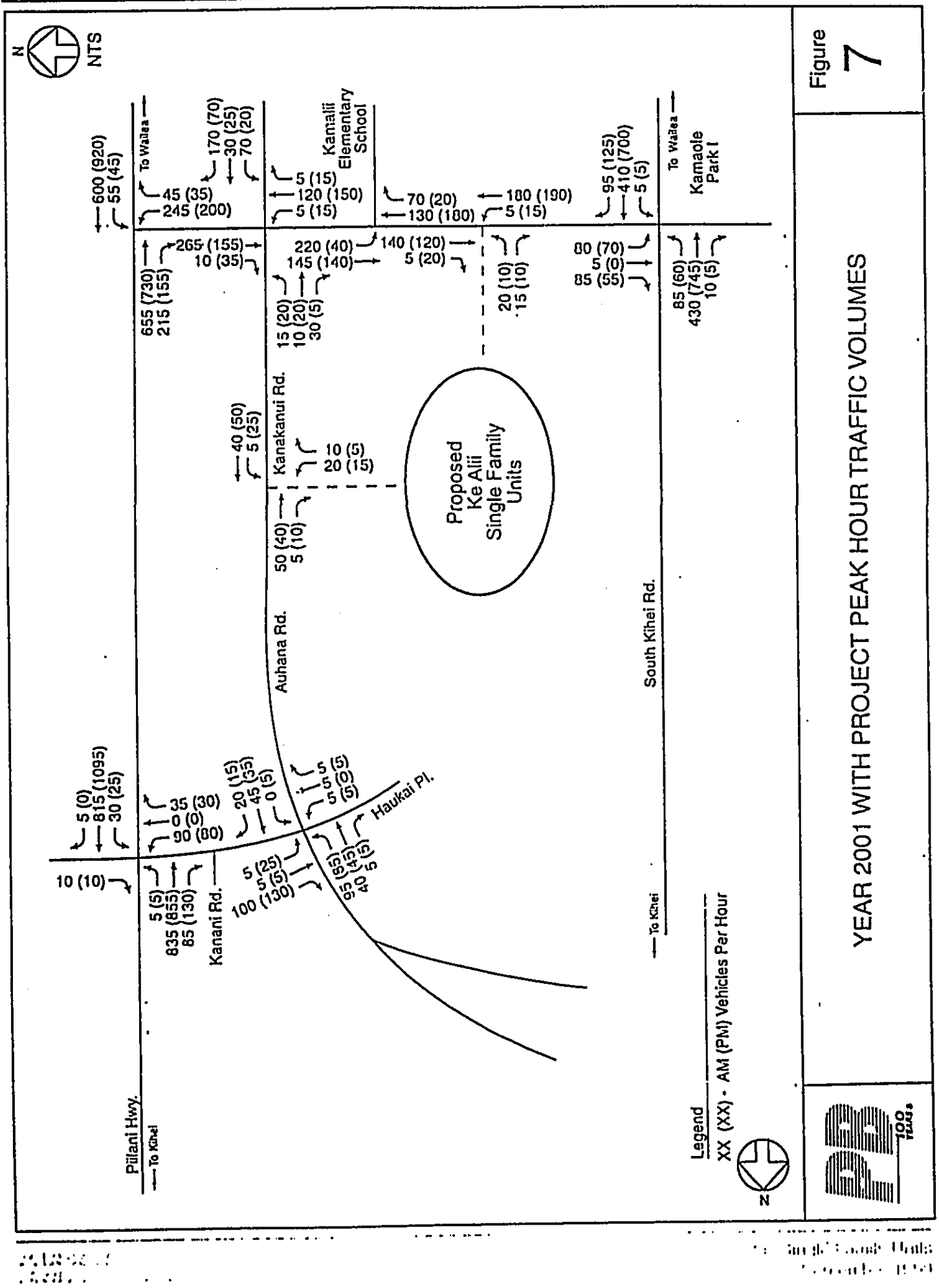


Figure 7

YEAR 2001 WITH PROJECT PEAK HOUR TRAFFIC VOLUMES

The computed queue for the left turns from Alanui Ke Alii to Piilani Highway will remain at 10 vehicles. The added left turning traffic volume is not expected to increase the queue above the existing 95% confidence queue length.

Table 4

Year 2001 Without Project Conditions
Level of Service - Unsignalized Intersections

Intersection	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Kanakanui Road	**A**	**3.0**	**A**	**1.7**
NB Kanakanui Road Approach	B	6.6	A	4.5
SB Kanakanui Road Approach	B	6.0	B	5.7
EB Alanui Ke Alii Approach	A	0.2	A	0.2
WB Alanui Ke Alii Approach	A	0.0	A	0.0
Alanui Ke Alii/Kamalii Elem. Sch.	**A**	**1.6**	**A**	**0.4**
WB Alanui Ke Alii Approach	A	2.4	A	0.9
Alanui Ke Alii/South Kihei Road	**Assume Signalized**			
WB Alanui Ke Alii Approach				
NB South Kihei Road Approach				
SB South Kihei Road Approach				
Kanani Road/Piilani Highway	**A**	**1.5**	**A**	**1.3**
EB Kanani Road Approach	D	20.3	D	23.6
WB Approach	B	8.1	C	12.6
NB Piilani Highway Approach	A	0.4	A	0.2
SB Piilani Highway Approach	A	0.1	A	0.1
Auhana Road/Kanani Road	**A**	**2.4**	**A**	**2.7**
EB Haukai Road Approach	B	5.0	A	4.9
WB Kanani Road Approach	A	3.8	A	4.0
NB Auhana Road Approach	A	0.0	A	0.3
SB Auhana Road Approach	A	1.8	A	1.7

Note: NB= northbound, SB= southbound, EB= eastbound, WB= westbound

Table 5

Year 2001 Without Project Conditions
Level-of-Service - Signalized Intersections

Intersection	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Piilani Highway	**B**	**12.4**	**B**	**12.7**
EB Alanui Ke Alii Approach	D	29.0	D	27.6
NB Piilani Highway Approach	B	8.9	B	12.1
SB Piilani Highway Approach	B	9.4	B	9.3
Alanui Ke Alii/South Kihei Road	**B**	**9.8**	**B**	**12.8**
WB Alanui Ke Alii Approach	C	16.3	C	17.0
NB South Kihei Road Approach	B	10.6	C	15.8
SB South Kihei Road Approach	B	7.8	B	9.8

Note: NB= northbound, SB= southbound, EB= eastbound, WB= westbound

2. Year 2001 With Project

Tables 6 and 7 show the results of the Year 2001 With Project analyses, and the analysis worksheets are in Appendix C. The tables show that the traffic generated by the proposed development is not projected to result in changes to levels of service at intersections analyzed. The average overall intersection delays are not projected to increase by more than one second per vehicle. The two new intersections are projected to operate at the highest level of service overall.

The computed 95% confidence queue length for the left turns from Alanui Ke Alii to Piilani Highway will remain at the existing 10 vehicles. The added left turning traffic volume from the single-family units is not expected to increase the queue above the existing conditions.

There is very little change in traffic operations between the without and with proposed single-family development. This is attributable to the relatively small amount of traffic

generated by the proposed single-family development and the available capacity in the roadway system.

Table 6

Year 2001 With Project Conditions
Level of Service - Unsignalized Intersections

Intersection	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Kanakanui Road	**A**	**3.1**	**A**	**1.7**
NB Kanakanui Road Approach	B	6.8	A	4.7
SB Kanakanui Road Approach	B	6.8	B	6.5
EB Alanui Ke Alii Approach	A	0.2	A	0.2
WB Alanui Ke Alii Approach	A	0.0	A	0.0
Alanui Ke Alii/Kamalii Elem. Sch.	**A**	**1.6**	**A**	**0.4**
WB Alanui Ke Alii Approach	A	2.5	A	0.9
Alanui Ke Alii/South Kihei Road	**Assume Signalized**			
WB Alanui Ke Alii Approach				
NB South Kihei Road Approach				
SB South Kihei Road Approach				
Kanani Road/Piilani Highway	**A**	**1.9**	**A**	**1.7**
EB Kanani Road Approach	D	25.7	D	30.1
WB Approach	B	8.3	C	12.8
NB Piilani Highway Approach	A	0.4	A	0.2
SB Piilani Highway Approach	A	0.1	A	0.1
Auhana Road/Kanani Road	**A**	**2.4**	**A**	**2.7**
EB Haukai Road Approach	B	5.3	B	5.1
WB Kanani Road Approach	A	3.9	A	4.1
NB Auhana Road Approach	A	0.0	A	0.3
SB Auhana Road Approach	A	1.8	A	1.7

Note: NB= northbound, SB= southbound, EB= eastbound, WB= westbound

Table 7

Year 2001 With Project Conditions
Level-of-Service - Signalized Intersections

Intersection	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Piilani Highway	**B**	**12.9**	**B**	**12.8**
EB Alanui Ke Alii Approach	D	30.6	D	28.1
NB Piilani Highway Approach	B	9.2	B	12.3
SB Piilani Highway Approach	B	9.4	B	9.3
Alanui Ke Alii/South Kihei Road	**B**	**10.0**	**B**	**12.8**
WB Alanui Ke Alii Approach	C	16.4	C	17.0
NB South Kihei Road Approach	B	10.6	C	15.8
SB South Kihei Road Approach	B	7.9	B	9.9

IV. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSION

Tables 8 and 9 summarize the intersection operational analysis for the existing, Year 2001 Without Project and Year 2001 With Project conditions. The results of the traffic analysis show that the proposed development will not change any intersection levels of service within the study area. The Kanani Road approach to Piilani Highway is projected to experience some delay with or without the proposed development. The proposed development is not projected to increase intersection approach delay significantly on Kanani Road.

The intersection of Alanui Ke Alii and Piilani Highway is projected to operate well with and without the proposed development. The additional traffic volume is not projected to change future intersection levels of service. The queue on Alanui Ke Alii at Piilani Highway is not projected to increase the expected queue beyond the existing queue length.

It is, therefore, concluded that the single-family parcel can be accommodated by the roadway system anticipated to be in place at its buildout.

B. RECOMMENDATIONS

The following recommendations identify specific improvements that help to enhance traffic operations and to protect existing development in the vicinity of the proposed single-family parcel.

1. Site Access to Alanui Ke Alii

The driveway to Alanui Ke Alii is proposed to be located approximately 425 feet west of the Kamalii Elementary School entrance. Figure 8 shows the approximate intersection spacing on Alanui Ke Alii. It will be a full-movement intersection with STOP-sign control at the single-family parcel driveway. This intersection spacing exceeds the minimum spacing usually required by the Maui County Department of Public Works & Waste Management.

Table 8

Level of Service Summary
Unsignalized Intersections

Intersections	Existing Condition				Yr 2001 w/o Project				Yr 2001 w/ Project			
	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM		AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM		AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Kanakanui Road	**A**	**3.0**	**A**	**1.7**	**A**	**3.0**	**A**	**1.7**	**A**	**3.1**	**A**	**1.7**
NB Kanakanui Road Approach	B	6.1	A	4.2	B	6.6	A	4.5	B	6.8	A	4.7
SB Kanakanui Road Approach	B	5.8	B	5.2	B	6.0	B	5.7	B	6.8	B	6.5
EB Alanui Ke Alii Approach	A	0.1	A	0.1	A	0.2	A	0.2	A	0.2	A	0.2
WB Alanui Ke Alii Approach	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
Alanui Ke Alii/Kamalii Elem.	**A**	**1.6**	**A**	**0.4**	**A**	**1.6**	**A**	**0.4**	**A**	**1.6**	**A**	**0.4**
WB Alanui Ke Alii Approach	A	2.4	A	0.9	A	2.4	A	0.9	A	2.5	A	0.9
Alanui Ke Alii/South Kihei Road	**A**	**1.6**	**A**	**1.9**	Assume Signalized				Assume Signalized			
WB Alanui Ke Alii Approach	C	11.5	E	30.7								
NB South Kihei Road Approach	A	0.1	A	0.0								
SB South Kihei Road Approach	A	0.6	A	0.3								
Kanani Road/Piilani Highway	**A**	**1.3**	**A**	**1.1**	A	1.5	A	1.3	A	1.9	A	1.7
EB Kanani Road Approach	C	17.0	C	19.9	D	20.3	D	23.6	D	25.7	D	30.1
WB Approach	B	7.5	C	11.5	B	8.1	C	12.6	B	8.3	C	12.8
NB Piilani Highway Approach	A	0.3	A	0.2	A	0.4	A	0.2	A	0.4	A	0.2
SB Piilani Highway Approach	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1
Auhana Road/Kanani Road	**A**	**2.1**	**A**	**2.6**	**A**	**2.4**	**A**	**2.7**	**A**	**2.4**	**A**	**2.7**
EB Haukai Road Approach	A	4.8	A	4.5	B	5.0	A	4.9	B	5.3	B	5.1
WB Kanani Road Approach	A	3.4	A	3.9	A	3.8	A	4.0	A	3.9	A	4.1
NB Auhana Road Approach	A	0.0	A	0.2	A	0.0	A	0.3	A	0.0	A	0.3
SB Auhana Road Approach	A	1.8	A	1.7	A	1.8	A	1.7	A	1.8	A	1.7

NB – Northbound, SB – Southbound, EB – Eastbound, WB – Westbound

Table 8 – Con't.

Level of Service Summary
Unsignalized Intersections

Intersections	Existing Condition				Yr 2001 w/o Project				Yr 2001 w/ Project			
	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM		AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM		AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Site Access/Alanui Ke Alii	Not Constructed				Not Constructed				A	0.5	A	0.4
SB Site Access Approach									B	5.2	A	4.9
EB Alanui Ke Alii Approach									A	0.1	A	0.2
Site Access/Kanakanui Road									A	3.4	A	3.6
NB Kanakanui Road Approach									A	3.9	A	4.0
SB Kanakanui Road Approach									A	4.1	A	3.7
EB Site Access Approach									A	1.4	A	1.6

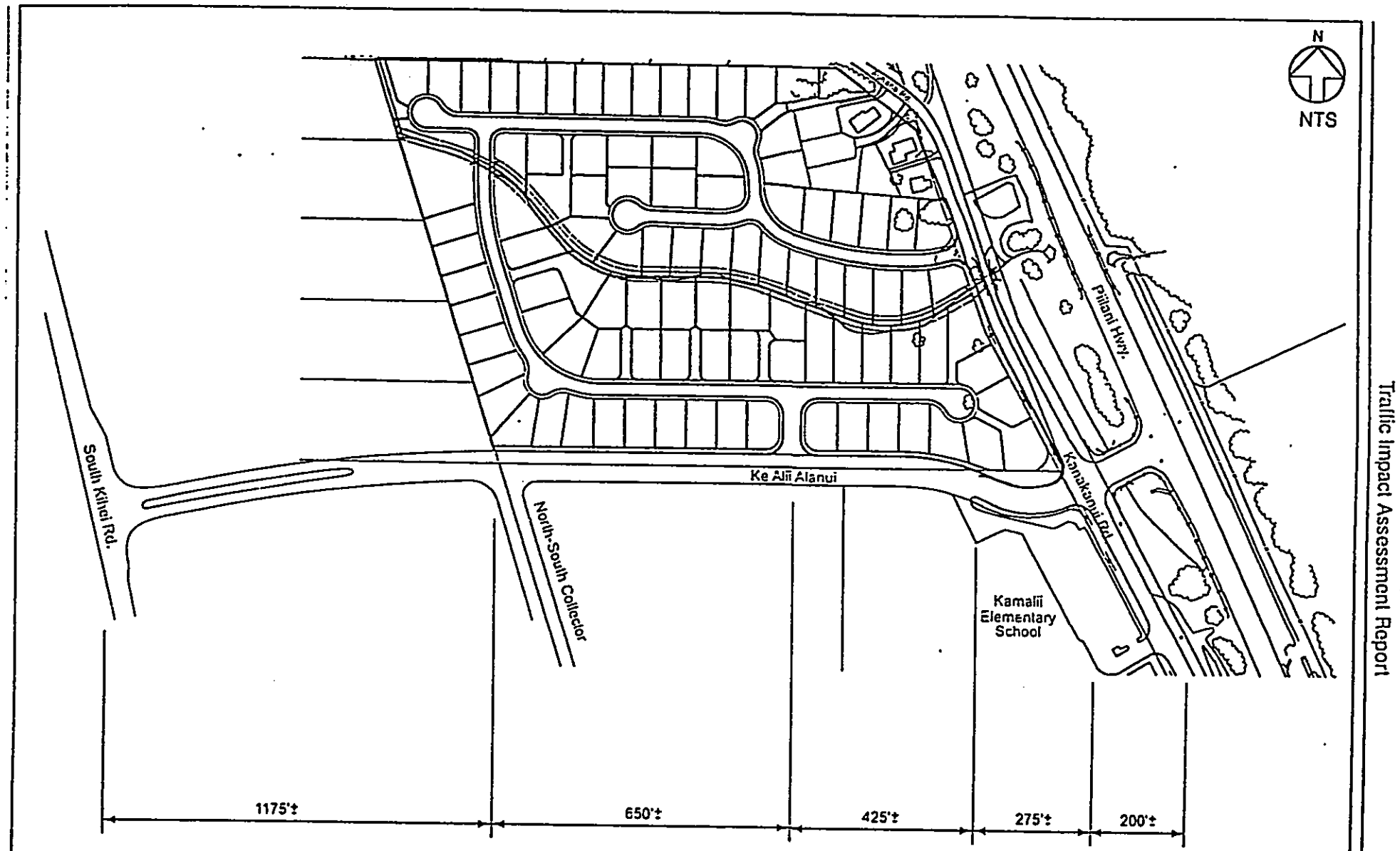
NB – Northbound, SB – Southbound, EB – Eastbound, WB – Westbound

Table 9

Level of Service Summary
Signalized Intersections

Intersection	Existing Condition				Yr 2001 w/o Project				Yr 2001 w/ Project			
	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM		AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM		AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Piilani Highway	B	11.5	B	11.3	B	12.4	B	12.7	B	12.9	B	12.8
EB Alanui Ke Alii Approach	D	26.6	D	25.6	D	29.0	D	27.6	D	30.6	D	28.1
NB Piilani Highway Approach	B	8.5	B	10.6	B	8.9	B	12.1	B	9.2	B	12.3
SB Piilani Highway Approach	B	8.5	B	8.3	B	9.4	B	9.3	B	9.4	B	9.3
Alanui Ke Alii/South Kihei Road	Existing Condition is Unsignalized				B	9.8	B	12.8	B	10.0	B	12.8
WB Alanui Ke Alii Approach					C	16.3	C	17.0	C	16.4	C	17.0
NB South Kihei Road Approach					B	10.6	C	15.8	B	10.6	C	15.8
SB South Kihei Road Approach					B	7.8	B	9.8	B	7.9	B	9.9

NB – Northbound, SB – Southbound, EB – Eastbound, WB – Westbound



INTERSECTION SPACING ON ALANUI KE ALII

Figure 8

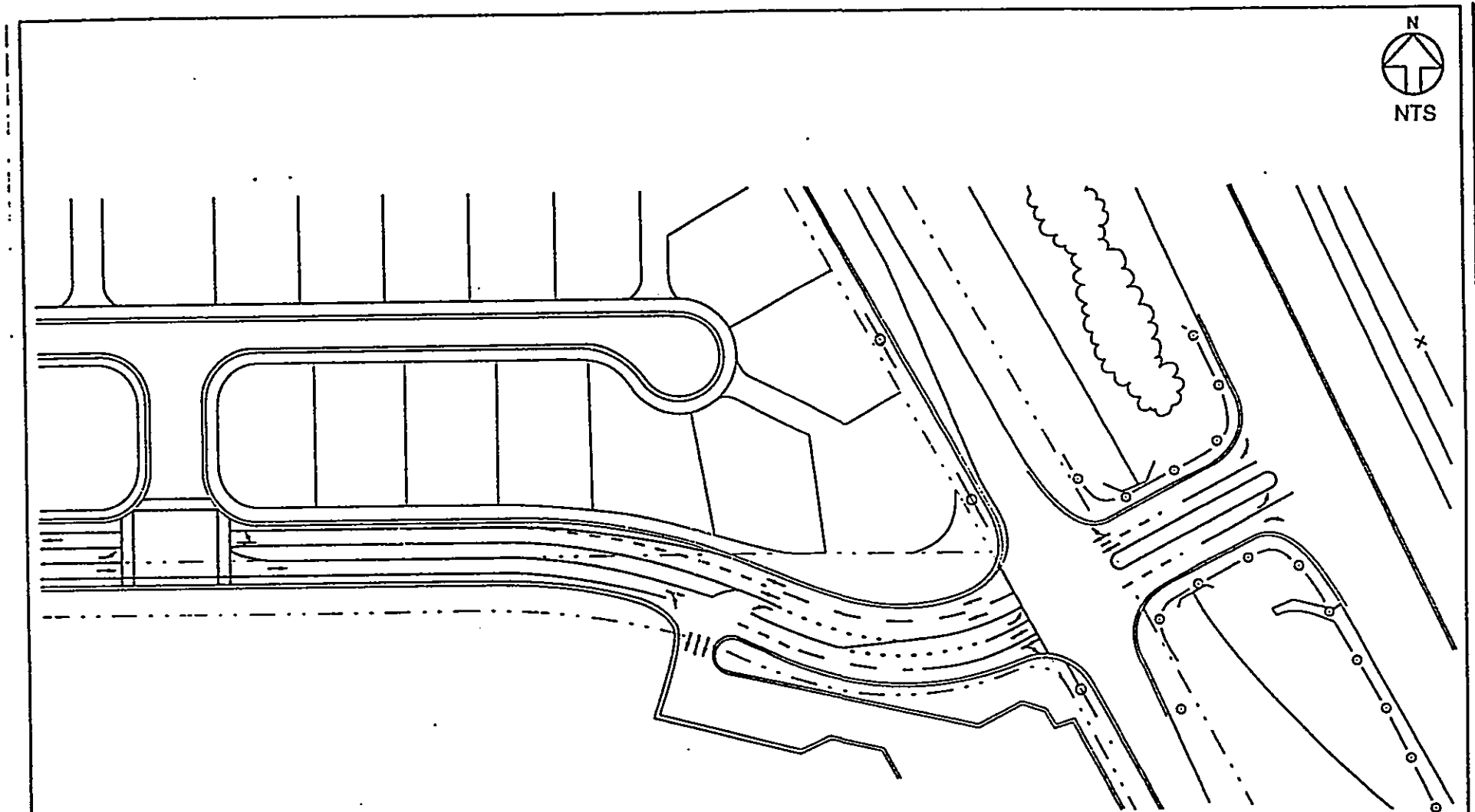
As part of the single-family development, Alanui Ke Alii will be widened and improved on its north side along the frontage of the single-family parcel. Curb and gutter will be installed along this frontage. The improved roadway will be 48-feet wide measured from face of curb to face of curb along the frontage of the proposed single-family parcel. This will provide enough roadway width to allow the installation of a median left-turn lane for traffic turning into the single-family development along with 6 foot bike lanes in both directions.

Figure 9 illustrates the recommended configuration of the site access intersection.

2. Site Access to Kanakanui Road

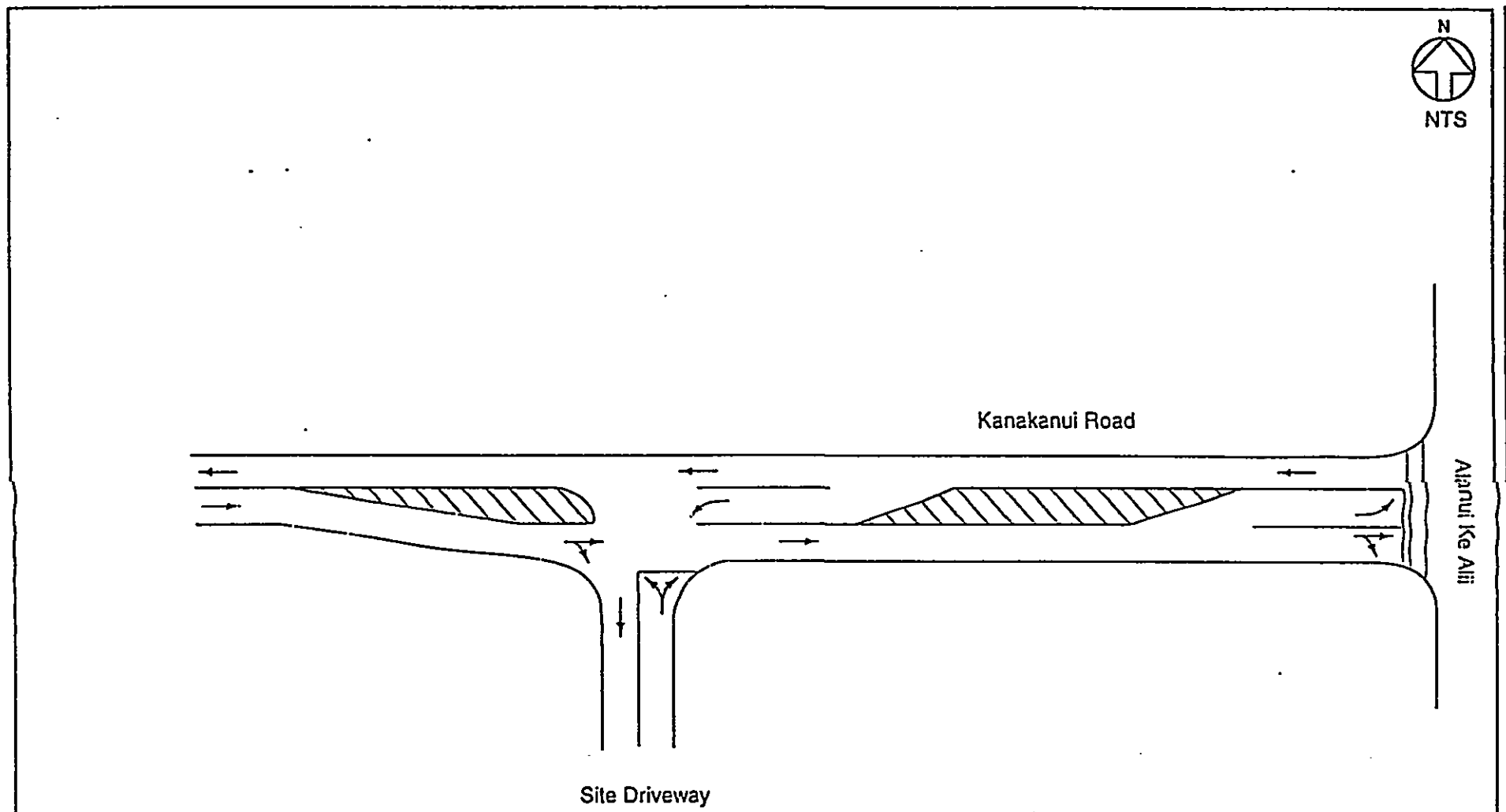
The second access to the single-family parcel is located on Kanakanui Road and is proposed approximately 600 feet north of the Alanui Ke Alii. It will be a full-movement intersection with STOP-sign control at the single-family parcel driveway.

As part of the single-family development, Kanakanui Road will be widened and improved on its west side along the frontage of the single-family parcel. Curb and gutter will be installed along this frontage. The improved roadway will be 36-feet wide measured from face of curb to edge of pavement along the frontage of the proposed single-family parcel. This will provide enough roadway width to allow the installation of a median left-turn lane for traffic turning into the single-family. Figure 10 illustrates the recommended configuration of the site access intersection.



PROPOSED LANE CONFIGURATIONS ON ALANUI KE ALII

Figure 9



Traffic Impact Assessment Report

PB 100 YEARS

PROPOSED SITE ACCESS TO KANAKANUI ROAD

Figure 10

APPENDIX

Appendix A Traffic Count Data

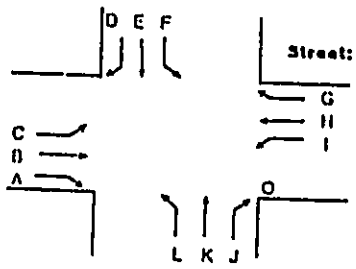
AM COUNT SHEET

Intersection: Kanakanui-Alanui Ke Alii

Date: 07/28-29/09

By: Sharon (Aloha)

Weather: Clear

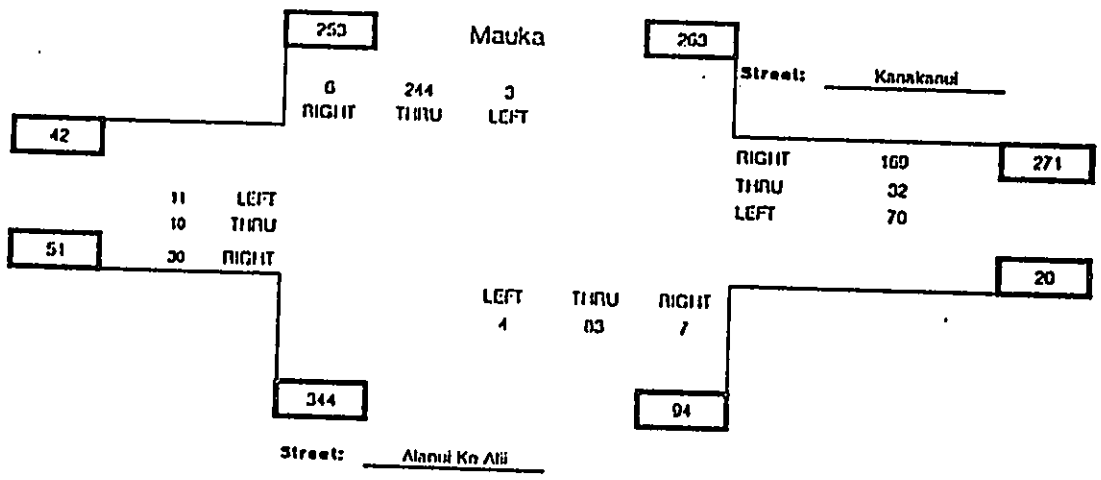


Street Alanui Ke Alii

TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 - 6:45	0	3	3	0	14	1	6	1	2	0	16	0	46	234
6:45 - 7:00	0	2	3	1	20	3	12	2	2	1	16	0	62	279
7:00 - 7:15	2	0	4	0	13	1	9	2	1	3	14	0	49	350
7:15 - 7:30	1	2	2	2	19	1	22	4	3	4	16	1	77	408
7:30 - 7:45	4	0	1	1	35	2	23	5	5	1	14	0	91	669
7:45 - 8:00	4	1	0	1	42	1	34	8	14	1	20	1	133	
8:00 - 8:15	13	5	3	2	74	0	47	8	10	2	23	1	187	
8:15 - 8:30	0	4	1	2	93	0	65	11	32	3	20	2	240	
Pkf	0.577	0.500	0.458	0.750	0.656	0.375	0.650	0.727	0.547	0.583	0.700	0.500	Peak	Pkf
7:30 - 8:30	30	10	11	6	244	3	169	32	70	7	83	4	669	0.674

Peak Hour

7:00 - 8:30



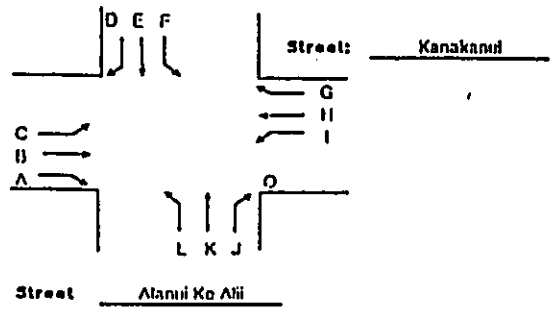
PM COUNT SHEET

Intersection: Kanakanui-Alanui Ke Alii

Date: 07/26-29/99

By: Sharon (Akina)

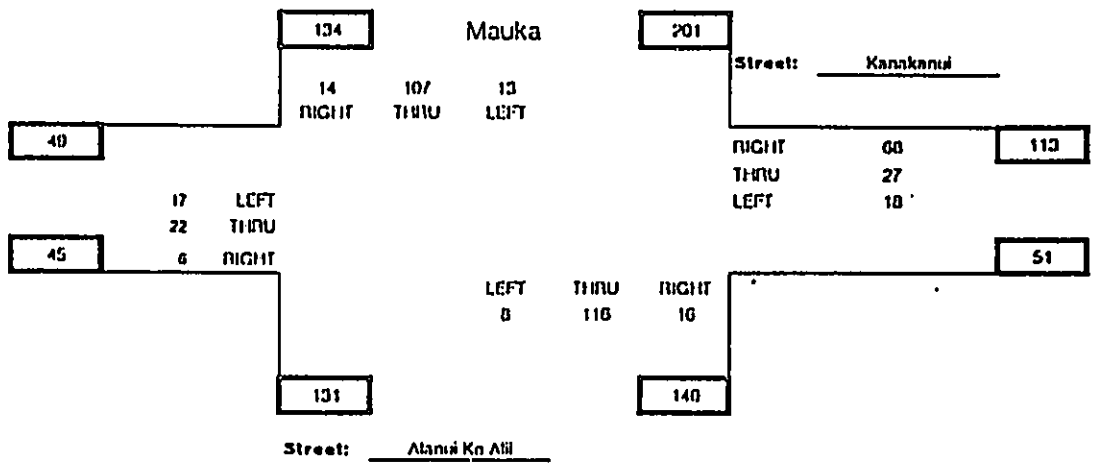
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 - 3:45	2	6	0	1	23	0	10	4	3	5	32	1	104	420
3:45 - 4:00	1	0	1	1	24	1	13	6	5	5	37	1	103	432
4:00 - 4:15	1	0	7	5	25	7	13	6	0	6	26	1	111	416
4:15 - 4:30	0	2	7	4	28	1	23	7	5	3	28	3	111	423
4:30 - 4:45	4	4	2	4	30	4	10	0	2	2	25	3	107	420
4:45 - 5:00	1	7	4	1	27	1	15	8	2	4	15	2	87	
5:00 - 5:15	1	14	5	1	30	0	20	7	6	4	28	2	118	
5:15 - 5:30	1	13	3	0	23	10	15	5	0	0	28	1	100	
PM	0.375	0.608	0.607	0.700	0.892	0.464	0.739	0.844	0.750	0.667	0.784	0.667	Peak	PM
3:45 - 4:45	6	22	17	14	107	13	60	27	18	18	118	6	432	0.973

Peak Hour

3:45 - 4:45



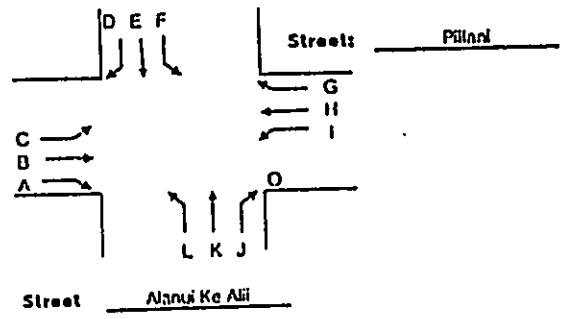
AM COUNT SHEET

Intersection: Pilani/Alanui Ke Alii

Date: 07/28-29/09

By: Sue (Aloha)

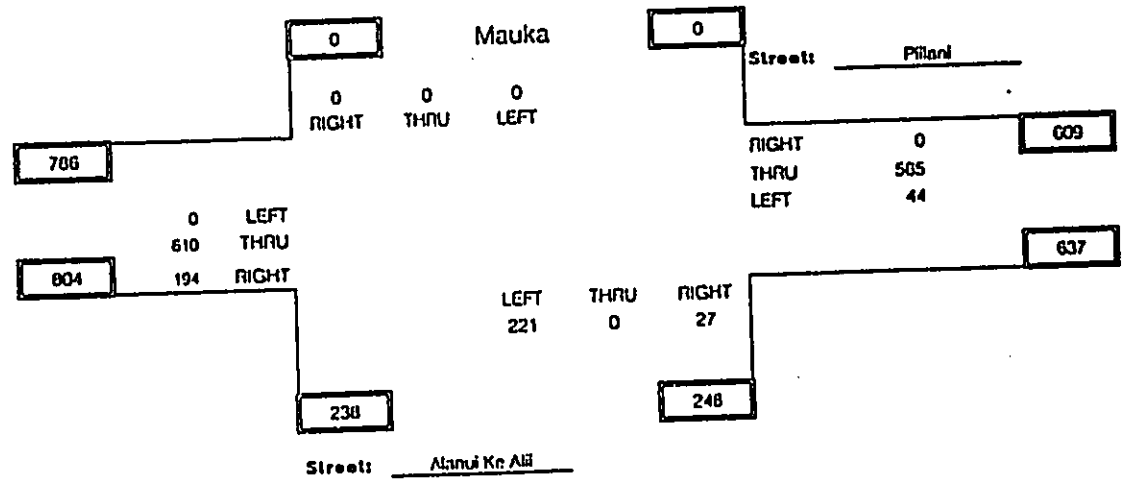
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 - 6:45	4	98						98	2	2		20	224	1150
6:45 - 7:00	22	113						96	6	5		21	263	1346
7:00 - 7:15	13	130						128	4	2		26	303	1491
7:15 - 7:30	17	150						150	3	5		35	360	1569
7:30 - 7:45	33	203						130	2	4		40	420	1661
7:45 - 8:00	35	167						147	8	7		44	408	
8:00 - 8:15	50	107						140	12	7		65	381	
8:15 - 8:30	76	133						140	22	9		72	452	
PhF	0.638	0.751						0.961	0.500	0.750		0.787	Peak	Phf
7:30 - 8:30	194	610						565	44	27		221	1661	0.919

Peak Hour

7:30 - 8:30



CORRECTION

THE PRECEDING DOCUMENT(S) HAS BEEN REPHOTOGRAPHED TO ASSURE LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

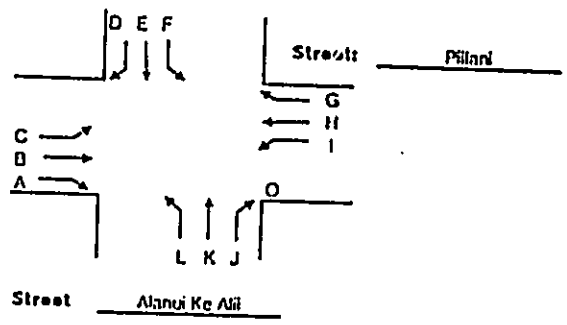
AM COUNT SHEET

Intersection: Piilani/Alanui Ke Alii

Date: 07/28-29/99

Dy: Sue (Aloha)

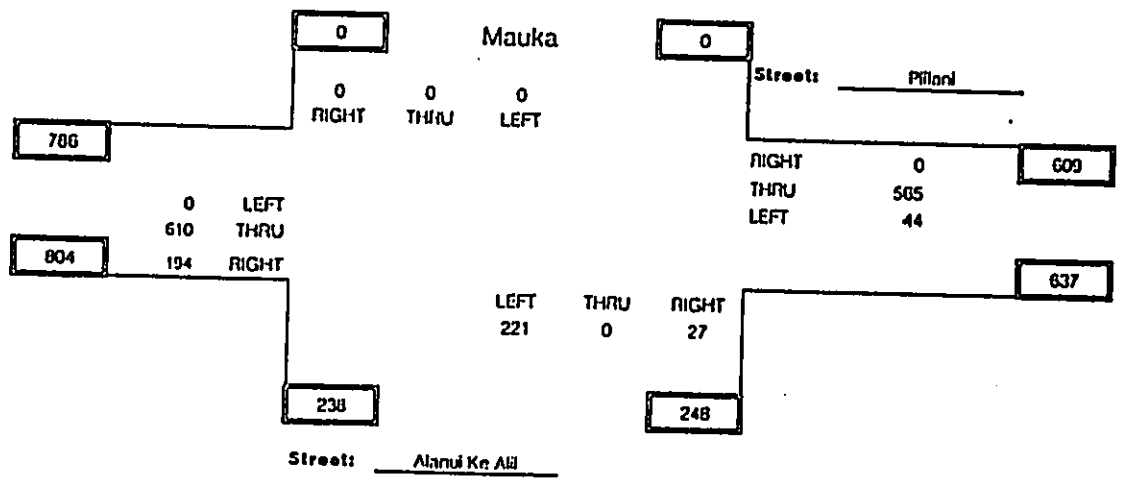
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 - 6:45	4	98						98	2	2		20	224	1150
6:45 - 7:00	22	113						90	6	5		21	263	1346
7:00 - 7:15	13	130						128	4	2		26	303	1491
7:15 - 7:30	17	150						150	3	5		35	360	1569
7:30 - 7:45	33	203						130	2	4		40	420	1661
7:45 - 8:00	35	167						147	8	7		44	408	
8:00 - 8:15	50	107						140	12	7		65	381	
8:15 - 8:30	76	133						140	22	9		72	452	
Phf	0.638	0.751						0.961	0.500	0.750		0.787	Peak	Phf
7:30 - 8:30	194	610						565	44	27		221	1661	0.919

Peak Hour

7:30 - 8:30



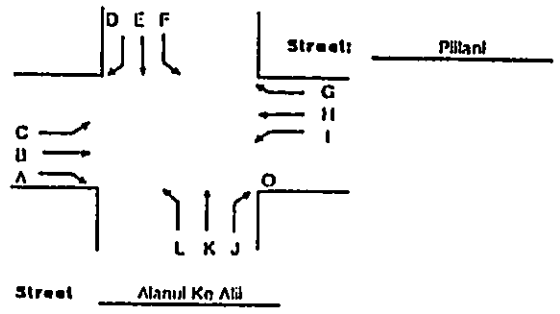
PM COUNT SHEET

Intersection: Pilani/Alanui Ke Alii

Date: 07/20-20/00

By: Sio (Aloha)

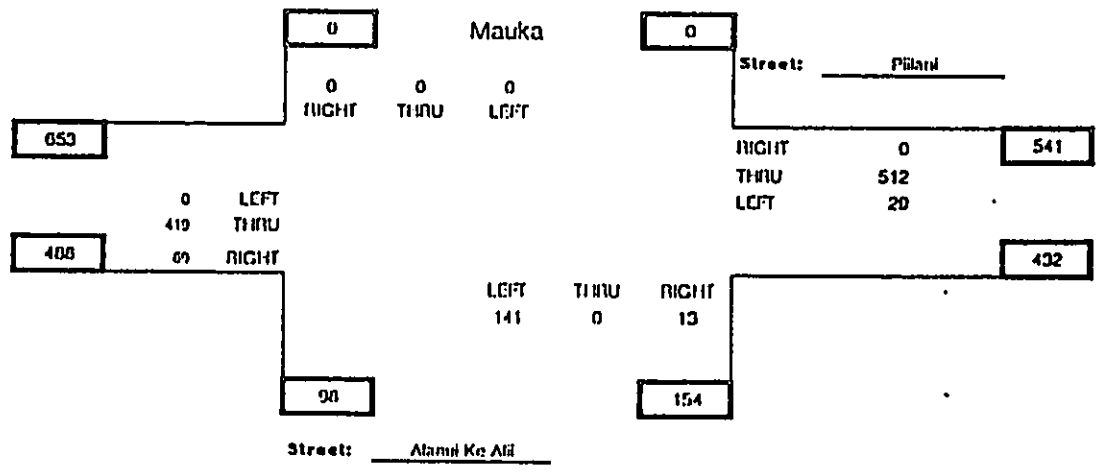
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 - 3:45	21	185						102	15	0		53	465	1251
3:45 - 4:00	15	119						115	0	8		35	200	1183
4:00 - 4:15	7	57						80	3	2		17	166	1363
4:15 - 4:30	26	116						126	8	3		43	322	1750
4:30 - 4:45	21	127						191	12	0		48	397	2056
4:45 - 5:00	35	100						100	13	8		53	478	
5:00 - 5:15	34	236						220	11	6		55	562	
5:15 - 5:30	44	247						247	0	12		60	610	
Phf	0.683	0.825						0.670	0.604	0.406		0.766	Peak	Phf
3:45 - 4:45	69	419						512	20	13		141	1183	0.745

Peak Hour

3:45 - 4:45



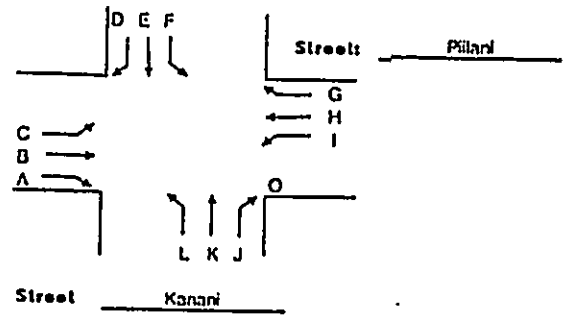
AM COUNT SHEET

Intersection: Pilani/Kanani

Date: 07/28-29/09

By: Francine (Aloha)

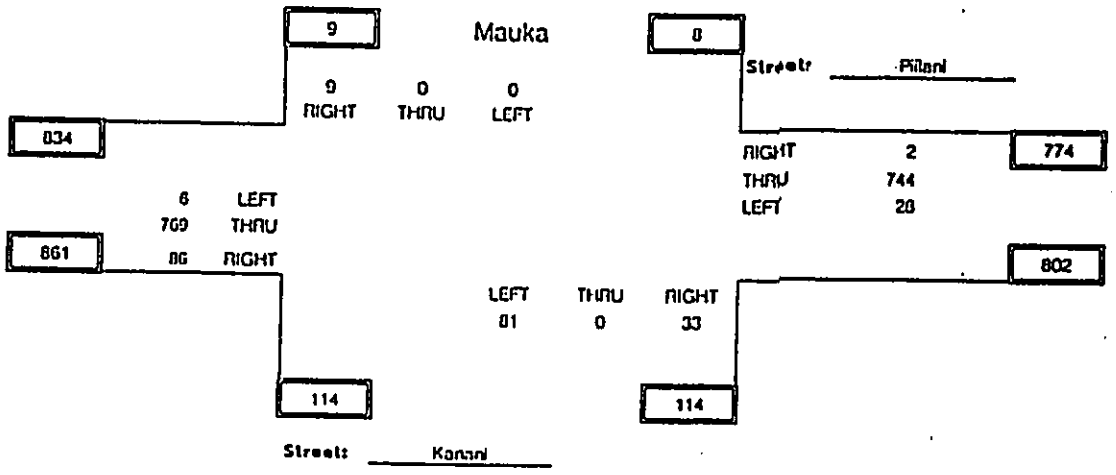
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 - 6:45	9	133	19	1	0	0	1	140	4	2	1	12	322	1406
6:45 - 7:00	14	142	17	6	0	0	1	121	5	0	0	19	325	1544
7:00 - 7:15	11	144	5	3	0	1	0	159	5	4	0	24	356	1649
7:15 - 7:30	13	210	2	2	0	0	0	157	2	2	0	15	403	1727
7:30 - 7:45	23	234	0	2	0	0	0	164	11	6	0	20	460	1758
7:45 - 8:00	23	200	4	2	0	0	1	171	3	9	0	17	430	
8:00 - 8:15	20	149	0	4	0	0	0	218	7	8	0	28	434	
8:15 - 8:30	20	186	2	1	0	0	1	191	7	10	0	16	434	
PhF	0.035	0.022	0.375	0.563	0.000	0.000	0.500	0.853	0.636	0.625	0.000	0.723	Peak	Phf
7:30 - 8:30	86	709	8	9	0	0	2	744	28	33	0	81	1758	0.955

Peak Hour

7:30 - 8:30



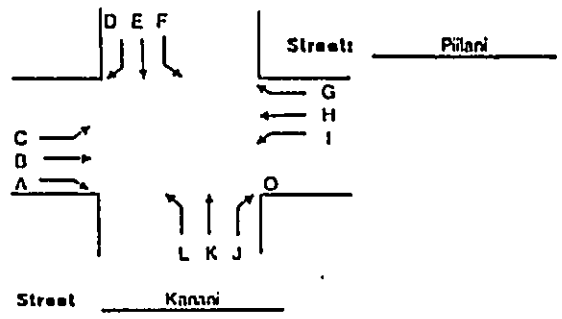
PM COUNT SHEET

Intersection: Pilani/Kanani

Date: 07/28-29/09

By: Francine (Aloha)

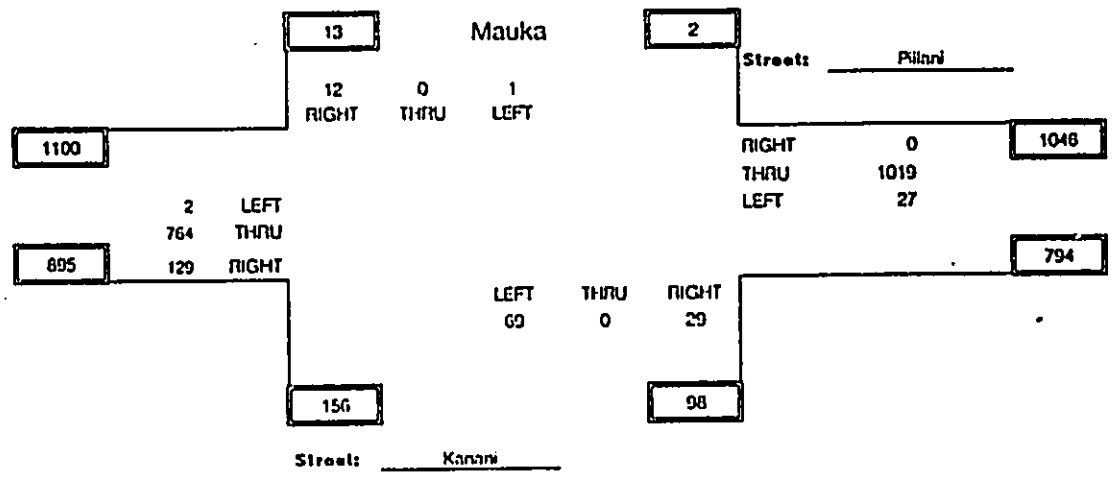
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 - 3:45	19	192	3	33	0	1	0	201	8	7	1	26	491	2015
3:45 - 4:00	26	174	1	0	0	0	0	234	7	7	0	16	471	2052
4:00 - 4:15	34	170	0	2	0	1	0	256	8	9	0	20	500	1993
4:15 - 4:30	32	182	1	1	0	0	0	303	7	8	0	19	553	2012
4:30 - 4:45	37	238	0	3	0	0	0	226	5	5	0	14	520	1869
4:45 - 5:00	35	171	0	3	0	0	0	170	5	10	0	18	412	
5:00 - 5:15	43	197	0	2	0	1	1	236	9	13	0	17	519	
5:15 - 5:30	32	187	1	1	0	0	0	163	4	5	0	17	410	
PhF	0.872	0.803	0.500	0.500	0.000	0.250	0.000	0.841	0.844	0.806	0.000	0.863	Peak	PhF
3:45 - 4:45	129	764	2	12	0	1	0	1019	27	29	0	69	2052	0.928

Peak Hour

3:45 - 4:45



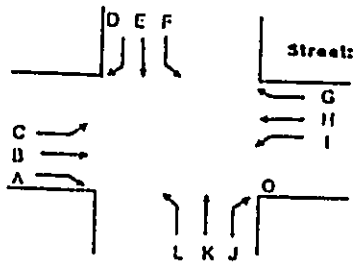
AM COUNT SHEET

Intersection: Haukel/Kanani/Auhana

Date: 07/26-29/00

By: Diane (Aloha)

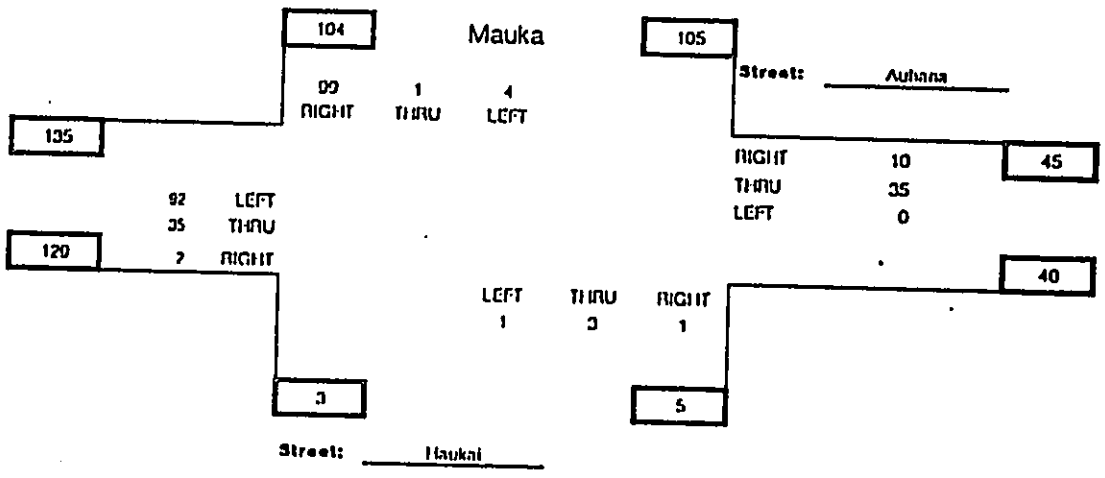
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 - 6:45	1	3	10	13	0	2	3	3	0	2	0	1	38	177
6:45 - 7:00	0	3	14	17	1	1	2	3	0	0	1	1	43	186
7:00 - 7:15	0	5	24	16	0	1	2	5	0	0	0	2	55	220
7:15 - 7:30	0	3	17	15	0	1	1	3	0	0	0	1	41	250
7:30 - 7:45	0	2	20	27	0	2	3	4	0	0	0	1	59	203
7:45 - 8:00	0	0	16	23	0	0	2	13	0	0	2	0	65	
8:00 - 8:15	0	15	33	25	1	2	1	8	0	0	0	0	85	
8:15 - 8:30	2	9	23	24	0	0	4	10	0	1	1	0	74	
PH	0.250	0.563	0.607	0.917	0.250	0.500	0.625	0.673	0.000	0.250	0.375	0.250	Peak	PH
7:30 - 8:30	2	35	92	99	1	4	10	35	0	1	3	1	283	0.932

Peak Hour

7:30 - 8:30



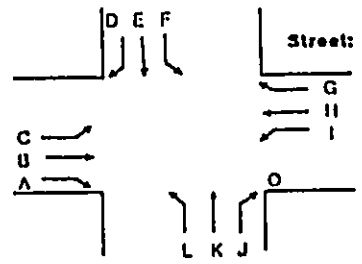
PM COUNT SHEET

Intersection: Haukal/Kanani/Auhana

Date: 07/20-20/00

By: Diane (Aloha)

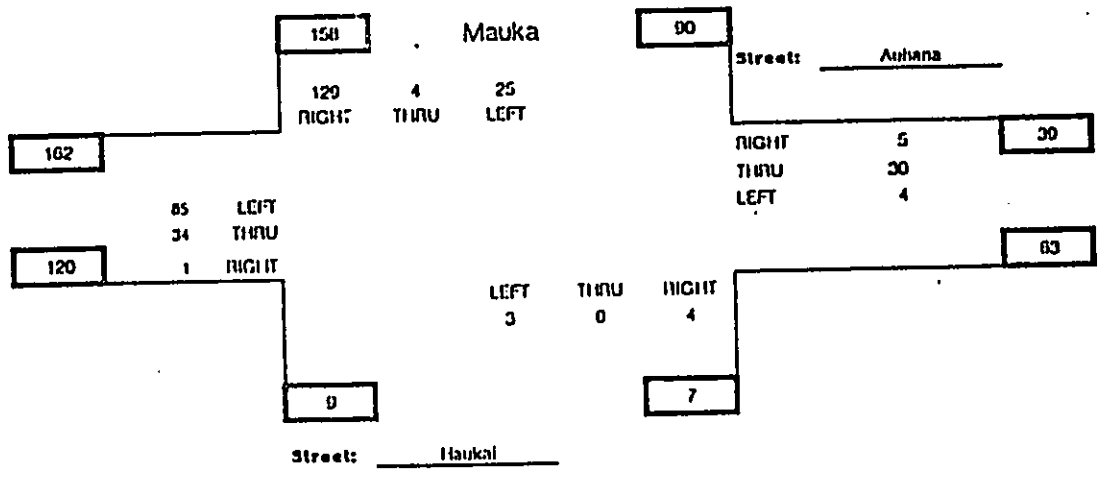
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 - 3:45	1	0	31	28	0	1	2	0	0	0	2	1	81	324
3:45 - 4:00	0	0	19	30	0	0	3	4	0	1	0	0	74	324
4:00 - 4:15	0	11	20	35	0	6	0	0	2	2	0	0	84	328
4:15 - 4:30	1	7	26	26	3	7	1	11	1	1	0	1	85	337
4:30 - 4:45	0	7	20	30	1	4	1	7	1	0	0	2	81	337
4:45 - 5:00	1	10	16	32	2	4	0	11	0	0	0	2	78	
5:00 - 5:15	0	12	20	35	0	4	5	0	0	0	0	0	93	
5:15 - 5:30	1	16	17	33	2	4	2	7	0	1	0	2	85	
Phf	0.250	0.773	0.817	0.849	0.333	0.781	0.417	0.682	0.500	0.500	0.000	0.375	Peak	Phf
3:45 - 4:45	1	34	85	120	4	25	5	30	4	4	0	3	324	0.953

Peak Hour

3:45 - 4:45



Appendix B Levels of Service Definitions

The *Highway Capacity Manual* defines six Levels of Service (LOS), labeled A through F, from best to worst conditions. Levels of Service for signalized and unsignalized intersections are defined in terms of average user delays. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time.

For unsignalized intersections, the *Highway Capacity Manual* evaluates gaps in the major street traffic flow and calculates available gaps for left-turns across oncoming traffic and for the left and right-turns onto the major roadway from the minor street.

LEVEL-OF-SERVICE A: Little or no delay.

LEVEL-OF-SERVICE B: Short traffic delays.

LEVEL-OF-SERVICE C: Average traffic delays.

LEVEL-OF-SERVICE D: Long traffic delays.

LEVEL-OF-SERVICE E: Very long traffic delays.

LEVEL-OF-SERVICE F: Demand volume exceeds capacity, resulting in extreme delays with queuing that may cause severe congestion and affect other movements at the intersection.

Appendix C Intersection Capacity Analysis Worksheets

Center For Microcomputers In Transportation
University of Florida
512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) Kanakanui Road (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Existing 1999 AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	< 0	0	2	< 0	1	1	< 0	1	1	< 0
Stop/Yield			N			N						
Volumes	4	83	7		244	6	70	32	169	11	10	30
PHF	.5	.8	.58		.66	.75	.55	.73	.65	.46	.5	.58
Grade		0			0			0			0	
MC's (%)	0						0	0	0	0	0	0
SU/RV's (%)	0						0	0	0	0	0	0
CV's (%)	0						0	0	0	0	0	0
PCE's	1.00						1.00	1.00	1.00	1.00	1.00	1.00

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	58	189
Potential Capacity: (pcph)	1294	1111
Movement Capacity: (pcph)	1294	1111
Prob. of Queue-Free State:	0.80	0.95

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		378
Potential Capacity: (pcph)		1074
Movement Capacity: (pcph)		1074
Prob. of Queue-Free State:		0.99

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	496	498
Potential Capacity: (pcph)	559	558
Capacity Adjustment Factor due to Impeding Movements	0.99	0.99
Movement Capacity: (pcph)	555	554
Prob. of Queue-Free State:	0.92	0.96

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	498	508
Potential Capacity: (pcph)	509	501
Major LT, Minor TH Impedance Factor:	0.96	0.91
Adjusted Impedance Factor:	0.97	0.93
Capacity Adjustment Factor due to Impeding Movements	0.92	0.75
Movement Capacity: (pcph)	469	374

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB L	127	469		10.5	1.3	C	
NB T	44	555 >					6.1
NB R	260	1294 >	1085	4.6	1.3	A	
SB L	24	374		10.3	0.1	C	
SB T	20	554 >					5.8
SB R	52	1111 >	868	4.5	0.2	A	
EB L	8	1074		3.4	0.0	A	0.1

Intersection Delay = 3.0 sec/veh

Center For Microcomputers In Transportation
University of Florida
512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) Kanakanui Road (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Existing 1999 PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	< 0	0	2	< 0	1	1	< 0	1	1	< 0
Stop/Yield			N			N						
Volumes	8	116	16		107	14	18	27	68	17	22	6
PHF	.67	.78	.67		.89	.7	.75	.84	.74	.61	.69	.38
Grade		0			0			0			0	
MC's (%)	0						0	0	0	0	0	0
SU/RV's (%)	0						0	0	0	0	0	0
CV's (%)	0						0	0	0	0	0	0
PCE's	1.00						1.00	1.00	1.00	1.00	1.00	1.00

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	86	70
Potential Capacity: (pcph)	1252	1276
Movement Capacity: (pcph)	1252	1276
Prob. of Queue-Free State:	0.93	0.99

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		140
Potential Capacity: (pcph)		1442
Movement Capacity: (pcph)		1442
Prob. of Queue-Free State:		0.99

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	313	315
Potential Capacity: (pcph)	716	714
Capacity Adjustment Factor due to Impeding Movements	0.99	0.99
Movement Capacity: (pcph)	710	708
Prob. of Queue-Free State:	0.95	0.95

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	309	307
Potential Capacity: (pcph)	672	674
Major LT, Minor TH Impedance Factor:	0.95	0.95
Adjusted Impedance Factor:	0.96	0.96
Capacity Adjustment Factor due to Impeding Movements	0.95	0.89
Movement Capacity: (pcph)	637	599

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB	L	24	637		5.9	0.0	B	
NB	T	32	710	>				4.2
NB	R	92	1252	> 1046	3.9	0.4	A	
SB	L	28	599		6.3	0.0	B	
SB	T	32	708	>				5.2
SB	R	16	1276	> 831	4.6	0.0	A	
EB	L	12	1442		2.5	0.0	A	0.1

Intersection Delay = 1.7 sec/veh

Center For Microcomputers In Transportation
University of Florida
512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) Elem. School Ent. (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/3/99
Other Information.....Existing 1999 AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1 <	0	1	1	0	0	0	0	0	0	0
Stop/Yield			N			N						
Volumes		94	69	218	126							
PHF		.87	.51	.64	.69							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	243	
Potential Capacity: (pcph)	1313	
Movement Capacity: (pcph)	1313	
Prob. of Queue-Free State:	0.71	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	375	1313		3.8	1.4	A	2.4

Intersection Delay = 1.6 sec/veh

Center For Microcomputers In Transportation
University of Florida
512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) Elem. School Ent. (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/3/99
Other Information.....Existing 1999 PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	< 0	1	1	0	0	0	0	0	0	0
Stop/Yield			N			N						
Volumes		140	18	41	90							
PHF		.81	.64	.79	.76							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	201	
Potential Capacity: (pcph)	1375	
Movement Capacity: (pcph)	1375	
Prob. of Queue-Free State:	0.96	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	57	1375		2.7	0.0	A	0.9

Intersection Delay = 0.4 sec/veh

Center For Microcomputers In Transportation
University of Florida
512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) S. Kihei Road (E-W) Ke Alii Alanui Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Existing 1999 AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	< 0	0	0	0	0	> 1	1
Stop/Yield			Y			N						
Volumes	7	385	84	79	405	9				63	1	62
PHF	.88	.91	.77	.8	.92	.56				.74	.25	.58
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10			1.10						1.10	1.10	1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	*3.30
Left Turn Minor Road	*6.00	*3.30

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	423	
Potential Capacity: (pcph)	845	
Movement Capacity: (pcph)	845	
Prob. of Queue-Free State:	0.86	

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	423	456
Potential Capacity: (pcph)	1078	1039
Movement Capacity: (pcph)	1078	1039
Prob. of Queue-Free State:	0.90	0.99

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	986	
Potential Capacity: (pcph)	331	
Capacity Adjustment Factor due to Impeding Movements	0.89	
Movement Capacity: (pcph)	295	
Prob. of Queue-Free State:	0.99	

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	978	
Potential Capacity: (pcph)	335	
Major LT, Minor TH Impedance Factor:	0.89	
Adjusted Impedance Factor:	0.89	
Capacity Adjustment Factor due to Impeding Movements	0.89	
Movement Capacity: (pcph)	299	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	94	299 >	299	17.9	1.6	C	
WB T	4	295 >					11.5
WB R	118	845		5.0	0.5	A	
NB L	9	1039		3.5	0.0	A	0.1
SB L	109	1078		3.7	0.3	A	0.6

Intersection Delay = 1.6 sec/veh

Center For Microcomputers In Transportation
University of Florida
512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) S. Kihei Road (E-W) Ke Alii Alanui Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 10/28/97
Other Information.....Existing 1999 PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	< 0	0	0	0	0	> 1	1
Stop/Yield			Y			N						
Volumes	3	660	107	51	700	5				55	0	35
PHF	.38	.96	.85	.82	.88	.63				.83	1	.71
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10			1.10						1.10	1.10	1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	*3.30
Left Turn Minor Road	*6.00	*3.30

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	688	
Potential Capacity: (pcph)	620	
Movement Capacity: (pcph)	620	
Prob. of Queue-Free State:	0.91	

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	688	803
Potential Capacity: (pcph)	806	710
Movement Capacity: (pcph)	806	710
Prob. of Queue-Free State:	0.92	0.99

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	1561	
Potential Capacity: (pcph)	165	
Capacity Adjustment Factor due to Impeding Movements	0.90	
Movement Capacity: (pcph)	149	
Prob. of Queue-Free State:	1.00	

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	1557	
Potential Capacity: (pcph)	166	
Major LT, Minor TH Impedance Factor:	0.90	
Adjusted Impedance Factor:	0.90	
Capacity Adjustment Factor due to Impeding Movements	0.90	
Movement Capacity: (pcph)	150	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	73	150	>	150	46.2	2.8	F	
WB T	0	149	>					30.7
WB R	54	620			6.4	0.2	B	
NB L	9	710			5.1	0.0	B	0.0
SB L	68	806			4.9	0.2	A	0.3

Intersection Delay = 1.9 sec/veh

Center For Microcomputers In Transportation
University of Florida
512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) Piilani Highway (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Existing 1999 AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	0	> 1	1	0	0	1
Stop/Yield			N			N						
Volumes	28	744	2	6	769	86	81	0	33			9
PHF	.64	.85	.5	.5	.82	.94	.72	.25	.83			.56
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0			0
SU/RV's (%)	1			1			1	1	1			1
CV's (%)	1			1			1	1	1			1
PCE's	1.02			1.02			1.02	1.02	1.02			1.02

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	875	938
Potential Capacity: (pcph)	499	464
Movement Capacity: (pcph)	499	464
Prob. of Queue-Free State:	0.97	0.91

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	879	1029
Potential Capacity: (pcph)	653	554
Movement Capacity: (pcph)	653	554
Prob. of Queue-Free State:	0.98	0.92

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		1873
Potential Capacity: (pcph)		113
Capacity Adjustment Factor due to Impeding Movements		0.90
Movement Capacity: (pcph)		102
Prob. of Queue-Free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		1876
Potential Capacity: (pcph)		87
Major LT, Minor TH Impedance Factor:		0.90
Adjusted Impedance Factor:		0.90
Capacity Adjustment Factor due to Impeding Movements		0.87
Movement Capacity: (pcph)		76

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	114	76 >	76	* 20.0	~~23.1~~	~~F~~ D	
EB	T	0	102 >					~~764.3~~
EB	R	41	464		8.5	0.2	B	
WB	R	16	499		7.5	0.0	B	7.5
NB	L	45	554		7.1	0.2	B	0.3
SB	L	12	653		5.6	0.0	B	0.0

ADJUSTED BASED ON DELAY SURVEY DATA SEE ATTACHED WORKSHEET

Intersection Delay = ~~19.7~~ sec/veh

~~* The calculated value was greater than 999.9.~~

TRAFFIC IMPACT ASSESSMENT REPORT

Unsignalized Intersection Analysis

Level-Of-Service Adjustment

WEIGHTED AVERAGE OF INTERSECTION DELAY (UNSIGNALIZED)
ADJUSTMENTS BASED ON FIELD OBSERVATIONS

Intersection: Kanani Road Approaching Piilani Highway (AM Peak Hour)

Approach	Lane Movement	Volume	Phf	Movement Delay	Adjusted Volume	Volume * Delay	Approach Delay	App Del * App Vol	Intersection Delay
NB	1	28	0.64	7.1	43.75	310.63	0.34	260.47	
	2	744	0.85	0	875.29	0.00			
	3	2	0.5	0	4.00	0.00			
	4				0.00	0.00			
SB	1	6	0.5	5.6	12.00	67.20	0.06	55.56	
	2	769	0.82	0	937.80	0.00			
	3	86	0.94	0	91.49	0.00			1.32
	4				0.00	0.00			
WB	1	9	0.56	7.5	16.07	120.54	7.50	67.50	
	2				0.00	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
EB	1	81	0.72	20	112.50	2250.00	17.00	1937.66	
	2	33	0.83	8.5	39.76	337.95			
	3				0.00	0.00			
	4				0.00	0.00			

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Ph: (352) 392-0378

Streets: (N-S) Piilani Highway (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Existing 1999 PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	0	> 1	1	0	0	1
Stop/Yield			N			N						
Volumes	27	1019	0	2	764	129	69	0	29			12
PHF	.84	.84	.25	.5	.8	.87	.86	.25	.81			.5
Grade		0			0			0		0		
MC's (%)	0			0			0	0	0			0
SU/RV's (%)	1			1			1	1	1			1
CV's (%)	1			1			1	1	1			1
PCE's	1.02			1.02			1.02	1.02	1.02			1.02

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	1213	955
Potential Capacity: (pcph)	336	454
Movement Capacity: (pcph)	336	454
Prob. of Queue-Free State:	0.93	0.92

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	1213	1103
Potential Capacity: (pcph)	453	511
Movement Capacity: (pcph)	453	511
Prob. of Queue-Free State:	0.99	0.94

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		2204
Potential Capacity: (pcph)		76
Capacity Adjustment Factor due to Impeding Movements		0.93
Movement Capacity: (pcph)		71
Prob. of Queue-Free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		2216
Potential Capacity: (pcph)		55
Major LT, Minor TH Impedance Factor:		0.93
Adjusted Impedance Factor:		0.93
Capacity Adjustment Factor due to Impeding Movements		0.86
Movement Capacity: (pcph)		47

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	81	47 >	47	~~*~~ 25.0	~~20.1~~	~~F~~ D	*
EB	T	0	71 >					
EB	R	37	454		8.6	0.2	B	
WB	R	24	336		11.5	0.1	C	11.5
NB	L	32	511		7.5	0.1	B	0.2
SB	L	4	453		8.0	0.0	B	0.0

ADJUSTED BASED ON DELAY SURVEY DATA SEE ATTACHED WORKSHEET

Intersection Delay = ~~52.1~~ sec/veh

~~* The calculated value was greater than 999.9.~~

TRAFFIC IMPACT ASSESSMENT REPORT

Unsignalized Intersection Analysis

Level-Of-Service Adjustment

WEIGHTED AVERAGE OF INTERSECTION DELAY (UNSIGNALIZED)
ADJUSTMENTS BASED ON FIELD OBSERVATIONS

Intersection: Kanani Road Approaching Piilani Highway (PM Peak Hour)

Approach	Lane Movement	Volume	Phf	Movement Delay	Adjusted Volume	Volume * Delay	Approach Delay	App Del * App Vol	Intersection Delay
NB	1	27	0.84	7.5	32.14	241.07	0.19	202.50	
	2	1019	0.84	0	1213.10	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
SB	1	2	0.5	8	4.00	32.00	0.03	25.87	
	2	764	0.8	0	955.00	0.00			
	3	129	0.87	0	148.28	0.00			1.13
	4				0.00	0.00			
WB	1	12	0.5	11.5	24.00	276.00	11.50	138.00	
	2				0.00	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
EB	1	69	0.86	25	80.23	2005.81	19.94	1954.10	
	2	29	0.81	8.6	35.80	307.90			
	3				0.00	0.00			
	4				0.00	0.00			

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Streets: (N-S) Auhana Road (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Existing 1999 AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0
Stop/Yield			N			N						
Volumes	0	35	10	92	35	2	1	3	1	4	1	99
PHF	.25	.67	.63	.7	.58	.25	.25	.38	.25	.5	.25	.92
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0	0	0	0
SU/RV's (%)	0			1			0	0	0	0	0	1
CV's (%)	0			0			0	0	0	0	0	0
PCE's	1.00			1.01			1.00	1.00	1.00	1.00	1.00	1.01

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	60	64
Potential Capacity: (pcph)	1291	1285
Movement Capacity: (pcph)	1291	1285
Prob. of Queue-Free State:	0.92	1.00
Step 2: LT from Major Street	**SB**	**NB**
Conflicting Flows: (vph)	68	68
Potential Capacity: (pcph)	1591	1591
Movement Capacity: (pcph)	1591	1591
Prob. of Queue-Free State:	0.92	1.00
TH Saturation Flow Rate: (pcphpl)	1700	1700
RT Saturation Flow Rate: (pcphpl)	1700	1700
Major LT Shared Lane Prob. of Queue-Free State:	0.91	1.00
Step 3: TH from Minor Street	**WB**	**EB**
Conflicting Flows: (vph)	259	263
Potential Capacity: (pcph)	798	794
Capacity Adjustment Factor due to Impeding Movements	0.91	0.91
Movement Capacity: (pcph)	729	725
Prob. of Queue-Free State:	0.99	0.99
Step 4: LT from Minor Street	**WB**	**EB**
Conflicting Flows: (vph)	261	311
Potential Capacity: (pcph)	748	699
Major LT, Minor TH Impedance Factor:	0.90	0.91
Adjusted Impedance Factor:	0.93	0.93
Capacity Adjustment Factor due to Impeding Movements	0.92	0.85
Movement Capacity: (pcph)	691	595

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	4	595	>					
EB	T	8	725	>	767	4.8	0.0	A	4.8
EB	R	4	1285	>					
WB	L	8	691	>					
WB	T	4	729	>	1192	3.4	0.3	A	3.4
WB	R	109	1291	>					
NB	L	0	1591			2.3	0.0	A	0.0
SB	L	132	1591			2.5	0.2	A	1.8

Intersection Delay = 2.1 sec/veh

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Streets: (N-S) Auhana Road (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Existing 1999 PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0
Stop/Yield			N			N						
Volumes	4	30	5	85	34	1	3	0	4	25	4	129
PHF	.5	.68	.42	.82	.77	.25	.38	.25	.5	.78	.33	.85
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0	0	0	0
SU/RV's (%)	0			1			0	0	0	0	0	1
CV's (%)	0			0			0	0	0	0	0	0
PCE's	1.00			1.01			1.00	1.00	1.00	1.00	1.00	1.01

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	50	46
Potential Capacity: (pcph)	1306	1312
Movement Capacity: (pcph)	1306	1312
Prob. of Queue-Free State:	0.88	0.99

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	56	48
Potential Capacity: (pcph)	1612	1626
Movement Capacity: (pcph)	1612	1626
Prob. of Queue-Free State:	0.93	1.00
TH Saturation Flow Rate: (pcphpl)	1700	1700
RT Saturation Flow Rate: (pcphpl)	1700	1700
Major LT Shared Lane Prob. of Queue-Free State:	0.93	0.99

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	210	214
Potential Capacity: (pcph)	846	842
Capacity Adjustment Factor due to Impeding Movements	0.93	0.93
Movement Capacity: (pcph)	785	782
Prob. of Queue-Free State:	0.98	1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	212	290
Potential Capacity: (pcph)	798	719
Major LT, Minor TH Impedance Factor:	0.93	0.91
Adjusted Impedance Factor:	0.95	0.93
Capacity Adjustment Factor due to Impeding Movements	0.94	0.82
Movement Capacity: (pcph)	750	593

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	8	593 >					
EB	T	0	782 >	817	4.5	0.0	A	4.5
EB	R	8	1312 >					
WB	L	32	750 >					
WB	T	12	785 >	1125	3.9	0.7	A	3.9
WB	R	153	1306 >					
NB	L	8	1626		2.2	0.0	A	0.2
SB	L	105	1612		2.4	0.1	A	1.7

Intersection Delay = 2.6 sec/veh

Center for Microcomputers in Transportation

Streets: (E-W) Alanui Ke Alii (N-S) Piilani Highway
Analyst: Miyamoto File Name: ALAEAM.HC9
Area Type: Other 8-2-99 Morning
Comment: Existing 1999 Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
Volumes	221		27				44	565			610	194
PHF or PK15	0.80		0.80				0.80	0.96			0.80	0.80
Lane W (ft)	12.0		12.0				12.0	12.0			12.0	12.0
Grade		0						0			0	
% Heavy Veh	2		2				2	2			2	2
Parking	N		N				N		N	N		
Bus Stops			0						0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N					(Y/N)	N		(Y/N)	N	
Arr Type	3		3				3	3			3	3
RTOR Vols			27						0		194	
Lost Time	3.00		3.00				3.00	3.00			3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	*				NB Left	*		
	Thru					Thru		*	
	Right	*				Right			
	Peds					Peds			
WB	Left					SB Left			
	Thru					Thru		*	
	Right					Right		*	
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right			
Green		17.0A				Green	5.0A	53.0A	
Yellow/AR		5.0				Yellow/AR	5.0	5.0	

Cycle Length: 90 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	374	1770	0.739	0.211	26.6	D	26.6	D
	R	393	1863	0.000	0.211	0.0	A		
NB	L	138	1770	0.400	0.078	26.6	D	8.5	B
	T	1138	1863	0.517	0.611	6.8	B		
SB	T	1138	1863	0.669	0.611	8.5	B	8.5	B
	R	1138	1863	0.000	0.611	0.0	A		

Intersection Delay = 11.5 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.662

Streets: (E-W) Alanui Ke Alii (N-S) Piilani Highway
Analyst: Miyamoto File Name: ALAEPM.HC9
Area Type: Other 8-2-99 Evening
Comment: Existing 1999 Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
Volumes	181		21				29	869			682	113
PHF or PK15	0.80		0.80				0.80	0.95			0.83	0.80
Lane W (ft)	12.0		12.0				12.0	12.0			12.0	12.0
Grade		0						0			0	
% Heavy Veh	2		2				2	2			2	2
Parking	N	N					N	N		N	N	
Bus Stops			0						0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N					(Y/N)	N		(Y/N)	N	
Arr Type	3		3				3	3			3	3
RTOR Vols			21						0			113
Lost Time	3.00		3.00				3.00	3.00			3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	*				NB Left	*		
Thru					Thru		*	
Right	*				Right			
Peds					Peds			
WB Left					SB Left			
Thru					Thru		*	
Right					Right		*	
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	15.0A				Green	5.0A	55.0A	
Yellow/AR	5.0				Yellow/AR	5.0	5.0	

Cycle Length: 90 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	334	1770	0.676	0.189	25.6	D	25.6	D
	R	352	1863	0.000	0.189	0.0	A		
NB	L	138	1770	0.262	0.078	25.5	D	10.6	B
	T	1180	1863	0.776	0.633	10.0	B		
SB	T	1180	1863	0.697	0.633	8.3	B	8.3	B
	R	1180	1863	0.000	0.633	0.0	A		

Intersection Delay = 11.3 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.710

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Streets: (N-S) Kanakanui Road (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 Without Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	< 0	0	2	< 0	1	1	< 0	1	1	< 0
Stop/Yield			N			N						
Volumes	5	105	5		260	5	70	30	170	10	10	30
PHF	.5	.8	.58		.66	.75	.55	.73	.65	.46	.5	.58
Grade		0			0			0			0	
MC's (%)	0						0	0	0	0	0	0
SU/RV's (%)	0						0	0	0	0	0	0
CV's (%)	0						0	0	0	0	0	0
PCE's	1.00						1.00	1.00	1.00	1.00	1.00	1.00

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	70	200
Potential Capacity: (pcph)	1276	1096
Movement Capacity: (pcph)	1276	1096
Prob. of Queue-Free State:	0.79	0.95

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		401
Potential Capacity: (pcph)		1044
Movement Capacity: (pcph)		1044
Prob. of Queue-Free State:		0.99

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	546	548
Potential Capacity: (pcph)	523	521
Capacity Adjustment Factor due to Impeding Movements	0.99	0.99
Movement Capacity: (pcph)	518	516
Prob. of Queue-Free State:	0.92	0.96

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	550	559
Potential Capacity: (pcph)	471	465
Major LT, Minor TH Impedance Factor:	0.95	0.91
Adjusted Impedance Factor:	0.96	0.93
Capacity Adjustment Factor due to Impeding Movements	0.92	0.74
Movement Capacity: (pcph)	432	345

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB	L	127	432			11.8	1.4	C	
NB	T	41	518	>					6.6
NB	R	262	1276	>	1065	4.7	1.4	A	
SB	L	22	345			11.1	0.1	C	
SB	T	20	516	>					6.0
SB	R	52	1096	>	835	4.7	0.2	A	
EB	L	10	1044			3.5	0.0	A	0.2

Intersection Delay = 3.0 sec/veh

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Streets: (N-S) Kanakanui Road (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 Without Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	< 0	0	2	< 0	1	1	< 0	1	1	< 0
Stop/Yield			N			N						
Volumes	10	140	15		135	15	20	25	70	15	20	5
PHF	.67	.78	.67		.89	.7	.75	.84	.74	.61	.69	.38
Grade		0			0			0			0	
MC's (%)	0						0	0	0	0	0	0
SU/RV's (%)	0						0	0	0	0	0	0
CV's (%)	0						0	0	0	0	0	0
PCE's	1.00						1.00	1.00	1.00	1.00	1.00	1.00

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	100	86
Potential Capacity: (pcph)	1232	1252
Movement Capacity: (pcph)	1232	1252
Prob. of Queue-Free State:	0.92	0.99

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		173
Potential Capacity: (pcph)		1384
Movement Capacity: (pcph)		1384
Prob. of Queue-Free State:		0.99

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	378	378
Potential Capacity: (pcph)	656	656
Capacity Adjustment Factor due to Impeding Movements	0.99	0.99
Movement Capacity: (pcph)	649	649
Prob. of Queue-Free State:	0.95	0.96

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	372	372
Potential Capacity: (pcph)	612	612
Major LT, Minor TH Impedance Factor:	0.94	0.94
Adjusted Impedance Factor:	0.96	0.96
Capacity Adjustment Factor due to Impeding Movements	0.95	0.88
Movement Capacity: (pcph)	580	540

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB L	27	580		6.5	0.0	B	
NB T	30	649 >					
NB R	95	1232 >	1013	4.1	0.4	A	4.5
SB L	25	540		7.0	0.0	B	
SB T	29	649 >					
SB R	13	1252 >	763	5.0	0.0	A	5.7
EB L	15	1384		2.6	0.0	A	0.2

Intersection Delay = 1.6 sec/veh

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Streets: (N-S) Elem. School Ent. (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/3/99
Other Information.....Yr 2001 Without Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	< 0	1	1	0	0	0	0	0	0	0
Stop/Yield			N			N						
Volumes		115	70	220	140							
PHF		.87	.51	.64	.69							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	269	
Potential Capacity: (pcph)	1276	
Movement Capacity: (pcph)	1276	
Prob. of Queue-Free State:	0.70	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	378	1276		4.0	1.4	A	2.4

Intersection Delay = 1.6 sec/veh

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Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/3/99
Other Information.....Yr 2001 Without Project PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	< 0	1	1	0	0	0	0	0	0	0
Stop/Yield			N			N						
Volumes		145	20	40	120							
PHF		.81	.64	.79	.76							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	210	
Potential Capacity: (pcph)	1361	
Movement Capacity: (pcph)	1361	
Prob. of Queue-Free State:	0.96	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	56	1361		2.8	0.0	A	0.7

Intersection Delay = 0.3 sec/veh

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Streets: (N-S) Piilani Highway (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 Without Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	0	> 1	1	0	0	1
Stop/Yield			N			N						
Volumes	30	800	5	5	825	85	80	0	35			10
PHF	.64	.85	.5	.5	.82	.94	.72	.25	.83			.56
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0			0
SU/RV's (%)	1			1			1	1	1			1
CV's (%)	1			1			1	1	1			1
PCE's	1.02			1.02			1.02	1.02	1.02			1.02

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	941	1006
Potential Capacity: (pcph)	462	428
Movement Capacity: (pcph)	462	428
Prob. of Queue-Free State:	0.96	0.90

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	951	1096
Potential Capacity: (pcph)	604	515
Movement Capacity: (pcph)	604	515
Prob. of Queue-Free State:	0.98	0.91

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		2014
Potential Capacity: (pcph)		96
Capacity Adjustment Factor due to Impeding Movements		0.89
Movement Capacity: (pcph)		86
Prob. of Queue-Free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		2013
Potential Capacity: (pcph)		72
Major LT, Minor TH Impedance Factor:		0.89
Adjusted Impedance Factor:		0.89
Capacity Adjustment Factor due to Impeding Movements		0.86
Movement Capacity: (pcph)		62

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	113	62 >	62	~~*~~	~~28.5~~	~~F~~	~~*~~
EB	T	0	86 >					
EB	R	43	428		9.4	0.3	B	8.1
WB	R	18	462		8.1	0.0	B	
NB	L	48	515		7.7	0.3	B	0.3
SB	L	10	604		6.1	0.0	B	0.0

ADJUSTED BASED ON DELAY STUDY DATA SEE ATTACHED WORKSHEET

Intersection Delay = ~~71.1 sec/veh~~

~~* The calculated value was greater than 999.9.~~

TRAFFIC IMPACT ASSESSMENT REPORT

Unsignalized Intersection Analysis

Level-Of-Service Adjustment

WEIGHTED AVERAGE OF INTERSECTION DELAY (UNSIGNALIZED)
ADJUSTMENTS BASED ON FIELD OBSERVATIONS

Intersection: Kanani Road Approaching Piilani Highway (AM Peak Hour) (Yr 2001 Without Project)

Approach	Lane Movement	Volume	Phf	Movement Delay	Adjusted Volume	Volume * Delay	Approach Delay	App Del * App Vol	Intersection Delay
NB	1	30	0.64	7.7	46.88	360.94	0.36	301.97	
	2	800	0.85	0	941.18	0.00			
	3	5	0.5	0	10.00	0.00			
	4				0.00	0.00			
SB	1	5	0.5	6.1	10.00	61.00	0.06	50.44	
	2	825	0.82	0	1006.10	0.00			
	3	85	0.94	0	90.43	0.00			1.47
	4				0.00	0.00			
WB	1	10	0.56	8.1	17.86	144.64	8.10	81.00	
	2				0.00	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
EB	1	80	0.72	24.4	111.11	2711.11	20.27	2331.44	
	2	35	0.83	9.4	42.17	396.39			
	3				0.00	0.00			
	4				0.00	0.00			

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Streets: (N-S) Piilani Highway (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 Without Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	0	> 1	1	0	0	1
Stop/Yield			N			N						
Volumes	25	1090	0	5	830	130	70	0	30			10
PHF	.84	.84	.25	.5	.8	.87	.86	.25	.81			.5
Grade		0			0			0		0		
MC's (%)	0			0			0	0	0			0
SU/RV's (%)	1			1			1	1	1			1
CV's (%)	1			1			1	1	1			1
PCE's	1.02			1.02			1.02	1.02	1.02			1.02

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	1298	1037
Potential Capacity: (pcph)	305	413
Movement Capacity: (pcph)	305	413
Prob. of Queue-Free State:	0.93	0.91

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	1298	1186
Potential Capacity: (pcph)	413	467
Movement Capacity: (pcph)	413	467
Prob. of Queue-Free State:	0.98	0.94

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		2375
Potential Capacity: (pcph)		62
Capacity Adjustment Factor due to Impeding Movements		0.91
Movement Capacity: (pcph)		57
Prob. of Queue-Free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		2386
Potential Capacity: (pcph)		44
Major LT, Minor TH Impedance Factor:		0.91
Adjusted Impedance Factor:		0.91
Capacity Adjustment Factor due to Impeding Movements		0.85
Movement Capacity: (pcph)		38

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	82	38 >	38	*	~~21.1~~	~~F~~	*
EB	T	0	57 >					
EB	R	38	413		9.6	0.2	B	
WB	R	20	305		12.6	0.1	C	12.6
NB	L	30	467		8.2	0.1	B	0.2
SB	L	10	413		8.9	0.0	B	0.0

Adjusted based on Delay Study Data See Attached Worksheet

Intersection Delay = ~~75.2 sec/veh~~

~~* The calculated value was greater than 999.9.~~

TRAFFIC IMPACT ASSESSMENT REPORT

Unsignalized Intersection Analysis

Level-Of-Service Adjustment

WEIGHTED AVERAGE OF INTERSECTION DELAY (UNSIGNALIZED)
ADJUSTMENTS BASED ON FIELD OBSERVATIONS

Intersection: Kanani Road Approaching Piilani Highway (PM Peak Hour) (Yr 2001 Without Project)

Approach	Lane Movement	Volume	Phf	Movement Delay	Adjusted Volume	Volume * Delay	Approach Delay	App Del * App Vol	Intersection Delay
NB	1	25	0.84	8.2	29.76	244.05	0.18	205.00	
	2	1090	0.84	0	1297.62	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
SB	1	5	0.5	8.9	10.00	89.00	0.07	71.75	
	2	830	0.8	0	1037.50	0.00			
	3	130	0.87	0	149.43	0.00			1.26
	4				0.00	0.00			
WB	1	10	0.5	12.6	20.00	252.00	12.60	126.00	
	2				0.00	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
EB	1	70	0.86	30	81.40	2441.86	23.62	2362.04	
	2	30	0.81	9.6	37.04	355.56			
	3				0.00	0.00			
	4				0.00	0.00			

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Streets: (N-S) Auhana Road (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 Without Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0
Stop/Yield			N			N						
Volumes	0	35	10	95	35	5	5	5	5	5	5	100
PHF	.25	.67	.63	.7	.58	.25	.25	.38	.25	.5	.25	.92
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0	0	0	0
SU/RV's (%)	0			1			0	0	0	0	0	1
CV's (%)	0			0			0	0	0	0	0	0
PCE's	1.00			1.01			1.00	1.00	1.00	1.00	1.00	1.01

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	60	70
Potential Capacity: (pcph)	1291	1276
Movement Capacity: (pcph)	1291	1276
Prob. of Queue-Free State:	0.91	0.98

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	68	80
Potential Capacity: (pcph)	1591	1570
Movement Capacity: (pcph)	1591	1570
Prob. of Queue-Free State:	0.91	1.00
TH Saturation Flow Rate: (pcphpl)	1700	1700
RT Saturation Flow Rate: (pcphpl)	1700	1700
Major LT Shared Lane Prob. of Queue-Free State:	0.91	1.00

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	276	274
Potential Capacity: (pcph)	782	783
Capacity Adjustment Factor due to Impeding Movements	0.91	0.91
Movement Capacity: (pcph)	711	712
Prob. of Queue-Free State:	0.97	0.98

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	282	330
Potential Capacity: (pcph)	727	682
Major LT, Minor TH Impedance Factor:	0.89	0.88
Adjusted Impedance Factor:	0.92	0.91
Capacity Adjustment Factor due to Impeding Movements	0.90	0.83
Movement Capacity: (pcph)	657	568

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	20	568	>					
EB	T	13	712	>	767	5.0	0.1	B	5.0
EB	R	20	1276	>					
WB	L	10	657	>					
WB	T	20	711	>	1089	3.8	0.5	A	3.8
WB	R	110	1291	>					
NB	L	0	1570			2.3	0.0	A	0.0
SB	L	137	1591			2.5	0.2	A	1.7

Intersection Delay = 2.4 sec/veh

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Streets: (N-S) Auhana Road (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 Without Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0
Stop/Yield			N			N						
Volumes	5	30	5	85	35	5	5	0	5	25	5	130
PHF	.5	.68	.42	.82	.77	.25	.38	.25	.5	.78	.33	.85
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0	0	0	0
SU/RV's (%)	0			1			0	0	0	0	0	1
CV's (%)	0			0			0	0	0	0	0	0
PCE's	1.00			1.01			1.00	1.00	1.00	1.00	1.00	1.01

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	50	55
Potential Capacity: (pcph)	1306	1299
Movement Capacity: (pcph)	1306	1299
Prob. of Queue-Free State:	0.88	0.99

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	56	65
Potential Capacity: (pcph)	1612	1596
Movement Capacity: (pcph)	1612	1596
Prob. of Queue-Free State:	0.93	0.99
TH Saturation Flow Rate: (pcphpl)	1700	1700
RT Saturation Flow Rate: (pcphpl)	1700	1700
Major LT Shared Lane Prob. of Queue-Free State:	0.93	0.99

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	229	225
Potential Capacity: (pcph)	827	831
Capacity Adjustment Factor due to Impeding Movements	0.93	0.93
Movement Capacity: (pcph)	766	770
Prob. of Queue-Free State:	0.98	1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	224	303
Potential Capacity: (pcph)	785	707
Major LT, Minor TH Impedance Factor:	0.93	0.91
Adjusted Impedance Factor:	0.94	0.93
Capacity Adjustment Factor due to Impeding Movements	0.94	0.82
Movement Capacity: (pcph)	735	580

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move. Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	13	580 >					
EB	T	0	770 >	764	4.9	0.0	A	4.9
EB	R	10	1299 >					
WB	L	32	735 >					
WB	T	15	766 >	1110	4.0	0.7	A	4.0
WB	R	154	1306 >					
NB	L	10	1596		2.3	0.0	A	0.3
SB	L	105	1612		2.4	0.1	A	1.6

Intersection Delay = 2.7 sec/veh

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-05-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) Piilani Highway
Analyst: Miyamoto File Name: ALAAM.HC9
Area Type: Other 8-2-99 Morning
Comment: Yr2001 Without Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
Volumes	235		35				50	600			655	205
PHF or PK15	0.80		0.80				0.80	0.96			0.80	0.80
Lane W (ft)	12.0		12.0				12.0	12.0			12.0	12.0
Grade		0						0			0	
% Heavy Veh	2		2				2	2			2	2
Parking	N	N					N	N		N	N	
Bus Stops			0						0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N					(Y/N)	N		(Y/N)	N	
Arr Type	3		3				3	3			3	3
RTOR Vols			35						0			205
Lost Time	3.00		3.00				3.00	3.00			3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	*							
	Thru								
	Right	*							
	Peds								
WB	Left								
	Thru								
	Right								
	Peds								
NB	Right								
SB	Right								
Green		17.0A				5.0A	53.0A		
Yellow/AR		5.0				5.0	5.0		
NB	Left					*			
	Thru						*		
	Right								
	Peds								
SB	Left								
	Thru						*		
	Right						*		
	Peds								
EB	Right								
WB	Right								

Cycle Length: 90 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	374	1770	0.787	0.211	29.0	D	29.0	D
	R	393	1863	0.000	0.211	0.0	A		
NB	L	138	1770	0.450	0.078	27.2	D	8.9	B
	T	1138	1863	0.549	0.611	7.1	B		
SB	T	1138	1863	0.719	0.611	9.4	B	9.4	B
	R	1138	1863	0.000	0.611	0.0	A		

Intersection Delay = 12.4 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.712

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-04-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) Piilani Highway
Analyst: Miyamoto File Name: ALAPM.HC9
Area Type: Other 8-2-99 Evening
Comment: Yr 2001 Without Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
Volumes	195		30				35	920			730	130
PHF or PK15	0.80		0.80				0.80	0.95			0.83	0.80
Lane W (ft)	12.0		12.0				12.0	12.0			12.0	12.0
Grade		0						0			0	
% Heavy Veh	2		2				2	2			2	2
Parking	N	N					N	N		N	N	
Bus Stops			0						0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N					(Y/N)	N		(Y/N)	N	
Arr Type	3		3				3	3			3	3
RTOR Vols			30						0		130	
Lost Time	3.00		3.00				3.00	3.00			3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	*							
Thru								
Right	*							
Peds								
WB Left								
Thru								
Right								
Peds								
NB Right								
SB Right								
Green	15.0A				5.0A	55.0A		
Yellow/AR	5.0				5.0	5.0		

Cycle Length: 90 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	334	1770	0.730	0.189	27.6	D	27.6	D
	R	352	1863	0.000	0.189	0.0	A		
NB	L	138	1770	0.320	0.078	25.8	D	12.1	B
	T	1180	1863	0.821	0.633	11.5	B		
SB	T	1180	1863	0.746	0.633	9.3	B	9.3	B
	R	1180	1863	0.000	0.633	0.0	A		

Intersection Delay = 12.7 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.758

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-05-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) South Kihei Road
Analyst: Miyamoto File Name: SOKAM.HC9
Area Type: Other 8-2-99 Morning
Comment: Yr2001 Without Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0	> 1	1	1	1	1	1	1	< 0
Volumes				70	5	75	5	410	90	80	430	10
PHF or PK15				0.74	0.25	0.58	0.88	0.91	0.77	0.80	0.92	0.56
Lane W (ft)					12.0	12.0	12.0	12.0	12.0	12.0	12.0	
Grade					0			0			0	
% Heavy Veh				0	0	0	0	2	0	0	2	0
Parking				N	N		N	N		N	N	
Bus Stops						0			0			0
Con. Peds			25			25			25			25
Ped Button				(Y/N)	Y	11.5 s	(Y/N)	Y	8.5 s	(Y/N)	Y	7.0
Arr Type					3	3	3	3	3	3	3	
RTOR Vols						75			70			0
Lost Time				3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination		1	2	3	4	5	6	7	8
EB	Left					NB Left	*		
	Thru					Thru		*	
	Right					Right		*	
	Peds		*			Peds		*	
WB	Left		*			SB Left	*	*	
	Thru		*			Thru		*	*
	Right		*			Right		*	*
	Peds		*			Peds		*	*
NB	Right					EB Right			
SB	Right					WB Right			
Green			14.0A			Green	5.0A	5.0A	31.0A
Yellow/AR			5.0			Yellow/AR	5.0	5.0	5.0

Cycle Length: 75 secs Phase combination order: #1 #5 #6 #7

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
WB	LT	351	1646	0.328	0.213	16.3	C	16.3	C
	R	405	1900	0.000	0.213	0.0	A		
NB	L	168	1805	0.036	0.093	20.0	C	10.6	B
	T	820	1863	0.550	0.440	10.6	B		
	R	701	1592	0.037	0.440	7.7	B		
SB	L	409	1805	0.244	0.227	15.4	C	7.8	B
	TR	1062	1852	0.457	0.573	6.2	B		

Intersection Delay = 9.8 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.417

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-05-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) South Kihei Road
Analyst: Miyamoto File Name: SOKPM.HC9
Area Type: Other 8-2-99 Evening
Comment: Yr2001 Without Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0	> 1	1	1	1	1	1	1	< 0
Volumes				65	1	50	5	700	115	50	745	5
PHF or PK15				0.83	0.25	0.71	0.38	0.96	0.85	0.82	0.88	0.63
Lane W (ft)					12.0	12.0	12.0	12.0	12.0	12.0	12.0	
Grade					0			0			0	
% Heavy Veh				0	0	0	0	2	0	0	2	0
Parking				N	N		N	N		N	N	
Bus Stops						0			0			0
Con. Peds			25			25			25			25
Ped Button				(Y/N)	Y	11.5 s	(Y/N)	Y	8.5 s	(Y/N)	Y	7.0
Arr Type					3	3	3	3	3	3	3	
RTOR Vols						50			65			0
Lost Time				3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination		1	2	3	4	5	6	7	8
EB	Left					NB Left	*		
	Thru					Thru		*	
	Right					Right		*	
	Peds		*			Peds		*	
WB	Left		*			SB Left	*	*	
	Thru		*			Thru		*	
	Right		*			Right		*	
	Peds		*			Peds		*	
NB	Right					EB Right			
SB	Right					WB Right			
Green		12.0A				Green	5.0A	5.0A	33.0A
Yellow/AR		5.0				Yellow/AR	5.0	5.0	5.0

Cycle Length: 75 secs Phase combination order: #1 #5 #6 #7

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
WB	LT	300	1607	0.273	0.187	17.0	C	17.0	C
	R	355	1900	0.000	0.187	0.0	A		
NB	L	168	1805	0.077	0.093	20.1	C	15.8	C
	T	869	1863	0.839	0.467	16.5	C		
	R	743	1592	0.079	0.467	7.2	B		
SB	L	409	1805	0.149	0.227	15.0	B	9.8	B
	TR	1116	1860	0.766	0.600	9.4	B		

Intersection Delay = 12.8 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.589

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Streets: (N-S) Kanakanui Road (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 With Project, AM Peak Hour .
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	< 0	0	2	< 0	1	1	< 0	1	1	< 0
Stop/Yield			N			N						
Volumes	5	120	5		265	10	70	30	170	15	10	30
PHF	.5	.8	.58		.66	.75	.55	.73	.65	.46	.5	.58
Grade		0			0			0			0	
MC's (%)	0						0	0	0	0	0	0
SU/RV's (%)	0						0	0	0	0	0	0
CV's (%)	0						0	0	0	0	0	0
PCE's	1.00						1.00	1.00	1.00	1.00	1.00	1.00

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	80	208
Potential Capacity: (pcph)	1261	1086
Movement Capacity: (pcph)	1261	1086
Prob. of Queue-Free State:	0.79	0.95

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		415
Potential Capacity: (pcph)		1026
Movement Capacity: (pcph)		1026
Prob. of Queue-Free State:		0.99

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	580	578
Potential Capacity: (pcph)	499	501
Capacity Adjustment Factor due to Impeding Movements	0.99	0.99
Movement Capacity: (pcph)	494	496
Prob. of Queue-Free State:	0.92	0.96

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	576	589
Potential Capacity: (pcph)	453	445
Major LT, Minor TH Impedance Factor:	0.95	0.91
Adjusted Impedance Factor:	0.96	0.93
Capacity Adjustment Factor due to Impeding Movements	0.92	0.74
Movement Capacity: (pcph)	415	328

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB L	127	415		12.5	1.5	C	
NB T	41	494	>				6.8
NB R	262	1261	> 1042	4.9	1.4	A	
SB L	33	328		12.2	0.3	C	
SB T	20	496	>				6.8
SB R	52	1086	> 816	4.8	0.2	A	
EB L	10	1026		3.5	0.0	A	0.1

Intersection Delay = 3.1 sec/veh

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Streets: (N-S) Kanakanui Road (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 With Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	< 0	0	2	< 0	1	1	< 0	1	1	< 0
Stop/Yield			N			N						
Volumes	15	150	15		155	35	20	25	70	20	20	5
PHF	.67	.78	.67		.89	.7	.75	.84	.74	.61	.69	.38
Grade		0			0			0			0	
MC's (%)	0						0	0	0	0	0	0
SU/RV's (%)	0						0	0	0	0	0	0
CV's (%)	0						0	0	0	0	0	0
PCE's	1.00						1.00	1.00	1.00	1.00	1.00	1.00

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	107	112
Potential Capacity: (pcph)	1222	1215
Movement Capacity: (pcph)	1222	1215
Prob. of Queue-Free State:	0.92	0.99

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		224
Potential Capacity: (pcph)		1300
Movement Capacity: (pcph)		1300
Prob. of Queue-Free State:		0.98

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	449	435
Potential Capacity: (pcph)	596	607
Capacity Adjustment Factor due to Impeding Movements	0.98	0.98
Movement Capacity: (pcph)	586	597
Prob. of Queue-Free State:	0.95	0.95

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	414	428
Potential Capacity: (pcph)	576	564
Major LT, Minor TH Impedance Factor:	0.94	0.93
Adjusted Impedance Factor:	0.95	0.95
Capacity Adjustment Factor due to Impeding Movements	0.94	0.87
Movement Capacity: (pcph)	542	493

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB L	27	542			7.0	0.0	B	
NB T	30	586	>					4.7
NB R	95	1222	>	969	4.3	0.5	A	
SB L	33	493			7.8	0.1	B	
SB T	29	597	>					6.5
SB R	13	1215	>	709	5.4	0.1	B	
EB L	22	1300			2.8	0.0	A	0.2

Intersection Delay = 1.7 sec/veh

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Streets: (N-S) Elem. School Ent. (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/3/99
Other Information.....Yr 2001 With Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	< 0	1	1	0	0	0	0	0	0	0
Stop/Yield			N			N						
Volumes		130	70	220	145							
PHF		.87	.51	.64	.69							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	286	
Potential Capacity: (pcph)	1253	
Movement Capacity: (pcph)	1253	
Prob. of Queue-Free State:	0.70	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	378	1253		4.1	1.5	A	2.5

Intersection Delay = 1.6 sec/veh

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Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/3/99
Other Information.....Yr 2001 With Project PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	< 0	1	1	0	0	0	0	0	0	0
Stop/Yield			N			N						
Volumes		180	20	40	140							
PHF		.81	.64	.79	.76							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	253	
Potential Capacity: (pcph)	1299	
Movement Capacity: (pcph)	1299	
Prob. of Queue-Free State:	0.96	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	56	1299		2.9	0.0	A	0.6

Intersection Delay = 0.3 sec/veh

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Streets: (N-S) Piilani Highway (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 With Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	0	> 1	1	0	0	1
Stop/Yield			N			N						
Volumes	30	815	5	5	835	85	90	0	35			10
PHF	.64	.85	.5	.5	.82	.94	.72	.25	.83			.56
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0			0
SU/RV's (%)	1			1			1	1	1			1
CV's (%)	1			1			1	1	1			1
PCE's	1.02			1.02			1.02	1.02	1.02			1.02

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	959	1018
Potential Capacity: (pcph)	452	422
Movement Capacity: (pcph)	452	422
Prob. of Queue-Free State:	0.96	0.90

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	969	1108
Potential Capacity: (pcph)	592	508
Movement Capacity: (pcph)	592	508
Prob. of Queue-Free State:	0.98	0.91

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		2044
Potential Capacity: (pcph)		92
Capacity Adjustment Factor due to Impeding Movements		0.89
Movement Capacity: (pcph)		82
Prob. of Queue-Free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		2043
Potential Capacity: (pcph)		69
Major LT, Minor TH Impedance Factor:		0.89
Adjusted Impedance Factor:		0.89
Capacity Adjustment Factor due to Impeding Movements		0.85
Movement Capacity: (pcph)		59

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	127	59	>	59	*	~~36.3~~	~~F~~	*
EB	T	0	82	>					
EB	R	43	422			9.5	0.3	B	8.3
WB	R	18	452			8.3	0.0	B	
NB	L	48	508			7.8	0.3	B	0.3
SB	L	10	592			6.2	0.0	B	0.0

ADJUSTED BASED ON DELAY STUDY DATA SEE ATTACHED WORKSHEET

Intersection Delay = ~~106.1 sec/veh~~

* ~~This movement is~~

TRAFFIC IMPACT ASSESSMENT REPORT

Unsignalized Intersection Analysis

Level-Of-Service Adjustment

WEIGHTED AVERAGE OF INTERSECTION DELAY (UNSIGNALIZED)
ADJUSTMENTS BASED ON FIELD OBSERVATIONS

Intersection: Kanani Road Approaching Piilani Highway (AM Peak Hour) (Yr 2001 With Project)

Approach	Lane Movement	Volume	Phf	Movement Delay	Adjusted Volume	Volume * Delay	Approach Delay	App Del * App Vol	Intersection Delay
NB	1	30	0.64	7.8	46.88	365.63	0.36	305.98	
	2	815	0.85	0	958.82	0.00			
	3	5	0.5	0	10.00	0.00			
	4				0.00	0.00			
SB	1	5	0.5	6.2	10.00	62.00	0.06	51.26	
	2	835	0.82	0	1018.29	0.00			
	3	85	0.94	0	90.43	0.00			1.91
	4				0.00	0.00			
WB	1	10	0.56	8.3	17.86	148.21	8.30	83.00	
	2				0.00	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
EB	1	90	0.72	31.1	125.00	3887.50	25.65	3206.42	
	2	35	0.83	9.5	42.17	400.60			
	3				0.00	0.00			
	4				0.00	0.00			

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Streets: (N-S) Piilani Highway (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 With Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	0	> 1	1	0	0	1
Stop/Yield			N			N						
Volumes	25	1095	0	5	855	130	80	0	30			10
PHF	.84	.84	.25	.5	.8	.87	.86	.25	.81			.5
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0			0
SU/RV's (%)	1			1			1	1	1			1
CV's (%)	1			1			1	1	1			1
PCE's	1.02			1.02			1.02	1.02	1.02			1.02

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	1304	1069
Potential Capacity: (pcph)	302	398
Movement Capacity: (pcph)	302	398
Prob. of Queue-Free State:	0.93	0.90

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	1304	1218
Potential Capacity: (pcph)	410	450
Movement Capacity: (pcph)	410	450
Prob. of Queue-Free State:	0.98	0.93

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		2413
Potential Capacity: (pcph)		59
Capacity Adjustment Factor due to Impeding Movements		0.91
Movement Capacity: (pcph)		54
Prob. of Queue-Free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		2424
Potential Capacity: (pcph)		42
Major LT, Minor TH Impedance Factor:		0.91
Adjusted Impedance Factor:		0.91
Capacity Adjustment Factor due to Impeding Movements		0.85
Movement Capacity: (pcph)		36

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	94	36	>	36	*	~~30.6~~	~~F~~	*
EB	T	0	54	>					
EB	R	38	398			10.0	0.3	B	
									12.8
WB	R	20	302			12.8	0.1	C	
NB	L	30	450			8.6	0.1	B	0.2
SB	L	10	410			9.0	0.0	B	0.0

Intersection Delay = ~~113.5 sec/veh~~

~~* The calculated value was greater than 999.9....~~

ADJUSTED BASED ON DELAY STUDY DATA SEE ATTACHED WORKSHEET

TRAFFIC IMPACT ASSESSMENT REPORT

Unsignalized Intersection Analysis

Level-Of-Service Adjustment

WEIGHTED AVERAGE OF INTERSECTION DELAY (UNSIGNALIZED)
ADJUSTMENTS BASED ON FIELD OBSERVATIONS

Intersection: Kanani Road Approaching Pilani Highway (PM Peak Hour) (Yr 2001 With Project)

Approach	Lane Movement	Volume	Phf	Movement Delay	Adjusted Volume	Volume * Delay	Approach Delay	App Del * App Vol	Intersection Delay
NB	1	25	0.84	8.6	29.76	255.95	0.19	215.00	
	2	1095	0.84	0	1303.57	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
SB	1	5	0.5	9	10.00	90.00	0.07	72.55	
	2	855	0.8	0	1068.75	0.00			
	3	130	0.87	0	149.43	0.00			1.67
	4				0.00	0.00			
WB	1	10	0.5	12.8	20.00	256.00	12.80	128.00	
	2				0.00	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
EB	1	80	0.86	36.1	93.02	3344.19	30.10	3310.78	
	2	30	0.81	10	37.04	370.37			
	3				0.00	0.00			
	4				0.00	0.00			

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512 Weil Hall
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Ph: (352) 392-0378

Streets: (N-S) Auhana Road (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 With Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0
Stop/Yield			N			N						
Volumes	0	45	20	95	40	5	5	5	5	5	5	100
PHF	.25	.67	.63	.7	.58	.25	.25	.38	.25	.5	.25	.92
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0	0	0	0
SU/RV's (%)	0			1			0	0	0	0	0	1
CV's (%)	0			0			0	0	0	0	0	0
PCE's	1.00			1.01			1.00	1.00	1.00	1.00	1.00	1.01

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	83	79
Potential Capacity: (pcph)	1257	1263
Movement Capacity: (pcph)	1257	1263
Prob. of Queue-Free State:	0.91	0.98

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	99	89
Potential Capacity: (pcph)	1538	1555
Movement Capacity: (pcph)	1538	1555
Prob. of Queue-Free State:	0.91	1.00
TH Saturation Flow Rate: (pcphpl)	1700	1700
RT Saturation Flow Rate: (pcphpl)	1700	1700
Major LT Shared Lane Prob. of Queue-Free State:	0.91	1.00

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	308	314
Potential Capacity: (pcph)	752	746
Capacity Adjustment Factor due to Impeding Movements	0.91	0.91
Movement Capacity: (pcph)	681	676
Prob. of Queue-Free State:	0.97	0.98

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	314	362
Potential Capacity: (pcph)	697	653
Major LT, Minor TH Impedance Factor:	0.89	0.88
Adjusted Impedance Factor:	0.91	0.91
Capacity Adjustment Factor due to Impeding Movements	0.90	0.83
Movement Capacity: (pcph)	627	541

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	20	541 >					
EB	T	13	676 >	736	5.3	0.1	B	5.3
EB	R	20	1263 >					
WB	L	10	627 >					
WB	T	20	681 >	1054	3.9	0.5	A	3.9
WB	R	110	1257 >					
NB	L	0	1555		2.3	0.0	A	0.0
SB	L	137	1538		2.6	0.2	A	1.7

Intersection Delay = 2.3 sec/veh

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Streets: (N-S) Auhana Road (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 With Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0
Stop/Yield			N			N						
Volumes	5	35	15	85	45	5	5	0	5	25	5	130
PHF	.5	.68	.42	.82	.77	.25	.38	.25	.5	.78	.33	.85
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0	0	0	0
SU/RV's (%)	0			1			0	0	0	0	0	1
CV's (%)	0			0			0	0	0	0	0	0
PCE's	1.00			1.01			1.00	1.00	1.00	1.00	1.00	1.01

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	69	68
Potential Capacity: (pcph)	1278	1279
Movement Capacity: (pcph)	1278	1279
Prob. of Queue-Free State:	0.88	0.99

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	87	78
Potential Capacity: (pcph)	1558	1574
Movement Capacity: (pcph)	1558	1574
Prob. of Queue-Free State:	0.93	0.99
TH Saturation Flow Rate: (pcphpl)	1700	1700
RT Saturation Flow Rate: (pcphpl)	1700	1700
Major LT Shared Lane Prob. of Queue-Free State:	0.93	0.99

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	261	269
Potential Capacity: (pcph)	796	788
Capacity Adjustment Factor due to Impeding Movements	0.92	0.92
Movement Capacity: (pcph)	735	727
Prob. of Queue-Free State:	0.98	1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	256	335
Potential Capacity: (pcph)	753	677
Major LT, Minor TH Impedance Factor:	0.92	0.90
Adjusted Impedance Factor:	0.94	0.93
Capacity Adjustment Factor due to Impeding Movements	0.93	0.82
Movement Capacity: (pcph)	703	552

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	13	552 >					
EB	T	0	727 >	733	5.1	0.0	B	5.1
EB	R	10	1279 >					
WB	L	32	703 >					
WB	T	15	735 >	1078	4.1	0.8	A	4.1
WB	R	154	1278 >					
NB	L	10	1574		2.3	0.0	A	0.2
SB	L	105	1558		2.5	0.1	A	1.6

Intersection Delay = 2.6 sec/veh

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-04-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) Piilani Highway
Analyst: Miyamoto File Name: ALAAM.HC9
Area Type: Other 8-2-99 Morning
Comment: Yr2001 With Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
Volumes	245		45				55	600			655	215
PHF or PK15	0.80		0.80				0.80	0.96			0.80	0.80
Lane W (ft)	12.0		12.0				12.0	12.0			12.0	12.0
Grade		0						0			0	
% Heavy Veh	2		2				2	2			2	2
Parking	N	N					N	N		N	N	
Bus Stops			0						0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N					(Y/N)	N		(Y/N)	N	
Arr Type	3		3				3	3			3	3
RTOR Vols			35						0			205
Lost Time	3.00		3.00				3.00	3.00			3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	*							
Thru								
Right	*							
Peds								
WB Left								
Thru								
Right								
Peds								
NB Right								
SB Right								
Green	17.0A				5.0A	53.0A		
Yellow/AR	5.0				5.0	5.0		
NB Left					*			
Thru						*		
Right								
Peds								
SB Left								
Thru						*		
Right						*		
Peds								
EB Right								
WB Right								

Cycle Length: 90 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	374	1770	0.819	0.211	31.1	D	30.6	D
	R	334	1583	0.036	0.211	18.2	C		
NB	L	138	1770	0.501	0.078	28.1	D	9.2	B
	T	1138	1863	0.549	0.611	7.1	B		
SB	T	1138	1863	0.719	0.611	9.4	B	9.3	B
	R	968	1583	0.013	0.611	4.4	A		

Intersection Delay = 12.9 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.724

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-04-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) Piilani Highway
Analyst: Miyamoto File Name: ALAPM.HC9
Area Type: Other 8-2-99 Evening
Comment: Yr 2001 With Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
Volumes	200		35				45	920			730	155
PHF or PK15	0.80		0.80				0.80	0.95			0.83	0.80
Lane W (ft)	12.0		12.0				12.0	12.0			12.0	12.0
Grade		0						0			0	
% Heavy Veh	2		2				2	2			2	2
Parking	N	N					N	N		N	N	
Bus Stops			0						0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N					(Y/N)	N		(Y/N)	N	
Arr Type	3		3				3	3			3	3
RTOR Vols			30						0			130
Lost Time	3.00		3.00				3.00	3.00			3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	*							
Thru								
Right	*							
Peds								
WB Left								
Thru								
Right								
Peds								
NB Right								
SB Right								
Green	15.0A				5.0A	55.0A		
Yellow/AR	5.0				5.0	5.0		
NB Left					*			
Thru						*		
Right								
Peds								
SB Left								
Thru						*		
Right						*		
Peds								
EB Right								
WB Right								

Cycle Length: 90 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	334	1770	0.748	0.189	28.4	D	28.1	D
	R	299	1583	0.023	0.189	19.2	C		
NB	L	138	1770	0.407	0.078	26.6	D	12.3	B
	T	1180	1863	0.821	0.633	11.5	B		
SB	T	1180	1863	0.746	0.633	9.3	B	9.1	B
	R	1003	1583	0.032	0.633	4.0	A		

Intersection Delay = 12.8 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.770

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-05-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) South Kihei Road
Analyst: Miyamoto File Name: SOKAM.HC9
Area Type: Other 8-2-99 Morning
Comment: Yr2001 With Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0	> 1	1	1	1	1	1	1	< 0
Volumes				80	5	85	5	410	95	85	430	10
PHF or PK15				0.74	0.25	0.58	0.88	0.91	0.77	0.80	0.92	0.56
Lane W (ft)					12.0	12.0	12.0	12.0	12.0	12.0	12.0	
Grade					0			0			0	
% Heavy Veh				0	0	0	0	2	0	0	2	0
Parking				N	N		N	N		N	N	
Bus Stops						0			0			0
Con. Peds			25			25			25			25
Ped Button				(Y/N)	Y	11.5 s	(Y/N)	Y	8.5 s	(Y/N)	Y	7.0
Arr Type					3	3	3	3	3	3	3	
RTOR Vols						75			70			0
Lost Time				3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left								
Thru								
Right								
Peds		*						
WB Left		*						
Thru		*						
Right		*						
Peds		*						
NB Right								
SB Right								
Green		14.0A						
Yellow/AR		5.0						
NB Left					*			
Thru							*	
Right							*	
Peds							*	
SB Left					*		*	
Thru							*	*
Right							*	*
Peds							*	*
EB Right								
WB Right								
Green					5.0A	5.0A	31.0A	
Yellow/AR					5.0	5.0	5.0	

Cycle Length: 75 secs Phase combination order: #1 #5 #6 #7

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
WB	LT	350	1640	0.366	0.213	16.6	C	16.4	C
	R	340	1592	0.053	0.213	15.2	C		
NB	L	168	1805	0.036	0.093	20.0	C	10.6	B
	T	820	1863	0.550	0.440	10.6	B		
	R	701	1592	0.046	0.440	7.8	B		
SB	L	409	1805	0.259	0.227	15.5	C	7.9	B
	TR	1062	1852	0.457	0.573	6.2	B		

Intersection Delay = 10.0 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.431

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-05-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) South Kihei Road
Analyst: Miyamoto File Name: SOKPM.HC9
Area Type: Other 8-2-99 Evening
Comment: Yr2001 With Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0	> 1	1	1	1	1	1	1	< 0
Volumes				70	1	55	5	700	125	60	745	5
PHF or PK15				0.83	0.25	0.71	0.38	0.96	0.85	0.82	0.88	0.63
Lane W (ft)					12.0	12.0	12.0	12.0	12.0	12.0	12.0	
Grade					0			0			0	
% Heavy Veh				0	0	0	0	2	0	0	2	0
Parking				N	N		N	N		N	N	
Bus Stops						0			0			0
Con. Peds			25			25			25			25
Ped Button				(Y/N)	Y	11.5 s	(Y/N)	Y	8.5 s	(Y/N)	Y	7.0
Arr Type					3	3	3	3	3	3	3	
RTOR Vols						50			65			0
Lost Time				3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left								
Thru								
Right								
Peds		*						
WB Left		*						
Thru		*						
Right		*						
Peds		*						
NB Left					*			
Thru							*	
Right							*	
Peds							*	
SB Left					*	*		
Thru						*	*	
Right						*	*	
Peds						*	*	
NB Right								
SB Right								
Green		12.0A				5.0A	5.0A	33.0A
Yellow/AR		5.0				5.0	5.0	5.0

Cycle Length: 75 secs Phase combination order: #1 #5 #6 #7

Intersection Performance Summary

	Lane Group: Mvmts	Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
WB	LT	300	1606	0.293	0.187	17.1	C	17.0	C
	R	297	1592	0.024	0.187	16.1	C		
NB	L	168	1805	0.077	0.093	20.1	C	15.7	C
	T	869	1863	0.839	0.467	16.5	C		
	R	743	1592	0.096	0.467	7.2	B		
SB	L	409	1805	0.178	0.227	15.1	C	9.9	B
	TR	1116	1860	0.766	0.600	9.4	B		

Intersection Delay = 12.8 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.593

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Streets: (N-S) Site Access (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/5/99
Other Information.....Yr 2001 With Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	0	1	< 0	0	0	0	1	0	1
Stop/Yield			N			N						
Volumes	5	180			145	5				20		15
PHF	.5	.87			.69	.5				.5		.5
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10									1.10		1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)		215
Potential Capacity: (pcph)		1077
Movement Capacity: (pcph)		1077
Prob. of Queue-Free State:		0.97

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		220
Potential Capacity: (pcph)		1347
Movement Capacity: (pcph)		1347
Prob. of Queue-Free State:		0.99

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)		432
Potential Capacity: (pcph)		595
Major LT, Minor TH Impedance Factor:		0.99
Adjusted Impedance Factor:		0.99
Capacity Adjustment Factor due to Impeding Movements		0.99
Movement Capacity: (pcph)		590

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
SB	L	44	590		6.6	0.2	B	5.2
SB	R	33	1077		3.4	0.0	A	
EB	L	11	1347		2.7	0.0	A	0.1

Intersection Delay = 0.5 sec/veh

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Streets: (N-S) Site Access (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/5/99
Other Information.....Yr 2001 With Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	0	1	< 0	0	0	0	1	0	1
Stop/Yield			N			N						
Volumes	15	190			120	20				10		10
PHF	.5	.81			.76	.5				.5		.5
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10									1.10		1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)		178
Potential Capacity: (pcph)		1125
Movement Capacity: (pcph)		1125
Prob. of Queue-Free State:		0.98

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		198
Potential Capacity: (pcph)		1380
Movement Capacity: (pcph)		1380
Prob. of Queue-Free State:		0.98

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)		443
Potential Capacity: (pcph)		587
Major LT, Minor TH Impedance Factor:		0.98
Adjusted Impedance Factor:		0.98
Capacity Adjustment Factor due to Impeding Movements		0.98
Movement Capacity: (pcph)		573

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
SB L	22	573		6.5	0.0	B	
SB R	22	1125		3.3	0.0	A	4.9
EB L	33	1380		2.7	0.0	A	0.2

Intersection Delay = 0.4 sec/veh

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University of Florida
512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) Kanakanui Road (E-W) Site Access
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/5/99
Other Information.....Yr 2001 With Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 0	< 0	0	0	0	1	1	0	0	1	< 0
Stop/Yield			N			N						
Volumes	20		10				5	40			50	5
PHF	.5		.5				.5	.73			.5	.5
Grade		0						0			0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10						1.10	1.10			1.10	1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)		0
Potential Capacity: (pcph)		1385
Movement Capacity: (pcph)		1385
Prob. of Queue-Free State:		0.99

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		0
Potential Capacity: (pcph)		1714
Movement Capacity: (pcph)		1714
Prob. of Queue-Free State:		0.97
TH Saturation Flow Rate: (pcphpl)		0
RT Saturation Flow Rate: (pcphpl)		1700
Major LT Shared Lane Prob. of Queue-Free State:		0.97

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	50	60
Potential Capacity: (pcph)	1020	1006
Capacity Adjustment Factor due to Impeding Movements	0.97	0.97
Movement Capacity: (pcph)	994	980
Prob. of Queue-Free State:	0.94	0.89

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	105	
Potential Capacity: (pcph)	907	
Major LT, Minor TH Impedance Factor:	0.86	
Adjusted Impedance Factor:	0.90	
Capacity Adjustment Factor due to Impeding Movements	0.89	
Movement Capacity: (pcph)	806	

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB	L	11	806		4.5	0.0	A	
NB	T	61	994		3.9	0.1	A	3.9
SB	T	110	980	>				4.1
SB	R	11	1385	> 1007	4.1	0.4	A	
EB	L	44	1714		2.2	0.0	A	1.4

Intersection Delay = 3.4 sec/veh

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Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) Kanakanui Road (E-W) Site Access
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/5/99
Other Information.....Yr 2001 With Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 0	< 0	0	0	0	1	1	0	0	1	< 0
Stop/Yield			N			N						
Volumes	15		5				25	50			45	10
PHF	.5		.5				.5	.84			.65	.5
Grade		0						0			0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10						1.10	1.10			1.10	1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)		0
Potential Capacity: (pcph)		1385
Movement Capacity: (pcph)		1385
Prob. of Queue-Free State:		0.98

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		0
Potential Capacity: (pcph)		1714
Movement Capacity: (pcph)		1714
Prob. of Queue-Free State:		0.98
TH Saturation Flow Rate: (pcphpl)		0
RT Saturation Flow Rate: (pcphpl)		1700
Major LT Shared Lane Prob. of Queue-Free State:		0.98

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	35	40
Potential Capacity: (pcph)	1041	1034
Capacity Adjustment Factor due to Impeding Movements	0.98	0.98
Movement Capacity: (pcph)	1021	1014
Prob. of Queue-Free State:	0.94	0.93

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	80	
Potential Capacity: (pcph)	941	
Major LT, Minor TH Impedance Factor:	0.91	
Adjusted Impedance Factor:	0.93	
Capacity Adjustment Factor due to Impeding Movements	0.91	
Movement Capacity: (pcph)	860	

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB	L	55	860		4.5	0.1	A	
NB	T	66	1021		3.8	0.1	A	4.0
SB	T	76	1014	>				3.7
SB	R	22	1385	> 1079	3.7	0.2	A	
EB	L	33	1714		2.1	0.0	A	1.6

Intersection Delay = 3.6 sec/veh

FIGURES

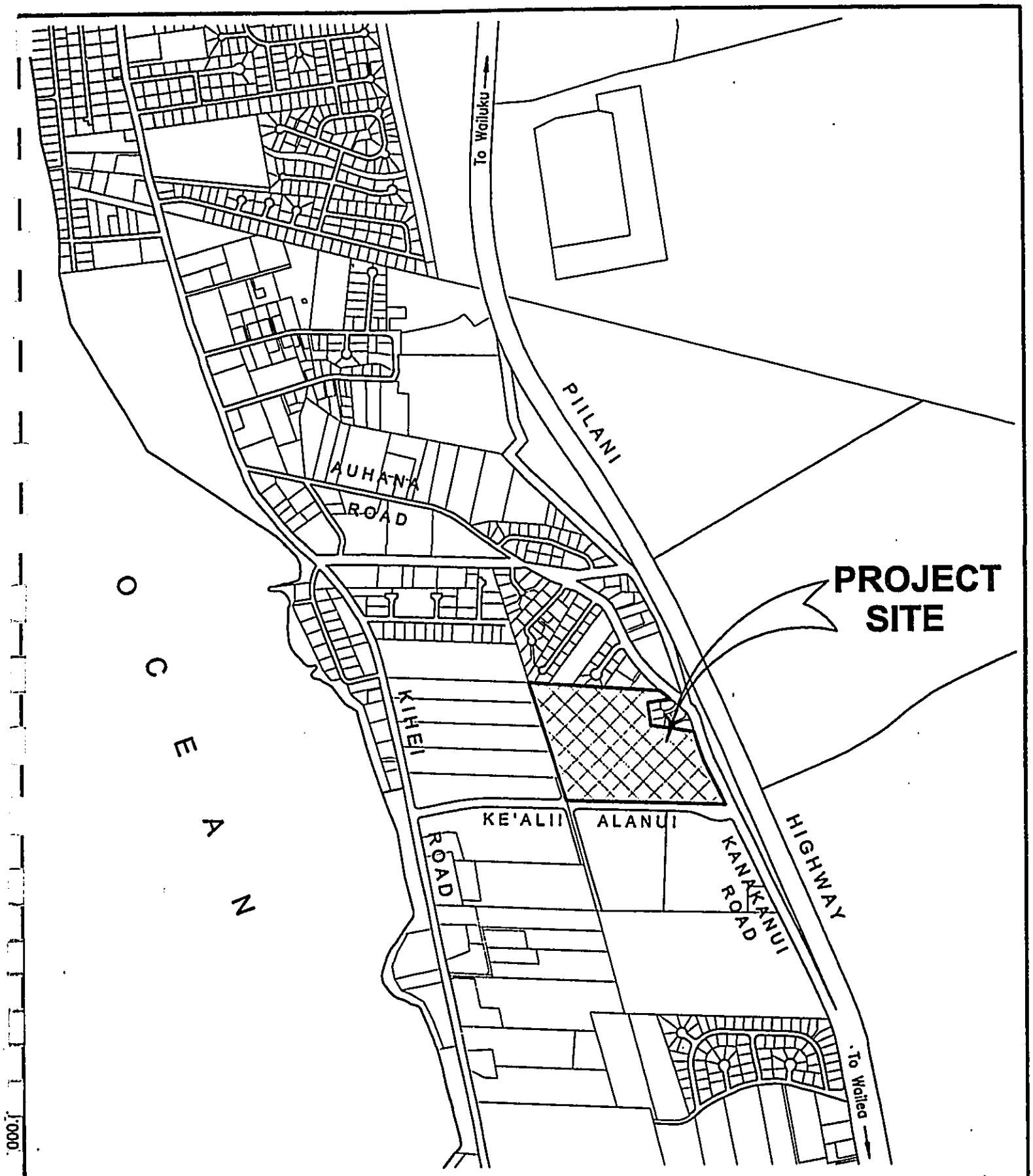
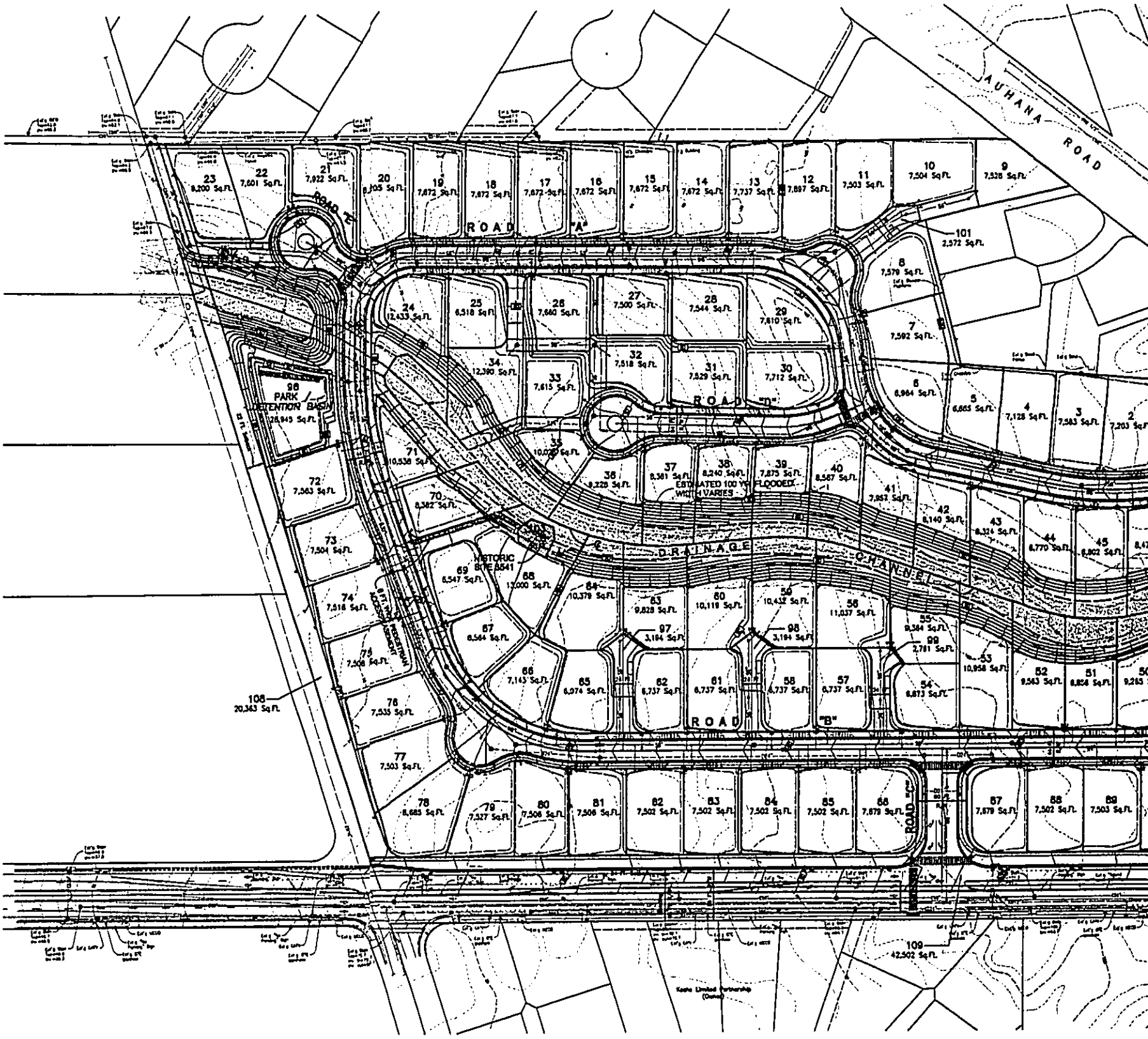


FIGURE 1
LOCATION MAP



MISC. INFORMATION

GROSS LAND AREA – 24.09 ACS.
ZONING – R-2 RESIDENTIAL
MIN. LOT SIZE – 7,500 Sq.Ft.
MIN. LOT WIDTH – 65 FT.
NO. OF HOUSELOTS – 95

PRELIMINARY SUBDIVISION M
(INCLUDING DEVELOPMENT AND DRAINAG

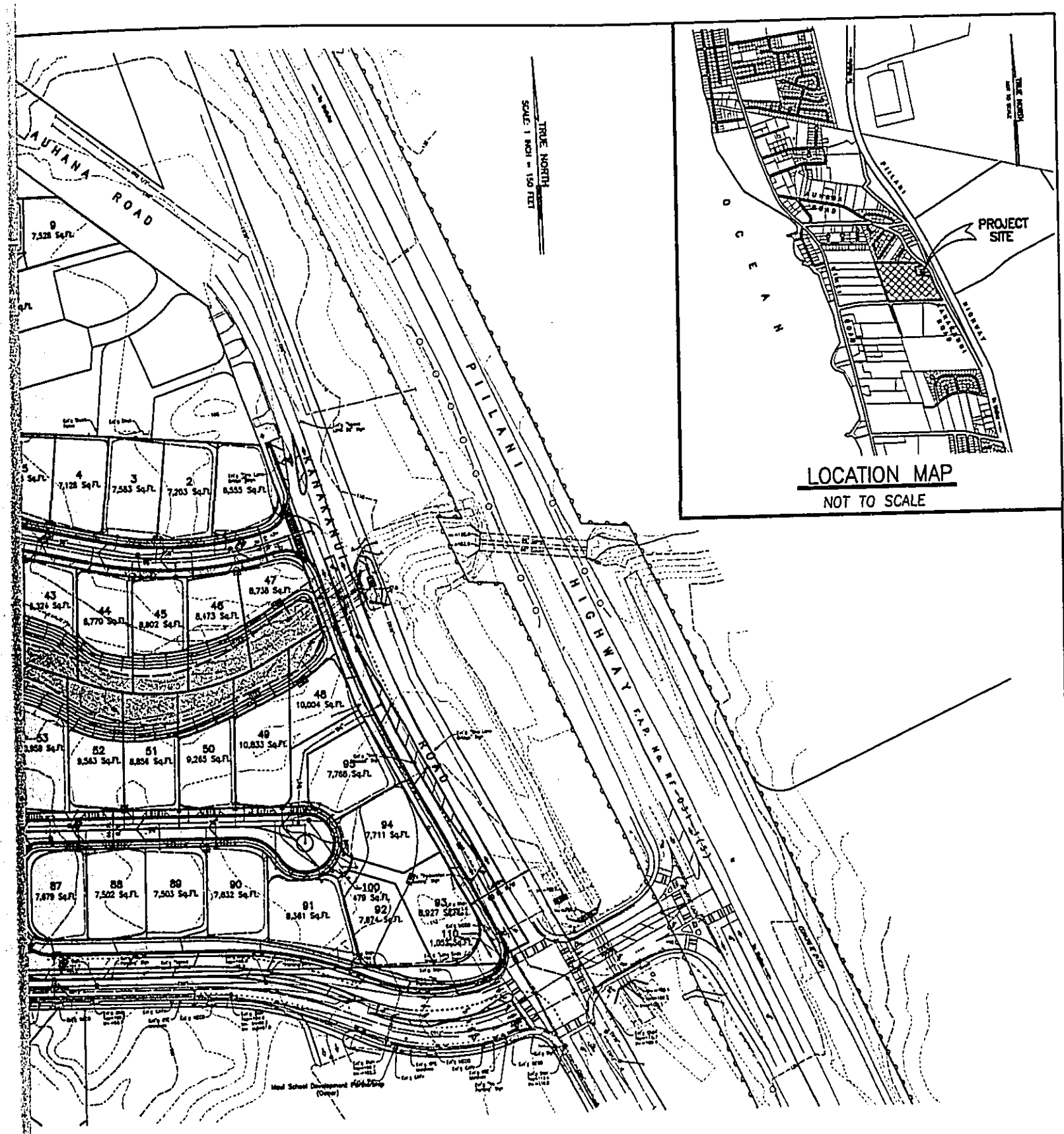
KE-ALII SUBDIVISION

KIHEI, MAUI, HAWAII

0 150 300 450 6

SCALE: 1 IN. = 150 FT.

T.M.K.: 3-9-18 : 01



BDIVISION MAP
AND DRAINAGE PLANS)

IVISION

HAWAII

450 600

150 FT.

FIGURE 2

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

October 8, 1999
Revised: June 19, 2000

NOTE:

ALL LANDSCAPE AREAS TO BE WATERED BY AN AUTOMATIC IRRIGATION SYSTEM.

ADD ROOTBARRIER TO ALL STREET TREES – AGAINST PAVEMENT SIDE ONLY.

PRELIMINARY LANDSCAPING PLANT

KE-ALII SUBDIVISION

KIHEI, MAUI, HAWAII

0 150 300 450

SCALE: 1 IN. = 150 FT.

T.M.K.: 3-9-18 : 01

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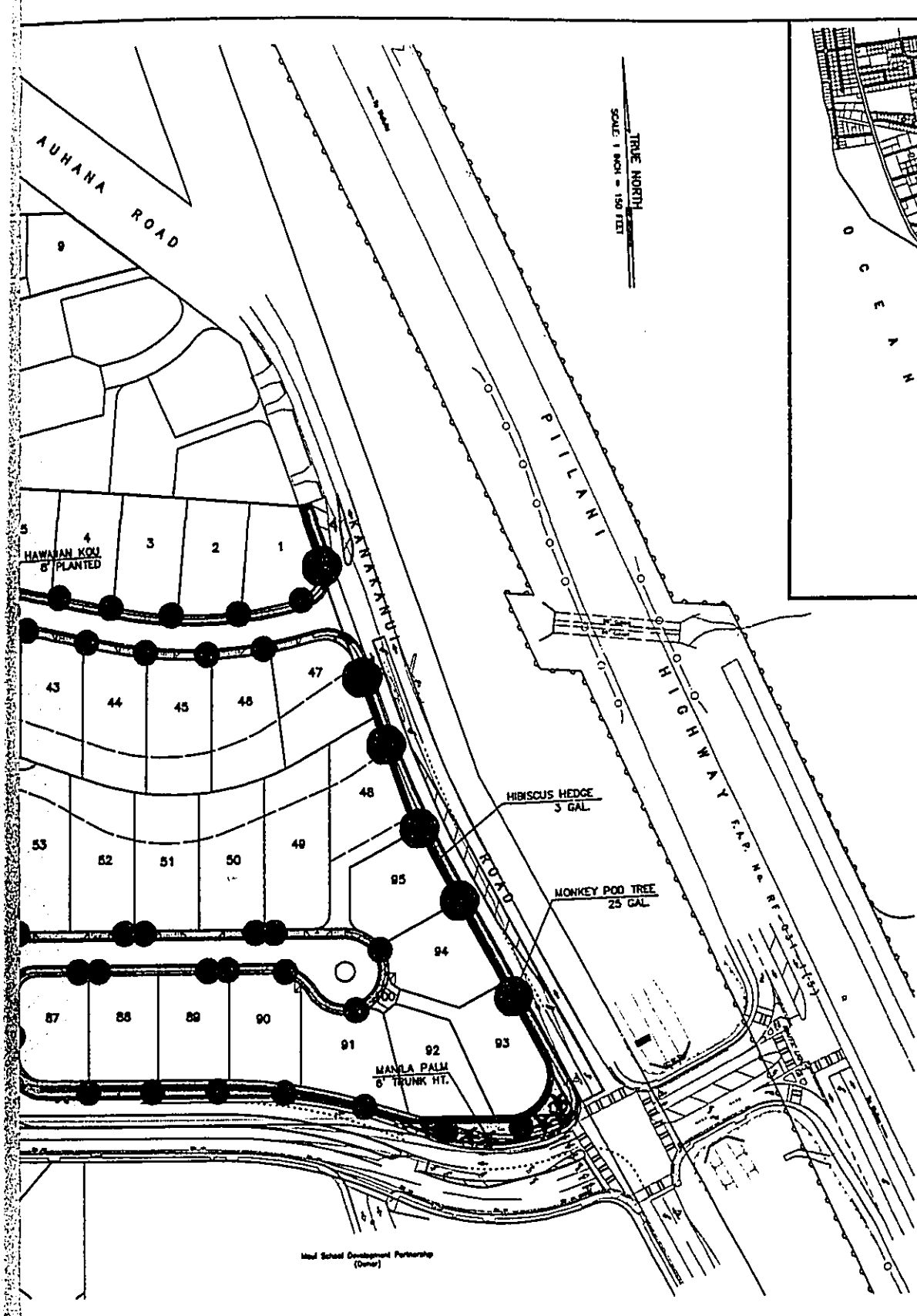
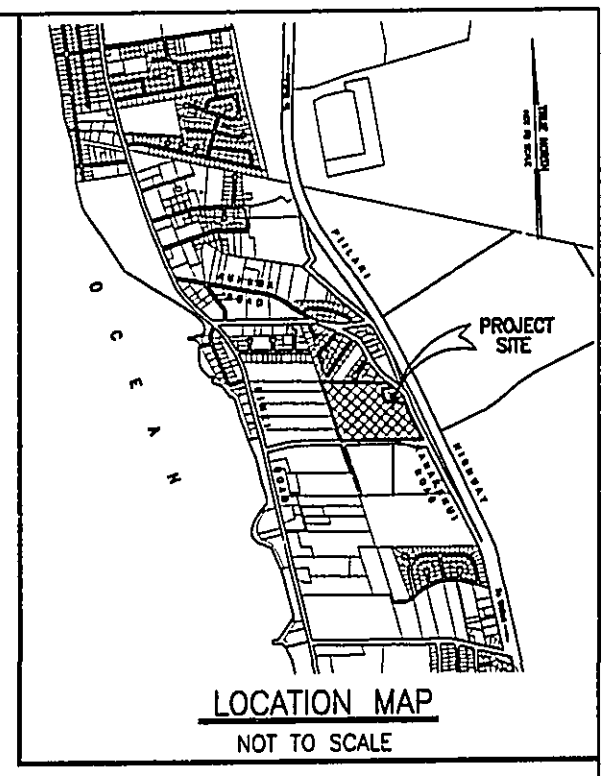




LOCATION MAP

NOT TO SCALE

LEGEND:

- MONKEY POD TREE
- HAWAIIAN KOU
- HIBISCUS HEDGE
- MANILA PALM
- GRASS LAWN

NG PLANTING PLAN

IVISION

HAWAII

450 600

150 FT.

FIGURE 3

CHRIS HART & PARTNERS

LANDSCAPE ARCHITECTURE AND PLANNING

1955 MAIN STREET, SUITE 200
WAILUKU, MAUI, HI 96793-1706
TELEPHONE: 808-242-1955
FACSIMILE: 808-242-1956
E-MAIL: ____@CHPMAUI.COM

October 8, 1999
Revised: June 19, 2000

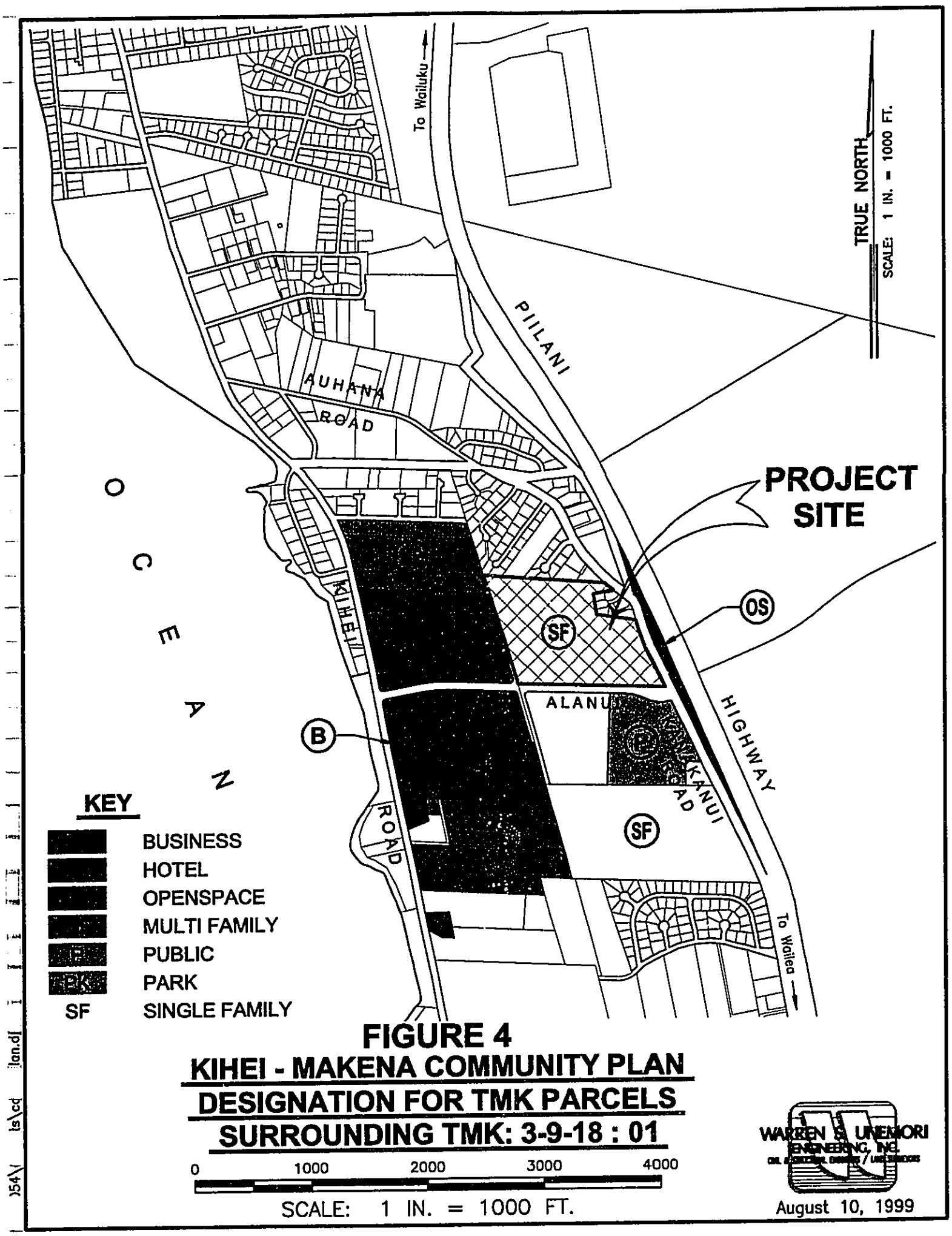


FIGURE 4
KIHEI - MAKENA COMMUNITY PLAN DESIGNATION FOR TMK PARCELS SURROUNDING TMK: 3-9-18 : 01

0 1000 2000 3000 4000

SCALE: 1 IN. = 1000 FT.

WARREN S. UNEMORI ENGINEERING, INC.

August 10, 1999

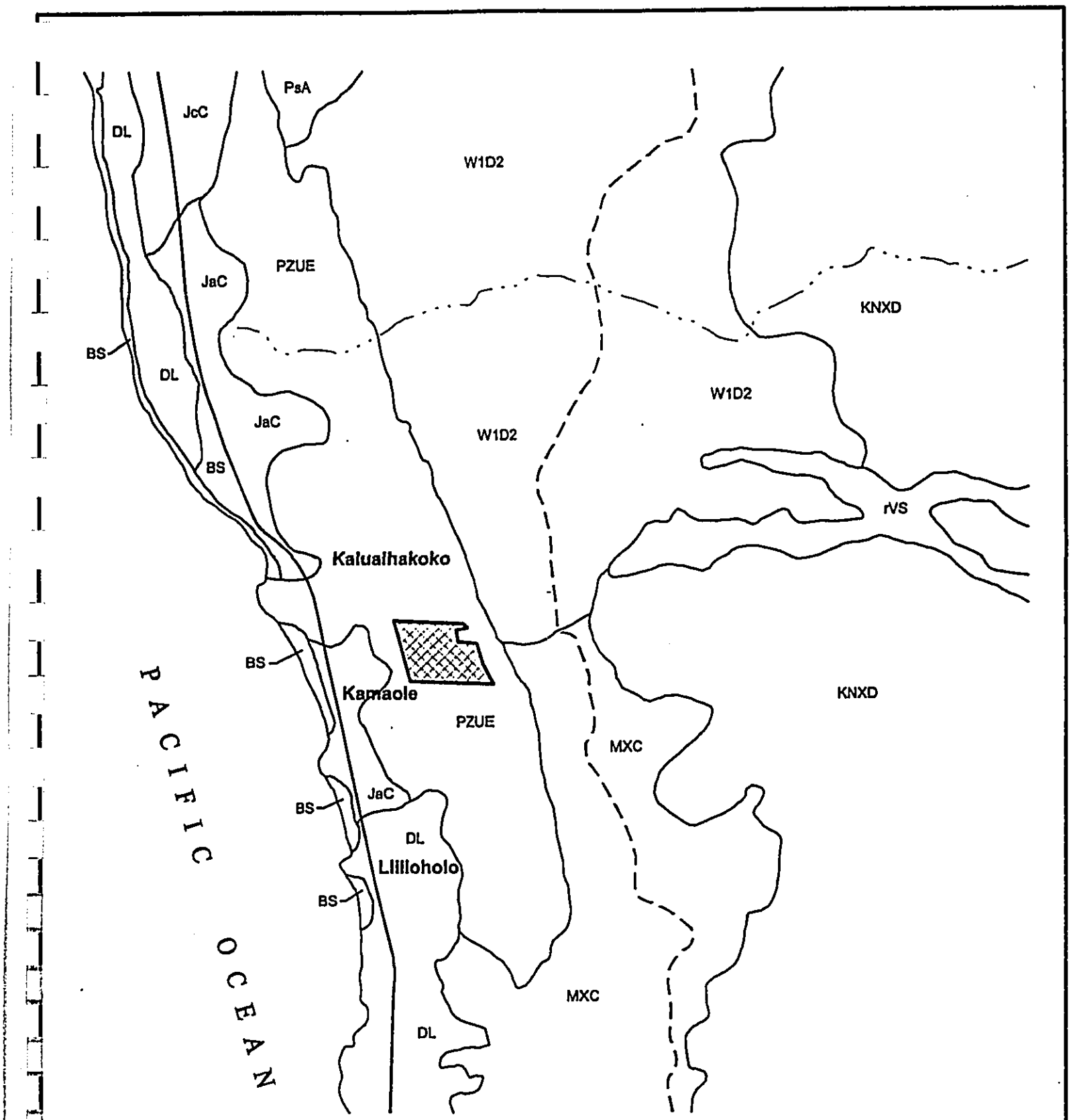
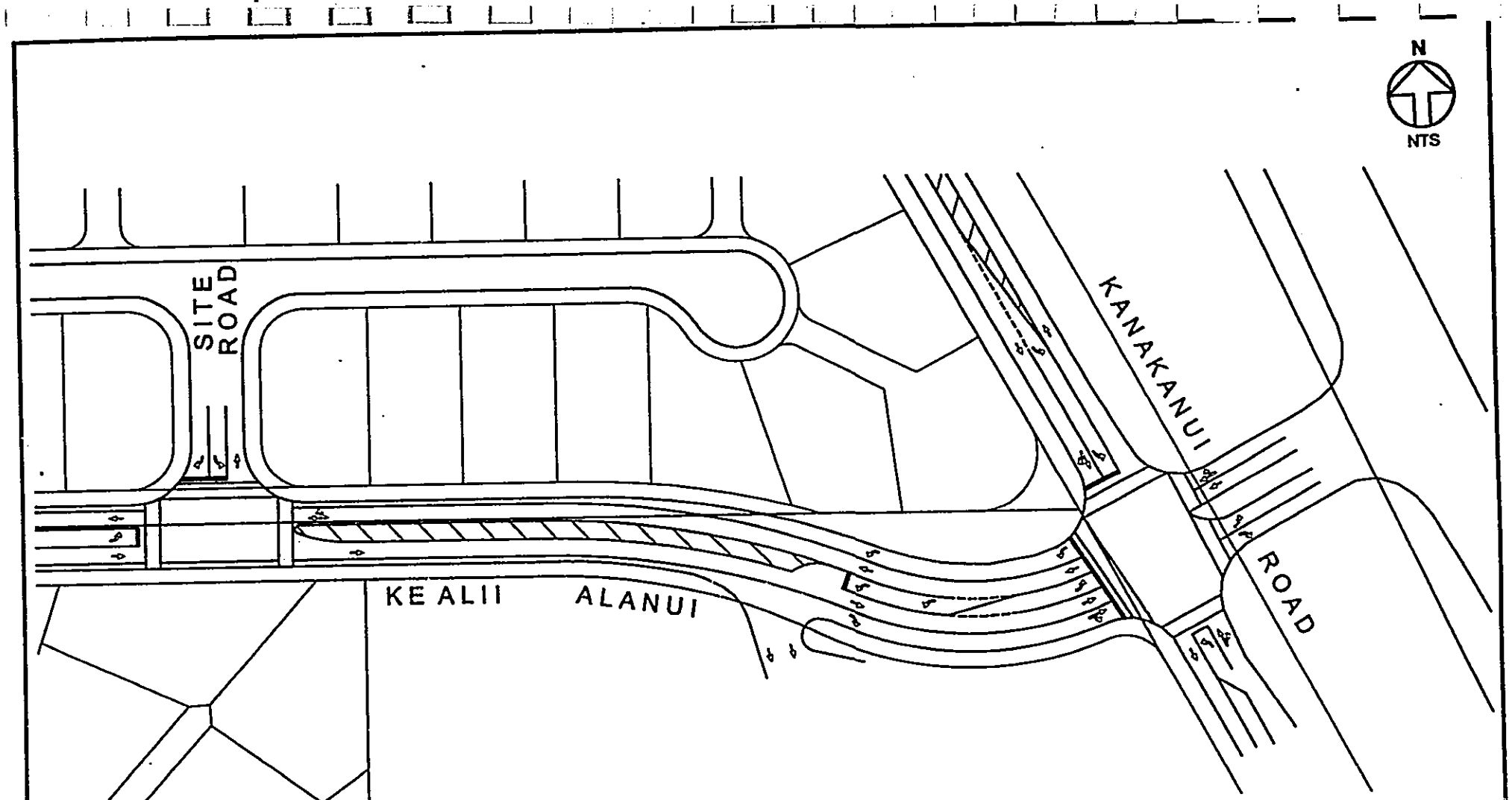


FIGURE 5

SITE SPECIFIC SOIL
CLASSIFICATION MAP

WARREN S. UNEMORI
ENGINEERING, INC.

August 11, 1999



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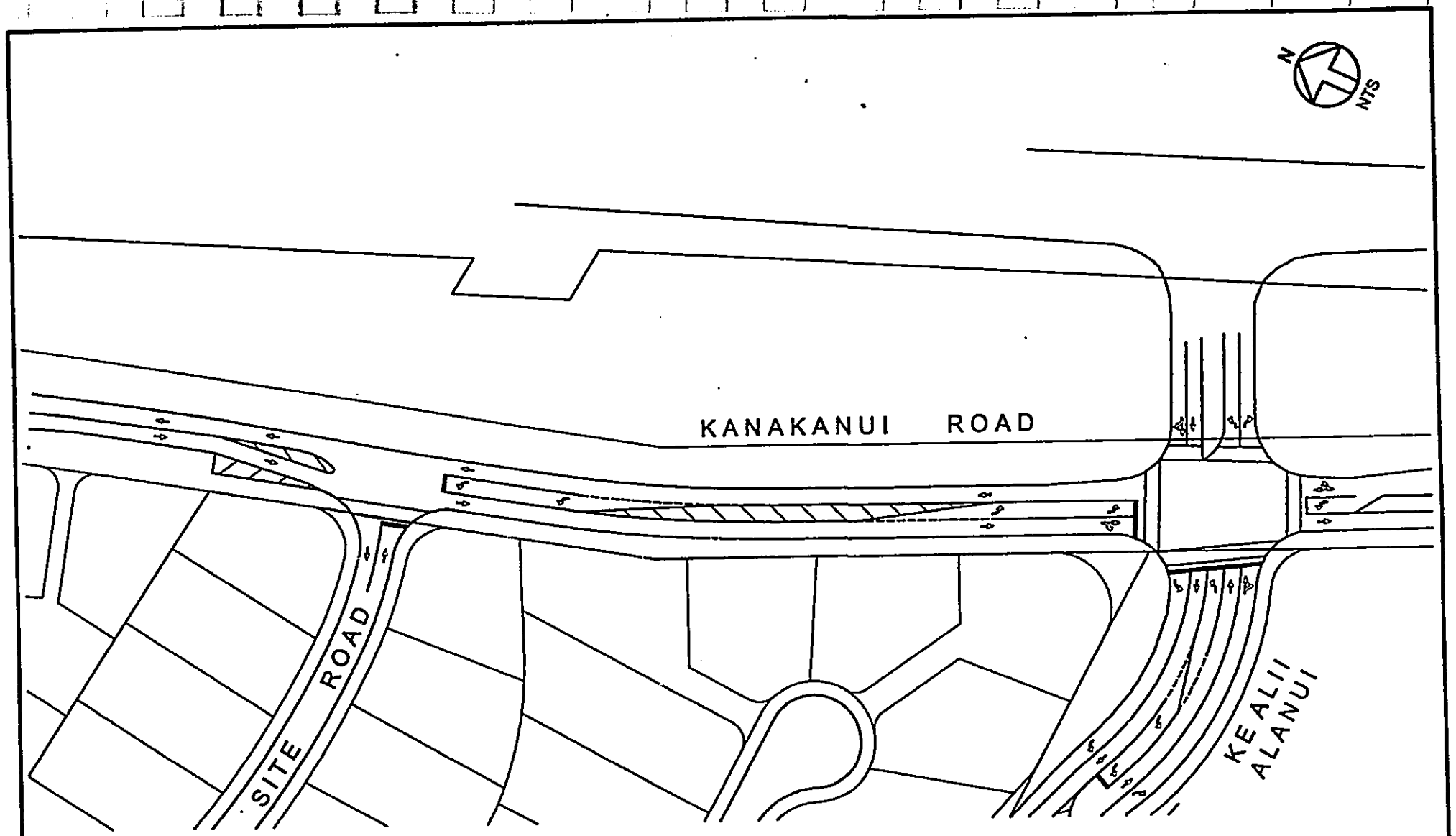
WARREN S. UNEMORI ENGINEERING, INC.

RECOMMENDED LANE CONFIGURATION ON KE ALII ALANUI

Figure **6**



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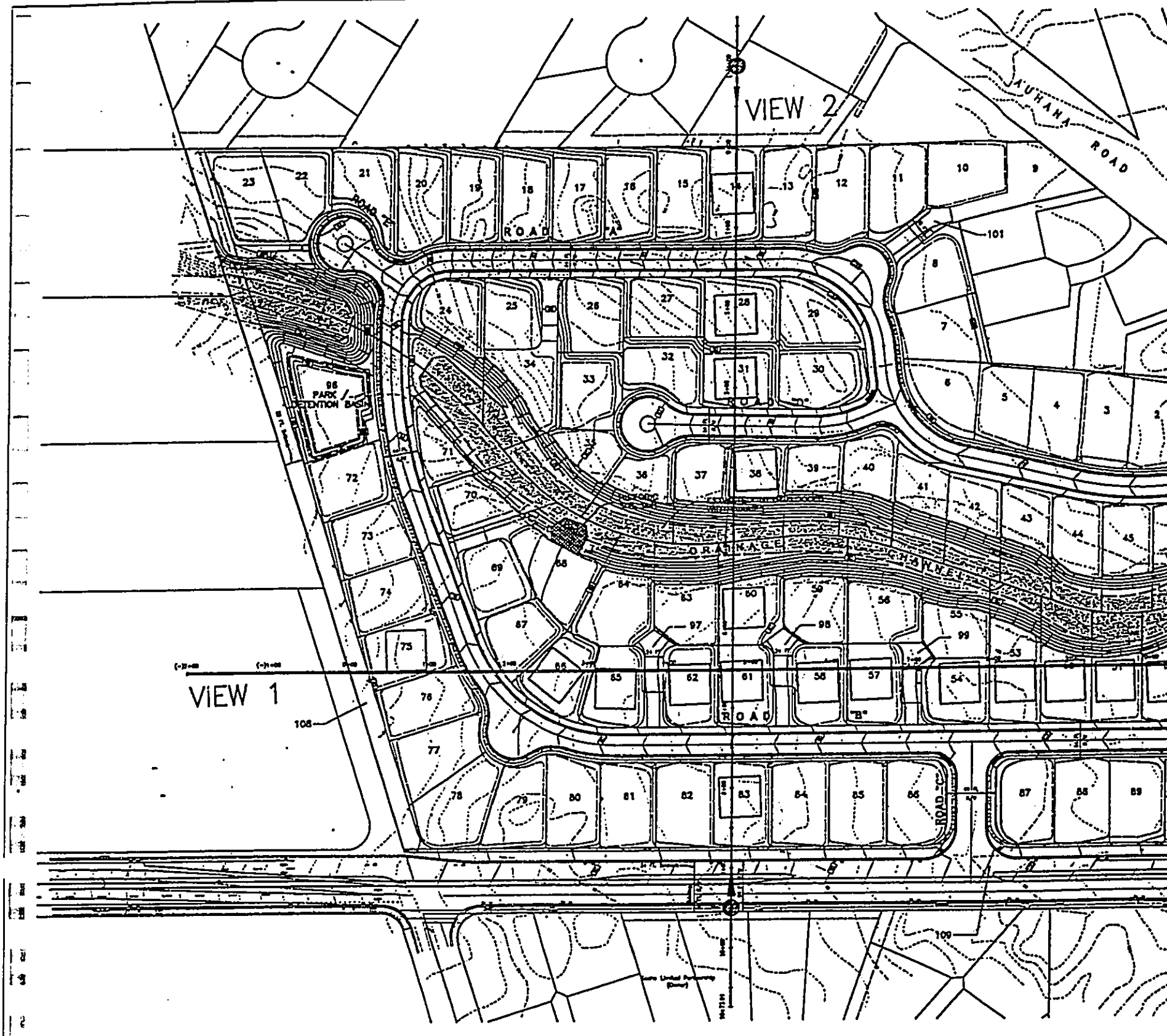
WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & TRAFFIC ENGINEERS / LAND SURVEYORS

RECOMMENDED SITE ACCESS TO KANAKANUI ROAD

Figure **7**



VIEW PLANE EXHIBIT

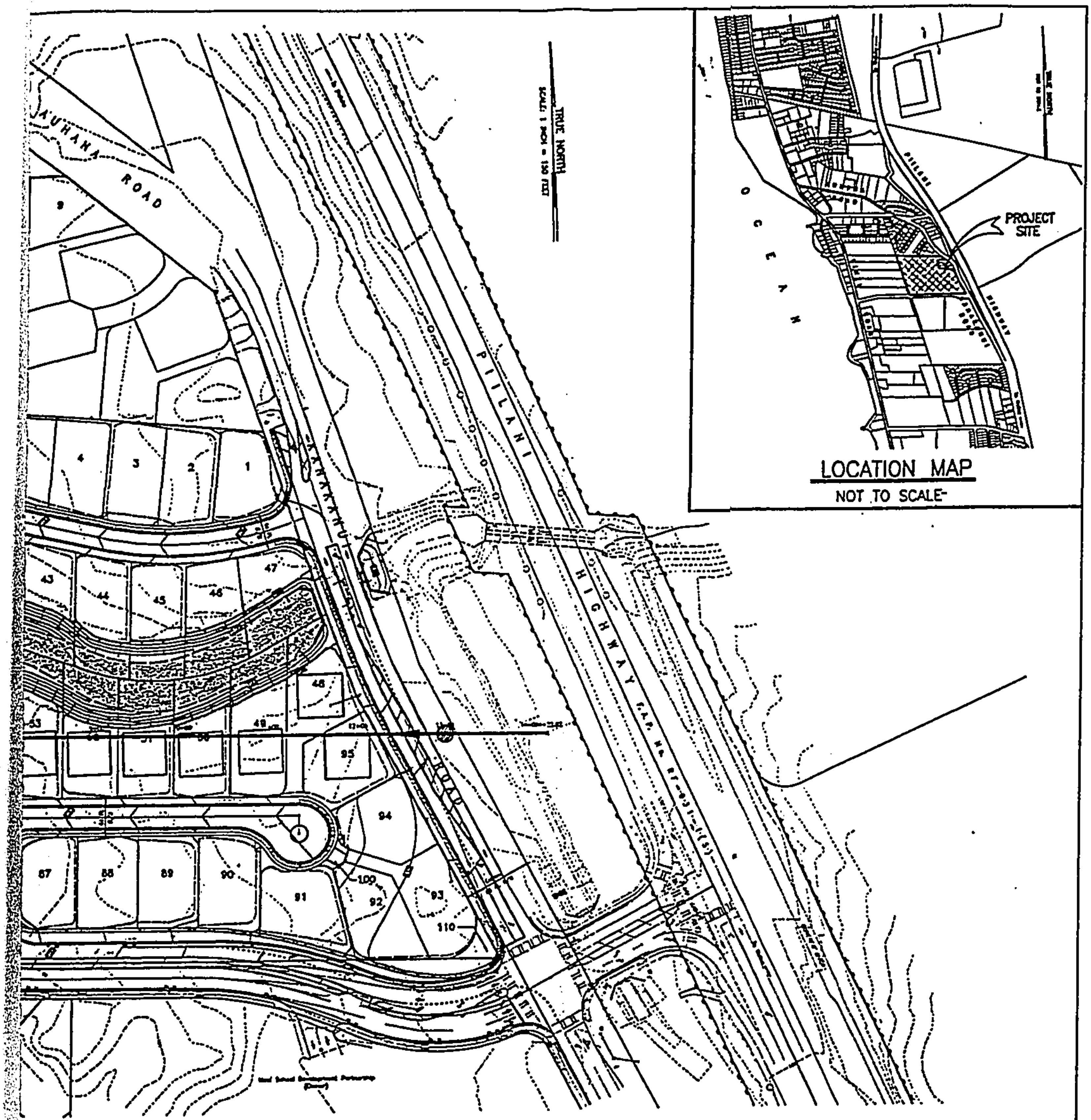
KE-ALII SUBDIVISION

KIHEI, MAUI, HAWAII

0 150 300 450

SCALE: 1 IN. = 150 FT.

T.M.K.: 3-9-18 : 01



EXHIBIT

VISION

HAWAII

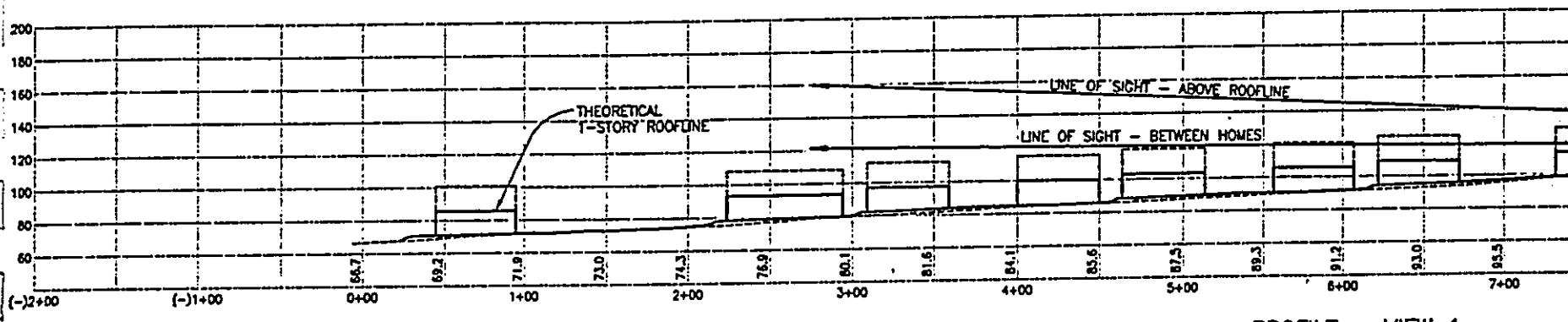
450 600

150 FT.

FIGURE 8

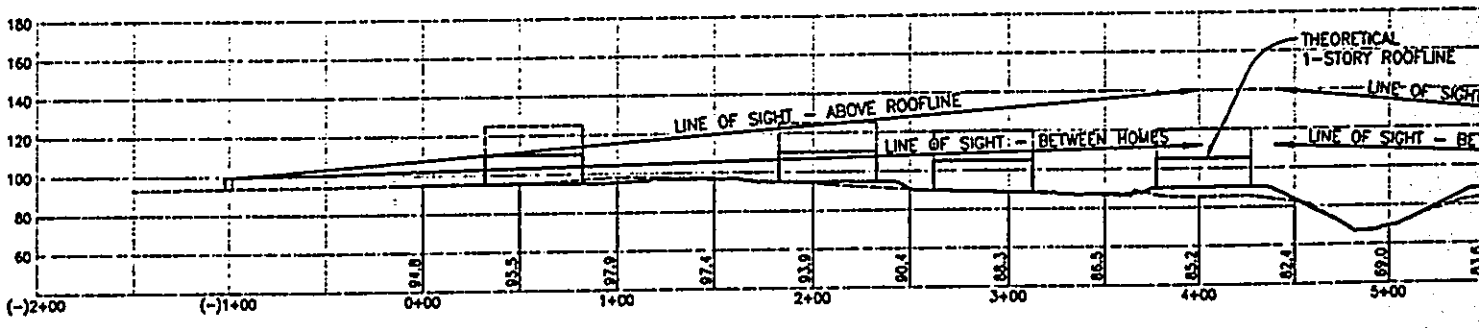
WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

June 20, 2000



PROFILE – VIEW 1

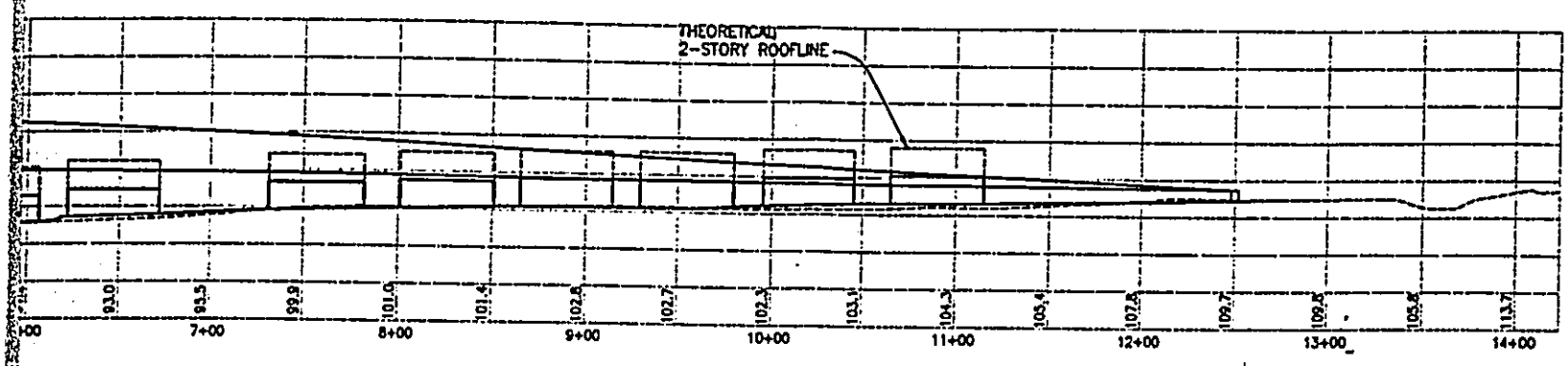
Scale: 1" = 100'



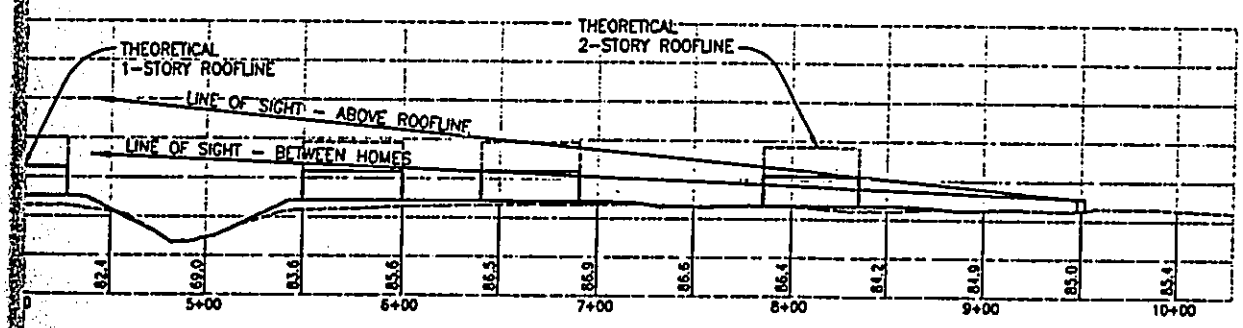
PROFILE – VIEW 2

Scale: 1" = 100'

VIEW PLANE EXHIBIT



– VIEW 1
1" = 100'



– VIEW 2
1" = 100'

E EXHIBIT

WARREN S. UNEMORI
ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

FIGURE 9

June 20, 2000

EXHIBITS

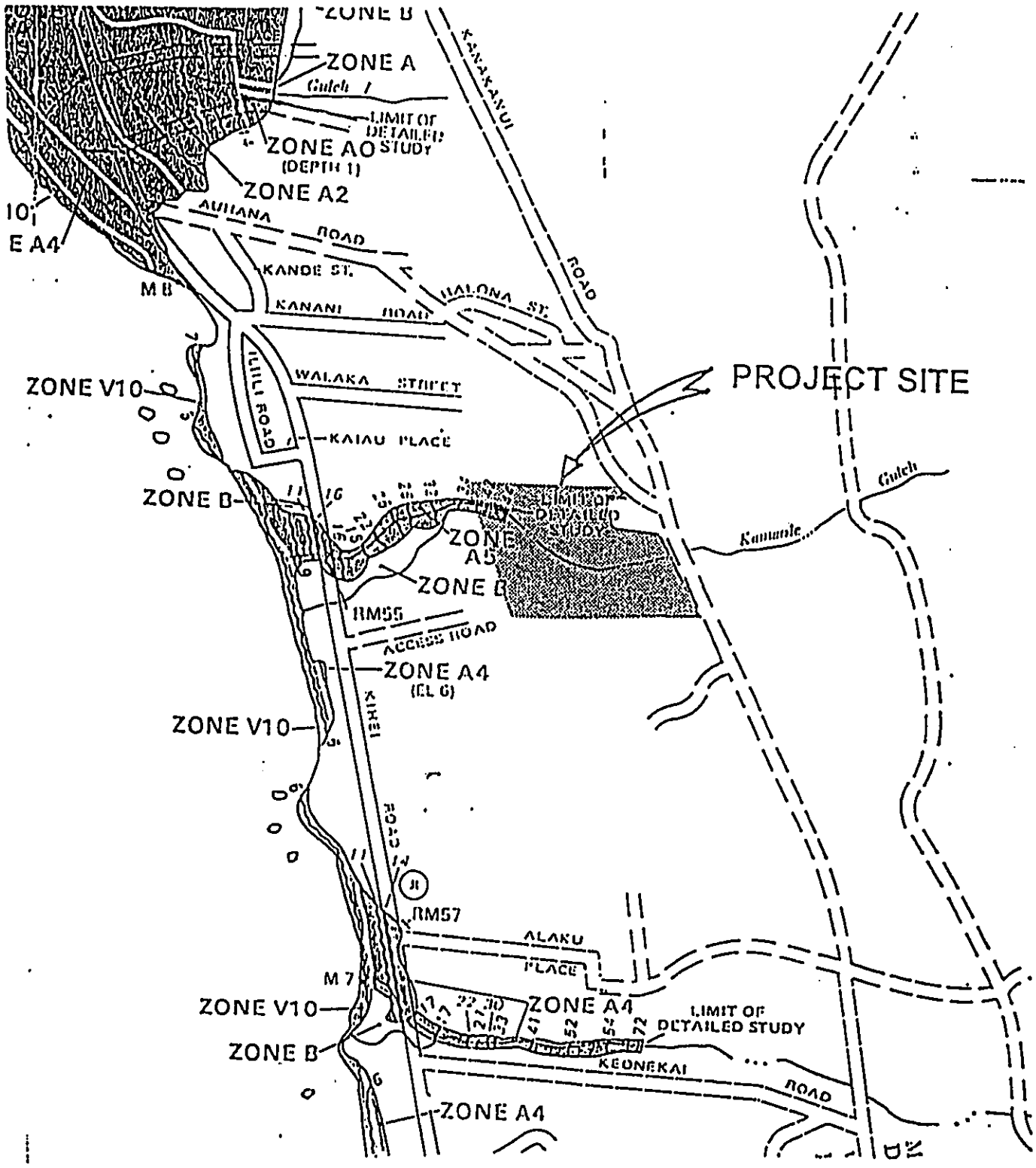


EXHIBIT "A"

FLOOD INSURANCE RATE MAP

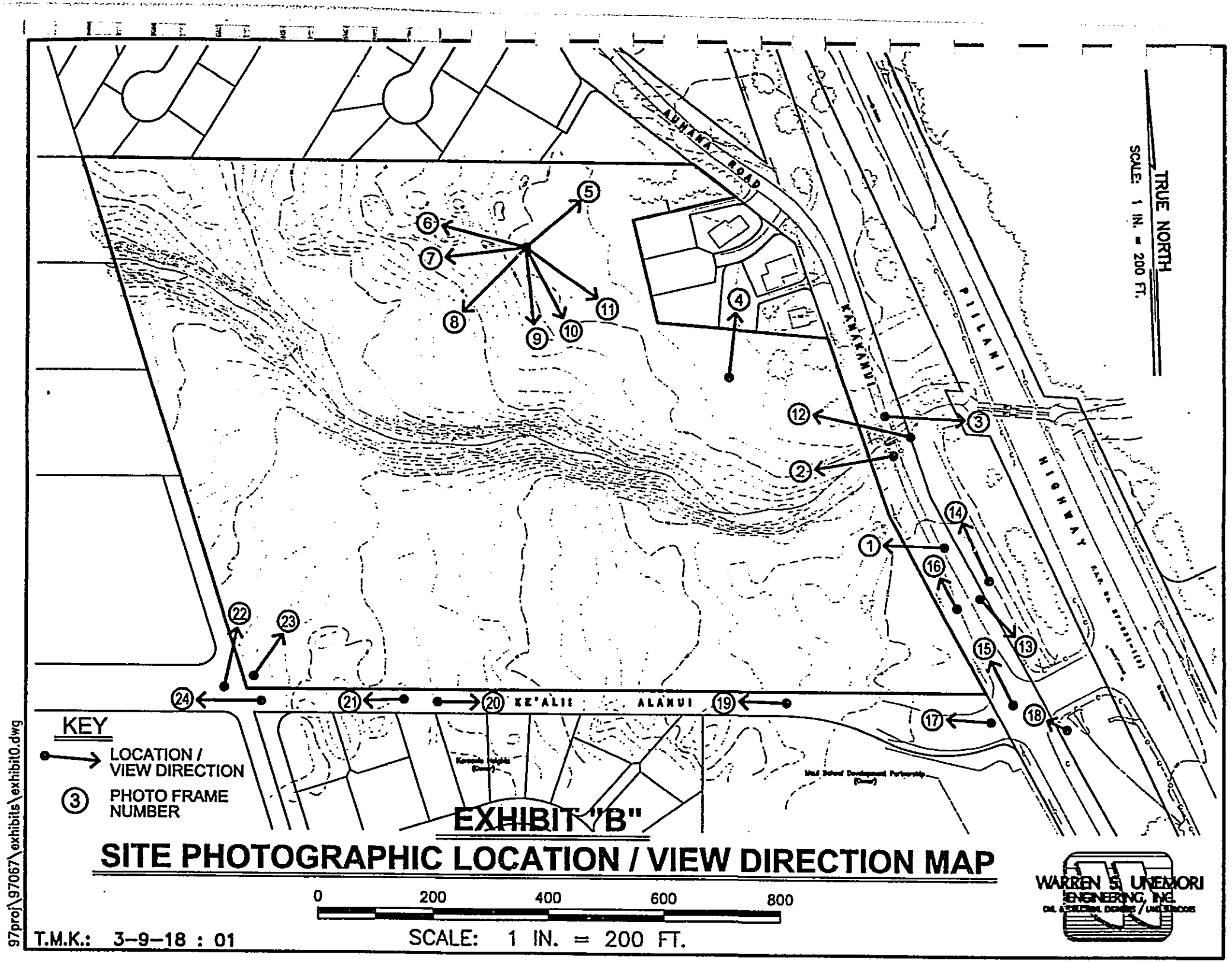


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EXHIBIT "B"

SITE PHOTOGRAPHIC LOCATION / VIEW DIRECTION MAP

T.M.K.: 3-9-18 : 01

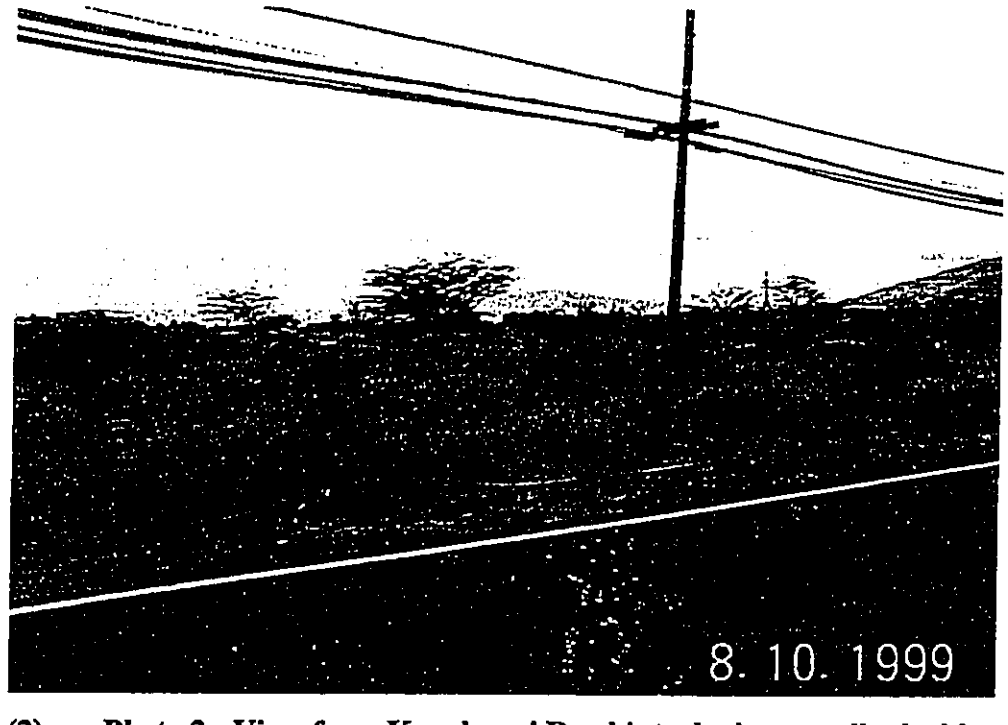
SCALE: 1 IN. = 200 FT.

WARREN S. UNEMORI ENGINEERING, INC.

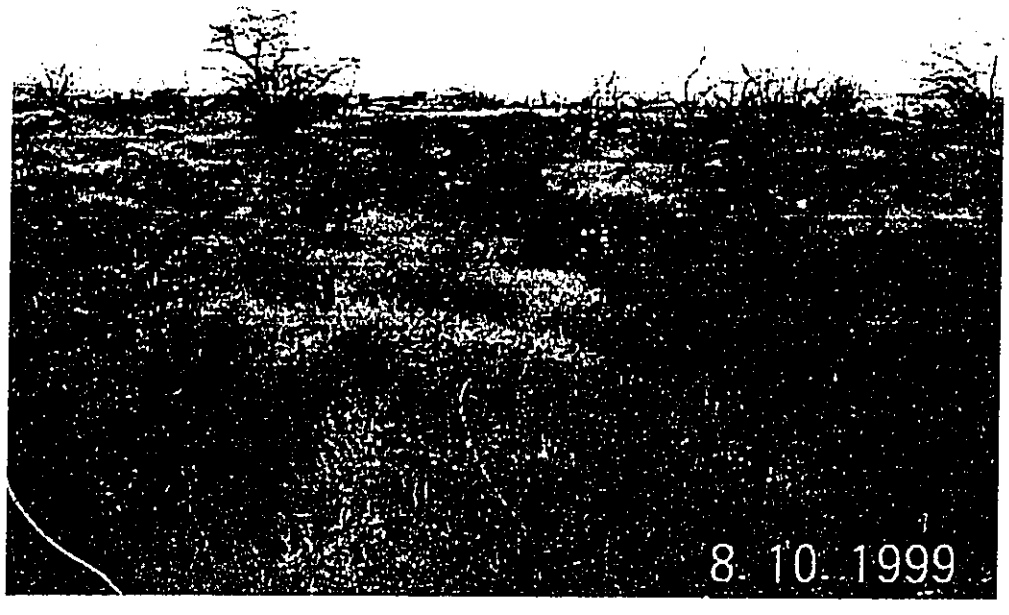
August 12, 1999

Exhibit "C" - Site Photos of Existing Property

(1) Photo 1 - View from Kanakanui Road near Intersection, looking northwest



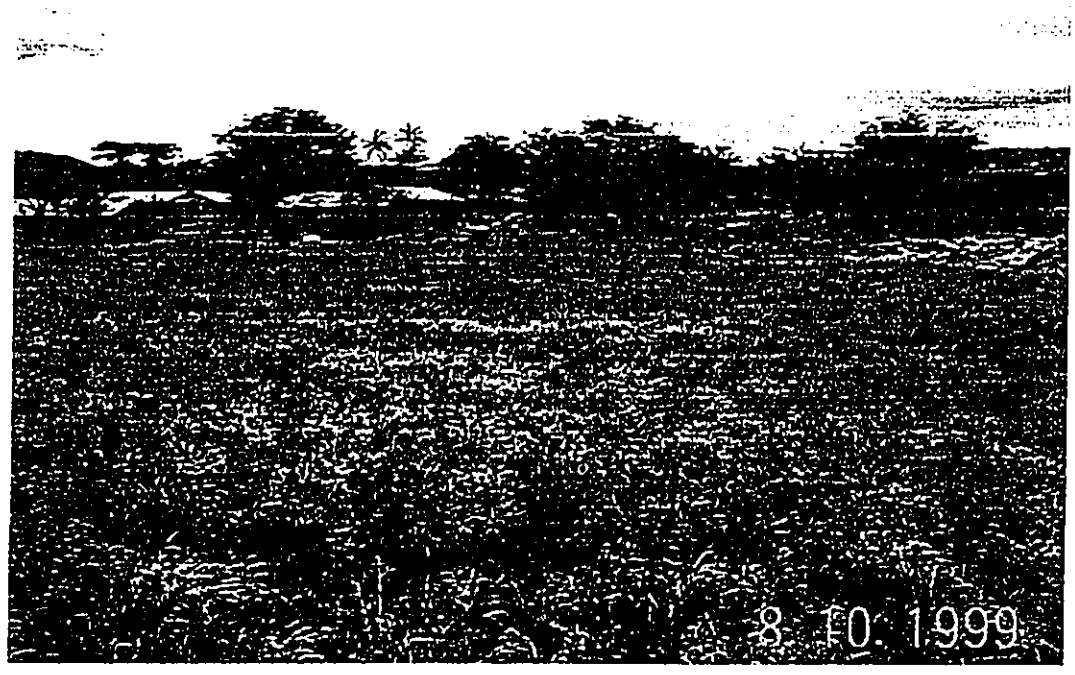
(2) Photo 2 - View from Kanakanui Road into drainage gully, looking westward



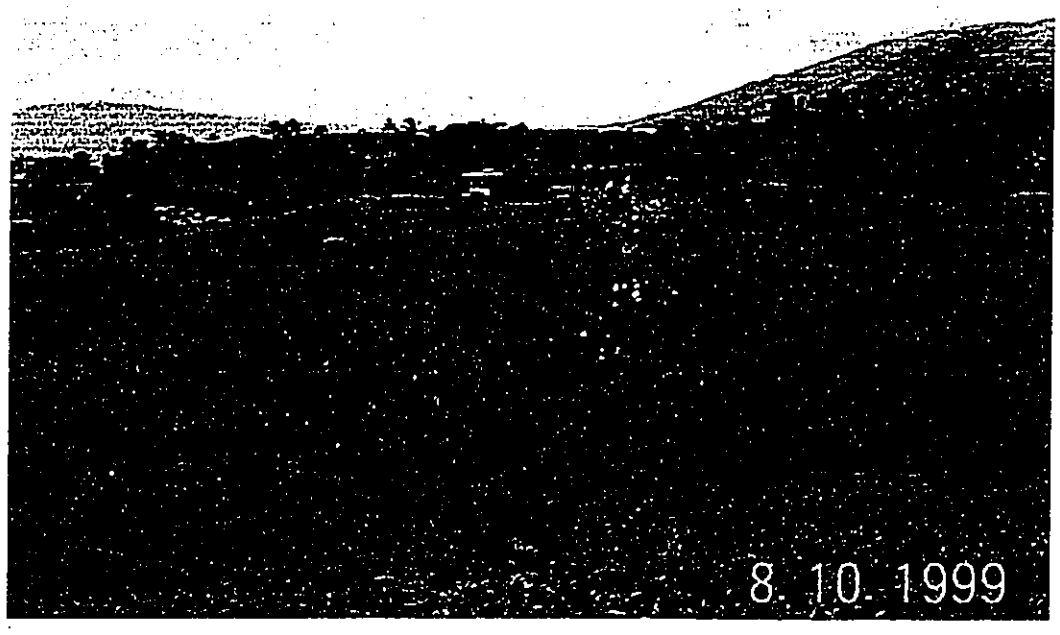
(3) **Photo 3 - Twin 96" Culverts Upstream from Kanakanui Road, looking east**

(4) **Photo 4 - View of existing residential subdivision, looking north**

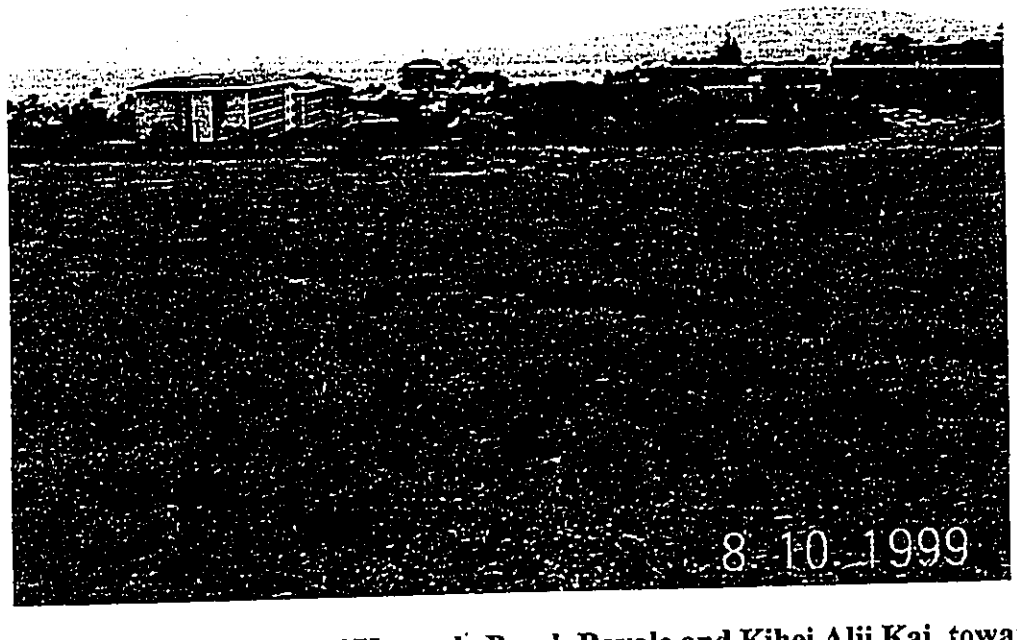
(5) **Photo 5 - View from top of knoll, looking toward northeast corner**



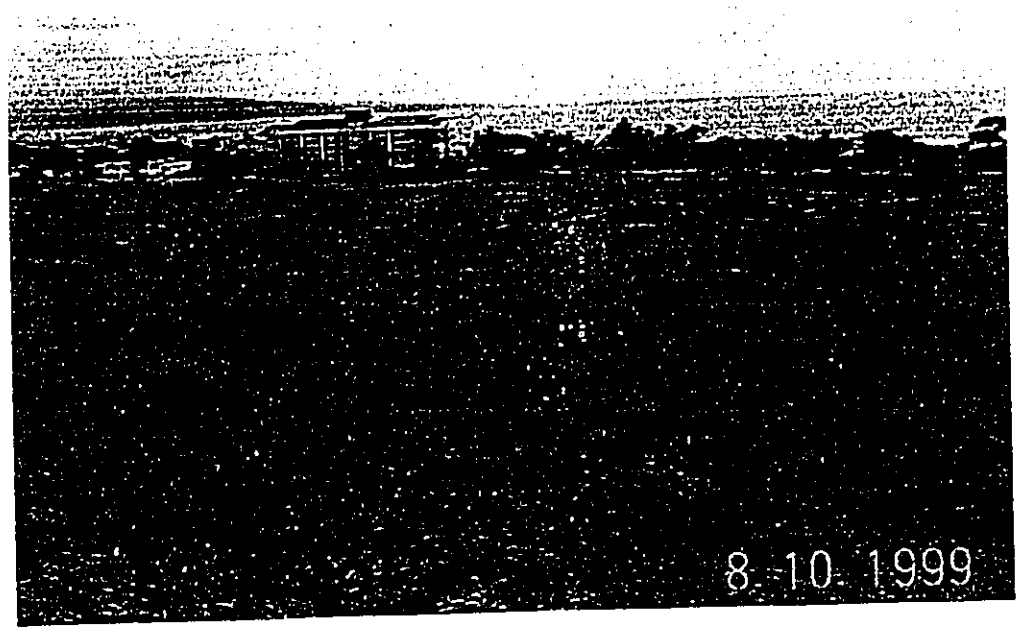
(6) **Photo 6 - View of Maui Vista Condo, looking to northwest corner**



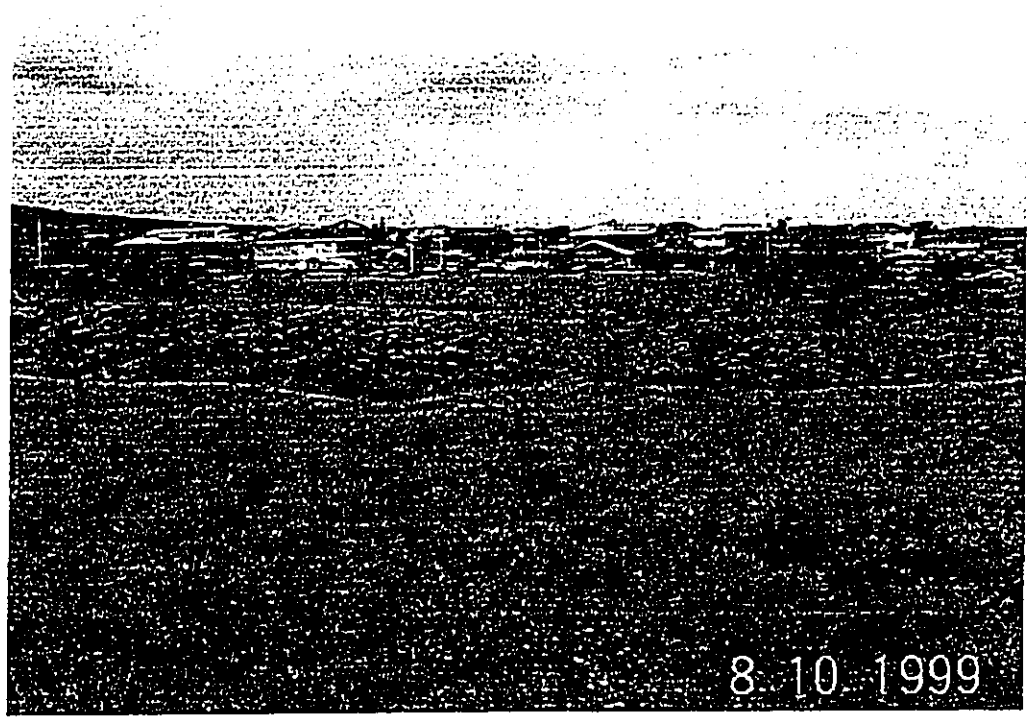
(7) **Photo 7 - View of Maui Coast Hotel and Pacific Shores Condo, looking west**



(8) **Photo 8 - View of Kamaole Beach Royale and Kihei Alii Kai, toward southwest**

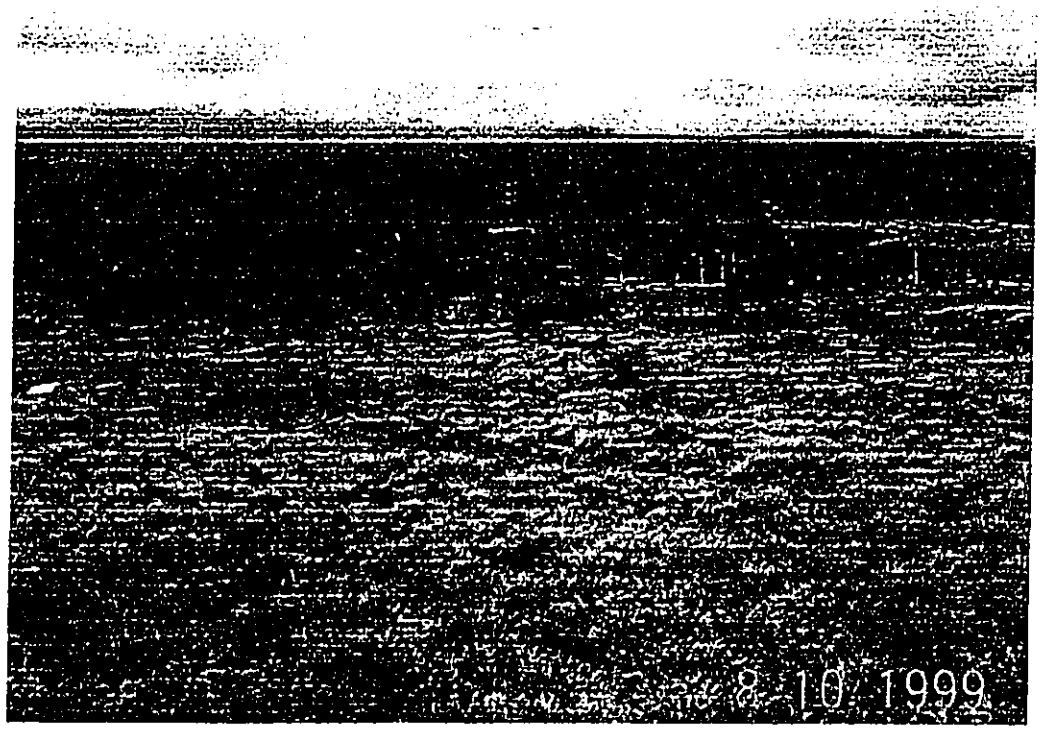


(9) **Photo 9 - View of Kamaole Heights SF Residential Subdivision, looking south**



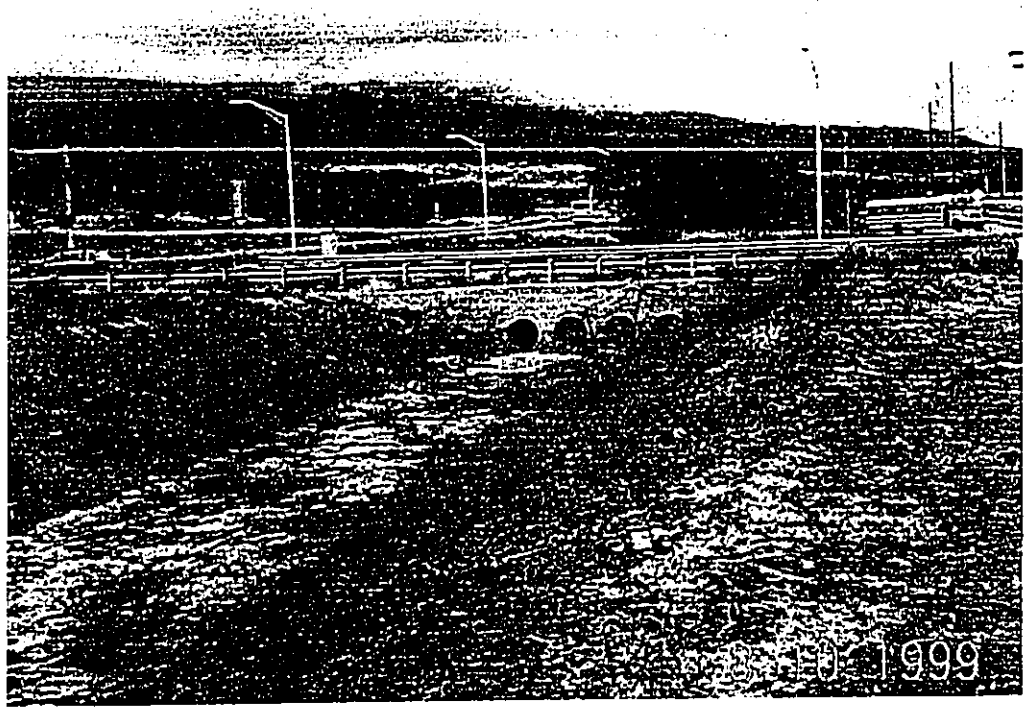
(10) **Photo 10 - View of Kamalii Elementary School, looking southeast**

(11) **Photo 11 - View of Kamaole Water Tank, looking toward southeast corner**



(12) **Photo 12 - View of 48" Culvert on east side of Kanakanui Road, looking west**

(13) **Photo 13 - View of Four 36" culverts upstream, looking south**

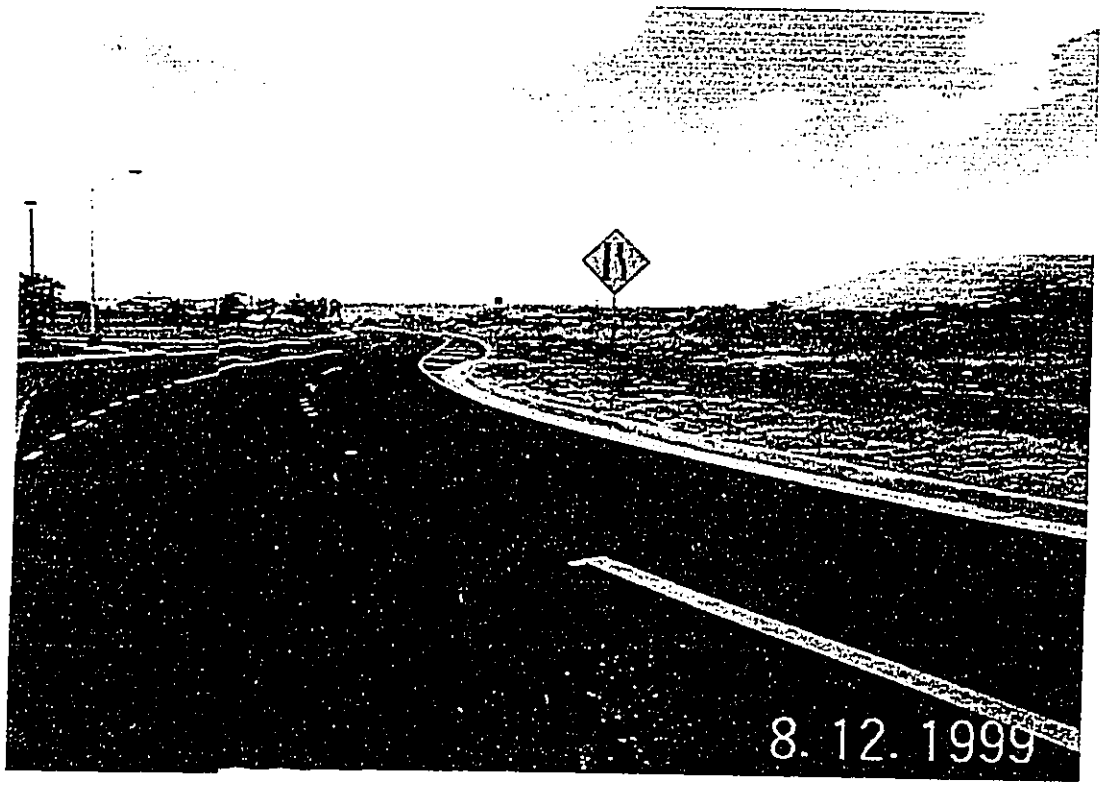


(14) **Photo 14 - View of Drainage Channel, looking north (downstream)**

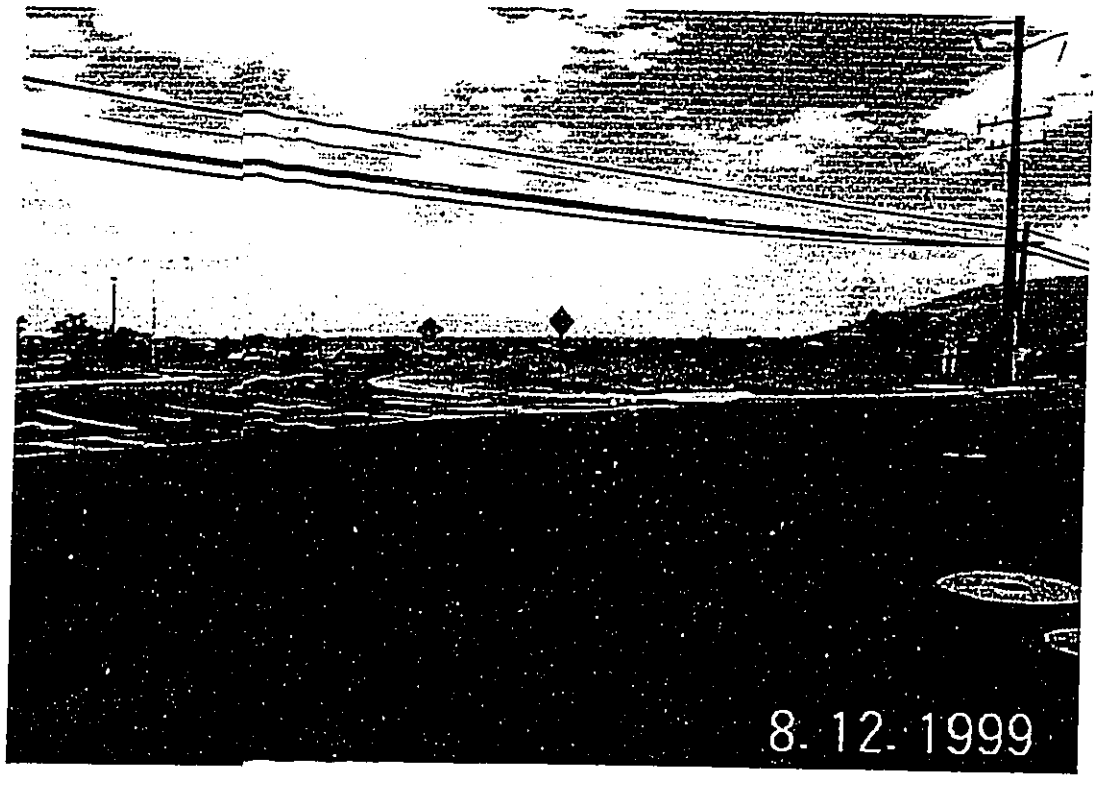
(15) **Photo 15 - View of Kanakanui Road from Ke Alii Alanui, looking north**

(16) **Photo 16 - View of Kanakanui Road as it narrows, looking north**

(17) **Photo 17 - View of Ke Alii Alanui at Intersection, looking west**

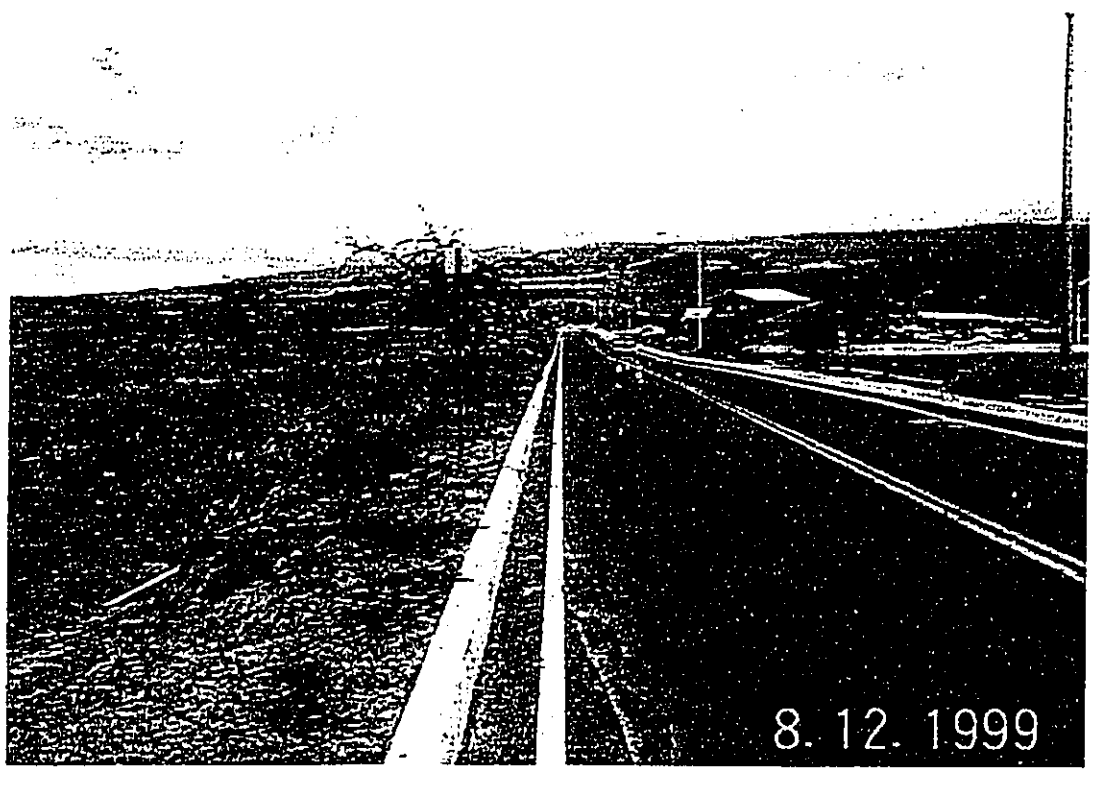


(18) **Photo 18 - View of southeast corner, looking northwest**



(19) **Photo 19 - View of Ke Alii Alanui, looking west**

(20) **Photo 20 - View of Ke Alii Alanui, looking eastward**



(21) **Photo 21 - View of Ke Alii Alanui from further downhill, looking west**

(22) **Photo 22 - View along western property line, looking north**

(23) **Photo 23 - View from southwest corner of lot, looking northeast**

(24) **Photo 24 - View from southwest corner, looking downhill (west)**

Established 1969

2000-07-23-MA-FEA

JUL 23 2000

FINAL ENVIRONMENTAL ASSESSMENT

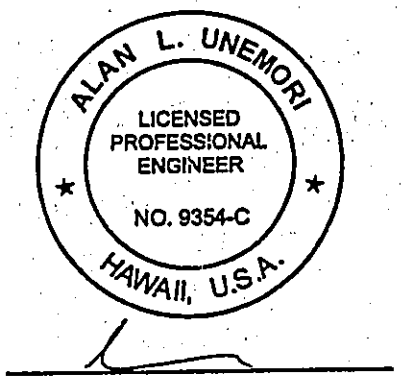
FILE COPY

KE ALI'I SUBDIVISION

Kihei, Maui, Hawaii
TMK: (2) 3-9-18:01

Prepared For:

Spencer Homes
4372 W. Waiola Street
Kihei, Maui, Hawaii 96753



Warren S. Unemori Engineering, Inc.
Civil and Structural Engineers - Land Surveyors
2145 Wells Street, Suite 403
Wailuku, Hawaii 96793

July, 2000

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PREFACE

Spencer Homes, Inc., proposes to construct a 95-lot single family residential subdivision on 24 acres of undeveloped and vacant land at the northwest corner of the intersection of Kanakanui Road and Ke Alii Alanui in Kihei, Maui.

Pursuant to Chapter 343, Hawaii Revised Statutes; and, Chapter 200 of Title 11, Hawaii Administrative Rules; this Environmental Assessment documents the project's technical characteristics, environmental impacts and alternatives, and advances findings and conclusions relative to the project.

SPENCER HOMES, INC. PROPOSED KE ALI'I SUBDIVISION

AGENCY: Spencer Homes, Inc.

PROJECT DESCRIPTION: Spencer Homes, Inc., proposes to develop a 95-lot single family residential subdivision at the northwest corner of Kanakanui Road and Ke Alii Alanui (see Figure 1) on a 24 acre property.

The project does not involve any County, State or Federal funds or lands, with the exception of replacing a substandard, and extremely undersized 48" culvert beneath Kanakanui Road (a County roadway right-of-way) with a larger drainage structure designed for a 100-year recurrence storm.

Spencer Homes, Inc., has prepared the present Final Environmental Assessment (EA) pursuant to Chapter 343, Hawaii Revised Statutes. In the Final EA, three (3) alternatives were considered: (1) Alternative "1": the Proposed Action; (2) Alternative "2": the "No-Build" alternative; and Alternative "3" the "Delayed Action" alternative.

PROJECT SUMMARY:

An undeveloped and vacant 24 acre lot at the northwest corner of Kanakanui Road and Ke Alii Alanui will be subdivided into 95 single family residential lots consistent with the State Land Use Commission designation "Urban", County Zoning "R-2 Residential" and Kihei-Makena Community Plan Designation "Single-Family (SF)". An Application for Special Management Area Permit has been filed with the County of Maui Planning Department.

Based on the EA and supporting analyses, Spencer Homes, Inc., is satisfied that potential improvement and long-term impacts have been identified and addressed.

FOR FURTHER INFORMATION, CONTACT: Mr. Jesse Spencer, Spencer Homes, Inc., 4372 W. Waiola Street, Kihei, Maui, HI 96753: (808) 891-8770

7-10-2000
Date

Jesse E Spencer
Jesse Spencer, President
SPENCER HOMES, INC.

I. PROJECT OVERVIEW

I. PROJECT OVERVIEW:

A. APPLICANT:

The applicant is Spencer Homes, Inc.

B. LOCATION:

The subject property is located at the northwest corner of the intersection of Kanakanui Road and Ke Alii Alanui (see Figure 1). The site is bordered by Kanakanui Road to the east, a single-family residential subdivision to the north, the recently-opened Kamalii Elementary School to the southeast, the Kamaole Heights single-family residential subdivision to the southwest, and the Maui Coast Hotel, Maui Vista Condominium, Pacific Shores Condominium and Worldmark, The Club, currently under construction to the west.

The project site is approximately 200 feet west (makai) of the State of Hawaii's Piilani Highway. Riilani Highway is the main north/south arterial highway linking Kihei to other urban areas of Maui.

Ke Alii Alanui was recently constructed by the County and abuts the south boundary of the project site. It serves as a major east-west collector road that connects Piilani Highway and South Kihei Road.

C. LAND OWNERSHIP:

This parcel is currently wholly and privately owned by Spencer Homes, Inc. (TMK 3-9-18:01).

D. EXISTING LAND USE:

The 24 acre project site is currently undeveloped and vacant. The project site generally slopes downward from an elevation of 112 feet at the southeast corner to about 56 feet at the makai boundary. This yields an overall cross slope of roughly 5%. A natural drainage gully bisects the property in a mauka-makai direction, beginning with an existing 48-inch diameter culvert crossing beneath Kanakanui Road on the mauka side and exiting the western property line roughly 200 feet south of the northwest corner.

E. PROJECT NEED:

The project's design objectives are to create an attractive single family residential subdivision with attractive landscape planting and site planning that will ensure a quality project that complements the existing urban design character of the Kihei area.

The project is consistent with the March 6, 1998, Update of the Kihei-Makena Community Plan's recommended goals, objectives and policies:

> *"**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 Maalaea, Kihei, Wailea and Makena as well as the region's natural environment, marine resources and traditional shoreline uses.*
>
> ***Objectives and Policies***
>
> *b. Identify priority growth areas to focus public and private efforts on the provision of infrastructure and amenities to serve existing residents and to accommodate new growth.*
>
> *f. Establish a distribution of land uses which provides housing, jobs, shopping, open space and recreation areas in close proximity to each other in order to enhance Kihei's neighborhoods and to minimize dependence on automobiles.*
>
> *g. Encourage the establishment of single-family and multi-family land use designations which provide affordable housing opportunities for areas which are in close proximity to infrastructure systems and other urban services."*

The proposed project will implement the objectives of the Kihei-Makena Community Plan.

F. PROPOSED ACTION:

The proposed action will involve the following subdivision improvements:

(1) Clearing, grubbing and grading of the overall Project Site.

(2) Widening of the existing 40 feet right-of-way for Ke Alii Alanui by 40 feet to 80 feet to provide three (3) 12-foot lanes (plus a turn lane) and 6-foot bike lanes (including gutter) in both directions and 8-foot shoulders. Curb, gutter and a 4-feet wide sidewalk will be added on the north side of Ke Alii Alanui (see Exhibit "C", Photos 17 through 21)

(3) Kanakanui Road, which is currently a narrow substandard County road, will be widened along the project frontage. Curb and gutter and a 4-feet wide sidewalk will also be added along the project frontage (see Exhibit "C", Photos 15 and 16)

(4) Dedication of a 22-feet wide strip of land along the makai or westerly boundary for a future two lane road with bike lanes, with none of the subdivision streets connected to this future road (see Exhibit "C", Photo 22)

(5) The existing single 48-inch culvert on Kanakanui Road will be replaced with a much larger culvert to handle the total estimated offsite runoff for a 100-year recurrence storm (see Exhibit "C", Photos 3 and 12), and the existing drainage channel bisecting the project site will be designed to accommodate a 100-year recurrence storm. Side slopes and channel invert sections that currently consist of erodible material will be shaped above the 100-year inundation limits utilizing rocky material from the rock excavation on site.

(6) Construction of a grassed Park/Detention basin above a subsurface detention system designed to keep the post-development flow equal to or less than the current runoff from the project site. The park area itself will be fully grassed and provided with a sprinkler system to keep it usable as a neighborhood passive mini-park (except during periods of heavy and prolonged rainstorms).

(7) Construction of new waterlines, fire hydrants, sewer and underground electricity/telephone/CATV facilities and street lights.

(8) Construction of two subdivision streets interconnected near the northwest corner of the project forming a continuous loop with a 44-feet right-of-way with a curb-to-curb travelway of 28 feet (including gutter) and 8-feet shoulders on both sides plus a 4-feet wide sidewalk on one side.

Exhibits "B" and "C" show other photos of the existing property. Figure 2 displays the Preliminary Subdivision Map (including Development and Drainage Plans) including the location of Lot 103, a 1,435 square foot area created for a historic site (Site 3541) and an easement providing public access to that site. Figure 3 displays the Preliminary Landscape Planting Plan for this subject property.

The proposed subdivision will provide a highly desirable location for single family residential housing accommodations to prospective home buyers near an elementary school and in the heart of the quickly expanding residential core of the Kihei-Makena Community.

II. ALTERNATIVES ANALYSIS

II. ALTERNATIVES ANALYSIS:

A. ALTERNATIVE "1":

Alternative "1" represents the proposed action. The project site is designated as "Urban" by the State Land Use Commission, the Kihei-Makena Community Plan as "Single Family (SF), and the Maui County Zoning as "R-2 Residential". The proposed development is consistent with all zoning regulations currently in place, and is consistent with the recommended goals, objectives and policies of the latest Kihei-Makena Community Plan.

The layout itself is largely dictated by the large natural drainage way that bisects the parcel from east to west, and by accessibility to both Kanakanui Road to the east and Ke Alii Alanui to the south. The single crossing of the drainage way in the northwest corner of the property allows for better traffic circulation and access to both entryways into and out of the proposed subdivision. The "R-2 Residential" zoning designation provides for a minimum lot size of 7,500 square feet, and a minimum lot width of 65 feet, but also permits a mixture of lot sizes provided that minimum lot size will not be less than six thousand square feet and that the overall project density is not exceeded (subject to approval of the Planning Commission).

In addition, the existing single 48" culvert beneath Kanakanui Road is completely inadequate for directing the expected volume of discharge from the two 96" culverts immediately upstream beneath Piilani Highway, and the four 36" culverts beneath Ke Alii Alanui into the natural drainage channel. This poses a serious threat of flooding to adjacent properties below Kanakanui Road. Development of the subject property will reduce the existing flooding potential by substantially improving the flow capacity across Kanakanui Road into the natural drainage channel.

The layout and improvements for the proposed subdivision is presented in Figure 2, while the landscape planting plan is shown in Figure 3. Details of the proposed action are given in Section "I(F)" above.

B. ALTERNATIVE "2"

Alternative "2" represents the "No-Build" alternative. This Alternative leaves the undeveloped and vacant parcel with no improvements, and the existing undersized and substandard 48" culvert below Kanakanui Road with an extremely high potential for flooding of adjacent properties should the design-level storm occur. This alternative is also in contradiction with the Project Needs and the stated "Goals, Objectives and Policies" of the latest "Kihei-Makena Community Plan.

For these reasons, Alternative "2" was eliminated in favor of Alternative "1".

C. ALTERNATIVE "3"

Alternative "3" represents the "Delayed Action" Alternative. This Alternative is one in which the construction of the proposed improvements is delayed. Delay of the project will serve no purpose other than to defer the expense of improvements which are currently needed. Delayed action will also maintain the high potential for flooding of adjacent properties, contrary to the best interests of adjacent property owners.

For these reasons, Alternative "3" was also eliminated in favor of Alternative "1".

III. DESCRIPTION OF EXISTING ENVIRONMENT

III. DESCRIPTION OF THE EXISTING ENVIRONMENT:

A. PHYSICAL ENVIRONMENT:

1. Surrounding Environment

The subject property is located in the community of Kihei, on the south coast of the Island of Maui. Kihei is one of the major communities of Maui and provides resort and residential condominiums, along with single family housing units and commercial shopping centers with resort and retail businesses. The Kihei area has grown substantially over the past twenty years

Specific uses and land designations surrounding the subject site include the following (see Figure 4)

- ***North:*** Abutting the property's entire northern boundary are several independent single family residential subdivisions. Present Kihei-Makena Community Plan designation is "Single Family (SF)"

- ***South:*** Abutting the subject property's southeastern boundary is Ke Alii Alanui and the recently opened Kamalii Elementary School. Present Kihei-Makena Community Plan designation is "Public". Abutting the subject property's's southwestern boundary is Ke Alii Alanui and the Kamaole Heights single-family residential subdivision. Present Kihei-Makena Community Plan designation is "Single Family (SF)".

- ***East:*** The property abuts Kanakanui Road, across from which is a long narrow strip of vacant, undeveloped land between Kanakanui Road and Piilani Highway. The Kihei-Makena Community Plan designation is "Open Space (OS)".

- ***West:*** The northwest corner of the western property line abuts the southeast corner of the 280-unit Maui Vista Condominiums and the eastern property line of the 136-unit Pacific Shores condominium. The Maui Coast Hotel abuts the center of the western property line of the subject property. The two other adjacent parcels are currently under construction for Worldmark, The Club, development. The Kihei-Makena Community Plan designation is "Multi-Family (MF)" or "Hotel" for these parcels.

2. Climate

The climate in the South Maui region is influenced by the persistent north-northeasterly trade winds. Average annual temperature in South Maui is 80° F. In Kihei Town, the annual high temperature averages in the high 80's with the low temperature averaging in the high 60's (Atlas of Hawaii, 1983). June through August are historically the warmer months of the year, while the cooler months are January through March.

Average rainfall distribution in the Kihei-Makena region varies from under 10 inches per year to 30-inches per year in the higher elevations. Rainfall in the Kihei-Makena region is highly seasonal, with most of the precipitation occurring in the winter months.

Northeast trade winds prevail approximately 80 to 85 percent of the time. Winds average 10 to 15 miles per hour during afternoons with slightly lighter winds during mornings and nights. Between October and April, the southerly winds of Kona storms may be felt.

In the absence of trade winds and of nearby storms, winds may become light and variable. The diurnal heating and cooling of the land mass gives rise to onshore sea breezes during the day and offshore land breezes at night.

3. Topography and Soils

The project site generally slopes downward from an elevation of 112 feet at the southeast corner to about 56 feet at the makai boundary at a slope of approximately 5%. A natural drainage gully bisects the property in a mauka-makai direction, beginning with an existing 48-inch diameter culvert crossing beneath Kanakanui Road on the mauka side and exiting the western property line roughly 200 feet south of the northwest corner.

Figure 5 shows the Site-Specific Soil Classification Map for the subject property and the adjacent landmarks. The U. S. Department of Agriculture, Soil Conservation Service designates soils within and surrounding the project site as part of the Puuone Series (PZUE). Puuone soils are developed in material derived from coral and seashells. They are typically located on the low uplands on the island of Maui in elevations ranging from 50 to 350 feet. These soils are used for pasture and home sites. The natural vegetation consists of bermuda grass, kiawe and lantana (see Exhibits "B" and "C" for photos of the existing site).

4. Flood and Tsunami Hazard

According to FEMA's Flood Insurance Map (Panel 150003 0265C), with the exception of a short segment of the natural drainage channel on the northwest corner of the property, the Ke Alii project site is located above the flood boundaries investigated by the National Flood Insurance program (Exhibit "A" shows the upper limits of the flood plain study in the Kamaole area of Kihei).

5. Flora and Fauna

Vegetation within the project area is dominated by buffelgrass (see Exhibits"B" and "C" for photos of the existing site).

Avifauna and mammals common to the project site and surrounding areas are also typical of species found in the urbanized Kihei area. Feral mammals typically found in the area include cats, rats, mice and mongoose. Exotic species of birds commonly found in this area include the Northern Cardinal, Common Mynah, Golden Plover, Spotted Dove, House Finch and Gray and Black Francolin.

6. Wetlands

The nearest "Wetlands" sites are located north of Welakahao Street, including the Azeka/Long's 3.5 acre wetland mitigation ponds, which are approximately 2 miles north of the project site.

7. Archaeological Resources

An Archaeological Inventory Survey of the project site was conducted by Xamanek and sent to the State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources (DLNR). This Report was subsequently reviewed and a letter from the SHPD to Xamanek was issued on September 7, 1999. This letter (see Appendix A) states the following:

> ***"The survey has adequately covered the project area, finding a total of 11 historic sites. The background review is good, indicating that this area might have a few temporary habitations and small agricultural sites. Site descriptions are very good, and interpretations are acceptable. Several late 1800s - 1900s ranch walls are present, but only one clearly pre-contact (a temporary***

> ***habitation site: a small rock shelter, 3541, in Kama'ole Gulch). Several of the sites may actually be less than 50 years in age, and may not technically be historic sites."***

The Archaeological Report suggested two mitigating measures, which were acknowledged by the SHPD in the letter as follows:

> ***"We also agree with your proposed mitigation actions. You recommend that site 3541 (the rock shelter of precontact age) be preserved. You indicate that the other 10 sites have had reasonable and adequate amounts of their significant information recorded/collected in the survey and need no further work or protection. We agree, since these are walls, small features with very shallow surface shell scatters of possibly recent age, or structures with deposits of very recent age.***
>
> ***You further suggest that the northwest part of the parcel with deeper sand deposits be archaeologically monitored when any land alteration occurs, just in case burials might be found. Test trenching in this area found no burials or archaeological deposits, but we agree that there is the possibility that a few burials might be found and that monitoring is reasonable."***

In conclusion, the letter states the following:

> ***"In sum, the report is acceptable. With the commitment to preserve site 3541 and to monitor any land alteration in the deeper sands in the northwest part of the parcel, we believe that any development of this parcel will have "no adverse effect" on significant historic sites."***

The Archaeological Mitigation Plans are shown in Appendix A. Figure 2 displays the Preliminary Subdivision Map (including Development and Drainage Plans) including the location of Lot 103, a 1,435 square foot area created for a historic site (Site 3541) and an easement providing public access to that site.

8. Air Quality

Air quality in the Kihei region is considered relatively good. There are no point source in the immediate vicinity and non-point sources (e.g.,

automobiles) of emissions are not significant to generate high concentration of pollutants. The relatively high quality of air can also be attributed to the region's constant exposure to the wind, which quickly disperses concentrations of emissions. Maui is currently in attainment of all criteria pollutants established by the Clean Air Act, as well as the State of Hawaii Air Quality Standards.

The State of Hawaii Air Quality Standards meet or exceed the Federal Air Quality Standards. Air pollutant levels in Hawaii are monitored by a network of sampling stations under the supervision of the State Department of Health (SDOH). On Maui, there are only two stations that are strategically located in Kihei and Paia to be downwind of several sugarcane fields, primarily to monitor sugarcane burning activities. In December, 1995, an air quality study was completed by B. D. Neal & Associates and published in a report entitled, ***"Air Quality Study for the Proposed Kahului Airport Improvements".*** This study concluded that the monitored levels of pollutants in the Maalaea/Kihei area were ***well below the applicable State and Federal standards.***

The northeast trade winds, which prevail approximately 80 to 85 percent of the time, with winds averaging 10 to 15 miles per hour during afternoons helps to disperse any airborne pollutants. The diurnal heating and cooling of the land mass also aids in the dispersal of any airborne pollutants in the area.

9. Noise Characteristics

Traffic noise from Piilani Highway is the predominant source of noise in the locality of the project. Other background noise levels are attributed to natural (e.g., wind) conditions. The following describes the surrounding neighborhood from which other ambient noise sources exist.

- North: Abutting the property's entire northern boundary are several independent single-family residential subdivisions

- South: Abutting the property's southeastern boundary is Ke Alii Alanui and the recently open Kamalii Elementary School, while the Kamaole Heights single-family residential subdivision sits across Ke Alii Alanui at the southwestern corner of the property..

- East: The property abuts Kanakanui Road, across from which is Piilani Highway

- West: The northwest corner of the western property line abuts the southeast corner of the 280-unit Maui Vista Condominiums and the eastern property line of the 136-unit Pacific Shores condominium. The Maui Coast Hotel abuts the center of the western property line of the proposed project, while Worldmark, The Club, abuts the southwestern corner of the proposed project.

The subject property is completely surrounded by developed single-family residential, multi-family condominiums, an elementary school and hotels.

10. Scenic and Open Space Resources

The subject property is situated makai (west) and downhill of the Piilani Highway and Kanakanui Road. Public views include those from Kanakanui Road looking makai (west) toward the ocean (see Exhibit "C", Photos 1 and 2), and from Ke Alii Alanui looking north (see Exhibit "C", Photo 22 and 23). Private views include those from the single family residential subdivisions immediately north of the property, looking south and west (Exhibit "C", Photos 7, 8 and 9, are taken from the top of a small knoll at the highest point inside the property boundary, not from the private subdivision immediately north).

The existing natural drainage channel which bisects the property in the mauka-makai direction provides a natural open space corridor which will be retained. Also, the natural slope of the property, rising at a slope of approximately 5% from an elevation of approximately 56 feet at the makai (west) end up to an elevation of approximately 112 feet at the southeast corner provides view planes typical of the surrounding area.

The 280-unit Maui Vista Condominium, the 136-unit Pacific Shores Condominium and the Maui Coast Hotel exist makai (west) and downhill from and between the Pacific Ocean and the subject property. Construction of Worldmark, The Club, which is immediately below the southwestern corner of the subject property, had not commenced at the time that the photos were taken in August, 1999. Views to the ocean, which is a minimum of 1300 feet from the shoreline, are for the most part obscured by the existing hotel and

condominiums (see Exhibit "C", Photos 6, 7 and 8), and may be further obscured upon completion of Worldmark, The Club.

B. COMMUNITY SETTING:

1. Community Character

The Kihei-Makena Community Plan region includes a diverse range of physical and socio-economic environments. With its dry and mild climate and proximity to recreation-oriented shoreline resources, the visitor-based economy has grown steadily over the past few years. The town of Kihei serves as the commercial and residential center of the region with the master-planned communities of Wailea and Makena serving as the focal point for visitor activities.

2. Population

The population of the County of Maui has exhibited relatively strong growth over the past decade with a 1996 population of 117,013, a 16.6% increase of the 1990 population of 100,374 (U.S. Bureau of Census, 3/20/97). The 1990 population of Maui Island was 91,361. Growth in the County is expected to continue, with resident population projected to the Years 2000 and 2010 estimated to be 124,562 and 145,872, respectively (Community Resources, Inc., January, 1994).

The 1990 population of the South Maui District was 15,365, which is 16.8% of Maui Island's population. South Maui's de facto population for 1990 was 31, 444 (Community Resources, Inc., March, 1994). The projection of the resident population for the Years 2000 and 2010 are 20,092 and 24,846, respectively (Community Resources, Inc., January, 1994)

3. Economy

The South Maui economy is based primarily upon the visitor industry. Visitor accommodations are located near the shoreline along with necessary support facilities and residential communities. Wailea has developed into an important visitor destination anchor while Kihei has developed into the region's visitor, service, commercial and residential center.

Support for the visitor industry is found in Kihei, where numerous retail commercial centers are found. New commercial centers in Kihei, such as the

Piilani Commercial Center and The Shops at Wailea in Wailea, both of which are now under construction, lend further support to the regional economy and the need for more residential housing.

4. Police and Fire Protection

The Maui Police Department (MPD) consists of five (5) patrol divisions and includes 410 employees. These divisions provide police services through its Hana, Lahaina, Lanai, Molokai and Wailuku districts. On Maui, the MPD includes 373 administrative, patrol and support personnel.

Police services for the Kihei-Makena subdistrict are currently provided by patrol officers on assignment from the Wailuku Patrol Division. Each eight (8) hour watch is staffed by a minimum of four (4) patrol officers.

Fire prevention, protection and suppression services are provided by the Maui Fire Department's (MFD) Kihei, Station. Situated approximately one mile north of the project site, the Kihei Fire Station is equipped with a 1,500 gallon pumper, and is staffed by one (1) captain and five (5) firefighters per twenty-four (24) hour shift. There are future plans to build a second South Maui Fire Station at the intersection of Kilohana Drive and Piilani Highway.

5. Medical Facilities

Maui Memorial Hospital, the only major medical facility on the island, services the Kihei-Makena region. Acute, general and emergency care services are provided by the 185-bed facility, which is located in Wailuku. Several Kihei clinics, and dental and medical offices provide local health care services for Kihei-Makena residents and visitors.

6. Recreational Facilities

The South Maui area has a wide reputation as a recreational destination, particularly for ocean-related activities. Ocean sports and recreation available in the South Maui District include swimming, fishing, surfing, scuba diving, snorkeling, sailing and para-sailing. State and County beach parks in the South Maui District include the Maipoina oe lau Beach Park, Kalama Beach Park, Kamaole Beach Park, Ulua Beach, Wailea Beach, Polo Beach, Makena Beach Park and Ahihi-Kinau Marine Reserve, including the northern portion of La Perouse Bay.

Wailea Resort offers numerous recreational amenities including three (3) golf courses, a tennis center, and two (2) public beach parks and an approximately 1.75 mile long coastal beach. Makena offers an additional golf course and tennis center.

Less than 2 miles north on Piilani Highway is the Silversword Golf Course and the recently-completed Kihei Community and Aquatic Center which also offers a 50-meter swimming pool.

The Kihei Small Boat Landing Ramp near Kamaole Beach Park is also available to the general public for off-shore boating activities.

7. Schools

The Kihei District is served by both private and public schools, which provide education for preschool through intermediate school age children. High schools are located in Wailuku and Kahului. There are various private schools in the Kihei District for grades kindergarten through eight along with several preschools.

The Kamalii Elementary School is located immediately across Ke Alii Alanui from the proposed subdivision. The Department of Education was contacted on February 24, 2000. Mr. Alan Honma of the DOE [Phone No.: (808) 733-4862] stated that the current enrollment in Kamalii Elementary School is 872 students in the 1999-2000 academic year. He further stated that since Kamalii Elementary School was designed as a "Year-Round" facility, it can accommodate 1051 students per year. Therefore, there s adequate room to accommodate the projected 20 additional students estimated by the DOE for a 95-lot subdivision. As the subdivision will allow up to half (50%) of the lots to permit "ohana" dwellings, 30 additional students could be projected to attend Kamalii Elementary School. (Refer to Sections "L(1)", "L(2)" and "L(16)" for more detailed comments on school capacity by the Planning Department, State Land Use Commission and Department of Education).

The nearest public Intermediate School to the proposed subdivision is Lokelani Intermediate School at the corner of Lipoa Avenue and Piilani Highway. Future residents of the proposed subdivision are in the public school district leading to attendance at Maui High School in Kahului.

The projected enrollment for academic year 200-2001 for Lokelani Intermediate School and Maui High School are as follows:

Lokelani Intermediate School:	679 student
Maui High School:	1751 students

8. Solid Waste

Only two landfills are currently operating on Maui, the Central Maui Landfill in Pulehu, and the Hana landfill. Single-family residential waste collection service is provided by the County of Maui on a once-a-week basis. Residential solid waste collected by County crews are disposed at the County's 55-acre Central Maui Landfill located four miles southeast of the Kahului airport. In addition to County-collected refuse, the Central Maui Landfill accepts commercial waste from private collection companies.

C. INFRASTRUCTURE

1. Roadway System

Piilani Highway is the main north/south arterial highway linking Kihei to other urban areas of Maui. Piilani Highway is a two-lane undivided highway owned and maintained by the State. It contains 12-foot wide travel lanes in each direction with 10-feet wide paved shoulders. Kihei Road is a two-lane collector that parallels Piilani Highway along a more coastal route.

Ke Alii Alanui was recently constructed by the County and abuts the south boundary of the project site (see Exhibit "C", Photos 17 through 21). It serves as a major east-west collector road that connects Piilani Highway and South Kihei Rod. Ke Alii Alanui along the project frontage presently consists of a 40-feet right-of-way, two 12-feet lanes, curb and gutter on both sides, and a four feet wide sidewalk on the south side. The intersection of Piilani Highway and Ke Alii Alanui is presently signalized with appropriate turn lanes and approaches.

Kanakanui Road is a narrow substandard County road that parallels Piilani Highway along the easterly boundary of the Project site (see Exhibit "C", Photos 15 and 16). The intersection of Kanakanui Road and Ke Alii Alanui is stop-controlled and is not signalized.

2. Water

The project site, which is located in the northwest corner of the intersection of Kanakanui Road and Ke Alii Alanui, is situated in the Kihei mid-level

service area. Storage for this area in upper Kamaole is provided by the recently-installed 2.0 MG Kamaole reservoir at elevation 311 feet.

The sources of water for this mid-level service area (MLS) are wells located in Upper Waiehu and North Waihee. The North Waihee wells were recently developed by the Department of Water Supply to augment the Upper Waiehu wells. These wells draw water from the heretofore undeveloped Waihee aquifer. Each well has a pumping capacity of 1.0 to 1.5 MGD. Two more wells in North Waihee, referred to as Kapuaa Well 1 and Kanoa Well 1, have also been drilled, tested, and are scheduled to be operational later this year pending acquisition of appropriate easements from the land owner.

A 24-inch transmission line, 1.0 MG storage tank, and a pair of booster pumps have been installed to interconnect this new source to the Upper Waiehu well source and transmission system. Water from the Upper Waiehu and North Waihee well sources is transported by gravity to the Kamaole area via a series of 42", 36" and 30" transmission lines. The 2.0 MG Kamaole tank (see Exhibit "C", Photo 11) is fed by the 30-inch transmission line on Kanakanui Road and conveyed back to the vicinity of Ke Alii Alanui and project site by means of a 12-inch distribution system.

3. Drainage

The project site generally slopes downward from an elevation of 112 feet at the southeast corner to about 56 at the makai boundary. This translates to an approximate cross slope of around 5%. A drainage gully bisects the property in a mauka-makai direction. According to the "Hydrology Report for Piilani Highway" prepared by Trans-Meridian Engineers and Surveyors, Inc., there are three tributary areas 21, 22 and 22a located above Piilani Highway that drain into the existing gully.

The 50-year recurrence interval storm runoffs from areas 21, 22 and 22a were computed to be 399 cfs, 363 cfs, and 91 cfs, respectively, for a total of 853 cfs. The 50-year storm runoff was adopted by the State to design their drainage structures across Piilani Highway. Using the NRCS (SCS) Method, our calculations indicate that for a 50-year recurrence interval storm, runoff from the same three basins is approximately 769 cfs. The existing 48-inch diameter culvert on Kanakanui Road is obviously too small to handle this flow (see Exhibit "C", Photos 3, 13 and 14, which display the twin 96" and four 36" culverts and drainage channel upstream of the existing property, and Photo 12, which displays the 48-inch culvert into which the runoff is

currently directed). Based on the NRCS (SCS) TR 20 Hydrograph method, total runoff from contributory basins above the project site for a 100-year/24-hour recurrent interval rainfall is estimated to total 1082 cfs.

Peak runoff from the 24 acre project site under its present undeveloped condition for a 50 year storm totals approximately 21 cfs.

According to FEMA's Flood Insurance Map, with the exception of a short segment of the natural drainage channel on the northwest corner of the property, the Ke Alii project site is located above the flood boundaries investigated by the National Flood Insurance program (Exhibit "A" shows the upper limits of the flood plain study in the Kamaole area of Kihei).

4. Wastewater System

There is an 8-inch sewer line on Ke Alii Alanui. This line was installed when Ke Alii Alanui and Kamalii Elementary Intermediate School were constructed a few years ago. There is also an 8-inch sewer line at the northwest corner of the project site. This line is located within a sewer easement that runs along the south boundary of the Maui Vista Condominium property and connects to the 10-inch gravity interceptor on South Kihei Road.

A series of gravity collectors, pump stations and force mains then transport wastewater collected on South Kihei Road to the Kihei Wastewater Reclamation Facility (KWRF) located above Piilani Highway south of Silversword Golf Course for processing and disposal.

5. Electrical and Telephone System

There are overhead electrical and telephone distribution systems along Kanakanui Road. The distribution system along Ke Alii Alanui were installed underground when this road was constructed. It presently serves the subdivision on the south side of Ke Alii Alanui.

IV. POTENTIAL IMPACTS AND MITIGATION MEASURES

IV. POTENTIAL IMPACTS AND MITIGATION MEASURES:

A. IMPACTS TO THE PHYSICAL ENVIRONMENT:

1. Surrounding Uses

As mentioned in Section III(A)1 above, specific uses and land designations surrounding the subject site include the following (see Figure 4)

- ***North:*** Abutting the property's entire northern boundary are several independent single family residential subdivisions. Present Kihei-Makena Community Plan designation is "Single Family (SF)"

- ***South:***Abutting the subject property's southeastern boundary is Ke Alii Alanui and the recently opened Kamalii Elementary School. Present Kihei-Makena Community Plan designation is "Public". Abutting the subject property's's southwestern boundary is Ke Alii Alanui and the Kamaole Heights single-family residential subdivision. Present Kihei-Makena Community Plan designation is "Single Family (SF)".

- ***East:*** The property abuts Kanakanui Road, across from which is a long narrow strip of vacant, undeveloped land between Kanakanui Road and Piilani Highway. The Kihei-Makena Community Plan designation is "Open Space (OS)".

- ***West:*** The northwest corner of the western property line abuts the southeast corner of the 280-unit Maui Vista Condominiums and the eastern property line of the 136-unit Pacific Shores condominium. The Maui Coast Hotel abuts the center of the western property line of the subject property. The two other adjacent parcels are currently under construction for Worldmark, The Club, development. The Kihei-Makena Community Plan designation is "Multi-Family (MF)" or "Hotel" for these parcels.

Given the land use designations above, the proposed project should have no significant negative impact with regards to land use patterns in the area, as the proposed project and the surrounding parcels have similar and compatible uses.

2. Flora, Fauna and Wetland Considerations

Vegetation types found on this site consist primarily of introduced species and does not include any rare, threatened or endangered native plants. There are no known endangered or threatened wildlife species in this region. (Refer to Photos 1 through 24 in Exhibit "C" to get an idea of the existing flora and fauna).

The nearest "wetlands" sites are located north of Welakahao Street, including the Azeka/Long's 3.5 acre wetland mitigation ponds, which are approximately 2 miles north of the project site. ***There are no wetlands on the proposed Project Site.***

3. Archaeological Resources

As mentioned in Section III(A)7 above, an Archaeological Inventory Study was performed by Xamanek and sent to the State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources. The Report was subsequently reviewed and a letter from the SHPD to Xamanek was issued on September 7, 1999 (see Appendix A) That SHPD letter states ***"With the commitment to preserve site 3541 and to monitor any land alteration in the deeper sands in the northwest part of the parcel, we believe that any development of this parcel will have 'no adverse effect' on significant historic sites"***

The Archaeological Mitigation Plan is attached in Appendix A. This Plan was developed by Xamanek in March, 2000, and recommends the following for the preservation of the Site 3541 Rock Shelter:

Short-Term Preservation

(1) An interim buffer be established around the rock shelter prior to construction.

(2) Orange construction fencing be placed along the southern top of the gulch in the vicinity of the shelter to ensure damage from bulldozer push from above.

(3) A 75-foot long fence along the southern side of the gulch be constructed

(4) A 30 foot diameter buffer area around the site itself marked by construction fencing be erected

Long-Term Preservation

(1) Signage to identify the site in compliance with the size (1.5 ft x 1.0 ft), heading and text recommended by Xamanek

(2) Use of only hand-held equipment for any maintenance in the vicinity of the site

Figure 2 displays the Preliminary Subdivision Map (including Development and Drainage Plans) including the location of Lot 103, a 1,435 square foot area created for historic Site 3541, and an easement providing public access to that site. This lot will be maintained by the Homeowners Association as a common area.

Monitoring of the land in the deeper sands in the northwest part of the project site will be done as recommended and outlined in the Archaeological Monitoring Plan, which was also prepared by Xamanek and is included in Appendix A of this Final EA Report.

4. Air Quality

Air quality impacts attributed to the proposed project could include dust generated by the *short-term* construction-related activities. Site work such as grading, for example, could generate airborne particulate. Clearing and grubbing will be limited to 15 acres at a time, consistent with provisions of the County Grading Ordinances. Dust control measures such as regular watering, sprinkling and the installation of dust screens will be implemented to minimize the potential impact from wind-blown emissions. (Refer to Section "L(11)" for details of a Best Management Practice program for dust and erosion control, together with Construction Plan Sheets "37" and "38", which give details on silt fences, filter berms, cleaning pads, dust fence and their location, which were formulated in response to comments from the Department of Health)

In the *long-term*, the increase in the number of residents will result in a slight increase in the volume of traffic in the project's vicinity, which in turn could affect the air quality. However, this increase is not considered significant when compared to the overall amount of vehicles in this area and current

ambient air quality (refer to Section III.A.8 for a detailed discussion of the current air quality)

Assuming a minimum of one vehicle per household, there will be an increase of 150+ cars in the area when fully built out. However, as the northeast trade winds prevail approximately 80 to 85 percent of the time, with winds averaging 10 to 15 miles per hour during afternoons and slightly lighter winds during mornings and nights, any airborne pollutants should readily disperse. In the absence of trade winds during periods of "Kona" storms, there may be some build-up of airborne pollutants. However, these storms are typically of relatively short durations (2-3 days). Further, the diurnal heating and cooling of the land mass should help to disperse any pollutants in the mornings and evenings after peak traffic periods. As such, the proposed project is not anticipated to be detrimental to local air quality.

5. Noise

In the *short-term*, the proposed project could generate some adverse impacts during construction. Noise from heavy construction equipment, such as bulldozers, front-end loaders and material-carrying trucks and trailers, would be the dominant source of noise during the construction period.

To minimize construction-related impact to the surrounding property owners, the developer proposes to limit construction activities to normal daylight working hours, and to adhere to the State Department of Health's noise regulations for construction equipment. In addition, the proposed site plan has been designed to follow existing topography to the greatest extent practical. This lessens the need for extensive cut and fill operations, which in turn lessens the potential for negative noise impacts.

In the *long-term*, the project, once completed, is not expected to have any adverse impact upon the existing noise conditions in the Kihei area. The Landscaping Plan (see Figure 3) calls for a dense, 6-ft high Hibiscus hedge surrounding the eastern and southern property boundaries between Kanakanui Road and Ke Alii Alanui, respectively. This hedge, as well as the numerous plantings of Hawaiian Kou, Monkeypod trees, and the expected grass lawns on the homeowners property will certainly contribute to quieting typical "backyard noises" in single-family residential subdivisions.

The following describes the surrounding neighborhood from which other ambient noise sources currently exist.

- ***North:*** Abutting the property's entire northern boundary are several independent single-family residential subdivisions

- ***South:*** Abutting the property's southeastern boundary is Ke Alii Alanui and the recently open Kamalii Elementary School, while the Kamaole Heights single-family residential subdivision sits across Ke Alii Alanui at the southwestern corner of the property..

- ***East:*** The property abuts Kanakanui Road, across from which is Piilani Highway

- ***West:*** The northwest corner of the western property line abuts the southeast corner of the 280-unit Maui Vista Condominiums and the eastern property line of the 136-unit Pacific Shores condominium. The Maui Coast Hotel abuts the center of the western property line of the proposed project, while Worldmark, The Club, abuts the southwestern corner of the proposed project.

The proposed subdivision will add another 95 (up to 142, including maximum Ohana) single-family units to this area which now consists of a mixture of single-family residential units, multi-unit condominiums, elementary schools and hotels. Noise levels emanating from the proposed subdivision are not expected to be at levels which are any higher than those that currently exist in the immediate surrounding area.
(Refer to Section "L(11)" for comments made by the Department of Health regarding "Noise Concerns" during construction; the Contractor will comply with the listed Administrative Rules for both "Community Noise Control" and "Vehicular Noise Control for Oahu" as referred to in that letter)

6. Scenic and Open Space Resources

Impacts to views from Piilani Highway and Kanakanui Road will be minimal and consistent with the Maui County Code, Chapter 19.08 "Residential Districts", Section 19.08.050, "Height Regulations",

"No building shall exceed two stories nor thirty-feet in height."

The project's design objectives are to create an attractive single family residential subdivision with attractive landscape planting and site planning that will ensure a quality project that complements the existing urban design character of the Kihei area. Thus, in terms of urban design and scenic

resources, the project is considered to have a positive effect upon the visual character of the site and its immediate surroundings.

As mentioned in Section III.A.10 above, public views include those from Kanakanui Road looking makai (west) toward the ocean, and from Ke Alii Alanui looking north. Private views include those from the single family residential subdivisions immediately north of the property, looking south and west.

In order to get some idea of the scenic public and private view planes, two Figures were prepared as follows. Figure 8 shows the location of two typical view planes. View 1 includes views from a person standing on Kanakanui Road, looking mauka (west) toward the ocean, with hypothetical "building pads" placed on the lots crossing this view plane. Similarly, View 2 includes views from a person standing on Ke Alii Alanui looking north, as well as a person standing in the single-family subdivision immediately to the north of the project, looking south, with hypothetical "building pads" placed on the lots crossing this view plane.

Figure 9 shows the corresponding profiles for both View 1 and View 2, showing the "lines of sight" both "above the roof for single-story buildings" and "between buildings for single story buildings". The profile for possible two-story buildings is also superimposed

The visual impact should therefore be typical of single-family residential subdivisions, and is aided by the 5% cross-slope across the project site.

B. IMPACTS TO COMMUNITY SETTING

1. Land Use and Community Character

As discussed in detail in Section I(E) and I(F), and in Sections III(A)1 and III(B)1, the proposed project is consistent with the designated Land Uses at the State, County and Kihei-Makena Community Plan levels, as well as consistent with the overall Community Character of the Kihei-Makena area.

2. Population

The proposed project will add a much needed 95 single family homes to the residential core of the Kihei area. According to the Atlas of Hawaii, Third Edition, 1998, ***"Hawaii's average household size is steadily shrinking:***

in 1990 it was 3.01 persons, compared with 3.15 in 1980, 3.87 in 1960 and 4.46 in 1940". Based on this estimate of average household size, accounting for a maximum number of "ohana" housing for half (50%) of the lots, the project can accommodate 429 residents (1.5 households including ohanas x 3.01 persons per household x 95 lots = 429 residents).

This is *less than 1.4%* (429/31,444 = 0.0136 => 1.36%) of the de facto population in South Maui ten years ago. Given the reported 16.6% growth increase in the County of Maui's population over a 6-year span, this is *not a significant impact* on the local population levels, and should be considered a welcome addition to the Kihei Community.

3. Police, Fire and Medical Services

The proposed project will not extend the existing service area limits for emergency services. Comments were received on an intra-departmental memorandum from Maui Police Officer Bradney Hickle to Maui Police Chief Tom Phillips (refer to Section "L(9)" for a full copy of the memorandum). The concerns raised were primarily related to traffic congestion, signage and roadway design. These are discussed in more detail in "Section C, Impacts to Infrastructure, 1. Roadways", which follows. While the memorandum describes Officer Hickle's observations of the existing situation, it does not state or imply that any additional Police manpower would be required (e.g., for issuing parking or speeding tickets - approximately 1 moving violation per day per Officer Hickle's memo).

Comments were also received from the Department of Fire Control regarding two design requirements as follows:

(1) Fire access roads must be provided when any building is located more than 150 feet from fire department vehicle access

(2) Fire hydrants (or standpipes) capable of supplying required fire flow must be located no farther than 150 feet from the nearest part of the building pad

Based on these requirements, the fire hydrant locations were modified to comply with the requirements, and a Fire Hydrant Layout Plan and close-up map showing locations of fire hydrants near private access roads in the

proposed project were sent to the Department of Fire Control. (Refer to Section "L(10)" for copies of this correspondence.)

4. Recreation

The proposed residential subdivision is not anticipated to have any significant impact upon existing recreation facilities and services in the region. The South Maui area has a wide reputation as a recreational destination, particularly for ocean-related activities. Ocean sports and recreation available in the South Maui District include swimming, fishing, surfing, scuba diving, snorkeling, sailing and para-sailing. State and County beach parks in the South Maui District include the Maipoina Oe lau Beach Park, Kalama Beach Park, Kamaole Beach Park, Ulua Beach, Wailea Beach, Polo Beach, Makena Beach Park and Ahihi-Kinau Marine Reserve, including the northern portion of La Perouse Bay.

Wailea Resort offers numerous recreational amenities including three (3) golf courses, a tennis center, and two (2) public beach parks and an approximately 1.75 mile long coastal path. Makena offers an additional golf course, and tennis center.

Less than 2 miles north on Piilani Highway is the Silversword Golf Course and the recently-completed Kihei Community and Aquatic Center which also offers a 50-meter swimming pool. The Kihei Small Boat Landing Ramp near Kamaole Beach Park is also available to the general public for off-shore boating activities.

Also, a 15 acre regional park site, hereinafter referred to as the "Kihei Regional Park" is planned and will be located across Piilani Highway and immediately northeast of the Ke Alii Subdivision. This will add yet another large recreational facility in the Kihei area.

In short, given the myriad of parks and recreational facilities in the South Maui region alone, the additional impact of the future residents of the proposed single-family residential subdivision should be insignificant on the existing recreational facilities and services.

An onsite park/detention basin will also be constructed near the northwest corner of the lot for use by Homeowners. A plan view drawing and profile for a corresponding section on the plan are shown in Section "L(1)". The park/detention basin will be approximately trapezoidal in shape, 119± feet

long and 59± feet wide at its narrowest point. A 10-foot wide access road (with 15% slope) will provide ramp access into the park, while a concrete stairway off the street will provide conventional access.

The park will be a passive park, which will be privately owned and maintained by the Homeowners Association. The general public will be able to use the park except when individual homeowners reserve the park through the Homeowners Association for private activities. The general public will not be able to reserve the park for their private events through the Homeowners Association. Rules for use and reservation of the park by Homeowners will be included in the Bylaws and CC&Rs. (Refer to correspondence in Sections "L(1)" and "L(8)" for more details on the park site in response to comments from the Planning Department and Parks and Recreation)

5. Solid Waste

The proposed project will not extend the existing service area limits for County-collected refuse. Based on a typical estimated solid waste generation of 55 lbs per week per residence (phone call to the Public Works and Waste Management Department, Solid Waste Division on 8/13/1999), the Ke Alii Subdivision will generate approximately 55 x 95 = 5225 lbs of solid waste per week. Solid waste disposal fees are paid for by each participating household.

A Solid Waste Management Plan has been prepared and issued to the Department of Health. To summarize, the developer's Solid Waste Management Plan includes the following actions:

- *"o The dry brush will be grubbed and hauled to a property permitted recycling facility such as Campaign Recycle Maui.*
- *o The kiawes will be offered to various individuals for use as firewood. Any remaining kiawe waste will be composted on site for future landscape use or will be deposited to a proper recycling facility.*
- *o Any discarded vehicles or miscellaneous items will be taken to Maui Scrap Metal or any properly permitted recycling facility*

- ***We will at all times try to recycle any materials found during site construction. There will be no exporting of soil as the sitework requires importing fill materials."***

(Refer to Section "L(11)" for a copy of this correspondence).

6. Schools

The proposed 95-lot single-family residential subdivision is not anticipated to significantly affect school enrollment. Based on a phone conversation on 8/16/1999 with a Business and Facility Specialist, Mr. Sanford Beppu, of the DOE, the following statistics are expected for student enrollment per 100 single-family homes (prorated to 95 lots):

Elementary School:	21 students x 95/100 =	20 students
Intermediate School:	9 students x 95/100 =	9 students
High School:	10 students x 95/100 =	10 students

As the subdivision will allow up to half (50%) of the lots to permit "ohana" dwellings, the above numbers would correspondingly increase by 50% (e.g., 30 Elementary School students, 14 Intermediate School students, and 15 High School Students).

The Department of Education was contacted on February 24, 2000. Mr. Alan Honma of the DOE [Phone No.: (808) 733-4862] stated that the current enrollment in Kamalii Elementary School is 872 students in the 1999-2000 academic year. He further stated that since Kamalii Elementary School was designed as a "Year-Round" facility, it can accommodate 1051 students per year.

Therefore, there is adequate room to accommodate the projected 30 additional Elementary School students. (Refer to Section "L(2)" for more details on the capacity of schools in response to comments from the State Land Use Commission).

Based on a phone call on June 19, 2000, to Ms. Helen Fukugawa, Deputy District Superintendent, Maui [Phone No.: 984-8011], the projected attendance for academic year 2000-2001 for Lokelani Intermediate School and Maui High School are as follows:

Lokelani Intermediate School:	679 students

Maui High School	1751 students

Based on a phone conversation on June 20, 2000, with Ms. Marion Muller, Principal of Lokelani Intermediate School [Phone No.: 875-6800], when all planned school buildings are completed, Lokelani Intermediate School will have a capacity of 900 students. It should therefore be able to accommodate the estimated 14 additional Intermediate School students.

Based on a phone conversation on June 19, 2000, with Mr. Eugene Kennedy, Registrar at Maui High School [Phone No.: 873-3000], in past years Maui High has accommodated up to 1850 students. It should therefore be able to accommodate the estimated 15 additional high school students.

C. IMPACTS TO INFRASTRUCTURE

1. Roadways

Preliminary Project Plans call for the present 40-foot right-of-way to be widened by 40 feet to 80 feet (see Exhibit "C", Photos 17 through 21). The pavement along the project frontage will also be widened by 30 feet in the makai-bound direction to provide one (1) 12-feet lane (plus a turn lane) and one 6-foot bike lane (including gutter) with shoulders. Curb, gutter and a 4-feet sidewalk will also be added on the north side shoulder of Ke Alii Alanui.

Kanakanui Road will also be widened along the project frontage (see Exhibit "C", Photos 15 and 16). Curb and gutter and a four-feet wide sidewalk will also be added along the project frontage.

In addition to the above, the developer will be dedicating a 22-feet wide strip of land for the North-South Collector Road along the makai or westerly boundary of the project site to accommodate a future two-lane road with bike lanes. None of the subdivision streets will be connected to this future road.

Access to the project site will be provided form Kanakanui Road and Ke Alii Alanui. These two subdivision streets will be interconnected near the northwest corner of the project, forming a continuous loop. Subdivision streets will have a right-of-way of 44 feet with a curb-to-curb travelway of 28 feet (including gutter) and 8-feet shoulders on both sides. A 4-feet wide sidewalk will be installed on one side.

A Traffic Impact Assessment Study was recently completed for the Ke Alii Alanui Subdivision by Parsons Brinckerhoff Quade & Douglas, Inc. In this Study, estimates of the Level of Service (LOS) of traffic were prepared for the Year 2001 (the expected date of project build-out) for each of the unsignalized and signalized intersections in the immediate vicinity of the proposed project site considering expected traffic patterns both with and without the proposed project.

This Study concluded:

> ***"The results of the traffic analysis show that the proposed development will not change any intersection levels of service within the study area. The Kanakanui Road approach to Piilani Highway is projected to experience some delay with or without the proposed developments. The proposed development is not projected to increase intersection approach delay significantly on Kanakanui Road.***
>
> ***The intersection of Ke Alii Alanui and Piilani Highway is projected to operate well with and without the proposed development. The additional traffic volume is not projected to change future intersection levels of service. The queue on Ke Alii Alanui at Piilani Highway is not projected to increase the expected queue beyond the existing queue length.***
>
> ***It is, therefore, concluded that the single-family parcel can be accommodated by the roadway system anticipated to be in place at its build out."***

It is important to recognize that this September, 1999, Study recognized that the Kamaole Heights Subdivision was then currently under construction, and Worldmark, The Club had been recently approved. Traffic volumes generated by both developments were added to the background traffic volumes. Traffic volumes for Kamaole Heights were generated and distributed in a similar procedure to the proposed development. The traffic volumes for Worldmark, The Club were taken from the 1997 Traffic Impact Assessment Report (TIAR) prepared for Worldmark, The Club. Also, the new traffic signal at the intersection of South Kihei Road and Ke Alii Alanui was also recognized in the TIAR for the proposed project.

This Report also provided recommendations that identified specific roadway improvements that help to enhance traffic operations and to protect existing development in the vicinity of the proposed single-family parcel which are consistent with the construction plans of the proposed development, as follows:

Site Access to Ke Alii Alanui (see Figure 6)

> ***"The driveway to Ke Alii Alanui is proposed to be located 425 feet west of Kamalii Elementary School entrance ... It will be a full-movement intersection with STOP-sign control at the single-family parcel driveway. This intersection spacing exceeds minimum spacing usually required by the Maui County Department of Public Works and Waste Management.***
>
> ***As part of the single-family development, Ke Alii Alanui will be widened and improved on its north side along the frontage of the single-family parcel. Curb and gutter will be installed along this frontage. The improved roadway will be 30-feet wide in the makai-bound direction along the frontage of the proposed single-family parcel. This will provide enough roadway width to allow the installation of a median left turn lane, a 12-foot wide through lane, along with a 6-foot bike lane in the westward direction."***

Site Access to Kanakanui Road (see Figure 7)

> ***"The second access to the single-family parcel is located on Kanakanui Road and is proposed approximately 600 feet north of the Ke Alii Alanui. It will be a full-movement intersection with STOP-sign control at the single-family parcel driveway.***
>
> ***As part of the single-family development, Kanakanui Road will be widened and improved on its west side along the frontage of the single-family parcel. Curb and gutter will be installed along this frontage. The improved roadway will be 36-feet wide measured from face of curb to edge of pavement along the frontage of the proposed single-family parcel. This will provide enough roadway width to allow the installation of a median left-turn lane for traffic turning into the single family [parcel]."***

Appendix C provides a copy of the Traffic Impact Assessment Study Report in its entirety.

Comments were received on an intra-departmental memorandum from Maui Police Officer Bradney Hickle to Maui Police Chief Tom Phillips (refer to Section "L(9)" for a full copy of the memorandum), primarily stating that he believes that "adding 40 to 180 new vehicles to the area of Ke Alii Alanui Road/Kanakanui Road will greatly increase the traffic problems and the hazards to motorists and pedestrians". His comments were forwarded to Parsons Brinckerhoff (PB), the consultant who prepared the "Traffic Impact Analysis Update for the Ke Alii Single-Family Units", September, 1999. After reviewing these concerns, Mr. Wayne Yoshioka, Manager of Transportation Planning/Traffic Engineering, addressed each of these concerns. His letter summarizes as follows:

> ***"We believe this letter addresses the issues that Officer Hickle raised in his memorandum.***
>
> ***First, Ke Alii Single-Family Units development will generate very little traffic impact. Intersection analysis show that traffic from the development would not change the level of service at the intersections of Alanui Ke Alii. It contributes about 10 percent of the traffic projected for Alanui Ke Alii and a very small percentage on the traffic on South Kihei Road and Piilani Highway.***
>
> ***Second, many of the issues are related to existing traffic issues connected with the operation of Kamalii Elementary School. It is appropriate and desirable for Kamalii Elementary School to conduct the recommended internal traffic circulation study, the school crossing study, and the school speed zone study to enhance the safety for students attending the school."***

(Refer to Section "L(9)" for this correspondence).

In addition, Officer Hickle's concern regarding traffic congestion will be addressed as noted below.

Comments related to Traffic Study were also received from the Environmental Center at the University of Hawaii at Manoa. In response to these comments, roadway improvements were described as follows:

"The improvements to Ke Alii Alanui on the south side of the property include each of two 6-foot wide bicycle lanes adjacent to each of the mauka-bound and makai-bound traffic lanes. In addition, the Kihei-Makena Community Master Plan includes a North-South Collector Road which will eventually support two 6-foot wide bicycle lanes and two traffic lanes. The North-South Collector Road will eventually provide bicycle lanes going from Uwapo Road in North Kihei to Kilohana Drive at the Wailea border - a distance of approximately 6 miles. The 22-foot wide strip at the western border of the Ke Alii Subdivision will be donated by Spencer Homes to the County of Maui for this purpose.

In addition, two significant improvements to the traffic flow entering and existing Kamalii Elementary School are proposed as part of this project. First, the existing makai-bound left-hand turn lane into Kamalii Elementary School will be lengthened to accommodate more cars turning into Kamalii Elementary School. Second, in the mauka-bound direction, a second lane will be provided on Ke Alii Parkway for school-bound traffic. This will eliminate the bottleneck that currently exists at the start and end of classes as parents queue to take a right-hand turn into the Kamalii Elementary School parking lot from the one available lane on Ke Alii Parkway. Both of these proposed improvements are shown in the attached figure entitled, "Ke Alii Subdivision Proposed Improvements to Ke Alii Parkway/Kanakanui Road Intersection".

(Refer to Section "XI.A" for this correspondence including the "attached figure" referred to immediately above).

2. Water and Wastewater

The 95-lot subdivision project is expected to generate 33,600 to 38,000 gpd of wastewater when fully built out. The existing collection, transmission and treatment facilities have ample capacity to handle this flow. Since these facilities were recently upgraded, the developer will be fulfilling his obligation for this upgrade by paying a one-time assessment of approximately $4.65 per gallon of additional wastewater generated by the project and $0.80 per gallon for off-site transmission improvements.

Comments were received from the Department of Water Supply encouraging consideration of water conservation measures. Those recommendations will be included as part of the Homeowner's CC&Rs. (Refer to Section "L(15)" for this correspondence).

Comments were also received from the Department of Public Works and Waste Management relating to availability of wastewater system capacity and assessment fees for treatment plant expansion costs and off-site improvements. The developer agrees to pay the one-time assessment fees for treatment plant expansion as well as off-site improvements. (Refer to Section "L(7)" for this correspondence).

3. Drainage

After development, peak runoff from the project site is expected to total 44 cfs for a net increase of 23 cfs over current flow. This additional runoff will be intercepted by an offsite storm drain system and directed into a subsurface detention facility located at the northwest corner of the project site. This subsurface system, in combination with storage in the proposed park site, will be designed to keep the post-development flow equal to or less than the current runoff from the project site.

The park site will be bermed at the perimeter to serve as a detention basin. A plan view drawing and profile for a corresponding section on the plan are shown in Section "L(1)". The park/detention basin is approximately trapezoidal in shape, 119+ feet long and 59+ feet wide at its narrowest point. The bottom of the basin will be 5 feet below the top of the berm. Total storage capacity is approximately 267,800 gallons.

A 10-foot wide access road (with 15% slope) will provide ramp access into the park, while a concrete stairway off the street will provide conventional access. A subsurface 72-inch perforated pipe will provide additional initial storage.

The release line from the subsurface facility will be sized to limit the release into the channel to volumes which are equal to or less than current runoff volumes from the entire project site. The park area itself will be fully grassed, provided with an irrigation system to keep it usable as a mini-park, except during periods of heavy and prolonged rainstorm. (Refer to correspondence in Sections "L(1)" and "L(8)" for more details on the park site

in response to comments from the Planning Department and Parks and Recreation)

The existing drainage channel bisecting the entire project site will be preserved as a drainage way and designed to accommodate runoff from a 100 year-24 hour storm. Selected areas of side slopes beyond the 100-year inundation limits will be reshaped utilizing rocky material from rock excavation on site. The existing 48-inch culvert on Kanakanui Road will be replaced with a larger culvert to handle the total offsite runoff for a 100-year recurrence storm.

Comments were received from the State Land Use Commission requesting an explanation of the relationship between the Haleakala Ranch/Maui Research and Technology Park drainage and its effect, if any, on the proposed single-family residential subdivision. In response, a figure was prepared showing that the drainage watershed area for the Haleakala Ranch/Maui Research and Technology Park are completely isolated from the drainage watershed area for the project site. (Refer to Section "L(2)" for this correspondence and the figure referred to)

Comments were received from the Department of Land and Natural Resources, Engineering Branch, pointing out that there is a discrepancy between FEMA's 100-year design discharge (3,200 cfs) and those used for the Preliminary Drainage Report (1,209 cfs). The discrepancy in the volumes was identified in a meeting with individuals from Spencer Homes, the Planning Department, Department of Public Works and WSUE. Specifically, the FEMA design discharge comes from FEMA's "Flood Insurance Study for Maui County, Hawaii", hereinafter referred to as the "FEMA Report", while those in the Drainage Report are based primarily on the "Hydrology Report for Piilani Highway, Island of Maui", hereinafter referred to as the "Trans-meridian/SDOT Report", which served as the basis of design for the culverts beneath Piilani Highway. Although both studies identify a comparable combined drainage area draining into Kamaole Gulch and the adjacent Charley Young gulch to the north, the distribution of that flow into each gulch are substantially different, as follows:

(1) The FEMA Report assigns roughly 80% of the total flow to Kamaole Gulch, and the balance of 20% into Charley Young Gulch.

(2) The Trans-meridian Report, on the other hand, indicates roughly 35% of the total flow into Kamaole Gulch, and the balance of 65% into Charley Young Gulch.

As a result of this finding, a compromise was first proposed to the Planning Department whereby that portion of the drainage channel within the project area falling within the FEMA study limits would be designed for the FEMA design discharge, while the portion of the drainage channel between the FEMA study limits and Piilani Highway would be designed for the Trans-meridian/SDOT flow estimates, consistent with the design of the existing drainage structures beneath Piilani Highway.

The proposed compromise was apparently deliberated at length within the Planning Department with no resolution after 6 weeks. At this point, a letter was sent to the Department of Public Works and Waste Management (copy to the Planning Department) by WSUE on behalf of Spencer Homes, stating the following

> ***"Rather than further delay this project over this inconsistency, we will design the natural drainage channel (within the project site) and drainage structure beneath the roadway crossing at the northwest corner of the property to handle the FEMA 100-year design discharge level of 3200 cfs, as requested by the County."***

This was acknowledged by the Planning Department by phone on June 19, 2000, and in writing on July 3, 2000 (see Section "XI.B" for a copy of this letter from the Planning Department).

The Preliminary Drainage Report (see Appendix B) was updated for the FEMA flow. Two Figures in that Report, entitled, "Profile - Existing Drainage way", show that the computed water surface for the FEMA flow is well below the lower of the two banks surrounding the drainage channel.

(Refer to Section "L(4)" for this correspondence)

Comments were also received from the U. S. Department of Agriculture, Soil Conservation Service, requesting a plan defining the responsibilities for operation and maintenance of the natural drainage channel. A Policy Statement was provided defining those responsibilities. Subsequent to this response, the Planning Department, on behalf of the USDA, requested details on the different options for design of the outer curves of the drainage

channel to mitigate erosion. Two options were proposed and detailed in Construction Sheets "37" and "39", including (1) G.P. Slope Protection, and (2) Guaiacol Slope Protection.

(Refer to Section "L(6)" for this correspondence and Construction Plan sheets)

The Department of Public Works and Waste Management commented that the drainage channel and retention basin should be kept under private ownership and maintenance exclusive of the sections within the roadway rights-of-way. The developer responded that the drainage channel and retention basin would be privately owned. Further, a drainage easement would be created based on the estimated inundation limits for a 100-year storm, and the drainage channel maintained in its natural state by the individual homeowners whose lot includes part of the drainage way. Enforcement of proper maintenance would be the responsibility of the Homeowners Association. Similarly, the park/retention basin will be kept as a passive park, owned and maintained by the Homeowners Association.

(Refer to Section "L(7)" for this correspondence).

Comments were received from the Department of Health with respect to storm water discharges during construction. A Best Management Practices Plan was prepared and sent to the Department of Health, including an Erosion Control Plan and Details showing Silt Fences and Filter Beams designed to mitigate this potential problem.

(Refer to Section "L(11)" for this correspondence)

Comments were also received from the Environmental Center, University of Hawaii at Manoa stating that the changes to the drainage design should be ***"made in the document itself, not merely in the Correspondence section"***. This discussion of all Drainage issues has now been inserted into this section.

(Refer to Section "XI.A" for this correspondence)

V. RELATIONSHIPS TO GOVERNMENTAL PLANS, POLICIES, AND CONTROLS

V. RELATIONSHIPS TO GOVERNMENTAL PLANS, POLICIES AND CONTROLS:

A. STATE LAND USE DISTRICTS:

Chapter 205, Hawaii Revised Statutes, relating to the Land Use Commission, establishes the four major land use districts in which all lands in the State are placed. These districts are designated "Urban", "Rural", "Agricultural" and "Conservation". The subject property is within the "Urban" Districts. The proposed improvements are considered permissible uses within the "Urban" District, and therefore, are consistent with the State Land Use Law.

B. MAUI COUNTY GENERAL PLAN

The General Plan of the County of Maui (1990), updated in 1991, provides long term goals, objectives and policies directed toward the betterment of living conditions in the County. Addressed are social, environmental, and economic issues that influence future growth in Maui County. The subject property's use is consistent with the following General Plan objectives and policies:

"Objectives:

To see that all developments are well designed and are in harmony with their surroundings

Policies:

- ***Require that appropriate principles of urban design be observed in the planning of all new developments***

Objectives:

To encourage development which reflects the character and culture of Maui County's people."

C. KIHEI-MAKENA COMMUNITY PLAN

Nine (9) community plan regions have been established in Maui County. Each region's growth and development is guided by a Community Plan, which contains objectives and policies in accordance with the County General Plan. The purpose

of the Community Plan is to outline a relatively detailed agenda for carrying out the General Plan's objectives.

The most recent Kihei-Makena Community Plan was adopted on March 6, 1998. The subject property is designated as "Single Family (SF)" in the Plan's land use map (see Figure 4). Thus, the proposed project is consistent with the 1998 Kihei-Makena Community Plan Land Use Map.

The project is also consistent with the March 6, 1998, Update of the Kihei-Makena Community Plan's recommended goals, objectives and policies:

> ***Goal:*** *a well-planned community with land use and development patterns designed to achieve the efficient and timely provision of infra structural and community needs while preserving and enhancing the unique character of Maalaea, Kihei, Wailea and Makena as well as the region's natural environment, marine resources and traditional shoreline uses.*
>
> ***Objectives and Policies:***
>
> *b. Identify priority growth areas to focus public and private efforts on the provision of infrastructure and amenities to serve existing residents and to accommodate new growth.*
>
> *f. Establish a distribution of land uses which provides housing, jobs, shopping, open space and recreation areas in close proximity to each other in order to enhance Kihei's neighborhoods and to minimize dependence on automobiles.*
>
> *g. Encourage the establishment of single-family and multi-family land use designations which provide affordable housing opportunities for areas which are in close proximity to infrastructure systems and other urban services.*

D. ZONING

The Maui County Zoning designation for the subject property is "R-2 Residential", which provides for a minimum lot size of 7,500 square feet, and minimum lot width of 65 feet. Section 19.08.040.B of the Maui County Code also stipulates that:

> ***"Subject to approval of the commission, mixture of lot sizes may be permitted within any residential district: provided, however that the minimum lot size shall not be less than six thousand square feet, and that the overall project density shall not exceed that permitted within the district."***

The subdivision plot plan will be consistent with these and all other applicable provisions prescribed for the "R-2 Residential" zoning.

E. COUNTY OF MAUI SPECIAL MANAGEMENT AREA

The subject property is located within the County of Maui's Special Management Area. Pursuant to Chapter 205A, Hawaii Revised Statutes, and the Rules and Regulations of the Maui Planning Commission, projects located within the SMA are evaluated with respect to SMA objectives, policies and guidelines. This section addresses the project's relationship to applicable coastal zone management considerations, as set forth in Chapter 205A and the Rules and Regulations of the Maui Planning Commission.

1. Recreational Resources

Objective:

Provide coastal recreational resources accessible to the public.

Policies:

a. *Improve coordination and funding of coastal recreational planning and management; and*

b. *Provide adequate, accessible and diverse recreational opportunities in the coastal zone management area by:*

   (in) *Protecting coastal resources uniquely suited for recreation activities that cannot be provided in other areas;*

   (ii) *Requiring replacement of coastal resources having 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 recreation when replacement is not feasible or desirable;

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(v) Ensuring public recreational use of county, state and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

(vi) Adopting water quality standards and regulating point and non-point sources of pollution to protect and where feasible, restore the recreational value of coastal waters;

(vii) Developing new shoreline recreational opportunities where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the Land Use Commission, Board of Land and Natural Resources, County Planning Commission; and crediting such dedication against the requirements of Section 46-6 of the Hawaii Revised Statutes.

Response:

The subject property is located across South Kihei Road and is a minimum of 1300 feet inland from the shoreline. It is further separated from shoreline by the 280-unit Maui Vista Condominium, the 136-unit Pacific Shores Condominium, and the Maui Coast Hotel (see Exhibit "C", Photos 6, 7 and 8). The proposed project will have no impact on the public's access to existing coastal amenities and resources. The project's distance from the ocean as well as installing the subsurface detention facilities for on-site runoff will minimize the possibility of non-point source pollution from entering the marine environment.

2. *Historical/Cultural Resources*

Objective:

Protect, preserve and where desirable, restore those natural and man-made historic and prehistoric resources in the coastal zone management area that are in Hawaiian and American history and culture.

Policies:

a. *Identify and analyze 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*

Response:

As reported earlier in this Project Assessment Report, an Archaeological Inventory Survey of the project site was recently conducted by Xamanek and sent to the State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources (DLNR). This letter concluded the following:

> ***"In sum, the report is acceptable. With the commitment to preserve site 3541 and to monitor any land alteration in the deeper sands in the northwest part of the parcel, we believe that any development of this parcel will have 'no adverse effect' on significant historic sites."***

The Archaeological Mitigation Plan is attached in Appendix A.

3. Scenic and Open Space Resources

Objective:

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

Policies:

a. *Identify valued scenic resources in the coastal zone management area;*

b. *Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural land forms and existing public views to and along the shoreline;*

c. *Preserve, maintain and, where desirable, improve and restore shoreline open space and scenic resources; and*

d. *Encourage those developments which are not coastal dependent to locate in inland areas.*

Response:

The proposed project will not impact coastal scenic and open space resources. Furthermore, the project will not affect public views to and along the shoreline.

4. Coastal Ecosystems

Objective:

Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

a. *Improve the technical basis for natural resource management;*

b. *Preserve valuable coastal ecosystems, including reefs of biological economic importance;*

c. *Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and*

d. Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate State water quality standards

Response:

As noted earlier, the subject property is located a minimum of 1300 feet inland from the shoreline and is further separated by two large condominium complexes and one hotel. The project distance from the ocean as well as the addition of subsurface detention facilities will not increase the possibility of non-point source pollution from entering the marine environment above existing levels. The onsite subsurface system will be designed to intercept and induce settlement of waterborne particles before leaving the site. Erosion control measures will be implemented during construction to ensure that coastal ecosystems are not impacted.

5. *Economic Uses*

Objective:

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

Policies:

a. Concentrate coastal dependent development in appropriate areas;

b. Ensure that coastal dependent 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 and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

(in) Use of presently designated locations is not feasible;

(ii) Adverse environmental effects are minimized; and

(iii) The development is important to the State's economy.

Response:

The project would have a beneficial short term impact on the local economy during construction. In the long term, the addition of permanent residents in the residential core of the Kihei area will expand the consumer base and thereby support local commercial centers and businesses.

6. *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, subsidence, and point and non-point source pollution hazards;*

c. *Ensure that developments comply with requirements of the Federal Flood Insurance Program; and*

d. *Develop a coastal point and non-point source pollution control program.*

Response:

According to Panel Number 150003 0265C of the Flood Insurance Rate Map, revised September 6, 1989, prepared by the U. S. Federal Emergency Management Agency, Federal Insurance Administration, the project site is entirely within Flood Zone C (see Exhibit "A"), outside the tsunami inundation limits and subject to minimal flooding.

Erosion control measures such as silt and dust fences and crushed aggregate berms will be incorporated during the construction period to minimize soil loss and erosion hazards. Again, the addition of the subsurface detention facilities will minimize any adverse drainage impacts to downstream properties.

7. *Managing Development*

Objective:

Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

a. *Use, implement and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;*

b. *Facilitate timely processing of applications for development permits and resolve overlapping of conflicting permit requirements; and*

c. *Communicate the potential and short and long-term impacts of proposed coastal developments early in their life-cycle and in terms understandable to the general public to facilitate public participation in the planning and review process*

Response:

The development of the subject property is being conducted in accordance with applicable State and County requirements. Opportunity for review of the proposed action is provided through the County's Special Management Area (SMA) permitting process, for which this Project Assessment Report has been prepared.

8. *Public Participation*

Objective:

Stimulate public awareness, education and participation in coastal management.

Policies:

a. *Maintain a public advisory body to identify coastal management problems and to provide policy advice and assistance to the coastal zone management program;*

b. *Disseminate information on coastal management issues by means of educational materials, published reports, staff contact and public workshops for persons and organizations concerned with coastal related issues, development, and government activities; and*

c. *Organize workshops, policy dialogues, and site specific mediations to respond to coastal issues and conflict.*

Response:

The public will have ample opportunity to review and comment on the proposed project. Spencer Homes, Inc., has met with the adjoining neighbors and the Kihei Community Association. A "Notice of Application Special Management Area Use Permit" was published in the Maui News on January 9, 2000. A "Notice of Public Hearing" will be sent to the surrounding land owners and lessees within 500 feet of the subject property at least 30 days prior to the SMA permit's public hearing. Public hearing dates along with location maps will be published in the Maui News once that date is scheduled by the Planning Department. The public will be allowed to participate in the public hearing portion of the Maui Planning Commission review process.

9. *Beach Protection*

Objectives:

Protect Beaches for public use and recreation.

Policies:

a. *Locate new structures inland from the shoreline setback to conserve open space and to 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 interference with existing recreational and waterline activities; and

d. *Minimize the construction of public erosion-protection structures seaward of the shoreline.*

Response:

As noted earlier, the subject property is located a minimum of 1300 feet inland from the shoreline. Accordingly, the subject property has no involvement with the construction of any structures within the shoreline area. The subject property will not have any impact on any beaches.

10. Marine Resources

Objective:

Implement the State's ocean resource management plan.

Policies:

a. *Exercise an overall conservation ethic, and practice stewardship in the protection, use and development of marine and coastal resources;*

b. *Assure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;*

c. *Coordinate the management of marine and coastal resources and activities management to improve effectiveness and efficiency;*

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

e. *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 the ocean and coastal resources; and*

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

Response:

As noted earlier, the subject property is located across South Kihei Road and a minimum of 1300 feet inland from the shoreline. The project will have no direct impact on the region's coastal or marine resources, and with the incorporation of mitigation measures during construction as well as the permanent subsurface sediment control facilities, there will be no adverse impact to near shore waters from point and non-point sources of pollution. Therefore, the subject property will not have a significant negative impact upon any coastal or marine resources.

VI. SUMMARY OF ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

VI. SUMMARY OF ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED:

The proposed development will result in some unavoidable construction-related impacts as described in Chapter III, Potential Impacts and Mitigation Measures.

Potential effects include noise generated impacts occurring from site preparation and construction activities. In addition, there may be temporary air quality impacts associated with dust generated from construction activities, and exhaust emissions discharged by construction equipment. However, mitigation measures such as silt and dust fences and crushed aggregate berms will be used to control dust and erosion. All construction will occur during normal daylight hours.

The proposed project is not anticipated to create any significant, long-term adverse environmental effects.

VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES:

The proposed project will result in the "loss" of approximately 24.0 acres of undeveloped and vacant land to be replaced by a new single-family residential subdivision with substantial improvements to the infrastructure, landscaping, drainage and community character in the residential core of the Kihei area.

No other irreversible and irretrievable commitments of resources have been identified in connection with the proposed action.

VIII. FINDINGS AND CONCLUSIONS

VIII. FINDINGS AND CONCLUSIONS:

The proposed Project involves the construction of a 95-lot single-family residential subdivision in the residential core of the Kihei area on a 24 acre parcel which is current vacant and undeveloped.

Every phase of the proposed action, expected consequences, both primary and secondary, and the cumulative as well as the short-term and long-term effects of the action have been evaluated herein in accordance with the "Significance Criteria" of Section 11-200-12 of the Administrative Rules. Based on the analysis, the proposed project will not result in any adverse impacts. Discussion of project conformance to the criteria is given below:

1. ***No Irrevocable Commitment to Loss or Destruction of any Natural or Cultural Resource Would Occur as a result of the Proposed Project.***

   There are no known habitats of rare, endangered or threatened species of flora and fauna within the project limits. An Archaeological Inventory Study has been performed and mitigating measures agreed to by the State Historic Preservation Division of the Department of Land and Natural Resources.

2. ***The Proposed Action Would Not Curtail the Range of Beneficial Uses of the Environment.***

   The project site is currently undeveloped and vacant, and could pose a potential fire hazard if left undeveloped. On the contrary, the proposed improvements would add a much needed 95 single family homes to the residential core of the Kihei area at a time when Maui Island's population, particularly in the Kihei area, is significantly growing. The subject project will provide locations for single family residences within reasonable, if not convenient, travel distances/times for those residents who support the visitor industry within the Kihei-Makena Community area.

   The project will also extend the fire protection system into the parcel along roadways which are more accessible to fire fighting vehicles and equipment.

3. ***The Proposed Action Does not Conflict with the State's Long-Term Environmental Policies or Goals or Guidelines as Expressed in Chapter 344, Hawaii Revised Statutes.***

The State Environmental Policy and Guidelines are set forth in Chapter 344, Hawaii Revised Statutes. The proposed action is in conformance with the following policies and guidelines:

Environmental Policy:

Enhance the quality of life by:

> *"(c) Establishing communities which provide a sense of identity, wise use of land, efficient transportation, and aesthetic and social satisfaction in harmony with the natural environment which is uniquely Hawaiian."*

Guidelines:

Community life and housing

> *"(b) Develop communities which provide a sense of identify and social satisfaction in harmony with the environment...*
>
> *(d) Foster safe, sanitary, and decent homes*
>
> *(e) Recognize community appearances as major economic and aesthetic assets of the counties and the State; ... and preserve and promote mountain-to-ocean vistas."*

4. *The Economic or Social Welfare of the Community or State Would not be Substantially Affected*

The project would directly benefit the local economy during the construction phase. In the long term, the project should have an indirect beneficial effect of providing a larger residential population which local businesses in the area can provide typical consumer goods and services.

5. *The Proposed Action does not Affect Public Health*

No impacts to the public's health and welfare are anticipated.

6. ***No Substantial Secondary Impacts, such as Population Changes or Effects on Public Facilities are Anticipated.***

No major population changes are anticipated as a result of the proposed project. The project is not anticipated to have adverse impacts upon medical, police and fire protection services as well as other public service systems. In fact, the project will improve fire protection services within the Kihei area.

7. ***No Substantial Degradation of Environmental Quality is Anticipated***

No substantial degradation of environmental quality is anticipated as a result of the project. The project responds to a real need for improved single-family residential housing in the area.

8. ***The Proposed Action does not involve a Commitment to Larger Actions, nor would Cumulative Impacts Result in Considerable Effects on the Environment***

The proposed action does not involve a commitment to larger actions and should have no cumulative impacts on the environment.

9. ***No Rare, Threatened or Endangered Species or Their Habitats would be Adversely Affected by the Proposed Action***

There are no rare, threatened or endangered species of flora, fauna or avifauna or their habitats on the subject property. The nearest wetland is approximately 2 miles north of the subject property.

10. ***Air Quality, Water Quality or Ambient Noise Levels would not be Detrimentally Affected by the Proposed Project***

Construction activities will result in short term air quality and noise impacts. Dust control measures, such as regular watering and sprinkling, will be implemented to minimize wind-blown emissions. Noise impacts will occur primarily from construction equipment. All equipment will be provided with mufflers to suppress noise to allowable noise standards. Construction will be limited to daylight working hours.

In the long term, the project is not anticipated to have an impact on air quality or noise levels.

11. The Proposed Project would not affect Environmentally Sensitive Areas, such as Flood Plains, Tsunami Zones, Erosion-Prone Areas, Geologically Hazardous Lands, Estuaries, Fresh Waters or Coastal Waters.

The entire project area is located in Zone C, areas of minimal flooding. The project does not involve lands subject to tsunami inundation, erosion-prone areas, geologic hazards, estuaries, fresh waters or coastal waters. Hydrological calculations indicate that there will be no net increase of onsite surface runoff volume due to the proposed improvements. Drainage patterns in the area surrounding the project will not be altered.

12. The Proposed Project would not Substantially Affect Scenic Vistas and View planes Identified by County or State Plans or Studies

Scenic vistas and View planes from the subject property are not identified in any County or State plans or studies.

13. The Project would not Require Substantial Energy Consumption

The project will only require reasonable energy consumption due to the operation of construction equipment, which will be limited to the period of construction. Energy consumption at full build-out will be that for a typical single family residence.

Based on the foregoing findings, it is concluded that the proposed action will not result in any significant impacts.

IX. AGENCIES CONTACTED IN THE PREPARATION OF THE ENVIRONMENTAL ASSESSMENT

IX. AGENCIES CONTACTED IN THE PREPARATION OF THE ENVIRONMENTAL ASSESSMENT:

The following agencies and organizations were contacted during the Environmental Assessment review process:

1. U.S. Army Corps of Engineers
   U. S. Army Engineer District
   Fort Shafter, Hawaii 96858-5440

2. U. S. Fish and Wildlife Service
   Office of Environmental Services
   300 Ala Moana Blvd. Room 6307
   Honolulu, Hawaii 96813

3. U. S. Department of Agriculture
   Natural Resources Conservation Service
   210 Imi Kala Street, Suite 209
   Wailuku, Hawaii 96793

4. State of Hawaii
   Department of Transportation
   Highways Division
   650 Palapala Drive
   Kahului, Hawaii 96732

5. Department of Land and Natural Resources
   State Historic Preservation Division
   Kakuhihewa Building, Room 555
   601 Kamokila Boulevard
   Kapolei, Hawaii 96707

6. Department of Land and Natural Resources
   Land Division Planning Branch
   1151 Punchbowl Street
   Honolulu, Hawaii 96813

7. Department of Health
   Environmental Planning Office
   919 Ala Moana Blvd., Room 312
   Honolulu, Hawaii 96814

8. Department of Health
Maui District Health Office
54 High Street
Wailuku, Hawaii 96793

9. Department of Education
State of Hawaii
Maui District Office
54 High Street, 4th Floor
Wailuku, Hawaii 96793

10. Office of Hawaiian Affairs
State of Hawaii
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

11. Department of Accounting and General Services
Survey Division
P. O. Box 119
Honolulu, Hawaii 96810

12. Land Use Commission
State of Hawaii
P. O. Box 2359
Honolulu, Hawaii 96804

13. Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

14. Department of Public Works and Waste Management
County of Maui
200 South High Street
Wailuku, Hawaii 96793

15. Department of Water Supply
County of Maui
200 South High Street
Wailuku, Hawaii 96793

16. Department of Fire Control
County of Maui
200 Dairy Road
Kahului, Hawaii 96732

17. Department of Parks and Recreation
County of Maui
1580-C Kaahumanu Avenue
Wailuku, Hawaii 96793

18. Police Department
County of Maui
55 Mahalani Street
Wailuku, Hawaii 96793

19. Maui Electric Company
210 West Kamehama Avenue
Kahului, Hawaii 96732

20. Kihei Community Association
P. O. Box 662
Kihei, Hawaii 96732

21. 400+ residents of condominium and home owners within 500 feet of the project site who were notified as required for the Application for Special Management Area Permit.

22. University of Hawaii at Manoa
Environmental Center
2550 Campus Road, Crawford 317
Honolulu, HI 96822

X. COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD AND APPLICABLE RESPONSES

X. COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD AND APPLICABLE RESPONSES:

An application for Special Management Area Permit was submitted to the County of Maui Planning Department in October, 1999. Individual comments received from all agencies through the close of the comment period, ending January 28, 2000, are attached at the end of this section (subsection L).

A request to respond to outstanding comments were summarized in a letter from the Department of Planning, dated February 22, 2000, which is also included at the end of this section. The following is an item-by-item response to the comments summarized in that letter:

A. Planning Department Requests

Request

"1. Please provide a detailed description of the park/detention area. What are the dimensions of the park/detention area? Will this be a passive park or active park? If an active park, what types of activities are proposed? Where will parking be provided for use of the park? How high is the berm? How will users of the park access the park? Will it be accessible from the street? Will the park be open to the public? Will this be a common area owned by the Homeowner's Association? Will it be in the CC&R's?"

Response

A plan view drawing and profile for a corresponding section on the plan are shown in Section "L(1)". The park/detention basin is approximately trapezoidal in shape, 119± feet long and 59± feet wide at its narrowest point. The bottom of the basin will be 5 feet below the top of the berm. Total storage capacity is approximately 267,800 gallons.

A 10-foot wide access road (with 15% slope) will provide ramp access into the park, while a concrete stairway off the street will provide conventional access. A subsurface 72-inch perforated pipe will provide additional initial storage.

The park will be a passive park, which will be privately owned and maintained by the Homeowners Association. The general public will be able

to use the park except when individual homeowners reserve the park through the Homeowners Association for private activities. The general public will not be able to reserve the park for their private events through the Homeowners Association. Rules for use and reservation of the park by Homeowners will be included in the Bylaws and CC&Rs.

Request

"2. *Each lot owner abutting the drainage channel owns a portion of the drainage area. How will the maintenance and operation of the drainage channel be controlled and who will oversee the maintenance and operation of the drainage channel? Will this be incorporated in the bylaw and CC&R's? How will the Homeowner's Association ensure compliance?"*

Response

The drainage channel will essentially be left intact within the calculated inundation limits for the 100-year design storm. Drainage easement will be established based on the calculated 100-year design storm inundation limits. The individual lot owners will be responsible for the maintenance of the drainage channel within the drainage easement, while the Homeowner's Association will be responsible for enforcement of this policy upon individual owners through warning, penalties and fines. The Homeowner's Association will receive the right to go in and maintain the easement if any of the lot owners fail to do so. The negligent lot owner will be required to bear the cost of maintenance by the Homeowner's Association.

Request

"3. *Please provide a revised subdivision plan based upon comments made by the Department of Public Works and Waste Management (DPWWM) now that an additional right-of-way is required on Alanui Ke Alii Road."*

Response

A revised subdivision plan is attached in Section "L(1)".

B. State Land Use Commission Requests

Request

"1. State Land Use Commission (SLUC) - The SLUC stated in their letter that based upon two major reclassifications of land from agricultural to urban, the Maui Planning Commission (Commission) had major concerns relating tot he drainage problems of the lower Kihei area, the need for additional school facilities, and transportation improvements, as well as project-specific issues unrelated to your proposed project. Although the project-specific issues are unrelated to your project, issues that are regional in scope, along with your project, may have a cumulative effect. The cumulative effect of your proposed development along with these two approved developments should be addressed.

Schools - The data provided in your assessment report states that the projected enrollment for the elementary school level is approximately 20 students. This is equivalent to approximately one classroom. Please provide information on the total enrollment of Kamalii Elementary School and its capacity. Please discuss what effect the 20 additional students will have on the enrollment and capacity of the school."

Response

The Department of Education was contacted on February 24, 2000. Mr. Alan Honma of the DOE [Phone No.: (808) 733-4862] stated that the current enrollment in Kamalii Elementary School is 872 students in the 1999-2000 academic year. He further stated that since Kamalii Elementary School was designed as a "Year-Round" facility, it can accommodate 1051 students per year. Therefore there is adequate room to accommodate the projected 20 additional students.

It is also worth mention that the Department of Education itself had no comments on the SMA Project Assessment Report. See section "L(16)" for their comments.

Request

"Drainage - Please discuss the relationship of the Haleakala Ranch/Maui Research and Technology Park drainage and effect of the drainage, if any, on your proposed development."

Response

The Figure shown in Section "L(2)" clearly shows that the drainage watershed area for Haleakala Ranch/Maui Research and Technology Park are completely isolated from the project site, and will therefore not affect the drainage of the Ke Alii Subdivision.

Request

"Traffic - By addressing the concerns raised by the Police Department, the concerns raised by the SLUC may also be addressed."

Response

Maui Police Officer Bradney Hickle raised concerns referred to by Mr. John Min. His comments were forwarded to Parsons Brinckerhoff (PB), the consultant who prepared the "Traffic Impact Analysis Update for the Ke Alii Single-Family Units", September, 1999. After review of these concerns, Mr. Wayne Yoshioka, Manager of Transportation Planning/Traffic Engineering, addressed each of the concerns. This letter summarizes as follows:

"We believe this letter addresses the issues that officer Hickle raised in his memorandum.

First, Ke Alii Single-Family Units development will generate very little traffic impact. Intersection analysis show that traffic from the development would not change the level of service at the intersections of Alanui Ke Alii. It contributes about 10 percent of the traffic projected for Alanui Ke Alii and a very small percentage on the traffic on South Kihei Road and Piilani Highway.

Second, many of the issues are related to existing traffic issues connected with the operation of Kamalii Elementary School. It

is appropriate and desirable for Kamalii Elementary School to conduct the recommended internal traffic circulation study, the school crossing study, and the school speed zone study to enhance the safety for students attending the school."

See subsection "L(9)" for a copy of this correspondence. The developer will cooperate and work with the Police Department and Department of Education on these matters of concern.

C. Department of Land and Natural Resources, State Historic Preservation Division (DLNR, SHPD) Requests

Request

"2. *Department of Land and Natural Resources, State Historic Preservation Division (DLNR, SHPD.) - The DLNR, SHPD recommended that a preservation plan for Site 3541 and a monitoring plan be submitted to their office for review and acceptance. To date, they have not received either of these documents. Please provide this Department with a status of these documents and a time frame in which you intend to complete them."*

Response

The developer has retained Xamanek to prepare both the Archaeological Preservation Plan for Site 3541 and a Monitoring Plan for the sand dunes in the northwest corner of the parcel. No grading will occur until both of these documents have been reviewed and approved by the DLNR Historic Preservation Division. See subsection "L(3)" for a copy of this correspondence. A copy of the Archaeological Mitigation Plan is included in Appendix A.

We will coordinate the location survey of Site 3541 in the field with Xamanek. This information will then be plotted on our survey map to ensure its preservation.

D. Department of Land and Natural Resources, Engineering Branch (DLNR) Requests

Request

"3. Department of Land and Natural Resources, Engineering Branch (DLNR) - The DLNR recommended using FEMA's 100-year design discharge for the stream cross-section design proposed in the drainage report. FEMA's design discharge from the stream mouth to the upper end of the study area is 3,200 cfs. In future drainage studies, address decreasing peak discharge to pre-development conditions through the use of the proposed subsurface and bermed park site detention facilities. Please provide this Department with the necessary revisions and address the effect these changes have."

Response

The apparent discrepancy in the predicted storm flows for Kamaole Gulch was discussed in a meeting with Mark Spencer of Spencer Homes, Francis Cerizo of the Planning Department, Charles Jencks of the DPWWM and Warren Unemori of WSUE on March 2, 2000. The result of this meeting is summarized in the letter from Warren S. Unemori to John E. Min, Department of Planning, dated March 9, 2000.

The salient portion of that letter states that the DPWWM will accept the following as a reasonable solution:

"o The portion of the drainage channel within the project area and falling within FEMA study limits will be required to have a 100-year flow capacity of at least 3200 cfs in accordance with the current FEMA 'Flood Insurance Study'.

o The portion of the drainage channel between the FEMA study area and Piilani Highway shall be required to provide a 100-year floor capacity of at least 1200 cfs in keeping with both the existing drainage structures on Piilani Highway and the SDOT 'Hydrology Report for Piilani Highway'."

See Section "L(4)" for a copy of this correspondence.

E. Department of the Army, Corps of Engineers Request

Request

"4. Department of the Army, Corps of Engineers - Will you be acquiring a DA permit as noted by the Corps of Engineers?"

Response

The Department of the Army, Corps of Engineers states the following in their letter, dated February 23, 2000:

> ***"This letter is written regarding the proposed project, Keali'i Subdivision Project, file number 200000071 located in Kihei, Maui, Hawaii. After a further review of the project plans, it has been determined that this project will not require a Department of Army permit."***

See subsection "L(5)" for a copy of this correspondence.

F. United States Department of Agriculture (USDA), Soil Conservation Service Request

Request

"5. United States Department of Agriculture (USDA), Soil Conservation Service response - Your stated that Spencer Homes provided you with "Policy Statements". As noted in previous comments above, how will these be implemented and enforced? The last item states that a low CRM wall may be constructed at the base of the fill slope before the geo-cell lining is installed. How high will this wall be? This wall should be shown as part of this permit application. IF it is not included in this application, it may have to be processed as a separate application."

Response

The drainage channel will be kept in its natural state up to the 100-year storm inundation limits. Beyond these limits two (2) different options have been designed for outer curves of the channel as follows:

(1) GRP Slope Protection
(2) Geocell Slope Protection

The Construction Plan Sheets "37" and "39" show the location and details of these optional slope protection measures. See subsection "L(6)" for a copy of this correspondence and reduced size Construction Plans.

G. Department of Public Works and Waste Management Request

Request

"6. Department of Public Works and Waste Management - Please provide this Department with your comments to their Advisory Comments. Please provide the justification in which a 60-foot wide right-of-way is no longer necessary for only this portion of the North-South Collector Road."

Response

In a letter dated February 10, 2000, the Department of Public Works and Waste Management amended their original letter, dated January 31, 2000, as follows:

> ***"We wish to amend our January 31, 2000, letter by amending Advisory Comment 5. The right-of-way for the North-South Collector Road shall be 52 feet, which will consist of 22 feet wide from the subject property and 30 feet wide from the Worldmark property located west of the subject property. This is consistent with a letter the department sent to the applicant in July of 1999."***

Other comments to their advisory comments are attached in subsection "L(7)".

H. Department of Parks and Recreation Request

Request

"7. Department of Parks and Recreation - Please provide this Department with your comments on the Department of Parks and Recreation Comments"

Response

The park/detention basin area will be maintained as a private passive park by the Homeowner's Association. The developer agrees to pay a Parks and Playgrounds Assessment Fee less the 50% credit for maintaining the park as a private park in lieu of dedicating the park site to the County, on approval by the Parks and Recreation Department. See subsection "L(8)" for a copy of this correspondence.

I. Police Department Request

Request

"8. Police Department - Please provide this Department with your response to the Police Department's comments and concerns regarding the traffic problems. For your information, copies of their comments were sent to the Department of Transportation, Department of Public Works and Waste Management, and the Department of Education."

Response

Maui Police Officer Bradney Hickle raised concerns referred to by Mr. John Min. His comments were forwarded to Parsons Brinckerhoff (PB), the consultant who prepared the "Traffic Impact Analysis Update for the Ke Alii Single-Family Units", September, 1999. After review of these concerns, Mr. Wayne Yoshioka, Manager of Transportation Planning/Traffic Engineering, addressed each of the concerns. This letter summarizes as follows:

"We believe this letter addresses the issues that officer Hickle raised in his memorandum.

First, Ke Alii Single-Family Units development will generate very little traffic impact. Intersection analysis show that traffic from the development would not change the level of service at the intersections of Alanui Ke Alii. It contributes about 10 percent of the traffic projected for Alanui Ke Alii and a very small percentage on the traffic on South Kihei Road and Piilani Highway.

Second, many of the issues are related to existing traffic issues connected with the operation of Kamalii Elementary School. It is appropriate and desirable for Kamalii Elementary School to conduct the recommended internal traffic circulation study, the school crossing study, and the school speed zone study to enhance the safety for students attending the school."

See subsection "L(9)" for a copy of this correspondence. The developer will cooperate and work with the Police Department and Department of Education on these matters of concern.

J. Department of Fire Control Request

Request

"9. Department of Fire Control - Please provide this Department with an explanation of the location of any fire apparatus access roads and where any buildings would be in excess of 150 feet from a water supply on a public street."

Response

Fire hydrant locations have been revised such that all parcels are no more than 150 feet from the nearest fire hydrant. See subsection "L(10)" for a copy of this correspondence.

K. Department of Health (DOH) Requests

Request

"10. Department of Health (DOH) - How will a solid waste management plan be implemented? What and how will polluted runoff, vector, water pollution, fugitive dust, and noises be controlled? The DOH also recommended holding a public information meeting in the surrounding community to describe the project and potential environmental impacts, and to respond to concerns relating to the project. Please provide this Department with your response to the Department of Health's concerns and issues."

Response

The Solid Waste Management Plan has been prepared and issued to the Department of Health. To summarize, the developer's Solid Waste Manage Plan includes the following actions:

> ***"o The dry brush will be grubbed and hauled to a properly permitted recycling facility such as Campaign Recycle Maui.***
>
> ***o The kiawes will be offered to various individuals for use as firewood. Any remaining kiawe waste will be composted on site for future landscape use or will be deposited to a properly recycling facility.***
>
> ***o Any discarded vehicles or miscellaneous items will be taken to Maui Scrap Metal or any properly permitted recycling facility.***
>
> ***o We will at all times try to recycle any materials found during site construction. There will be no exporting of soil as the sitework requires importing fill material."***

See subsection "L(11)" for a copy of this correspondence.

As shown in subsection "L(11)", the Construction Plan Sheets "37" and "38", a Best Management Practice program has been developed as follows:

> ***"Best Management Practices***
>
> ***1. Erosion and Sediment Control Practices***
>
> ***A. Construction Management***
>
> ***(1) Grading operations will be planned so as to minimize time of construction***
>
> ***(2) Grading operations will be planned so as to minimize the size of the disturbed area. The***

area grubbed shall not extend beyond what will actually be required for grading

B. Stabilization Techniques

(1) Existing ground cover shall not be destroyed, removed or disturbed more than 7 calendar days prior to the start of grading operations

(2) Areas that remain unfinished for more than 15 calendar days shall be hydromulched to provide temporary soil stabilization

(3) After achieving finished grades, all slopes and exposed areas shall be permanently stabilized by hydromulching with grass seed as soon as practicable.

C. Structural Controls

(1) Silting basins will be constructed upstream of discharge points to remove sediment from onsite runoff prior to discharge into existing storm drains

(2) Drainage swales will be constructed to intercept onsite runoff and direct it into silting basins.

(3) When needed, additional silt fences, berms, cutoff ditches will be constructed to supplement the erosion control measures depicted on the grading plan

D. Inspection and Maintenance Procedures

All control measures will be inspected and repaired as necessary. Inspections will be performed at least weekly in dry periods, and within 24 hours after any rainfall 0.5 inches or greater over a 24-

hour period. Control measures will be checked daily during periods of prolonged rainfall.

2. Other Pollution Control Practices

Maintenance and fueling of construction equipment will be performed only in designated areas enclosed by a containment berm constructed so as to contain spills and prevent storm water runoff from carrying pollutants into downstream properties."

Vector control will be performed by Bugman, Inc., who have been retained to provide this service by the developer. See subsection "L(11)" for a copy of this authorization correspondence.

Mark Spencer of Spencer Homes, Inc., has already met with the Kihei Community Association Planning Committee on March 6, 2000, to discuss the Ke Alii Subdivision as well as other future Spencer Home projects in the Kihei-Wailea area.

L. Correspondence with Review Agencies

The individual comments received from each review agency mentioned above together with the direct responses to each of them, as well as responses from other agencies (which had no significant comments) are attached in this subsection.

1. Planning Department

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 9, 2000

Mr. John E. Min
Director
Department of Planning
County of Maui
250 South High Street
Wailuku, HI 96793

Re: Ke Alii Subdivision - Response to Your Requests for Additional Information, Dated February 22, 2000

Dear Mr. Min:

The following is our item-by-item response to your requests for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01 (SM1 990022):

Request

"1. *Please provide a detailed description of the park/detention area. What are the dimensions of the park/detention area? Will this be a passive park or active park? If an active park, what types of activities are proposed? Where will parking be provided for use of the park? How high is the berm? How will users of the park access the park? Will it be accessible from the street? Will the park be open to the public? Will this be a common area owned by the Homeowner's Association? Will it be in the CC&R's?"*

Response

A plan view drawing and profile for a corresponding section on the plan are enclosed. The park/detention basin is approximately trapezoidal in shape, 119± feet long and 59± feet wide at its narrowest point. The bottom of the basin will be 5 feet below the top of the berm. Total storage capacity is approximately 267,800 gallons.

A 10-foot wide access road (with 15% slope) will provide ramp access into the park, while a concrete stairway off the street will provide conventional access. At subsurface 72-inch perforated pipe will provide additional initial storage.

The park will be a passive park, which will be privately owned and maintained by the Homeowners Association. The general public will be able to use the park except when individual homeowners reserve the park through the Homeowners Association for private

activities. The general public will not be able to reserve the park for their private events through the Homeowners Association. Rules for use and reservation of the park by Homeowners will be included in the Bylaws and CC&Rs.

Request

"2. *Each lot owner abutting the drainage channel owns a portion of the drainage area. How will the maintenance and operation of the drainage channel be controlled and who will oversee the maintenance and operation of the drainage channel? Will this be incorporated in the bylaw and CC&R's? How will the Homeowner's Association ensure compliance?"*

Response

The drainage channel will essentially be left intact within the calculated inundation limits for the 100-year design storm. Drainage easement will be established based on the calculated 100-year design storm inundation limits. The individual lot owners will be responsible for the maintenance of the drainage channel within the drainage easement, while the Homeowner's Association will be responsible for enforcement of this policy upon individual owners through warning, penalties and fines. The Homeowner's Association will receive the right to go in and maintain the easement if any of the lot owners fail to do so. The negligent lot owner will be required to bear the cost of maintenance by the Homeowner's Association.

Request

"3. *Please provide a revised subdivision plan based upon comments made by the Department of Public Works and Waste Management (DPWWM) now that an additional right-of-way is required on Alanui Ke Alii Road."*

Response

A full-size revised subdivision plan is also enclosed for your reference.

Please note that we will be also be sending you copies of our responses to the comments made by each of the other review agencies as outlined in your letter, dated February 22, 2000, as we send them out in the next day or two. The summary of the comments and responses to these reviewing agencies (with reduced scale attachments, if any) will be included in the Environmental Assessment (EA) Report in Chapter X, "Comments Received During Public Comment Period and Applicable Responses". Copies of the actual correspondence will be included in Section L, "Correspondence with Review Agencies" of the EA Report, of which you will receive two (2) full copies.

Please feel free to call me if you have any questions or comments on our planned submittal of the EA Report.

Very truly yours,

Alan L. Unemori
Vice-President

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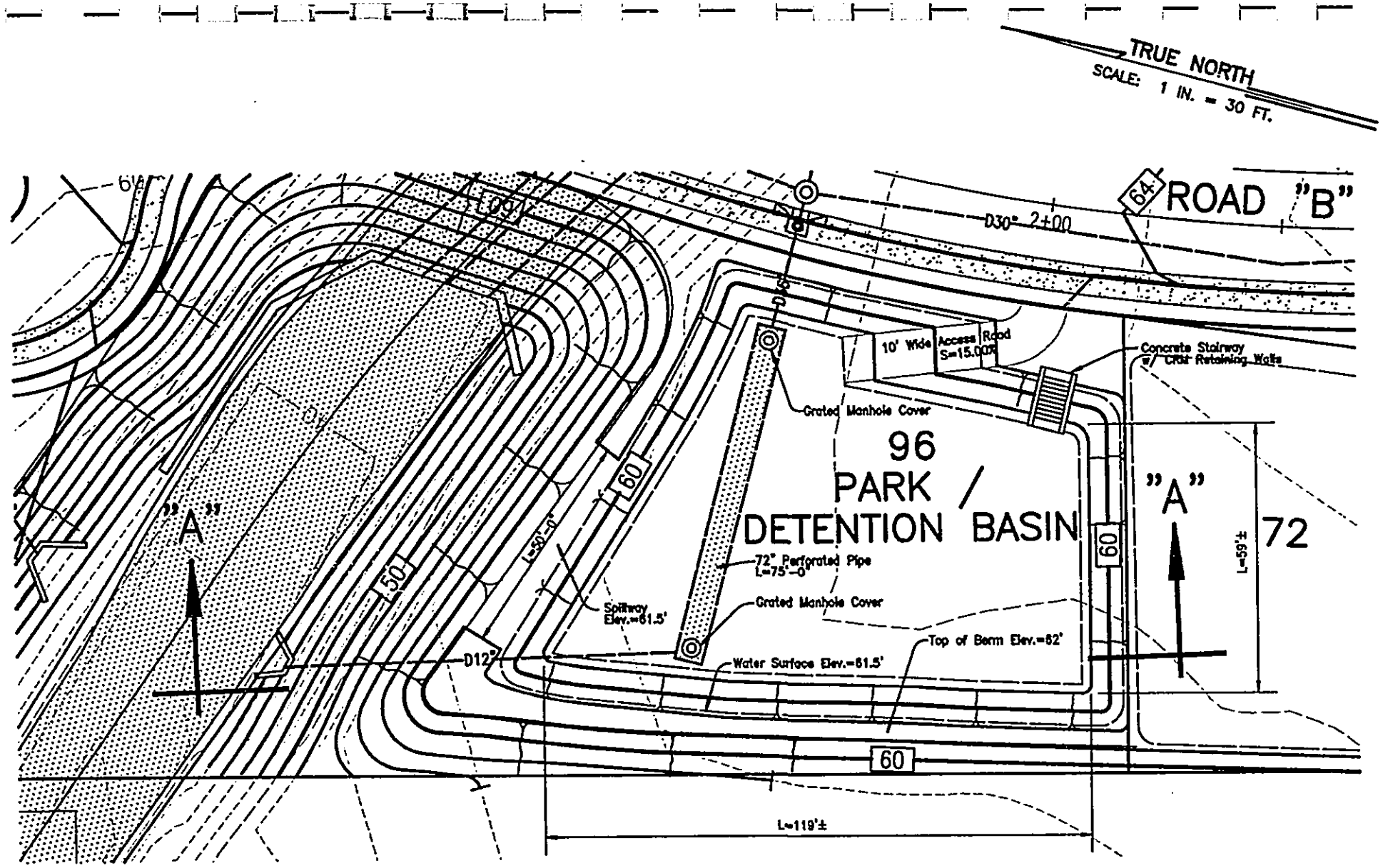
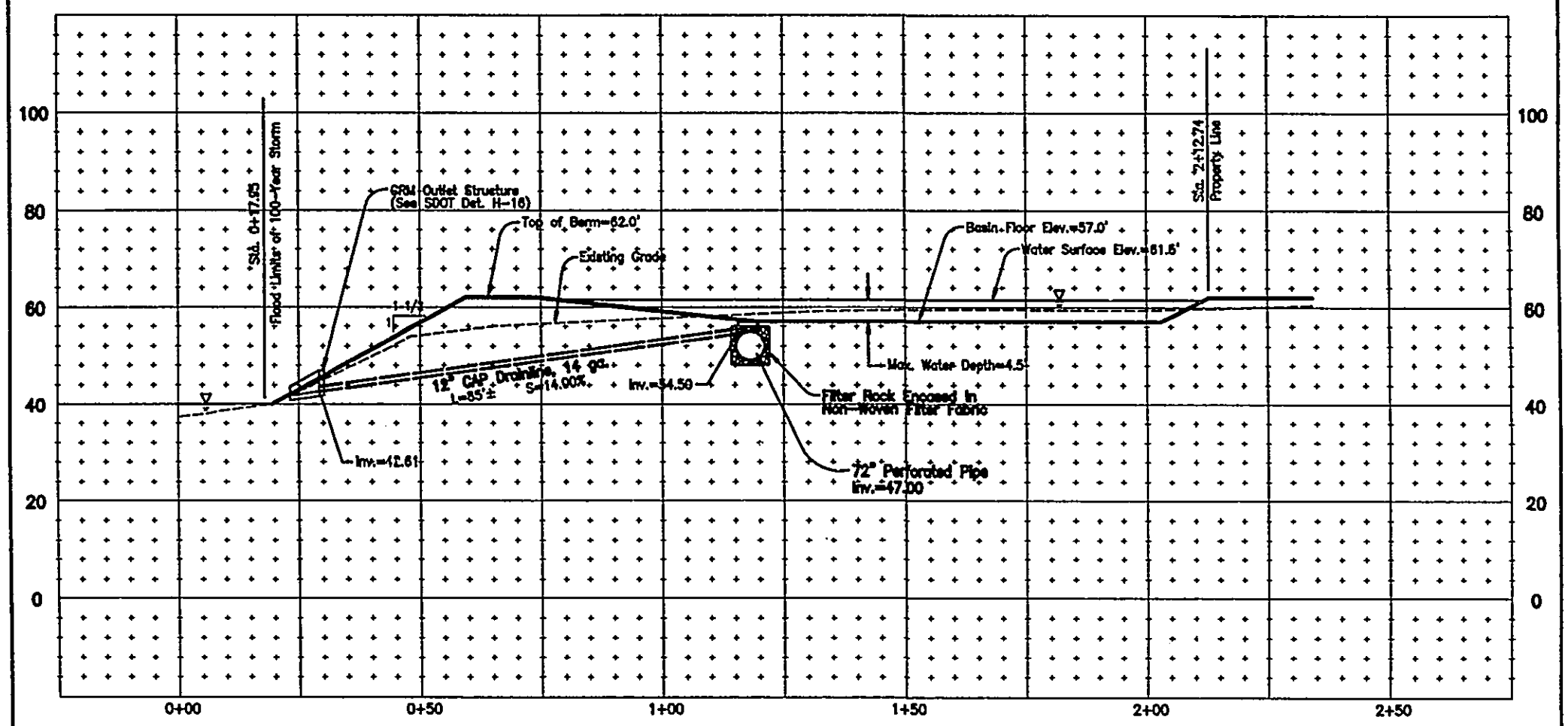


MAX. STORAGE CAPACITY=35,800 cf = 267,800 gallons

WARREN S. UNEMORI
ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

February 24, 2000

99054/dwg/exhibits/sec-basn.dwg



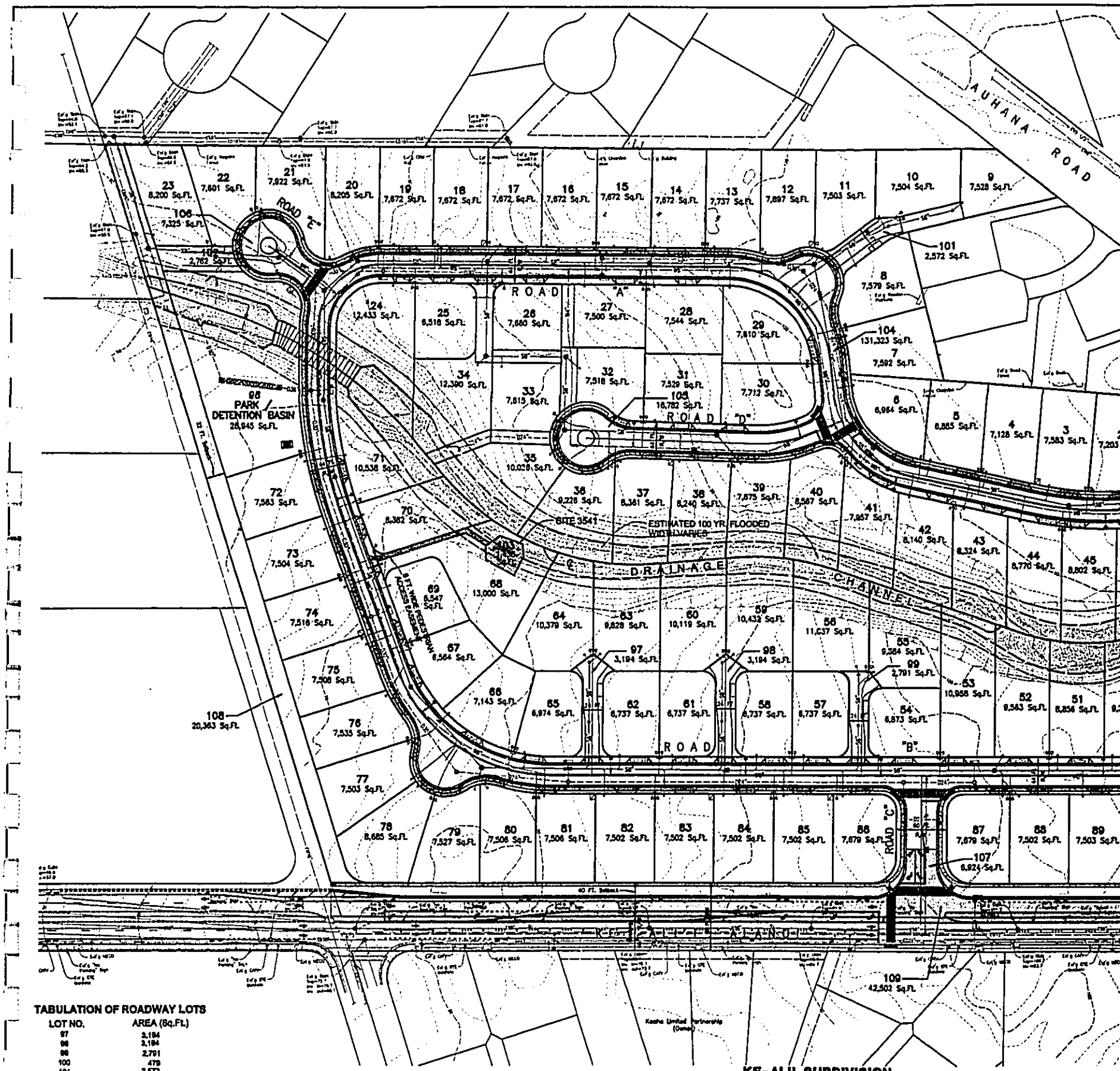
SECTION "A"–"A"

Scale: Horiz. 1" = 30'
Vert. 1" = 30'

WARREN S. UNEMORI
ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

February 24, 2000

99054/dwg/exhibits/sec-boat.dwg



TABULATION OF ROADWAY LOTS

LOT NO.	AREA (Sq.Ft.)
97	3,194
98	3,184
99	2,791
100	479
101	2,572
102	2,762
104	131,323
105	16,782
106	7,325
107	6,924
108	20,363
109	42,502
110	1,052
TOTAL:	341,263 Sq.Ft. = 5.84 Acs.

NET AREA: 24.09 - 5.84 = 18.66 ACS.
ALLOWABLE DENSITY: 18.66 x 5.81 = 107.77 LOTS
NO OF HOUSELOTS PROPOSED: 95 < 107

T.M.K.: 3-9-18 : 01

MISC. INFORMATION

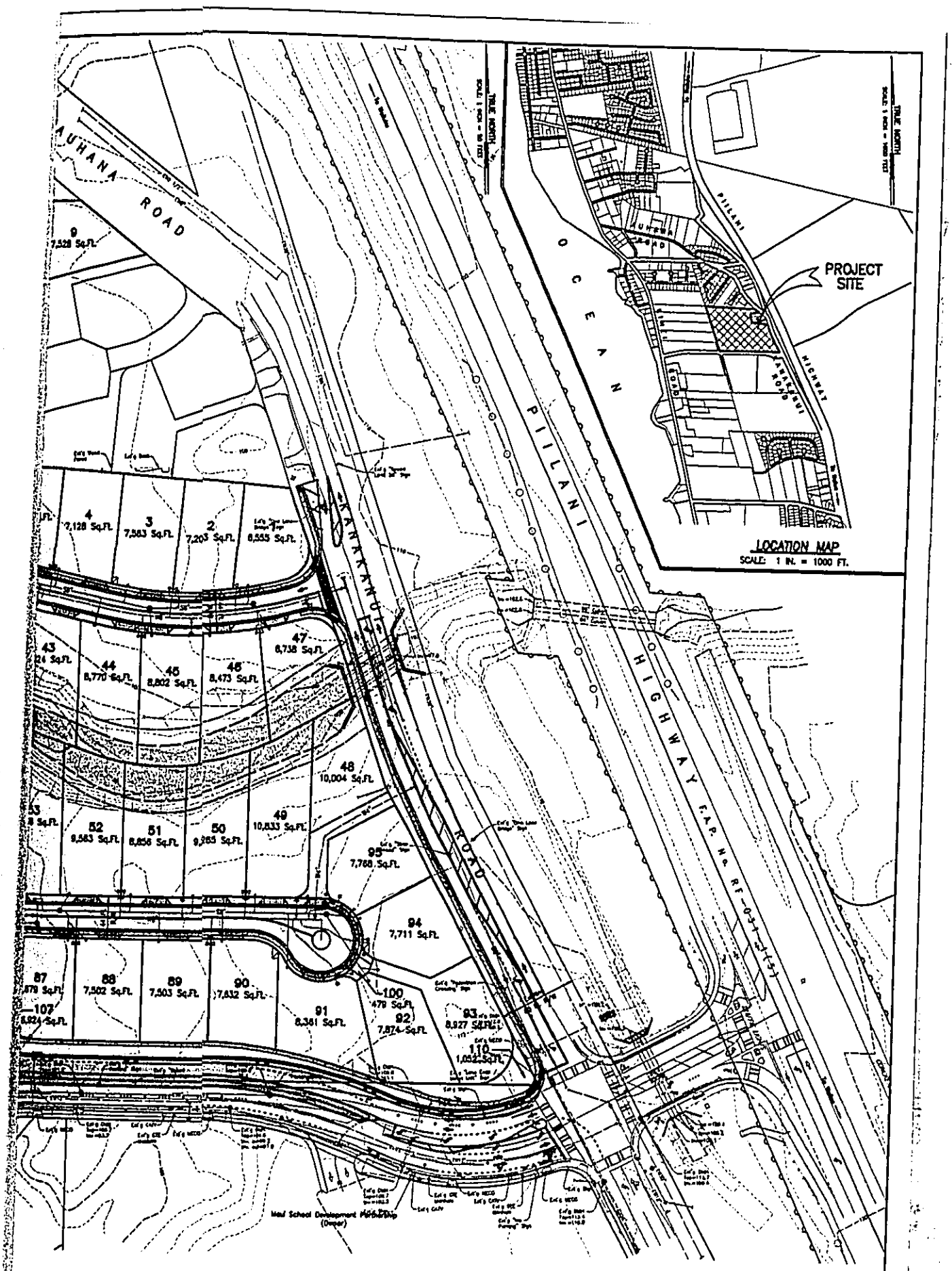
GROSS LAND AREA = 24.09 ACS.
ZONING = R-2 RESIDENTIAL
MIN. LOT SIZE = 6,500 Sq.Ft. (PROPOSED)
MIN. LOT WIDTH = 65 FT.
NO. OF HOUSELOTS = 95

KE-ALII SUBDIVISION

SUBDIVISION OF T.M.K.: 3-9-18 : 01,
INTO LOTS 1 TO 110, INCLUSIVE.
KIHEI, MAUI, HAWAII

DEVELOPER: SPENCER HOMES
ADDRESS: 4372 W. WAIOLA
KIHEI, MAUI, HI 96763
OWNER: KIHEI KAMAOLE ASSOCIATES
ADDRESS: 98-1608 HAPAHI STREET
AIEA, OAHU, HI 96701

0 50 100 150 200
SCALE: 1 IN. = 50 FT.



ADVANCED COPY
SUBJECT TO CHANGE

APPROXIMATE EARTHWORK QUANTITIES

EXCAVATION = 22,500 CU.YD.
EMBANKMENT = 35,600 CU YD.

WARREN S. UNEMORI ENGINEERING, INC.

July 29, 1997
Revised: October 9, 1998
Revised: January 18, 2000
Revised: March 17, 2000

W3UE #99054

JAMES "KIMO" APANA
Mayor

JOHN E. MIN
Director

CLAYTON I. YOSHIDA
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

February 22, 2000

Mr. Alan Unemori
2145 Wells Street
Wailuku, Hawaii 96793

Dear Mr. Unemori:

RE: Special Management Area Use Permit (SMA) Application for Ke Alii Subdivision - Spencer Homes, Single-Family Subdivision, Drainage and Related Improvements, Tax Map Key: 3-9-18:001, Kihei, Island of Maui, Hawaii (SM1 990022)

The Maui Planning Department (Department) requests that you provide additional information regarding the above subject application.

1. Please provide a detailed description of the park/detention area. What are the dimensions of the park/detention area? Will this be a passive park or active park? If an active park, what types of activities are proposed? Where will parking be provided for the use of the park? How high is the berm? How will users of the park access the park? Will it be accessible from the street? Will the park be open to the public? Will this be a common area owned by the Homeowner's Association? Will it be in the CC&R's?

2. Each lot owner abutting the drainage channel owns a portion of the drainage area. How will the maintenance and operation of the drainage channel be controlled and who will oversee the maintenance and operation of the drainage channel? Will this be incorporated in the bylaw and CC&R's? How will the Homeowner's Association ensure compliance?

3. Please provide a revised subdivision plan based upon comments made by the Department of Public Works and Waste Management (DPWWM) now that an additional right-of-way is required on Alanui Ke Alii Road.

The Department still has not received your responses addressing comments and concerns made by the following agencies:

1. State Land Use Commission (SLUC) - The SLUC stated in their letter that based upon two major reclassifications of land from agricultural to urban, the Maui Planning Commission (Commission) had major concerns relating to the drainage problems of the lower Kihei area, the need for additional school facilities, and transportation improvements, as well as project-specific issues unrelated to your proposed project. Although the project-specific issues are unrelated to your project, issues that are regional in scope, along with your project, may have a cumulative effect. The cumulative effect of your proposed development along with these two approved developments should be addressed.

   Schools - The data provided in your assessment report states that the projected enrollment for the elementary school level is approximately 20 students. This is equivalent to approximately one classroom. Please provide information on the total enrollment of Kamalii Elementary School and its capacity. Please discuss what effect the 20 additional students will have on the enrollment and capacity of the school.

   Drainage - Please discuss the relationship of the Haleakala Ranch/Maui Research and Technology Park drainage and effect of the drainage, if any, on your proposed development.

   Traffic - By addressing the concerns raised by the Police Department, the concerns raised by the SLUC may also be addressed.

2. Department of Land and Natural Resources, State Historic Preservation Division (DLNR, SHPD) - The DLNR, SHPD recommended that a preservation plan for Site 3541 and a monitoring plan be submitted to their office for review and acceptance. To date, they have not received either of these documents. Please provide this Department with a status of these documents and a time frame in which you intend to complete them.

3. Department of Land and Natural Resources, Engineering Branch (DLNR) - The DLNR recommended using FEMA's 100-year design discharge for the stream cross-section design proposed in the drainage report. FEMA's design discharge from the stream mouth to the upper end of the study area is 3,200 cfs. In future drainage studies, address decreasing peak discharge to pre-development conditions through the use of the proposed subsurface and bermed park site detention facilities. Please provide this Department with the necessary revisions and address the effect these changes have.

4. Department of the Army, Corps of Engineers - Will you be acquiring a DA permit as noted by the Corps of Engineers?

5. United States Department of Agriculture (USDA), Soil Conservation Service response - Your letter stated that Spencer Homes provided you with "Policy Statements." As noted in previous comments above, how will these be implemented and enforced? The last item states that a low CRM wall may be constructed at the base of the fill slope before the geo-cell lining is installed. How high will this wall be? This wall should be shown as part of this permit application. If it is not included in this application, it may have to be processed as a separate application.

6. Department of Public Works and Waste Management - Please provide this Department with your comments to their Advisory Comments. Please provide the justification in which a 60-foot wide right-of-way is no longer necessary for only this portion of the North-South Collector Road.

7. Department of Parks and Recreation - Please provide this Department with your comments on the Department of Parks and Recreation comments.

8. Police Department - Please provide this Department with your response to the Police Department's comments and concerns regarding the traffic problems. For your information, copies of their comments were sent to the Department of Transportation, Department of Public Works and Waste Management, and the Department of Education.

9. Department of Fire Control - Please provide this Department with an explanation of the location of any fire apparatus access roads and where any buildings would be in excess of 150 feet from a water supply on a public street.

10. Department of Health (DOH) - How will a solid waste management plan be implemented? What and how will polluted runoff, vector, water pollution, fugitive dust, and noises be controlled? The DOH also recommended holding a public information meeting in the surrounding community to describe the project and potential environmental impacts, and to respond to concerns relating to the project. Please provide this Department with your response to the Department of Health's concerns and issues.

In addition, this Department was informed by the Department of Public Works and Waste Management that you have been informed that an Environmental Assessment (EA) is required. The comments received from the agencies for the SMA application can be included in your draft EA. These concerns and comments should be addressed in your draft EA. The Department cannot proceed with the processing of your application until the EA has been filed and you have addressed the concerns and comments noted above. If during the 30-day comment period, there appears to be no significant comments made, the Department would be able to schedule the public hearing before the Maui Planning Commission, provided that you guarantee in writing that should there be a challenge during the Final EA period, whereby the public hearing has to be rescheduled, you will be responsible to pay for all costs associated with rescheduling and re-noticing of the public hearing.

Enclosed is a tentative schedule contingent upon you meeting all the requirements discussed above. A copy of the publication dates for the Office of Environmental Quality Control Bulletin is also enclosed for your information.

If you have any additional questions, please call Ms. Julie Higa, Staff Planner, of this office at 270-7814.

Very truly yours,

JOHN E. MIN
Planning Director

JEM:JH:cmb
Enclosures
c: Clayton Yoshida, AICP, Deputy Planning Director
Spencer Homes, Inc.
Charles Jencks, Director, Department of Public Works and Waste Management
Ralph Nagamine, Land Use and Codes Division
Julie Higa, Staff Planner
Project File
General File
S:\ALL\JULIE\KEALII.SM1\ADDINFO.LTR

2. State Land Use Commission

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 9, 2000

Ms. Esther Ueda
Executive Officer
Land Use Commission
State of Hawaii
P. O. Box 2359
Honolulu, HI 96804

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated January 25, 2000

Dear Ms. Ueda:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated January 25, 2000, he requested that we respond to you on several items. The following is our item-by-item response to his requests (on your behalf) for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"1. State Land Use Commission (SLUC) - The SLUC stated in their letter that based upon two major reclassifications of land from agricultural to urban, the Maui Planning Commission (Commission) had major concerns relating tot he drainage problems of the lower Kihei area, the need for additional school facilities, and transportation improvements, as well as project-specific issues unrelated to your proposed project. Although the project-specific issues are unrelated to your project, issues that are regional in scope, along with your project, may have a cumulative effect. The cumulative effect of your proposed development along with these two approved developments should be addressed.

Schools - The data provided in your assessment report states that the projected enrollment for the elementary school level is approximately 20 students. This is equivalent to approximately one classroom. Please provide information on the total enrollment of Kamalii Elementary School and its capacity. Please discuss what effect the 20 additional students will have on the enrollment and capacity of the school."

Response

The Department of Education was contacted on February 24, 2000. Mr. Alan Honma of the DOE [Phone No.: (808) 733-4862] stated that the current enrollment in Kamalii Elementary School is 872 students in the 1999-2000 academic year. He further stated that since Kamalii Elementary School was designed as a "Year-Round" facility, it can accommodate 1051 students per year. Therefore there is adequate room to accommodate the projected 20 additional students.

It is also worth mention that the Department of Education itself had no comments on the SMA Project Assessment Report (see attached letter from the DOE).

Request

"Drainage - Please discuss the relationship of the Haleakala Ranch/Maui Research and Technology Park drainage and effect of the drainage, if any, on your proposed development."

Response

Attached please find a Figure which clearly shows that the drainage watershed area for Haleakala Ranch/Maui Research and Technology Park are completely isolated from the project site, and will therefore not affect the drainage of the Ke Alii Subdivision.

Request

"Traffic - By addressing the concerns raised by the Police Department, the concerns raised by the SLUC may also be addressed."

Response

Maui Police Officer Bradney Hickle raised concerns referred to by Mr. John Min. His comments were forwarded to Parsons Brinckerhoff (PB), the consultant who prepared the "Traffic Impact Analysis Update for the Ke Alii Single-Family Units", September, 1999. After review of these concerns, Mr. Wayne Yoshioka, Manager of Transportation Planning/Traffic Engineering, addressed each of the concerns. This letter summarizes as follows:

> ***"We believe this letter addresses the issues that officer Hickle raised in his memorandum.***
>
> ***First, Ke Alii Single-Family Units development will generate very little traffic impact. Intersection analysis show that traffic from the development would not change the level of service at the intersections of Alanui Ke Alii. It contributes about 10 percent of the traffic projected for Alanui Ke Alii and a very small***

percentage on the traffic on South Kihei Road and Piilani Highway.

Second, many of the issues are related to existing traffic issues connected with the operation of Kamalii Elementary School. It is appropriate and desirable for Kamalii Elementary School to conduct the recommended internal traffic circulation study, the school crossing study, and the school speed zone study to enhance the safety for students attending the school."

Enclosed please find a copy of this correspondence. The developer will cooperate and work with the Police Department and Department of Education on these matters of concern.

Please feel free to call me at (808) 242-4403 if you have any questions or comments.

Very truly yours,

Alan L. Unemori
Vice-President

cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

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510

BENJAMIN J. CAYETANO
GOVERNOR

ESTHER UEDA
EXECUTIVE OFFICER

'00 JAN 26 P12:08

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
P.O. Box 2359
Honolulu, HI 96804-2359
Telephone: 808-587-3822
Fax: 808-587-3827

January 25, 2000

Mr. John E. Min
Planning Director
County of Maui
250 South High Street
Wailuku, Hawai'i 96793

Dear Mr. Min:

Subject: Notice of Application
Special Management Area Use Permit (SM1 990022)
Project Name: Ke Alii Subdivision – Spencer Homes
Owner: Spencer Homes, Inc.
Applicant: Warren Unemori Engineering, Inc.
TMK: 3-9-018: 001
Kihei, Maui, Hawaii

We have reviewed the subject application forwarded by your transmittal dated December 28, 1999, to subdivide a 24 acre lot into approximately 96 varied single family homesites in Kihei, Maui, Hawai'i. We confirm that the proposed project is designated within the State Land Use Urban District.

Based upon our review of the subject application, areas north of the project site were subject to two State Land District Boundary Amendments:

1. In 1983, the Commission approved the petition from Petitioner Halcakala Ranch Company (LUC Docket No. A82-536) to reclassify approximately 189.7 acres of land from the Agricultural District into the Urban District for residential development, and commercial and park uses, identified as TMK: 2-2-002: portion of 42. In the Commission's Decision and Order issued August 12, 1983, the Commission had indicated major issues, such as, the drainage problems of the lower Kihei area, the need for additional school facilities to accommodate growth, and transportation improvements. The Petitioner stated they were willing to work with the County and

State in mitigating these impacts. We do not know of the status of the improvements identified in the Decision and Order, since the Petitioner was not required to provide annual progress reports.

2. In another action, the Commission approved the petition from the Maui Economic Development Board, Inc. (LUC Docket No. A84-585) to reclassify approximately 300 acres of land from the Agricultural District into the Urban District to develop a research and technology park at Kihei, Maui, Hawaii, identified as TMK: 2-2-02: Portion of 42. Incremental districting was approved for two increments each of 150 acres. The first increment was reclassified from the Agricultural District into the Urban District with a five-year timeframe to complete urban development. The second increment was to remain in the Agricultural District subject to incremental districting into the Urban District with a ten to fifteen year timeframe to complete development upon reclassification. In LUC Docket No. A84-585 Finding of Fact, Conclusions of Law And Decision and Order issued July 15, 1985, and the amendment issued February 25, 1986, the Commission had specified that the Petitioner shall: conduct an archaeological reconnaissance survey prior to construction activities on the property; make roadway and traffic improvements to the Lipoa Street/Piilani Highway intersection as necessary; develop the property as an industrial park for high technology users; and, develop a secondary irrigation water source for irrigation.

The Decision and Orders for the dockets mentioned above are enclosed for your information. We have no further comments to offer at this time. We appreciate the opportunity to comment on the subject application.

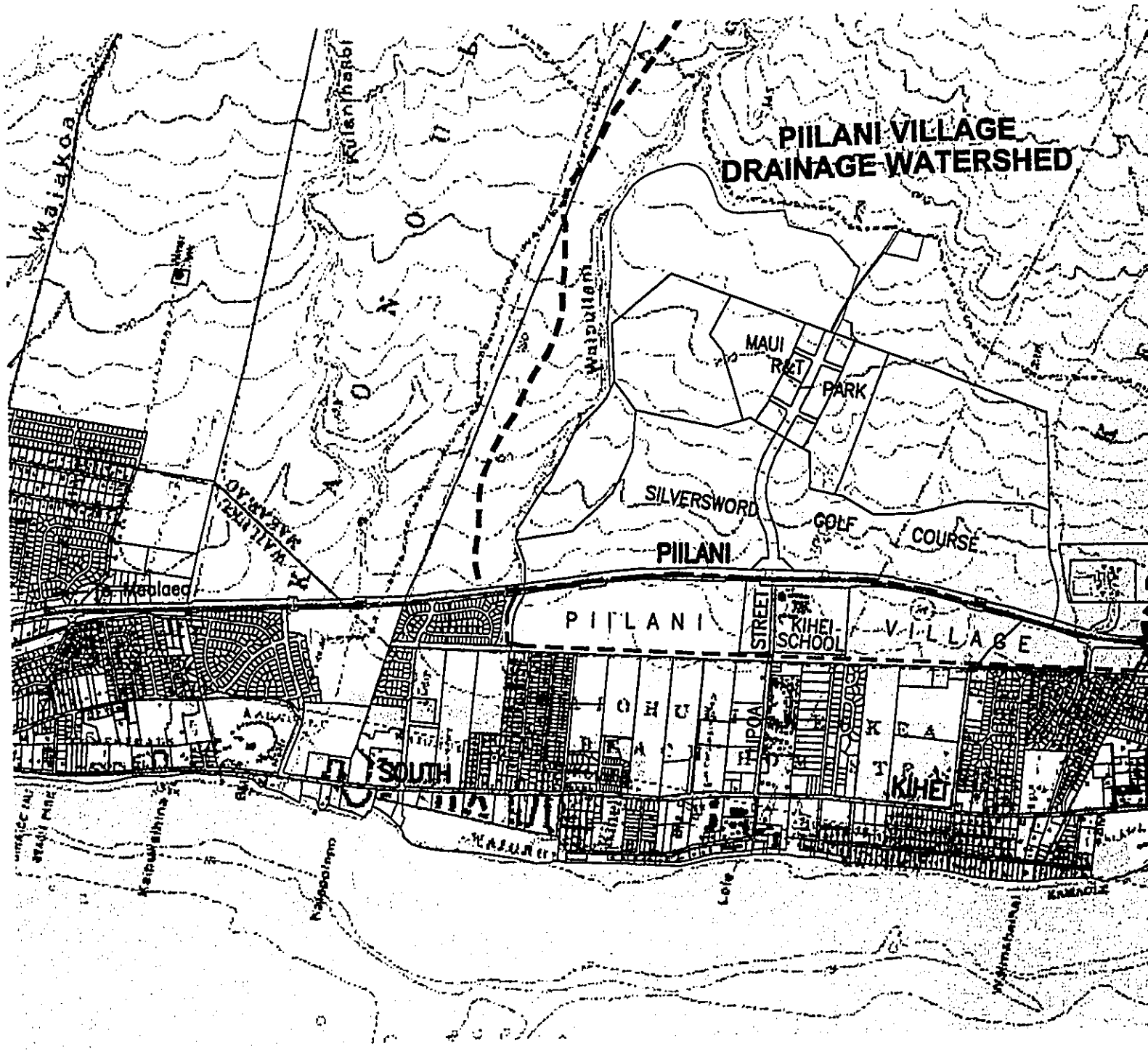
Should you have any questions, please feel free to call me or Russell Kumabe of our office at 587-3822.

Sincerely,

ESTHER UEDA
Executive Officer

EU:aa

Enclosures: Decision and Order for LUC Docket No. A82-536
Decision and Order for LUC Docket No. A84-585



OFFSITE DRAINAGE AREAS
PIILANI VILLAGE AND KE ALI'I

SCALE: 1 IN. = 2000 FT.

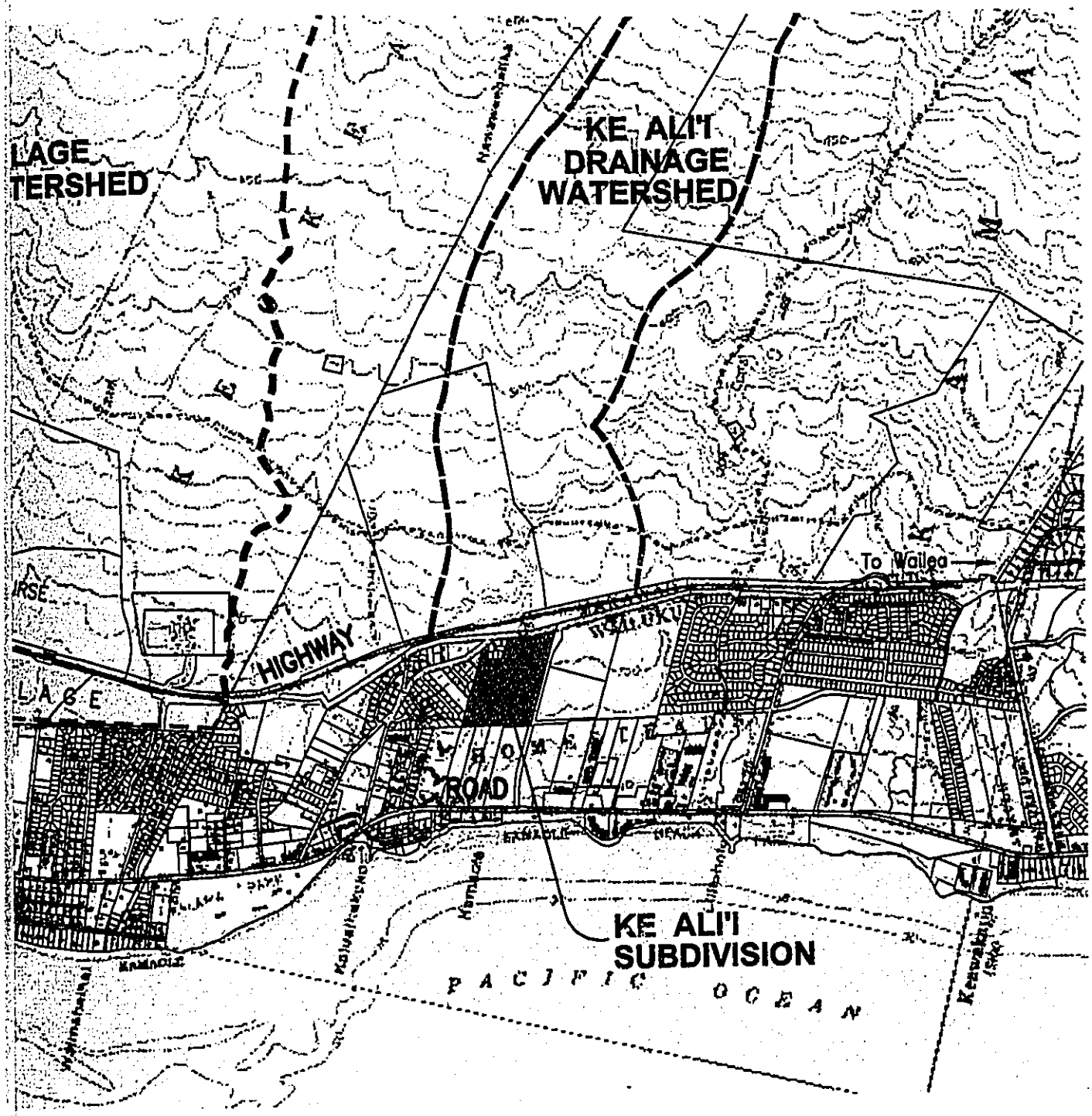
LEGEND:

- LIMITS OF PIILANI VILLAGE DRAINAGE WATERSHED
- LIMITS OF KE ALI'I SUBDIVISION DRAINAGE WATERSHED

99proj/99054/dwg/exhibits/drn-exbt.dwg

TRUE NORTH

SCALE: 1 IN. = 2000 FT.



E AREAS MAUKA OF KE ALI'I SUBDIVISION

2000 FT.

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

February 29, 2000

3. **Department of Land and Natural Resources, State Historic Preservation Division**

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 10, 2000

Mr. Don Hibbard
Administrator
Department of Land and Natural Resources
State Historic Preservation Division
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, HI 96707

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated January 21, 2000

Dear Mr. Hibbard:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated January 21, 2000, he requested that we respond to you for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"2. *Department of Land and Natural Resources, State Historic Preservation Division (DLNR, SHPD.) - The DLNR, SHPD recommended that a preservation plan for Site 3541 and a monitoring plan be submitted to their office for review and acceptance. To date, they have not received either of these documents. Please provide this Department with a status of these documents and a time frame in which you intend to complete them."*

Response

The developer has retained Xamanek to prepare both the Archaeological Preservation Plan for Site 3541 and a Monitoring Plan for the sand dunes in the northwest corner of the parcel. No grading will occur until both of these documents have been reviewed and approved by the DLNR Historic Preservation Division. Attached please find a copy of this correspondence and a copy of the Archaeological Mitigation Plan

We will coordinate the location survey of Site 3541 in the field with Xamanek. This information will then be plotted on our survey map to ensure its preservation.

Please feel free to call me at (808) 242-4403 if you have any questions or comments.

Very truly yours,

Alan L. Unemori
Vice-President

cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

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SPENCER HOMES, INC.
Building in Hawaii Since 1964

P.O. Box 97
Kihei , HI 96753
Telephone (808) 891-8770
Fax (808) 891-8771

AUTHORIZATION

March 6, 2000

To Whom It May Concern:

This letter authorizes Xamanek Researches to develop an Archaeological Preservation Plan for Site 3541 and Monitoring Plan for norwest corner sand dunes of the proposed Ke Alii Subdivision, located at Ke Alii Alanui Rd., in Kihei, Maui, with TMK No. 3-9-18:01.

Sincerely yours,

Mark Spencer
Project Manager

57

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

TIMOTHY E. JOHNS, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DEPUTIES
JANET E. KAWELO
LINNEL NISHIOKA

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS
WATER RESOURCE MANAGEMENT

January 21, 2000

Mr. John E. Min, Director
Department of Planning - Maui County
250 South High Street
Wailuku, Hawaii 96793

LOG NO: 24735 ✓
DOC NO: 0001CD10

Dear Mr. Min,

SUBJECT: Chapter 6E-42 Historic Preservation Review of an Application for a Special Management Area Permit for the Proposed Ke Ali'i Subdivision (Subject I.D.: SM1 990022)
Kama'ole Ahupua'a, Wailuku District, Island of Maui TMK: 3-9-18:001

Thank you for the opportunity to comment on your letter of December 28, 1999.

From the submitted document, we understand the proposed undertaking to consists of the subdivision of 24-acres, the construction of 96 single family house lots, and the associated infrastructure.

A search of our records indicates Xamanek Researches conducted an archaeological inventory survey [Fredericksen et al. 1994] which has been reviewed and accepted by this office [SHPD DOC NO: 9909RC05]. During this investigation, a total of 11 historic sites were identified; one of which was significant.

We subsequently reviewed a preliminary plat review for the proposed Ke Ali'i Subdivision [SHPD DOC NO:9910CD25]. At this time we recommended a preservation plan for site 3541 and a monitoring plan be submitted to this office for review and acceptance. To date, we have not received either of these documents.

Therefore, to ensure that the mitigation commitments are fulfilled, we recommend that any approved application have the following conditions attached:

1. An acceptable preservation plan for historic site 3541 be submitted to the State Historic Preservation Division and that this plan be executed prior to any land alteration in the vicinity of the site. The State Historic Preservation Division shall verify in writing the successful execution of the plan.

2. An archaeological monitoring plan for activities in the sand areas in the northwest part of the parcel be submitted to the State Historic Preservation Division for approval.

Please call Cathleen Dagher at 692-8023 if you have any questions.

Aloha,

Don Hibbard, Administrator
State Historic Preservation Division

CD:jen

4. Department of Land and Natural Resources, Engineering Branch

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

May 31, 2000

Mr. Charles Jencks
Director
Department of Public Works and Waste Management
COUNTY OF MAUI
200 S. High Street
Wailuku, HI 96793

Re: Ke Alii Subdivision - Spencer Homes, TMK: 3-9-018:001, SMA Application, SM1 9900022, Summary of Meeting on Friday, May 26, 2000, Regarding Use of FEMA's 100-year Design Discharge

Dear Mr. Jencks:

I met with Mr. Francis Cerizo of the Planning Department last Friday, May 26, 2000, to discuss the 100-year design discharge to be used as the basis of design for the drainage system for Ke Alii Subdivision. As you know there is a discrepancy between the design discharge estimated by FEMA (3200 cfs) and the State Highways Divisions "Hydrology Report for Piilani Highway" (1200 cfs).

Rather than further delay this project over this inconsistency, we will design the natural drainage channel and drainage structure beneath the roadway crossing at the northwest corner of the property to handle the FEMA 100-year design discharge level of 3200 cfs, as requested by the County.

If you have any questions or concerns on our comments, please feel free to contact us to further discuss this matter.

Very truly yours,

Warren S. Unemori
President

cc Mark Spencer, Spencer Homes, Inc.
John Min, Planning Department
Francis Cerizo, Planning Department

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 10, 2000

Mr. Dean Y. Uchida
Administrator
Department of Land and Natural Resources
Land Division Planning Branch
1151 Punchbowl Street
Honolulu, HI 96813

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated February 14, 2000

Dear Mr. Uchida:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated February 14, 2000, he requested that we respond to you for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"3. Department of Land and Natural Resources, Engineering Branch (DLNR) - The DLNR recommended using FEMA's 100-year design discharge for the stream cross-section design proposed in the drainage report. FEMA's design discharge from the stream mouth to the upper end of the study area is 3,200 cfs. In future drainage studies, address decreasing peak discharge to pre-development conditions through the use of the proposed subsurface and bermed park site detention facilities. Please provide this Department with the necessary revisions and address the effect these changes have."

Response

The apparent discrepancy in the predicted storm flows for Kamaole Gulch was discussed in a meeting with Mark Spencer of Spencer Homes, Francis Cerizo of the Planning Department, Charles Jencks of the DPWWM and Warren Unemori of WSUE on March 2, 2000. The result of this meeting is summarized in the letter from Warren S. Unemori to John E. Min, Department of Planning, dated March 9, 2000.

The salient portion of that letter states that the DPWWM will accept the following as a reasonable solution:

"o The portion of the drainage channel within the project area and falling within FEMA study limits will be required to have a 100-year flow capacity of at least 3200 cfs in accordance with the current FEMA 'Flood Insurance Study'.

o The portion of the drainage channel between the FEMA study area and Piilani Highway shall be required to provide a 100-year floor capacity of at least 1200 cfs in keeping with both the existing drainage structures on Piilani Highway and the SDOT 'Hydrology Report for Piilani Highway'."

A copy of this correspondence is attached.

Please feel free to call me at (808) 242-4403 if you have any questions or comments.

Very truly yours,

Alan L. Unemori
Vice-President

cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

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WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 9, 2000

Honorable John E. Min, Director
Department of Planning
County of Maui
250 S. High Street
Wailuku, Hawaii 96793

Dear Mr. Min,

Re: KE ALII SUBDIVISION DRAINAGE CHANNEL IMPROVEMENTS
Kihei, Maui, Hawaii
TMK: (2) 3-9-018: 001
LUCA File No. 3.1843; Planning Dept. ID # SM1 990022

I have received the copy of the letter from the DLNR Land Division that your department had forwarded to me which discusses the apparent discrepancy in storm flows for Kamaole Gulch, the existing natural drainageway that bisects the Ke Alii Subdivision project site. I met with Mr. Mark Spencer of Spencer Homes, Mr. Francis Cerizo of your department, and Mr. Charles Jencks, Director of the Dept. of Public Works, last week to discuss this issue in greater detail. Our discussion shed some light on the nature of the discrepancy noted by DLNR.

There are two regional drainage studies which have been widely used as the basis for determining the 100-year flows occurring in the natural drainageways within the Kihei area:

1) The Federal Emergency Management Agency's (FEMA) *Flood Insurance Study for Maui County, Hawaii*[1]. This study is the basis for the flood insurance maps for Maui County and the source of the 3200 cfs design flow for Kamaole Gulch cited by DLNR's Engineering Branch.

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[1]Federal Emergency Management Agency, *Flood Insurance Study for Maui County, Hawaii*, Community Number 150003, Revised March 16, 1995

2) State Highways Division's *Hydrology Report for Piilani Highway*[2]. This study was originally used to determine the design flows for the culverts and other drainage structures constructed by the Department of Transportation at the time Piilani Highway was built.

These two studies have generally agreed on the 100-year storm flows at Piilani Highway; however, Kamaole Gulch appears to be an exception. Both studies identify a comparable 5 to 5.5 square mile combined drainage area draining into Kamaole Gulch and the adjacent Charley Young gulch to the north; however, they disagree on the way the flow is divided into these two drainageways.

- The FEMA *Flood Insurance Study* assigns roughly 80% of the flow to Kamaole Gulch and 20% into Charley Young Gulch;

- The DOT *Hydrology Report for Piilani Highway* indicates roughly the reverse: only about 35% of the total flow is assigned to Kamaole Gulch, while 65% is assumed to flow into Charley Young Gulch.

As far as we can determine, both studies appear to have used USGS topographic data or the equivalent to determine the limits of the watersheds above Piilani Highway, and both appear to have made reasonable interpretations of the existing drainage areas that are difficult to either verify or refute without more detailed topographic information.

Prior to our meeting, we had discussed the matter with Mr. Sterling Yong, the State National Flood Insurance Program coordinator, who indicated that the County of Maui should establish a position on this matter to help resolve the apparent discrepancy in design flows being used for Kamaole Gulch in order for processing of the project's SMA application to continue in a timely manner.

---

2 *Hydrology Report for Piilani Highway, Island of Maui*, prepared for the State of Hawaii Department of Transportation, Highways Division, by Trans-meridian Engineers & Surveyors, Inc., January 1976.

After discussing this matter with Mr. Jencks, it was agreed that the Dept. of Public Works will accept the following as a reasonable solution to this apparent conflict of findings. The attached map, entitled "Offsite Drainage Studies Affecting Ke Alii Subdivision," places the limit of FEMA's detailed study area approximately 100 feet upstream of the westernmost boundary of the Ke Alii Subdivision project site. Therefore:

- The portion of the drainage channel within the project area and falling within the FEMA study limits will be required to have a 100-year flow capacity of at least 3200 cfs in accordance with the current FEMA *Flood Insurance Study*.

- The portion of the drainage channel between the FEMA study area and Piilani Highway shall be required to provide a 100-year flow capacity of at least 1200 cfs in keeping with both the existing drainage structures on Piilani Highway and the SDOT *Hydrology Report for Piilani Highway*.

I have based this recommendation on the following considerations:

- Without better topographic data for the region, we have no basis for determining which of the two studies is the more accurate of the two. It may take several months or longer to obtain current topographic data for this area for the level of detail we need. Waiting this long would impose an unfair burden on the developer, since this is really a regional drainage policy issue whose solution is beyond his control.

- The drainage improvements constructed with Piilani Highway, including the culvert crossings at Kamaole and Charley Young Gulches, were designed to conform to the flows reported in SDOT's *Hydrology Report for Piilani Highway*. Piilani Highway is a Federal-Aid- Highway; therefore, it is reasonable that the project developer be allowed to construct drainage improvements downstream of Piilani Highway in a manner consistent with the State Dept. of Transportation

on a highway project which carried the endorsement of the Federal Highway Administration. Furthermore, the County's 1994 Kihei *Drainage Master Plan*[3] adopts the SDOT *Hydrology Report for Piilani Highway* as the basis for runoff contributed by areas mauka of Piilani Highway, as do several other projects in the that have either been constructed or are now under construction.

- The County of Maui is a participant in the National Flood Insurance Program, and is, therefore, generally required to abide by the Federal requirements for flood plain management where applicable. Requiring drainage improvements to conform with FEMA's *Flood Insurance Study* within the detailed study area allows the County to meet its obligation.

- In addition, the County of Maui has already agreed to a 1200 cfs flow quantity for improvements downstream at South Kihei Road and for the Maui Coast Hotel project.

I feel that this solution offers as fair a compromise to both the public and the project developer as is possible at this time. Please contact me if you have any questions with regard to this recommendation.

Very truly yours,

Warren S. Unemori

enc.
cc: Charles Jencks, DPWWM w/ enc.
Mark Spencer, Spencer Homes w/ enc.

V:\PROJDATA\99proj\99054\Corrspdn\Mem\DLNR-response-draft-rev8.wpd

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[3]*Drainage Master Plan for Kihei, Maui, Hawaii*, prepared for the County of Maui Department of Public Works, Engineering Division, by Norman Saito Engineering Consultants, September 1994.

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
P.O. BOX 621
HONOLULU, HAWAII 96809

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND DIVISION
STATE PARKS
WATER RESOURCE MANAGEMENT

00 FEB 15 P1:30

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

February 14, 2000

LD-NAV

Ref.: SM1990022.RCM

Honorable John E. Min
Planning Director
County of Maui
Planning Department
250 S. High Street
Wailuku, Hawaii 96793

Dear Mr. Min:

SUBJECT: Application for Special Management Area Permit
Spencer Homes Kealii Subdivision

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

Attached herewith is a copy of our Land Division Engineering Branch's comment(s) on the proposed project.

The Department has no other comment to offer on the subject matter. Should you have any questions, please feel free to contact Nicholas Vaccaro of the Land Division's Support Services Branch at 808-587-0438.

Very truly yours,

DEAN Y. UCHIDA
Administrator

C: Maui District Land Office

ENGINEERING BRANCH

COMMENTS

Project must comply with rules and regulations of the National Flood Insurance Program (NFIP) and all applicable County Flood Ordinances. If there are any questions regarding the NFIP, please contact the State NFIP Coordinator, Sterling Yong, of the Department of Land and Natural Resources at 587-0248. If there are questions regarding flood ordinances, please contact the applicable County representative.

We confirm that the project site, according to FEMA Community –Panel No. 150003 265 C is located in Zones A5 and C. Zone A5 is an area subject to the following conditions:

1. 100-year flooding.
2. Base flood elevations and flood hazard factors determined.

Zone C is an area of minimal flooding. The site is also located above the flood boundaries investigated by the National Flood Insurance program.

Use FEMA's 100-year design discharge for the stream cross section design proposed in the drainage report, instead of the 1,082 cfs from Warren S. Unemori Engineering, Inc. or 1,209 cfs from the Hydrology Report for Piilani Highway. FEMA's design discharge from the stream mouth to the upper end of the study area (1,600 feet from the stream mouth) is 3,200 cfs.

In future drainage studies; address decreasing the future peak discharge to pre-development conditions, through the use of the proposed subsurface and bermed park site detention facilities.

5. Department of the Army, Corps of Engineers

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

REPLY TO
ATTENTION OF

Regulatory Branch

February 23, 2000

RECEIVED
FEB 25 2000
WARREN S UNEMORI ENGINEERING, INC.

Mr. Alan Unemori
Warren S. Unemori Engineering, Inc.
2145 Wells Street
Wailuku, Hawaii 96793

Dear Mr. Unemori:

This letter is written regarding the proposed project, Keali'i Subdivision Project, file number 200000071 located in Kihei, Maui, Hawaii. After a further review of the project plans, it has been determined that this project will not require a Department of the Army permit.

Should you need additional information, you may contact Ms. Lolly Silva of my staff at 438-7023.

Sincerely,

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

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

REPLY TO ATTENTION OF

Civil Works Technical Branch

January 20, 2000

'00 JAN 24 P1:41

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

Ms. Julie Higa, Staff Planner
County of Maui
Department of Planning
250 South High Street
Wailuku, Maui, Hawaii 96793

Dear Ms. Higa:

Thank you for the opportunity to review and comment on the Special Management Area Application and Project Assessment Report for the Keali Subdivision Project, Kihei, Maui (TMK 3-9-18: 1). The following comments are provided in accordance with Corps of Engineers authorities to provide flood hazard information and to issue Department of the Army (DA) permits.

a. Enlargement of the existing 48-inch culvert may require a DA permit. For further information, please contact Ms. Lolly Silva at (808) 438-7023 and refer to file number 20000071.

b. The flood hazard information provided on page 4 of the Project Assessment Report is correct.

Sincerely,

James Pennaz

James Pennaz, P.E.
Chief, Civil Works
Technical Branch

6. United States Department of Agriculture, Soil Conservation Service

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 10, 2000

Mr. Neal S. Fujiwara
District Conservationist
U. S. Department of Agriculture
Natural Resources Conservation Service
210 Imi Kala Street, Suite 209
Wailuku, HI 96793

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated January 10, 2000

Dear Mr. Fujiwara:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated January 10, 2000, he requested that we respond to you for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"5. *United States Department of Agriculture (USDA), Soil Conservation Service response - Your stated that Spencer Homes provided you with "Policy Statements". As noted in previous comments above, how will these be implemented and enforced? The last item states that a low CRM wall may be constructed at the base of the fill slope before the geo-cell lining is installed. How high will this wall be? This wall should be shown as part of this permit application. IF it is not included in this application, it may have to be processed as a separate application."*

Response

The drainage channel will be kept in its natural state up to the 100-year storm inundation limits. Beyond these limits two (2) different options have been designed for outer curves of the channel as follows:

(1) GRP Slope Protection
(2) Geocell Slope Protection

The attached full-size Construction Plan Sheets "37" and "39" show the location and details of these optional slope protection measures.

Please feel free to call me at (808) 242-4403 if you have any questions or comments.

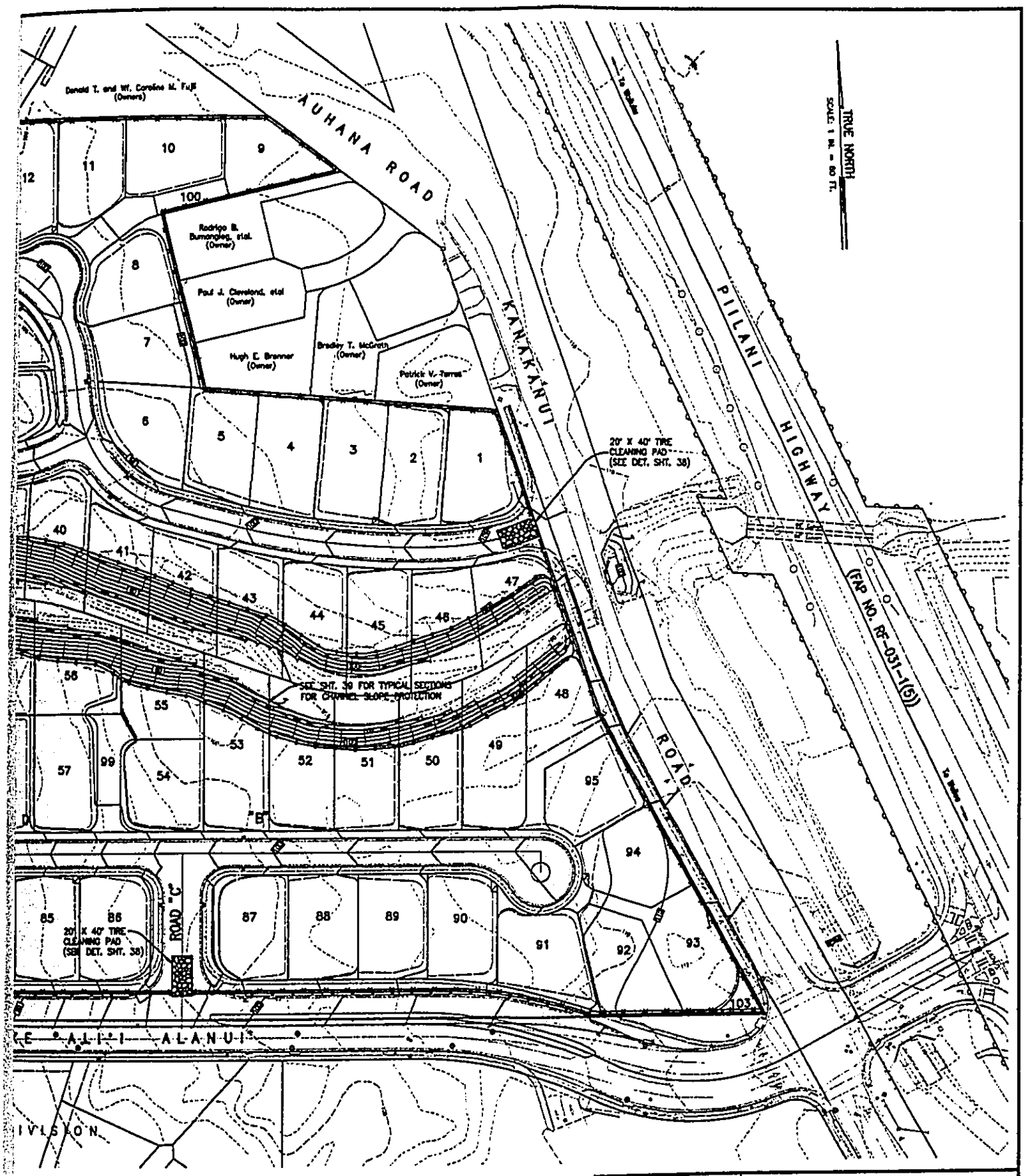
Very truly yours,

Alan L. Unemori
Vice-President

cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

D:\WP61DOCS\KEALII15.DOC


Kacor Realty Inc. (Owner)
Kihei Lutheran Church (Owner)
Lee E. Gardiner, Ltd. (Owner)
D.S. and W. Kathleen Robertson (Owners)
John A. Byrne, etal. (Owner)
Vincent J. Stiglone (Owner)
Wallace H. and W. Gladys H. Fujii (Owners)
Donald T. and W. Caroline M. Fujii (Owners)
Unicorn Live Lobster Co., Inc. (Owner)
FILTER BERM (SEE DET. SHT. 38)
United Realty Inc. (Owner)
WC Maui Coast LLC (Owner)
White Sands Maui Dev. Inc. (Owner)
Kachel Limited Partners (Owner)
98 PARK-DETENTION BASIN
ROAD "A"
ROAD "B"
ROAD "C"
ROAD "D"
ROAD "E"
20' X 40' TIRE CLEANING PAD (SEE DET. SHT. 38)
K E A L I I A L A N
K A M A O L E H E I G H T S S U B D I V I S I O N
LEGEND:
FINISH GRADE W/ ELEVATION
EXISTING GRADE W/ ELEVATION
TOP OF BANK
SILT FENCE OR FILTER BERM (SEE DET. SHT. 38)
DUST FENCE (SEE DET. SHT. 38)
CHANNEL SLOPE PROTECTION (SEE DET. SHT. 39 FOR OPTIONS)
TIRE CLEANING PAD (SEE DET. SHT. 38)
FILTER BERM (SEE DET. SHT. 38)
GEOCELL ON SLOPES GREATER THAN 2:1



DARREN T. UNEMORI
LICENSED PROFESSIONAL ENGINEER
NO. 7537-C
HAWAII, U.S.A.

Signature Date

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

NO.	DESCRIPTION	DATE

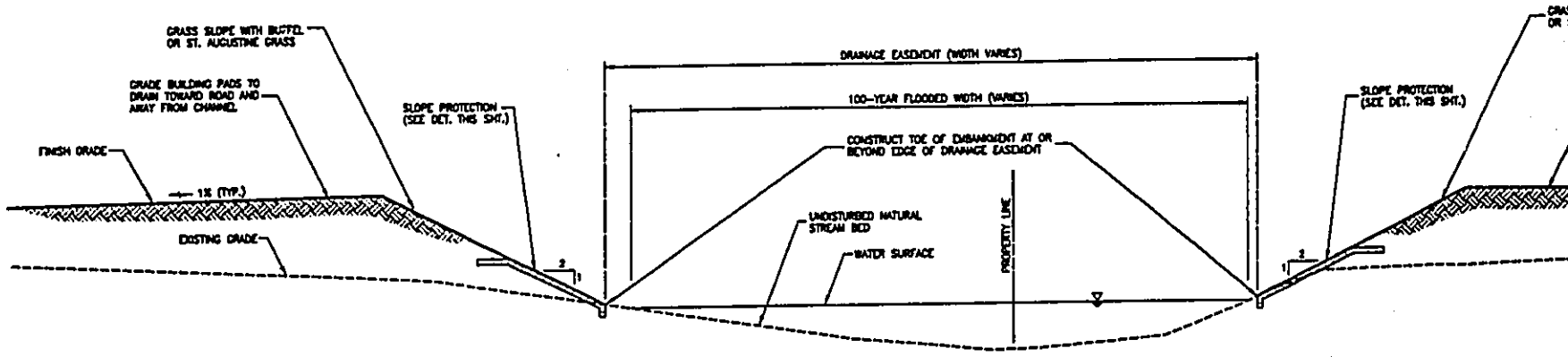
WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS/LAND SURVEYORS
WELLS STREET PROFESSIONAL CENTER, SUITE 403
2145 WELLS STREET, WAILUKU, MAUI, HAWAII 96793

KE ALI'I SUBDIVISION

KIHEI, MAUI, HAWAII

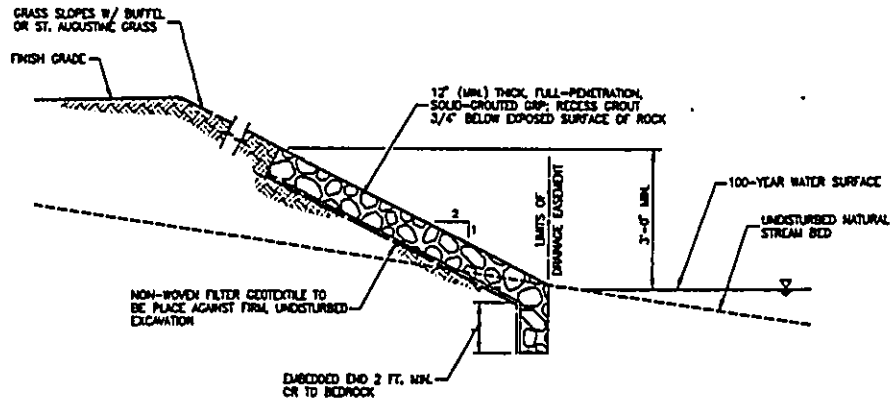
TITLE EROSION CONTROL PLAN

SRA DESIGNED BY	DTU CHECKED BY	99054 JOB NUMBER	37 SHEET
LCO DRAWN BY	WSU APPROVED BY	2-10-00 DATE	OF SHEETS
SCALE: 1 IN. = 60 FT.			



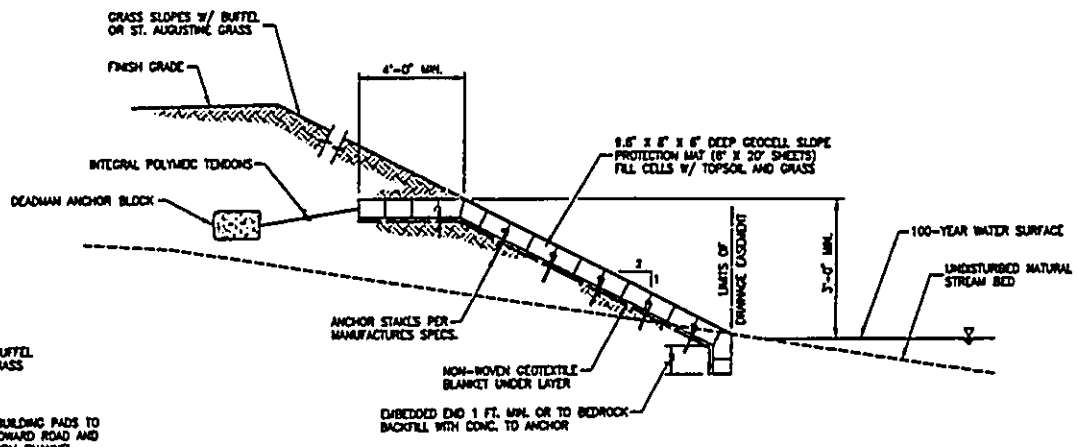
TYPICAL CHANNEL SECTION

SCALE: 1 IN. = 10 FT.



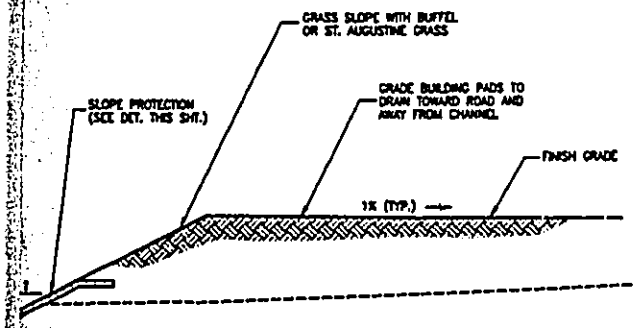
DETAIL – SLOPE PROTECTION (OPTION #1)

NOT TO SCALE



DETAIL – SLOPE PROTECTION (OPTION #2)

NOT TO SCALE



LETTER	DESCRIPTION	DATE

DARREN T. UNEMORI
LICENSED PROFESSIONAL ENGINEER
NO. 7937-C
HAWAII, U.S.A.

SIGNATURE DATE

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS/LAND SURVEYORS
WELLS STREET PROFESSIONAL CENTER, SUITE 403
2145 WELLS STREET, WAILUKU, MAUI, HAWAII 96793

KE ALI'I SUBDIVISION

KIHEI, MAUI, HAWAII

TYPICAL CHANNEL SECTION
TITLE AND SLOPE PROTECTION DETAILS

D.T.U. DESIGNED BY	D.T.U. CHECKED BY	99054 JOB NUMBER	39 SHEET
D.P.T. DRAWN BY	W.S.U. APPROVED BY	Jan. 24, 2000 DATE	OF SHEETS
AS NOTED SCALE			

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

January 19, 2000

Mr. Neal S. Fujiwara
District Conservationist
USDA
National Resources Conservation Service
210 Imi Kala Street, Suite 209
Wailuku, HI 96793

Re: Ke Alii Subdivision - Spencer Homes, TMK: 3-9-018:001, SMA Application, SM1 9900022

Dear Mr. Fujiwara:

Thank you for your comments on the Ke Alii Subdivision requesting an operation and maintenance plan of the existing drainage channel as outlined in your letter dated January 10, 2000, to Mr. John Min, Director, Planning Department (hereinafter referred to as Reference 1).

Your letter has been forwarded to Mr. Jesse Spencer of Spencer Homes, and he has provided the following Policy Statement regarding the existing drainage channel at Ke Alii Subdivision:

(1) The width of the drainage easment in the proposed subdivision was established according to the projected width of the inundation limits during a 100-year storm.

(2) The drainage channel easement will be in favor of the Ke Alii Homeowner's Association.

(3) Maintenance of the easement within each lot will be the responsibility of the respective land owner.

(4) The existing drainageway will be left as is. Only dead trees, branches and shrubs will be removed.

(5) No grading or planting within the existing drainageway will be permitted.

(6) Slopes along and outside of the drainage easement will be maintained by respective landowners.

(7) Slopes outside the drainage easements will be filled and lined with geoweb or geo-cell matting. Geo-cell linings will be backfilled with topsoil and grassed with St. Augustine or Buffel grass.

(8) Silt fences will be erected before any work is done on the slopes outside the drainage easement.

(9) In select locations along the outer curve of the channel, a low CRM wall may be constructed at the base of the fill slope before the geo-cell lining is installed.

If you have any questions on this Policy Statement, please contact us at (808) 242-4403. Thank you.

Very truly yours,

Warren S. Unemori
President

cc John Min, Planning Department
Jesse Spencer, Spencer Homes
Department of Public Works and Waste Management (w/ Reference 1)
Department of Health (w/ Reference 1)
Department of Land and Natural Resources (w/ Reference 1)
State Office of Planning (w/ Reference 1)
U. S. Army Corps of Engineers (w/ Reference 1)

United States
Department of
Agriculture

Natural
Resources
Conservation
Service

210 Imi Kala St.
Suite 209
Wailuku, HI 96793

Our People...Our Islands...In Harmony

'00 JAN 11 P1:01

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

DATE: January 10, 2000

Mr. John E. Min, Director
Department of Planning
County of Maui
250 S. High Street
Wailuku, Hawaii 96793

Dear Mr. Min,

SUBJECT: Ke Alii Subdivision; TMK: 3-9-018: 1
I.D. SM1 990022

It should be noted that operation and maintenance of the existing drainage channel is an integral part of the drainage system. An operation and maintenance plan defining responsibilities need to be developed.

Thank you for the opportunity to comment.

Sincerely,

Neal S. Fujiwara
District Conservationist

7. Department of Public Works and Waste Management

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

February 29, 2000

Mr. David Goode
Deputy Director
Department of Public Works and Waste Management
COUNTY OF MAUI
200 S. High Street
Wailuku, HI 96793

Re: Ke Alii Subdivision - Spencer Homes, TMK: 3-9-018:001, SMA Application, SM1 9900022, Response to the DPWWM's Advisory Comments, dated January 31, 2000, and Amended Comment 5, dated February 10, 2000 to John E. Min, Director of Planning,

Dear Mr. Goode:

The following is our item-by-item comments to the Advisory Comments in the DPWWM's letters to Mr. John Min, dated January 31, 2000, and amended February 10, 2000:

"1. *The Wastewater Reclamation Division cannot insure that wastewater system capacity will be available for the project."*

Your comment is noted.

"2. *The developer shall pay assessment fees for treatment plant expansion costs and fund any necessary off-site improvements to the collection system and wastewater pump stations."*

The developer understands from a phone conversation with Mr. Tracy Takamine of the Wastewater Reclamation Division on February 4, 2000, that there is a one-time assessment fee of $4.65 per gallon for treatment plant expansion costs, as well as a one-time assessment fee of $0.80 per gallon for offsite transmission improvements.

"3. *Provide a sewer impact study to substantiate that the existing water system is adequate to serve this project. Calculations are required before a building permit is issued."*

According to Mr. Takamine, this requirement is now obsolete and no longer required of the developer.

"4. *The drainage 'gully' and retention basin should be kept under private ownership and maintenance exclusive of the sections within the road rights-of-way."*

The developer intends to keep both the drainage "gully" and retention basin privately owned. The portion of the gully within the 100-year recurrence storm inundation limits will be designated as a drainage easement which is owned by the owner of each house lot immediately surrounding the drainage gully. This drainage "gully" will be maintained in its natural state with individual home owners responsible for the removal of loose branches or other natural debris which may accumulate thereon. Enforcement of reasonable maintenance in the drainage easement will be the responsibility of the Homeowners Association.

Similarly, the drainage retention basin will be kept as a passive park owned and maintained by the Homeowners Association.

"5. *(Modified February 20, 2000) The right-of-way for the North-South Collector Road shall be 52 feet, which will consist of 22 feet wide from the subject property and 30 feet wide from the Worldmark property located to the west of the subject property. This is consistent with a letter the department sent to the applicant in July of 1999."*

Agreed.

"6. *All structures, such as walls, trees, etc., shall be removed or relocated from the road widening strips. The rear boundaries of the road widening strips shall be clearly marked to determine if said structures have been properly removed and relocated."*

Agreed.

"7. *A 30-foot radii shall be provided at all the intersections of the proposed subdivision road and the adjoining Alanui Ke Alii and North-South Collector Road."*

Curves on the rights-of-ways at the intersections of both roads are, in fact, 30-feet in radius.

"8. *A site plan and a sight distance report to determine required sight distance and available sight distance at existing and proposed street intersections shall be provided for our review and approval."*

Agreed. The report will be submitted together with the Construction Plans and other reports will be sumitted during the design phase.

"9. *The subdivisions shall comply with the provisions of Title 18, "Subdivisions"*

Agreed.

"10. *Detailed and final drainage reports and site specific erosion control plans shall be submitted with the construction plans for review and approval prior to the issuance of grading permits. The drainage report shall include hydrologic and hydraulic*

calculations and the schemes for disposal of runoff waters. It must comply with the provisions of the 'Rules for Design of Storm Drainage Facilities in the County of Maui' and must provide verification that the grading and runoff water generated by the project will not have an adverse effect on adjacent and downstream properties. The site specific erosion control plan shall show the location and details of structural and non-structural Best Management measures."

Agreed. The drainage system will be designed in accordance with the provisions of the "Rules and Design of Storm Drainage Facilities in the County of Maui".

If you have any questions or concerns on our comments, please feel free to contact us to further discuss this matter.

Very truly yours,

Alan L. Unemori
Vice-President

cc Jesse Spencer, Spencer Homes, Inc.
John Min, Planning Department

D:\WP61DOCS\KEALII7.DOC

JAMES "KIMO" APANA
Mayor

CHARLES JENCKS
Director

DAVID C. GOODE
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
AND WASTE MANAGEMENT
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Land Use and Codes Administration

RON R. RISKA, P.E.
Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

ANDREW M. HIROSE
Solid Waste Division

February 10, 2000

MEMO TO: JOHN MIN, DIRECTOR OF PLANNING

F R O M: DAVID GOODE, DEPUTY DIRECTOR OF PUBLIC WORKS AND WASTE MANAGEMENT

SUBJECT: SPECIAL MANAGEMENT AREA PERMIT APPLICATION
KE ALII SUBDIVISION
TMK: (2) 3-9-018:001
SM 1 99/0022

We wish to amend our January 31, 2000 letter by amending Advisory Comment 5. The right-of-way for the North-South Collector Road shall be 52 feet, which will consist of 22 feet wide from the subject property and 30 feet wide from the Worldmark property located to the west of the subject property. This is consistent with a letter the department sent to the applicant in July of 1999.

If you have any further questions, please feel free to call me at ext. 7845.

DG:mt
cc: Land Use and Codes Administration
Charles Jencks

0500 & 74.

JAMES "KIMO" APANA
Mayor

CHARLES JENCKS
Director

DAVID C. GOODE
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
AND WASTE MANAGEMENT
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Land Use and Codes Administration

RON R. RISKA, P.E.
Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

ANDREW M. HIROSE
Solid Waste Division

February 8, 2000

MEMO TO: JULIE HIGA, PLANNER

F R O M: CHARLES JENCKS, DIRECTOR OF PUBLIC WORKS AND WASTE MANAGEMENT

SUBJECT: KE ALA'I SUBDIVISION, EA REQUIREMENTS

This memo is being provided to you as notice that an environmental assessment for the subject project will not be required. Thank you.

CJ:mt

648

JAMES "KIMO" APANA
Mayor

CHARLES JENCKS
Director

DAVID C. GOODE
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS AND WASTE MANAGEMENT
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Land Use and Codes Administration

RON R. RISKA, P.E.
Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

ANDREW M. HIROSE
Solid Waste Division

January 31, 2000

MEMO TO: JOHN E. MIN, DIRECTOR OF PLANNING

FROM: for CHARLES JENCKS, DIRECTOR OF PUBLIC WORKS AND WASTE MANAGEMENT

SUBJECT: SPECIAL MANAGEMENT AREA PERMIT APPLICATIONS
KE ALII SUBDIVISION
TMK: (2) 3-9-018:001
SM1 99/0022

We reviewed the subject application and have the following comments.

Advisory Comments

1. The Wastewater Reclamation Division cannot insure that wastewater system capacity will be available for the project.

2. The developer shall pay assessment fees for treatment plant expansion costs and fund any necessary off-site improvements to the collection system and wastewater pump stations.

3. Provide a sewer impact study to substantiate that the existing wastewater system is adequate to serve this project. Calculations are required before a building permit is issued.

4. The drainage "gully" and retention basin should be kept under private ownership and maintenance exclusive of the sections within the road rights-of-way.

5. Road widening lots shall be provided for the adjoining halves of Alanui Ke Alii and the North-South Collector Road to provide for future 80 and 60 foot wide rights-of-way and improved to County standards, to include, but not be limited to, pavement widening, construction of curb, gutter and sidewalk, street lights, and relocation of utilities

underground. Said lots shall be dedicated to the County upon completing of the improvements.

6. All structures, such as walls, trees, etc., shall be removed or relocated from the road widening strips. The rear boundaries of the road widening strips shall be clearly marked to determine if said structures have been properly removed and relocated.

7. A 30-foot radii shall be provided at all the intersections of the proposed subdivision road and the adjoining Alanui Ke Alii and North-South Collector Road.

8. A site plan and a sight distance report to determine required sight distance and available sight distance at existing and proposed street intersections shall be provided for our review and approval.

9. The subdivision shall comply with the provisions of Title 18, "Subdivisions."

10. Detailed final drainage reports and site specific erosion control plans shall be submitted with the construction plans for review and approval prior to the issuance of grading permits. The drainage report shall include hydrologic and hydraulic calculations and the schemes for disposal of runoff waters. It must comply with the provisions of the "Rules for Design of Storm Drainage Facilities in the County of Maui" and must provide verification that the grading and runoff water generated by the project will not have an adverse effect on adjacent and downstream properties. The site specific erosion control plan shall show the location and details of structural and non-structural Best Management measures.

If you have any questions, please call David Goode at 270-7845.

DG:msc/mt
S:\LUCA\CZM\kealii.wpd

JAMES "KIMO" APANA
Mayor

CHARLES JENCKS
Director

DAVID C. GOODE
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS AND WASTE MANAGEMENT
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Land Use and Codes Administration

RON R. RISKA, P.E.
Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

ANDREW M. HIROSE
Solid Waste Division

January 25, 2000

Mr. Warren Unemori
Warren S. Unemori Engineering
Wells Street Professional Center, Suite 403
2145 Wells Street
Wailuku, Hawaii 96793

Dear Mr. Unemori:

SUBJECT: KEALII SUBDIVISION AND IMPROVEMENTS TO ALANUI KEALII

Pursuant to the meeting of Thursday, January 20, 2000, in my office regarding the above referenced roadway improvements, I have considered the need to provide for the full master plan width of Alanui Kealii as well as the necessary roadway improvements which will be driven by your proposed subdivision.

After giving the matter relative to the amount of improvements and the amount of dedication for right-of-way purposes some thought, I have concluded that the 80-foot right-of-way is a reasonable requirement. However, the improvement requirements to Alanui Kealii adjacent to your subdivision will be restricted to development of the median strip, a travel lane, a bicycle lane, and any other reasonable modifications to the right-of-way to accommodate the impacts associated with development of your project. These improvements may require some additional striping and modification of existing striping within the existing right-of-way and those, of course, will also be your responsibility.

Should you have any questions with regard to this position, please feel free to contact me at 270-7845.

Sincerely,

for CHARLES JENCKS
Director of Public Works
and Waste Management

CJ:mt
cc: Engineering Division
Land Use and Codes Administration

8. Department of Parks and Recreation

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 10, 2000

Mr. Floyd S. Miyazono
Director
Department of Parks and Recreation
County of Maui
1580-C Kaahumanu Avenue
Wailuku, HI 96793

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated January 25, 2000

Dear Mr. Miyazono:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated January 25, 2000, he requested that we respond to you for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"7. *Department of Parks and Recreation - Please provide this Department with your comments on the Department of Parks and Recreation Comments"*

Response

The park/detention basin area will be maintained as a private passive park by the Homeowner's Association. The developer agrees to pay a Parks and Playgrounds Assessment Fee (PPAF) in lieu of dedicating the park site to the County, on approval by the Parks and Recreation Department.

It is our understanding that by the Maui County Code Section 18.16.320(E), the developer is given fifty percent credit for every 500 square feet of private park for each lot (in lieu of dedicating that amount of park to the County). Based on a total area of park site equal to 28,945 square feet, the calculation proceeds as follows:

PPAF = [(95 lots - 3 lots exempted) - 50%(park area/500 sq.ft. per lot)]
x ($2,040 per lot)

PPAF = [(92) - 0.5(28,945/500)] x ($2,040) = [92 - 28.945] x ($2,040)

PPAF = $128,632.20

Please feel free to call me at (808) 242-4403 if you have any questions or comments, or if our interpretation of the PPAF calculation procedure is incorrect..

Very truly yours,

Alan L. Unemori
Vice-President

cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

D:\WP61DOCS\KEALII16.DOC

DEPARTMENT
PARKS AND RECREATION
COUNTY OF MAUI

1580-C KAAHUMANU AVENUE WAILUKU, HAWAII 96793

JAMES "KIMO" APANA
Mayor

FLOYD S. MIYAZONO
Director

ELIZABETH D. MENOR
Deputy Director

(808) 270-7230
FAX (808) 270-7934

'00 JAN 25 P2:53

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

January 25, 2000

MEMO TO: John E. Min, Planning Director

FROM: FLOYD S. MIYAZONO, Director

SUBJECT: **Ke Ali'i Subdivision**
TMK: 3-9-018:01
SM1 990022

Thank you for the opportunity to review the subject application. We have the following comments:

1. The development would require a payment of $189,720.00 (96 lots - three lots x $2,040.00) to fulfill the parks and playgrounds assessment fee. We would prefer a cash contribution in lieu of land.

2. The proposed Park/Detention Basin site is part of the developer's drainage channel, and it is not an appropriate location and size for a park.

Should you have any questions please contact me at extension 7626 or Patrick Matsui at extension 7387.

FSM:PM:gu

c: Patrick Matsui, Chief-Planning and Development
SMA Files

south\jmin.18r

9. Police Department

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 10, 2000

Mr. Thomas M. Phillips
Chief of Police
Police Department
County of Maui
55 Mahalani Street
Wailuku, HI 96793

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated January 28, 2000

Dear Mr. Phillips:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated January 28, 2000, he requested that we respond to you for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"8. *Police Department - Please provide this Department with your response to the Police Department's comments and concerns regarding the traffic problems. For your information, copies of their comments were sent to the Department of Transportation, Department of Public Works and Waste Management, and the Department of Education."*

Response

Maui Police Officer Bradney Hickle raised concerns referred to by Mr. John Min. His comments were forwarded to Parsons Brinckerhoff (PB), the consultant who prepared the "Traffic Impact Analysis Update for the Ke Alii Single-Family Units", September, 1999. After review of these concerns, Mr. Wayne Yoshioka, Manager of Transportation Planning/Traffic Engineering, addressed each of the concerns. This letter summarizes as follows:

> ***"We believe this letter addresses the issues that officer Hickle raised in his memorandum.***

First, Ke Alii Single-Family Units development will generate very little traffic impact. Intersection analysis show that traffic from the development would not change the level of service at the intersections of Alanui Ke Alii. It contributes about 10 percent of the traffic projected for Alanui Ke Alii and a very small percentage on the traffic on South Kihei Road and Piilani Highway.

Second, many of the issues are related to existing traffic issues connected with the operation of Kamalii Elementary School. It is appropriate and desirable for Kamalii Elementary School to conduct the recommended internal traffic circulation study, the school crossing study, and the school speed zone study to enhance the safety for students attending the school."

Attached please find a copy of this letter. The developer will cooperate and work with the Police Department and Department of Education on these matters of concern.

Please feel free to call me at (808) 242-4403 if you have any questions or comments.

Very truly yours,

Alan L. Unemori
Vice-President

cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

D:\WP61DOCS\KEALII17.DOC

Parsons Brinckerhoff
Pacific Tower, Suite 3000
1001 Bishop Street
Honolulu, HI 96813
808-531-7094
Fax: 808-528-2368

March 7, 2000

Mr. Warren S. Unemori
Warren S. Unemori Engineering, Inc.
2145 Wells Street, Suite 403
Wailuku, Hawaii 96793

Re: Ke Alii Residential Subdivision
PBQD Reference: 16301A

Dear Mr. Unemori:

Per your request, we have reviewed the intra-departmental memorandum dated January 28, 2000 from Maui police officer Bradney Hickle to Maui police chief Tom Phillips. We applaud his caring and concern for the Kihei area.

In the memorandum, officer Hickle identified several concerns:

- Close spacing of Alanui Ke Alii/Piilani and Ke Alii Alanui/Kanakanui intersections;
- Traffic speeding on the Kanakanui Road approaches to Alanui Ke Alii;
- Lack of traffic control on Alanui Ke Alii between Piilani Highway and South Kihei Road;
- Lack of adequate parking for Kamalii Elementary School;
- Need for a change in speed limit on Alanui Ke Alii from 30 mph to 20 mph.

Officer Hickle also expresses an opinion that the addition of traffic from Kamaole Heights and Ke Alii residential subdivisions will greatly increase the traffic problems and the hazards to motorists and pedestrians. He also proposes a moratorium on new development within the Kihei area.

Traffic Impacts of Ke Alii Residential Development

The analyses documented in the Traffic Impact Analysis Update for the Ke Alii Single-Family Units, September 1999, found that the Ke Alii Single-Family Units development would generate an estimated 78 vehicles per hour (vph) during the AM peak hour and 104 vph during the PM peak hour. This amounts to about 10 percent of the total traffic projected for Alanui Ke Alii in Year 2001. The intersection analyses at the Alanui Ke Alii/Piilani Highway, the Alanui Ke Alii/Kanakanui Road, and the Alanui Ke Alii/South Kihei Road intersections show that the Ke Alii Single-Family Units development would not change their level of service (LOS) operations. In other words, the amount of traffic generated by Ke Alii Single-Family Units development does not affect the operation of these intersections.

If the Ke Alii Single-Family Units development only contributes about 10 percent of the total projected traffic on Alanui Ke Alii, then it contributes even a smaller proportion of the regional traffic on Piilani Highway and South Kihei Road. Ke Alii Single-Family Units development is targeted at the local residential market. Trips generated from this type of

development tend to be oriented more toward Piilani Highway, a benefit to South Kihei Road. Existing traffic conditions in Kihei are, at times, congested, especially on South Kihei Road, north of Lipoa Street. All the locations cited by officer Hickle are located in this area. The Ke Alii Single-Family Units development will have very little impact on this area of Kihei.

While frustrating to motorists, this sub-regional congestion is confined to relatively sharp peaks during selected time periods of the day. During other time periods, operations on South Kihei Road are acceptable. Piilani Highway operates well for most time periods and as access to Piilani Highway improves (Road C near Azeka Place), motorists will have an easier time utilizing it as an alternative to South Kihei Road. In the longer-range future, the North-South Collector Road between Lipoa and Uwapo will provide direct relief to South Kihei Road.

The key is to have the government and private sectors work together to implement these improvements.

Other Traffic-Related Concerns

Officer Hickle also expresses other traffic-related concerns. Existing traffic problems associated with the operation of the Kamalii Elementary School triggers many of these concerns.

Close spacing of Alanui Ke Alii/Piilani and Alanui Ke Alii/Kanakanui Intersections

The Piilani Highway and Kanakanui Road intersections on Alanui Ke Alii are closely spaced. To address this, the State of Hawaii Department of Transportation (SDOT) has treated the two intersections as a coordinated pair. Therefore, traffic turning into Alanui Ke Alii from Piilani Highway and proceeding makai-bound on Alanui Ke Alii, does not stop at Kanakanui Road, but have the right-of-way through the Kanakanui intersection. This minimizes the potentially hazardous situation of queuing traffic into Piilani Highway.

Traffic Speeding on Kanakanui Road Approaches to Alanui Ke Alii

The Kanakanui Road approaches to Alanui Ke Alii are STOP sign controlled. Therefore, to comply with the STOP sign, vehicles would have to slow down as they approach Alanui Ke Alii. Observations by our staff have not identified any instances of vehicles running the STOP sign, but if officer Hickle has observed this phenomenon, we agree that it is dangerous and needs to be stopped by Maui Police. As for vehicles speeding on Kanakanui Road, we agree that Maui Police is doing the right thing by issuing speeding citations.

Lack of Traffic Control on Alanui Ke Alii between Piilani Highway and South Kihei Road

As previously discussed, right-of-way for mauka-makai traffic flow on Alanui Ke Alii is maintained so that the Kanakanui and Piilani intersections can operate as a coordinated pair.

STOP-sign traffic control is provided on the Kanakanui Road approaches to Alanui Ke Alii. Traffic on Kanakanui Road must stop and wait for a safe gap in traffic on Alanui Ke Alii as they would at any other 2-way, STOP-controlled intersection.

Pedestrian crossing of Alanui Ke Alii is, likewise, handled in the same manner. It is acknowledged that children crossing Alanui Ke Alii as pedestrians should be protected in some way. It is suggested that Kamalii Elementary School conduct a school crossing study to determine the appropriate way to accomplish this goal.

Lack of Adequate Parking in Kamalii Elementary School

Currently, parents dropping off their children at Kamalii Elementary School queue onto Alanui Ke Alii. Part of the reason for this appears to be that the drop off site within Kamalii Elementary School is very near to the Alanui Ke Alii driveway entrance, leaving a relatively short distance for vehicles to stack before they protrude into Alanui Ke Alii.

Parents picking up their children in the afternoon often arrive early, and queue up on Alanui Ke Alii, waiting for school to end. The desire is to stage where they can see the children exit the school as opposed to a desire to park their car and leave it.

Given this situation, it may be more beneficial for Kamalii Elementary School to study ways to improve its internal traffic circulation and student drop-off and pick-up procedures.

Change Speed Limit Signs on Alanui Ke Alii

It is assumed that the designers of Alanui Ke Alii and the County of Maui followed the appropriate procedures in designating a Speed Limit of 30 mph on Alanui Ke Alii. Without having conducted an analysis, it is judged that 30 mph appears appropriate for a collector type roadway such as Alanui Ke Alii.

It may be prudent to establish a school speed zone on Alanui Ke Alii during the time periods immediately before and after school hours at Kamalii Elementary School. An engineering study should be conducted first. If the study finds that a school speed zone is appropriate, then one could be established in accordance with the appropriate Maui County ordinance. It is recommended that Kamalii Elementary School conduct such a study.

We believe this letter addresses the issues that officer Hickle raised in his memorandum.

First, Ke Alii Single-Family Units development will generate very little traffic impact. Intersection analyses show that traffic from the development would not change the level of service at the intersections on Alanui Ke Alii. It contributes about 10 percent of the traffic projected for Alanui Ke Alii and a very small percentage on the traffic on South Kihei Road and Piilani Highway.

Second, many of the issues are related to existing traffic issues connected with the operation of Kamalii Elementary School. It is appropriate and desirable for Kamalii Elementary School to conduct the recommended internal traffic circulation study, the school crossing study, and the school speed zone study to enhance the safety for students attending the school.

If you or the reviewing agencies have any further questions or comments, please call.

Very truly yours,

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.

Wayne Y. Yoshioka
Manager of Transportation Planning/Traffic Engineering

POLICE DEPARTMENT
COUNTY OF MAUI

'00 FEB -2 A10:22

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

JAMES "KIMO" APANA
MAYOR

OUR REFERENCE

YOUR REFERENCE

55 MAHALANI STREET
WAILUKU, HAWAII 96793
(808) 244-6400
FAX (808) 244-6411

THOMAS M. PHILLIPS
CHIEF OF POLICE

DEPUTY CHIEF OF POLICE

January 28, 2000

MEMORANDUM

TO : DIRECTOR, PLANNING DEPARTMENT

FROM : THOMAS M. PHILLIPS, CHIEF OF POLICE

SUBJECT : I.D.: SM1 990022
TMK: 3-9-018:001
Project Name: Ke Alii Subdivision - Spencer Homes (96-lot single-family subdivision on 24 acres on Kanakanui Road and Ke Alii Alanuui)
Owner: Spencer Homes, Inc.
Applicant: Warren Unemori Engineering, Inc.

____ No recommendation or special condition is necessary or desired.

_✓_ Refer to attachment.

AC Ho

Assistant Chief Robert Tam Ho
For: THOMAS M. PHILLIPS
Chief of Police

TO : TOM PHILLIPS, CHIEF OF POLICE, COUNTY OF MAUI

VIA : CHANNELS

FROM : BRADNEY HICKLE, POLICE OFFICER III, KIHEI CPO

SUBJECT : KE ALII SUBDIVISION, ID # SM 1 990022

Sirs, on 01/07/00 I received a copy of the Ke Alii Subdivision plan, ID # SM 1 990022. In the past I have worked very closely with residents in the area and faculty at Kamalii Elementary School. I have discovered most of the problems with motorist and pedestrians in the area are associated with the Ke Alii Alanui rd./Kanakanui rd. intersection.

Currently the traffic problems are associated with the two intersections of Piilani Highway/ Ke Alii Alanui rd. and Kanakanui rd./Ke Alii Alanui rd. being so close together by Kamalii Elementary School. Other traffic problems include vehicles speeding on Kanakanui road and Auhana roads approaching the intersection of Ke Alii Alanui rd.. I issued 228 moving citations in 1999 and many were speeding violations for motorist in this area. The primary excuse of speeding motorist being the easy access to the traffic light at the Ke Alii Alanui rd. /Piilani Highway intersection. Another problem I have observed is the intersection at Ke Alii Alanui rd. and Kanakanui rd. has no traffic controls at all for east and west bound traffic on Ke Alii Alanui road from the traffic light on Piilani Highway intersection to stop sign on South Kihei rd. This makes pedestrian and vehicles crossing at the Ke Alii Alanui road/Kanakanui road intersection very dangerous. Stop signs or a stop light has to be placed at this intersection to allow for safe passage of motorist and pedestrians, especially the children.

To note another ongoing problem associated with this area is the lack of adequate parking for Kamalii Elementary School. There are "No Parking Signs" posted all along Ke Alii Alanui road and Kanakanui road surrounding Kamalii Elementary School but vehicles still park there and add to the traffic problems. Parents who pick up and drop off their children have no other place to park. In 1999 I issued 83 parking citations, many were issued in this area. A parking lot has to be provided by the County or the State to eliminate this problem and this should to be added to the design of this plan. I have also noticed a 30 MPH sign posted on Ke Alii Alanui road directly across from the school. In all my years as a Police Officer I have never seen a 30 MPH sign posted within a school zone within a residential area. All other surrounding county roads/streets are posted as 20 MPH zones from Piilani highway to South Kihei Road. This should be also changed to a 20 MPH zone.

There has been a lot of newly developed housing areas in Kihei. Over the past year the developments have included Kamaole Heights Subdivision, which is located in the area just west of Kamalii Elementary School on Ke Alii Alanui rd.

When completed 40 new single family homes will be constructed and possibly adding 40 to 60 new vehicles to the area. This will surely add to the current traffic problems. The proposed Ke Alii Subdivision will add 96 single family homes to this area. To me this means adding at least 96 to120 vehicles to the area.

In Kihei we experience daily traffic jams on South Kihei Rd.. In the afternoons north bound traffic backs up from the Lipoa street/ South Kihei Rd. intersection to Kamaole I park, which is to the Ke Alii Alanui rd intersection. In the south bound direction I have observed traffic backed up from Lipoa street to Mokulele highway at peak hours of traffic and Piilani highway is not yet designed to handle the overflow.

In my opinion adding 40 to180 new vehicles to the area of Ke Alii Alanui rd./Kanakanui rd. will greatly increase the traffic problems and the hazards to motorist and pedestrians. I believe this is not in the best interest of the persons currently living in this area and using the surrounding roadways specifically the Ke Alii Alanui road/Kanakanui road intersection. It is also my opinion and recommendation that the State Highways Division and the County Roadway Division take a realistic look at the current problems and future problems involving these intersections and address those problems before any new development is allowed to occur in this area.

Respectfully Submitted,

Brad Hickle **E-9966**
01/24/2000 **1000 hours**

HICKLE EXPRESSES VALID CONCERNS AS WELL AS SOLUTIONS. IT IS HIGHLY RECOMMENDED THAT PLANNERS WORK WITH HICKLE/MPO TO POSSIBLY PREVENT PROBLEMS.

1/25/2000 0823HRS

1/26/00 concur.

10. Department of Fire Control

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 10, 2000

Mr. Scott English
Lieutenant, Fire Prevention Bureau
Department of Fire Control
County of Maui
200 Dairy Road
Kahului, HI 96732

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated January 12, 2000

Dear Mr. English:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated January 12, 2000, he requested that we respond to you for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"9. Department of Fire Control - Please provide this Department with an explanation of the location of any fire apparatus access roads and where any buildings would be in excess of 150 feet from a water supply on a public street."

Response

Attached please find the Fire Hydrant Layout Plan for the Ke Alii Subdivision with the fire hydrant locations highlighted. A close-up of the fire hydrant locations near the private access roads on Road "B" is also provided to show compliance with the 150 feet criteria referred to in your letter.

Please feel free to call me at (808) 242-4403 if you have any questions or comments.

Very truly yours,

Alan L. Unemori
Vice-President

cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

D:\WP61DOCS\KEALII18.DOC

2 2

JAMES "KIMO" APANA
MAYOR

CLAYTON T ISHIKAWA
CHIEF

FRANK E. FERNANDEZ, JR.
DEPUTY CHIEF

'00 JAN 13 P2:55

DEPT OF PLANNING,
COUNTY OF MAUI
RECEIVED

COUNTY OF MAUI
DEPARTMENT OF FIRE CONTROL

200 DAIRY ROAD
KAHULUI, MAUI, HAWAII 96732
(808) 243-7561
FAX (808) 243-7919

January 12, 2000

Mr. Clayton Yoshida
Department of Planning
County of Maui

RE: Ke Alii Subdivision, I.D. # SM1 990022, TMK: (2) 3-9-018:001

Dear Mr. Yoshida

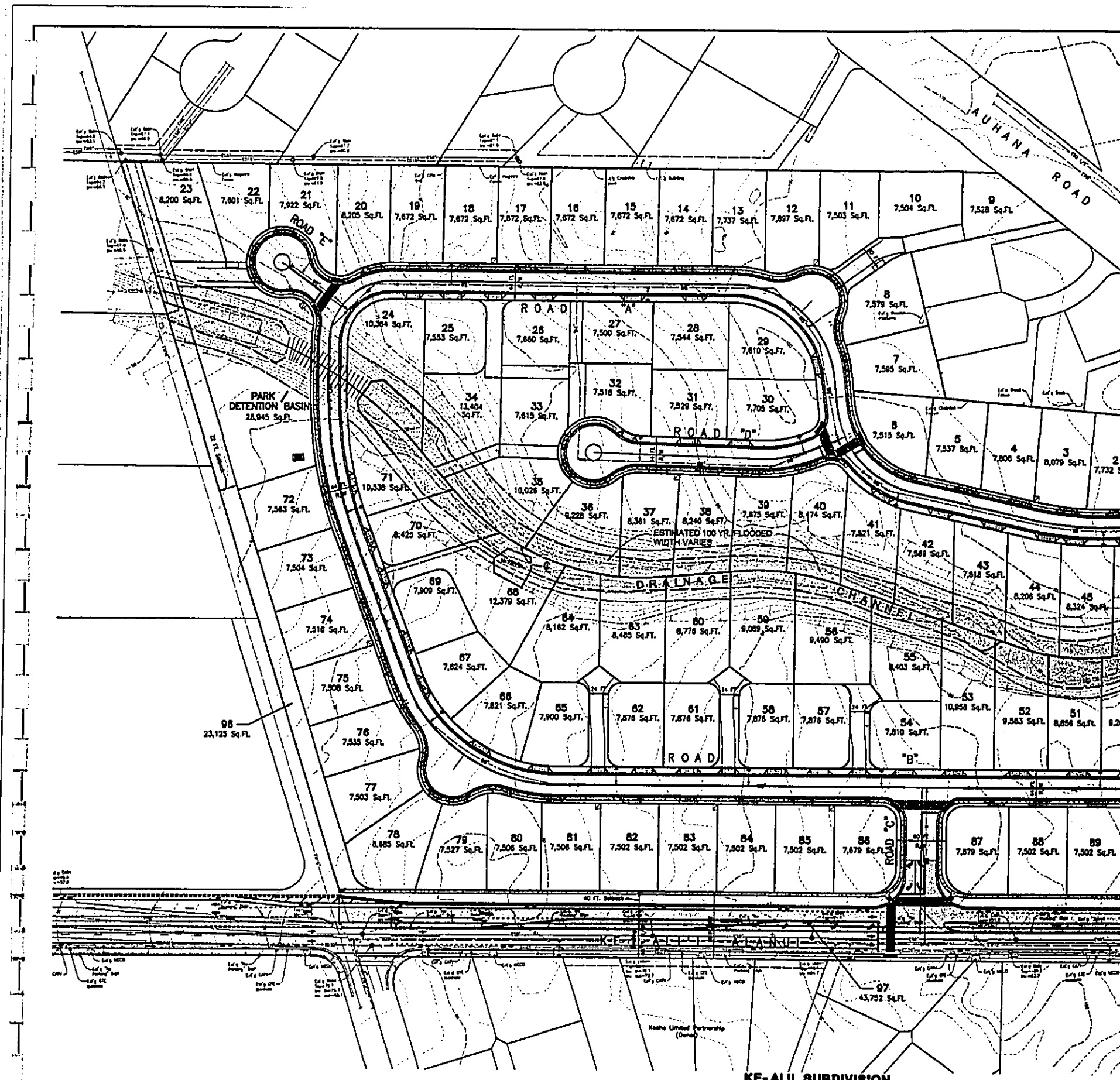
Thank you for the opportunity to comment of the proposed Ke Alii Subdivision, Fire Department Requirements are:

Fire Apparatus Access Road:
Fire apparatus access roads shall be required for every building hereafter constructed when any portion of an exterior wall of the first story is located more than 150 feet from fire department vehicle access. (Sec. 10.207.a UFC 1988)

Water Supply:
An approved water supply capable of supplying the required fire flow for fire protection shall be provided to all premises upon which buildings or portions of buildings are hereafter constructed. When any portion of the building protected is in excess of 150 feet from a water supply on a public street. (Sec. 10.301.c UFC 1988)

Sincerely,

Scott English
Lieutenant, Fire Prevention Bureau



KE-ALII SUBDIVISION

SUBDIVISION OF T.M.K.: 3-9-18 : 01,
INTO LOTS 1 TO 98, INCLUSIVE.
KIHEI, MAUI, HAWAII

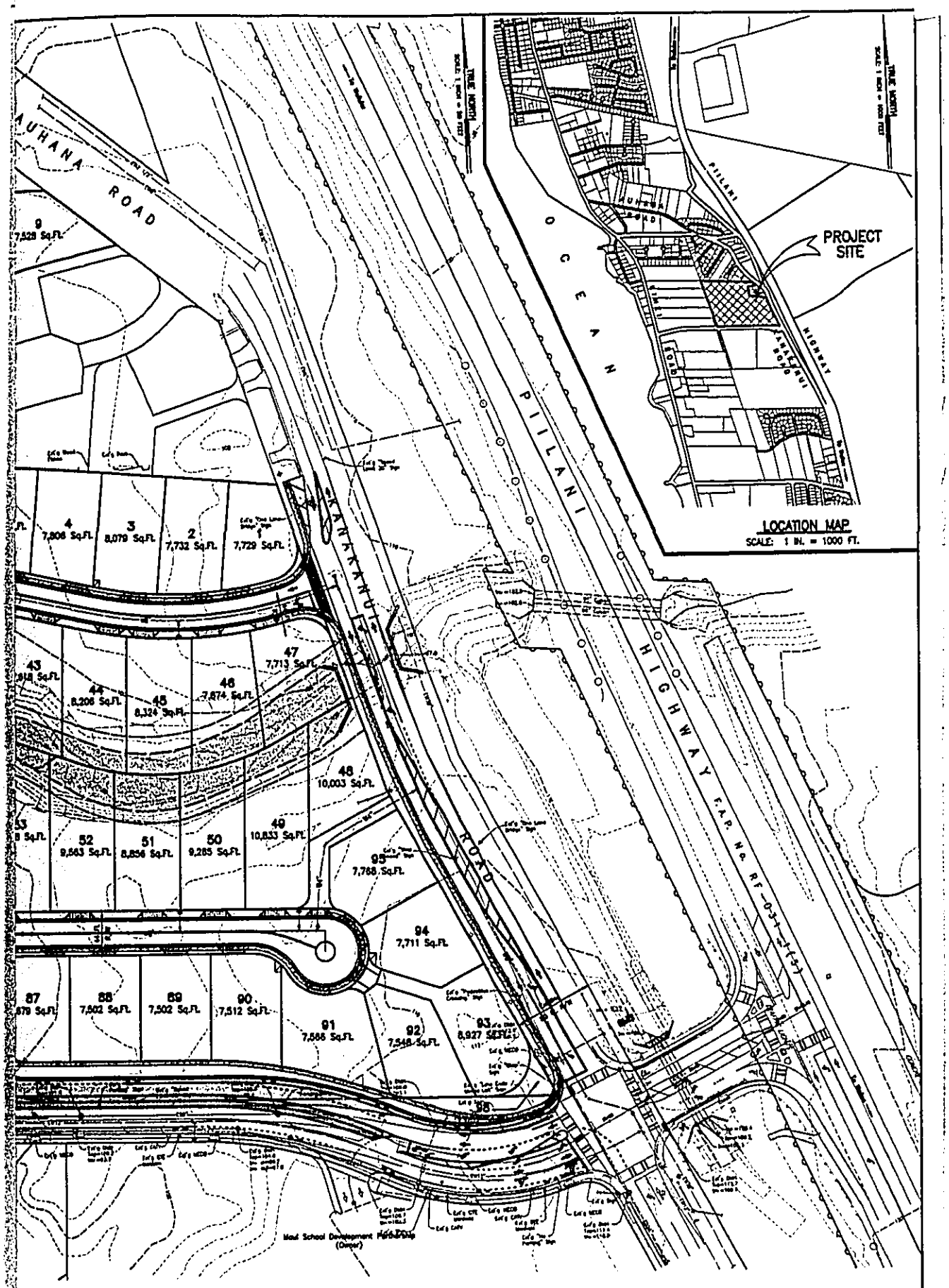
DEVELOPER: SPENCER HOMES
ADDRESS: 4372 W. WAIOLA
KIHEI, MAUI, HI 96763
OWNER: KIHEI KAMAOLE ASSOCIATES
ADDRESS: 98-1608 HAPAHI STREET
AIEA, OAHU, HI 96701

SCALE: 1 IN. = 50 FT.

MISC. INFORMATION

GROSS LAND AREA - 24.09 ACS.
ZONING - R-2 RESIDENTIAL
MIN. LOT SIZE - 7,500 SQ.FT.
MIN. LOT WIDTH - 65 FT.
NO. OF HOUSELOTS - 85

T.M.K.: 3-9-18 : 01



"FIRE HYDRANT LAYOUT PLAN"

ADVANCED COPY
SUBJECT TO CHANGE

APPROXIMATE EARTHWORK QUANTITIES

EXCAVATION = 22,500 CU.YD.
EMBANKMENT = 35,600 CU YD.

WARREN S. UNEMORI ENGINEERING, INC.

July 29, 1997
Revised: October 5, 1999
Revised: January 18, 2000

WSUE #99054

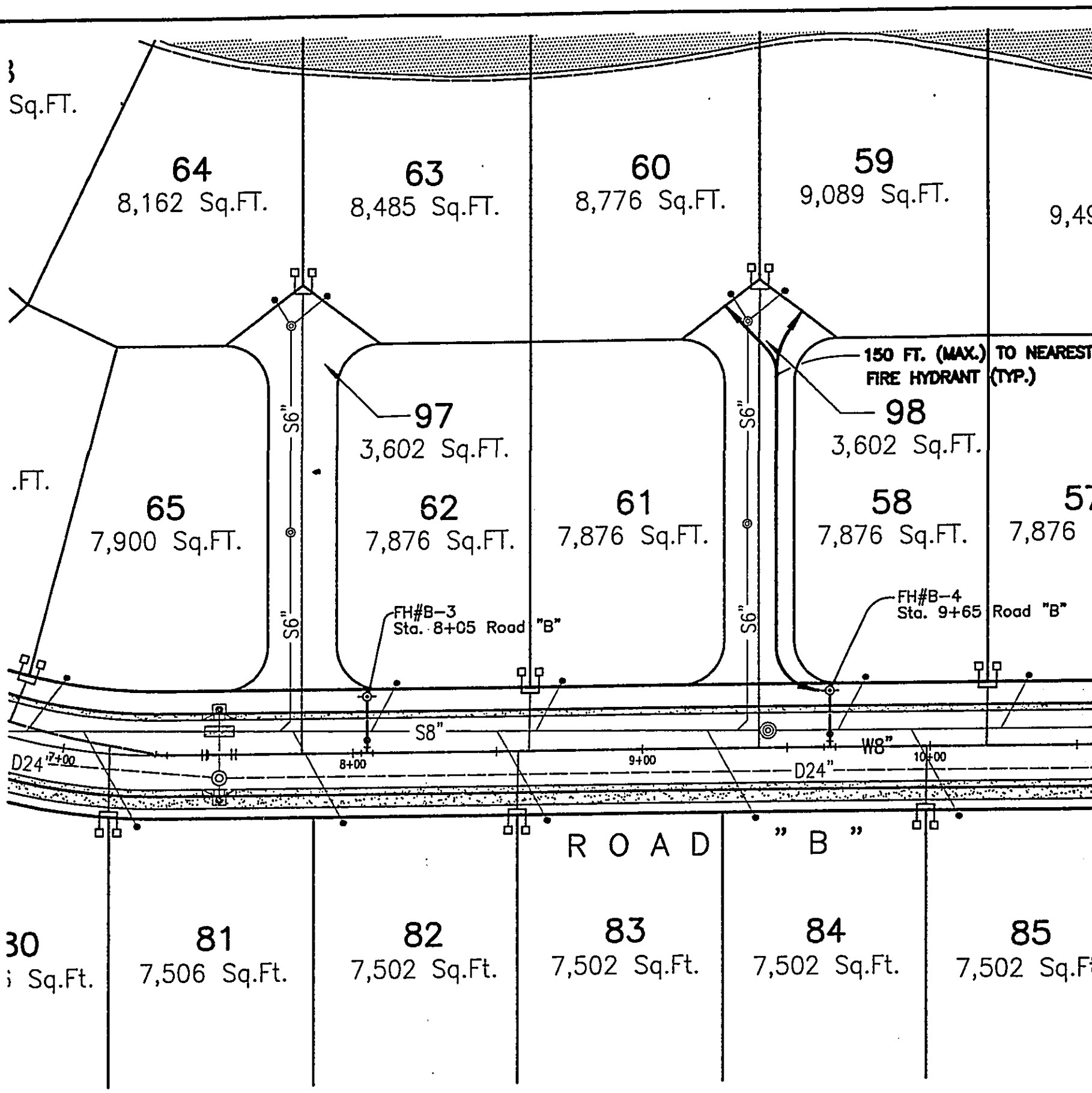
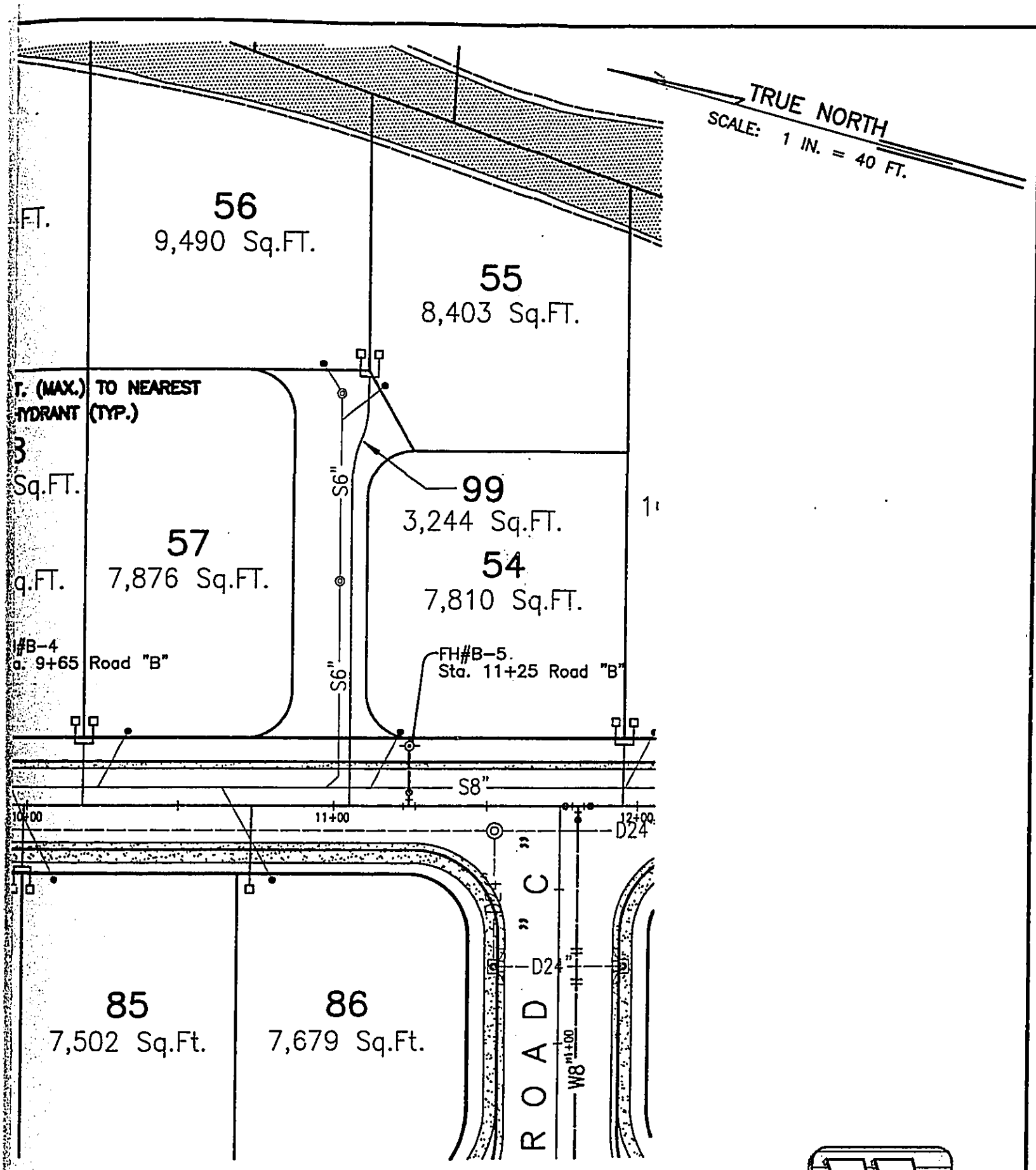


EXHIBIT – ROAD "B" FIRE HYDRANT LOCATIONS

SCALE: 1 IN. = 40 FT.



LOCATIONS

WARREN S. UNEMORI
ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

March 3, 2000

11. Department of Health

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 10, 2000

Mr. Gary Gill
Deputy Director
Department of Health
Environmental Planning Office
919 Ala Moana Blvd., Room 312
Honolulu, HI 96814

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated February 3, 2000

Dear Mr. Gill:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated February 3, 2000, he requested that we respond to you for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"10. Department of Health (DOH) - How will a solid waste management plan be implemented? What and how will polluted runoff, vector, water pollution, fugitive dust, and noises be controlled? The DOH also recommended holding a public information meeting in the surrounding community to describe the project and potential environmental impacts, and to respond to concerns relating to the project. Please provide this Department with your response to the Department of Health's concerns and issues."

Response

The Solid Waste Management Plan has been prepared and is hereby issued to the Department of Health. To summarize, the developer's Solid Waste Manage Plan includes the following actions:

- *"o The dry brush will be grubbed and hauled to a properly permitted recycling facility such as Campaign Recycle Maui.*
- *o The kiawes will be offered to various individuals for use as firewood. Any remaining kiawe waste will be composted on site for future*

landscape use or will be deposited to a properly recycling facility.

- *Any discarded vehicles or miscellaneous items will be taken to Maui Scrap Metal or any properly permitted recycling facility.*

- *We will at all times try to recycle any materials found during site construction. There will be no exporting of soil as the sitework requires importing fill material."*

As shown in the attached full-size Construction Plan Sheets "37" and "38", a Best Management Practice program (for dust and erosion control) has been developed as follows:

"Best Management Practices

1. Erosion and Sediment Control Practices

A. Construction Management

(1) Grading operations will be planned so as to minimize time of construction

(2) Grading operations will be planned so as to minimize the size of the disturbed area. The area grubbed shall not extend beyond what will actually be required for grading

B. Stabilization Techniques

(1) Existing ground cover shall not be destroyed, removed or disturbed more than 7 calendar days prior to the start of grading operations

(2) Areas that remain unfinished for more than 15 calendar days shall be hydromulched to provide temporary soil stabilization

(3) After achieving finished grades, all slopes and exposed areas shall be permanently stabilized by hydromulching with grass seed as soon as practicable.

C. Structural Controls

(1) Silting basins will be constructed upstream of discharge points to remove sediment from onsite runoff prior to discharge into existing storm drains

(2) Drainage swales will be constructed to intercept onsite runoff and direct it into silting basins.

(3) When needed, additional silt fences, berms, cutoff ditches will be constructed to supplement the erosion control measures depicted on the grading plan

D. Inspection and Maintenance Procedures

All control measures will be inspected and repaired as necessary. Inspections will be performed at least weekly in dry periods, and within 24 hours after any rainfall 0.5 inches or greater over a 24-hour period. Control measures will be checked daily during periods of prolonged rainfall.

2. Other Pollution Control Practices

Maintenance and fueling of construction equipment will be performed only in designated areas enclosed by a containment berm constructed so as to contain spills and prevent storm water runoff from carrying pollutants into downstream properties."

Vector control will be performed by Bugman, Inc., who have been retained to provide this service by the developer. See the attached copy of this authorization correspondence.

Mark Spencer of Spencer Homes, Inc., has already met with the Kihei Community Association Planning Committee on March 6, 2000, to discuss the Ke Alii Subdivision as well as other future Spencer Home projects in the Kihei-Wailea area.

Please feel free to call me at (808) 242-4403 if you have any questions or comments.

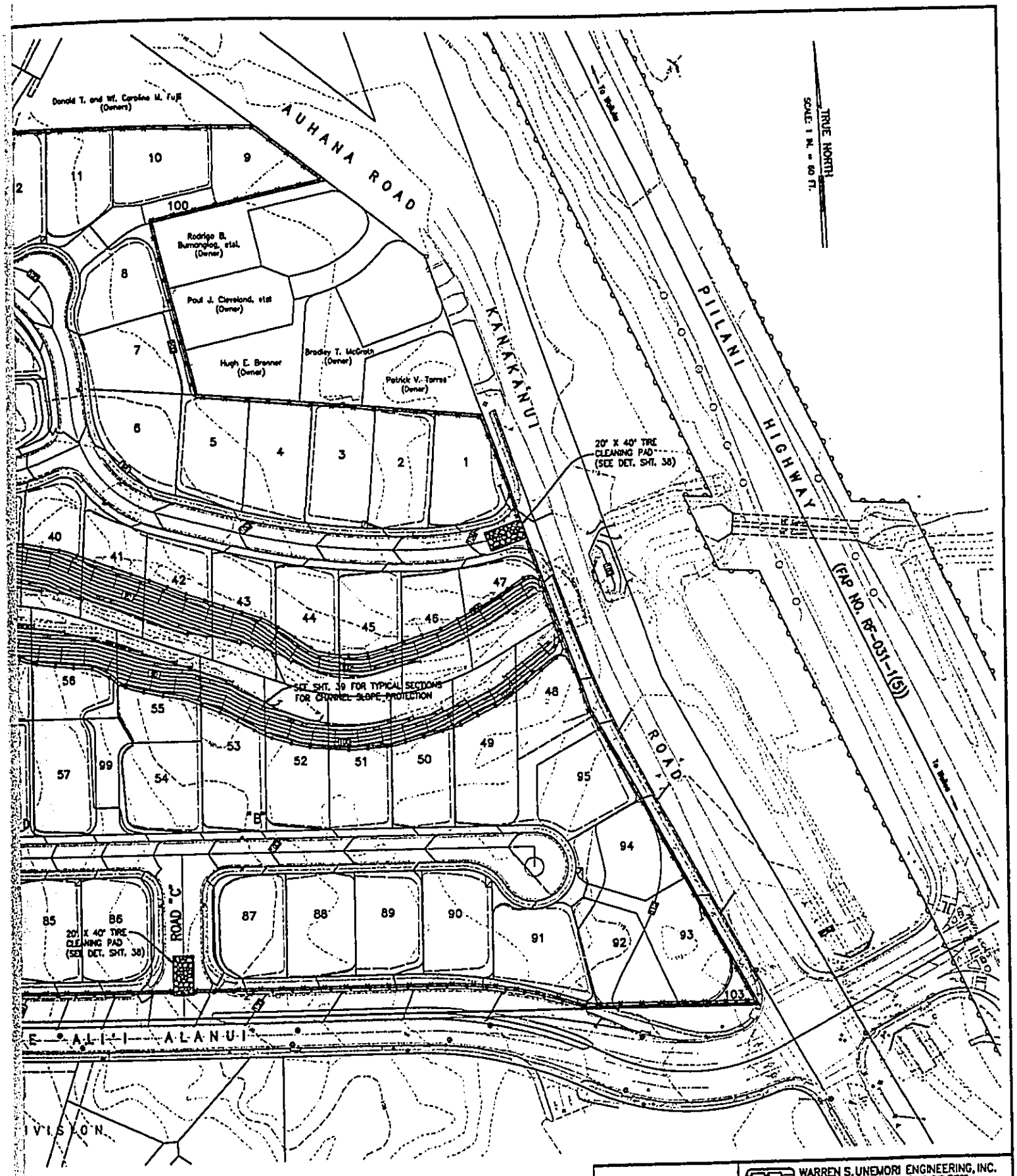
Very truly yours,

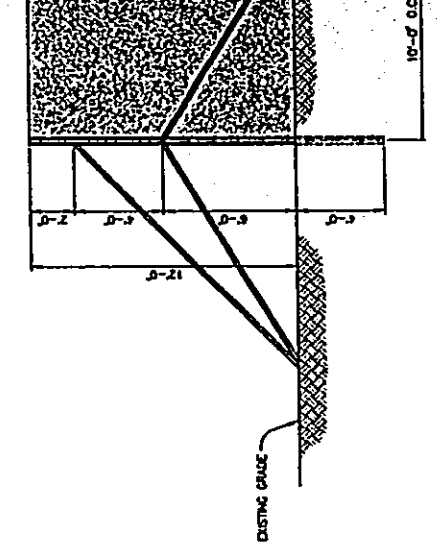
Alan L. Unemori
Vice-President

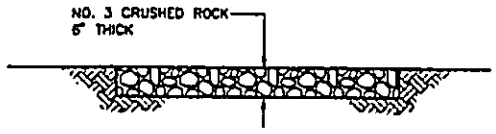
cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

D:\WP61DOCS\KEALII19.DOC


Kacor Realty Inc. (Owner)
Khai Lutheran Church (Owner)
Lee E. Conner, etal. (Owner)
D.S. and Wf. Kathleen Robertson (Owners)
John A. Byrne, etal. (Owner)
Vincent J. Stigliano (Owner)
Wallace H. and Wf. Gladys H. Fujii (Owners)
Donald T. and Wf. Caroline M. Fujii (Owners)
Unicorn Live Lobster Co., Inc. (Owner)
United Realty Inc. (Owner)
WC Maui Coast LLC (Owner)
White Sands Maui Dev. Inc. (Owner)
Kaole Limited Partners (Owner)
FILTER BERM (SEE DET. SHT. 38)
96 PARK-/ DETENTION BASIN
ROAD "A"
ROAD "B"
ROAD "C"
ROAD "D"
ROAD "E"
20' X 40' TIRE CLEANING PAD (SEE DET. SHT. 38)
K E A L I I A L A
K A M A O L E H E I G H T S S U B D I V I S I O N
LEGEND:
FINISH GRADE W/ ELEVATION
EXISTING GRADE W/ ELEVATION
TOP OF BANK
SILT FENCE OR FILTER BERM (SEE DET. SHT. 38)
DUST FENCE (SEE DET. SHT. 38)
CHANNEL SLOPE PROTECTION (SEE DET. SHT. 39 FOR OPTIONS)
TIRE CLEANING PAD (SEE DET. SHT. 38)
FILTER BERM (SEE DET. SHT. 38)
GEOCELL ON SLOPES GREATER THAN 2:1


AUHANA ROAD
KANAKANUI
PILILANI HIGHWAY
(FAP NO. RF-031-1(5))
TRUE NORTH
SCALE: 1 IN. = 60 FT.
To Kihei
To Makena
Donald T. and Wf. Caroline M. Fujii (Owner)
Rodrigo B. Bumanglag, etal (Owner)
Paul J. Cleveland, etal (Owner)
Hugh E. Brenner (Owner)
Bradley T. McGrath (Owner)
Patrick V. Torres (Owner)
20' X 40' TIRE CLEANING PAD (SEE DET. SHT. 38)
SEE SHT. 39 FOR TYPICAL SECTIONS FOR CHANNEL SLOPE PROTECTION
ROAD "B"
ROAD "C"
E A L I ' I A L A N U I
VISION
DARREN T. UNEMORI
LICENSED PROFESSIONAL ENGINEER
NO. 7937-C
HAWAII, U.S.A.
SIGNATURE
DATE
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
NO.
DESCRIPTION
DATE
WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS/LAND SURVEYORS
WELLS STREET PROFESSIONAL CENTER, SUITE 403
2145 WELLS STREET, WAILUKU, MAUI, HAWAII 96793
KE ALI'I SUBDIVISION
KIHEI, MAUI, HAWAII
TITLE EROSION CONTROL PLAN
DESIGNED BY SRA
DRAWN BY LCO
CHECKED BY DTU
APPROVED BY WSU
SCALE 1 IN. = 60 FT.
JOB NUMBER 99054
DATE 2-10-00
SHEET 37
OF SHEETS


10'-0" O.C.
FILTER FABRIC (DUST SCREEN)
2" x 4" NAILED FLAT TO SCREEN FABRIC MATERIAL TO POSTS
2'-0"
3'-0"
6'-0"
3'-0"
12'-0"
EXISTING GRADE

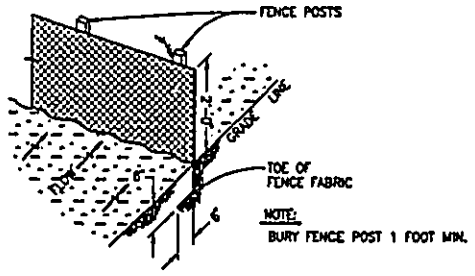


DETAIL -- TIRE CLEANING PAD

NOT TO SCALE

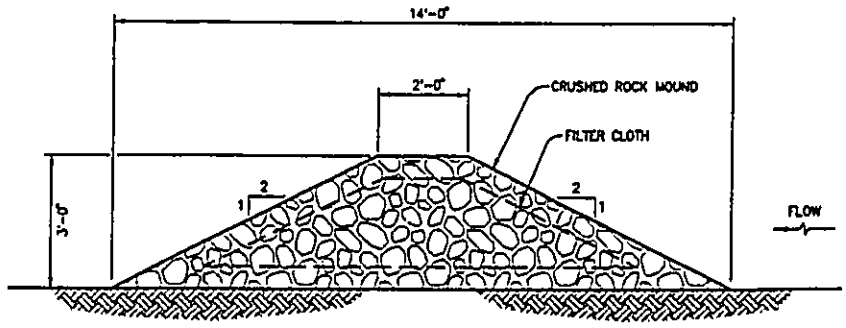
NOTE:

1. CONTRACTOR HAS RIGHT TO INTERCHANGE FILTER BERM FOR SILT FENCE WHERE SPECIFIED ON PLAN.
2. CONTRACTOR TO SURROUND PERIMETER OF BASEYARD WITH FILTER BERM ONCE LOCATION IS SPECIFIED.
3. CONTRACTOR TO MAINTAIN ALL EROSION CONTROL MEASURES IN GOOD WORKING CONDITION AT ALL TIMES.



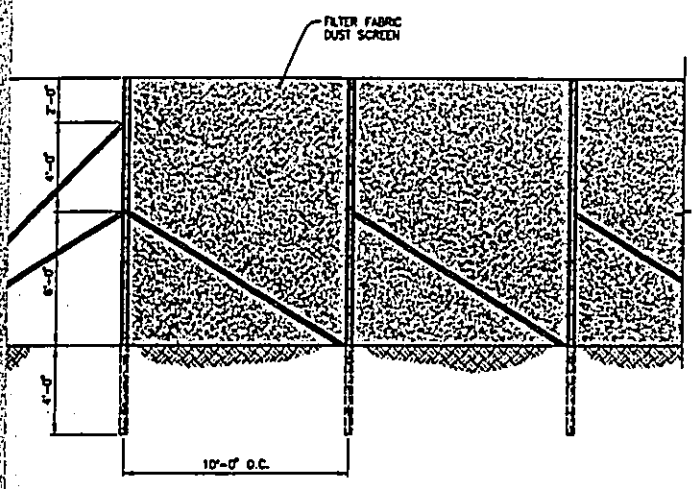
DETAIL -- SILT FENCE

NOT TO SCALE

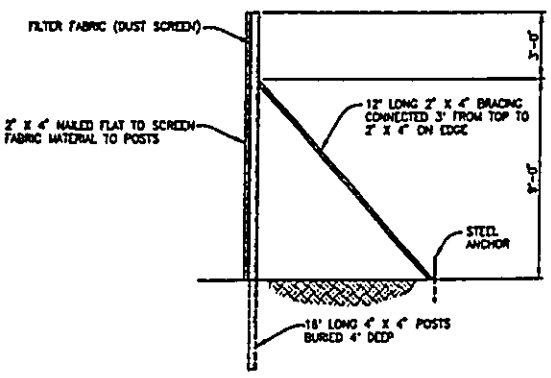


DETAIL -- FILTER BERM

SCALE: 1/2" = 1'-0"



FRONT ELEVATION



SIDE ELEVATION

DETAIL -- DUST FENCE

SCALE: 1/4 IN. = 1 FT.

BEST MANAGEMENT PRACTICES

1. EROSION AND SEDIMENT CONTROL PRACTICES

   A. CONSTRUCTION MANAGEMENT
      1) GRADING OPERATIONS WILL BE PLANNED SO AS TO MINIMIZE TIME OF CONSTRUCTION.
      2) GRADING OPERATIONS WILL BE PLANNED SO AS TO MINIMIZE SIZE OF THE DISTURBED AREA. THE AREA GRUBBED SHALL NOT EXTEND BEYOND WHAT WILL ACTUALLY REQUIRED FOR GRADING.

   B. STABILIZATION TECHNIQUES
      1) EXISTING GROUND COVER SHALL NOT BE DESTROYED, REMOVED OR DISTURBED MORE THAN 7 CALENDAR DAYS PRIOR TO THE START OF GRADING OPERATIONS.
      2) AREAS THAT REMAIN UNFINISHED FOR MORE THAN 15 CALENDAR DAYS SHALL BE HYDROMULCHED TO PROVIDE TEMPORARY SOIL STABILIZATION.
      3) AFTER ACHIEVING FINISHED GRADES, ALL SLOPES AND EXPOSED AREAS SHALL BE PERMANENTLY STABILIZED BY HYDROMULCHING WITH GRASS SEED AS SOON AS PRACTICABLE.

   C. STRUCTURAL CONTROLS
      1) SILTING BASINS WILL BE CONSTRUCTED UPSTREAM OF DISCHARGE POINTS TO REMOVE SEDIMENT FROM ONSITE RUNOFF PRIOR TO DISCHARGE INTO EXISTING STORM DRAINS.
      2) DRAINAGE SWALES WILL BE CONSTRUCTED TO INTERCEPT ONSITE RUNOFF AND DIRECT IT INTO SILTING BASINS.
      3) WHEN NEEDED, ADDITIONAL SILT FENCES, BERMS, CUTOFF DITCHES WILL BE CONSTRUCTED TO SUPPLEMENT THE EROSION CONTROL MEASURES DEPICTED ON THE GRADING PLAN.

   D. INSPECTION AND MAINTENANCE PROCEDURES

      ALL CONTROL MEASURES WILL BE INSPECTED AND REPAIRED AS NECESSARY. INSPECTIONS WILL BE PERFORMED AT LEAST WEEKLY IN DRY PERIODS, AND WITHIN 24 HOURS AFTER ANY RAINFALL 0.5 INCHES OR GREATER OVER A 24-HOUR PERIOD. CONTROL MEASURES WILL BE CHECKED DAILY DURING PERIODS OF PROLONGED RAINFALL.

2. OTHER POLLUTION CONTROL PRACTICES

   MAINTENANCE AND FUELING OF CONSTRUCTION EQUIPMENT WILL BE PERFORMED ONLY IN DESIGNATED AREAS ENCLOSED BY A CONTAINMENT BERM CONSTRUCTED SO AS TO CONTAIN SPILLS AND PREVENT STORM WATER RUNOFF FROM CARRYING POLLUTANTS INTO DOWNSTREAM PROPERTIES.

DARREN T. UNEMORI
LICENSED PROFESSIONAL ENGINEER
NO. 7937-C
HAWAII, U.S.A.

SIGNATURE DATE

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

LETTER	DESCRIPTION	DATE

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS/LAND SURVEYORS
WELLS STREET PROFESSIONAL CENTER, SUITE 403
2145 WELLS STREET, WAILUKU, MAUI, HAWAII 96793

KE ALI'I SUBDIVISION

KIHEI, MAUI, HAWAII

TITLE EROSION CONTROL NOTES AND DETAILS

DESIGNED BY: CRR	CHECKED BY: DTU	JOB NUMBER: 99054.00	SHEET: 38
DRAWN BY: DPT	APPROVED BY: WSU	DATE: 2-29-00	OF SHEETS
SCALE: 1 IN. = 40 FT.			

SPENCER HOMES, INC.
Building in Hawaii Since 1964

P.O. Box 97
Kihei , HI 96753
Telephone (808) 891-8770
Fax (808) 891-8771

Solid Waste Management Plan
Spencer Homes, Inc.
Project : Ke Alii Subdivision
T.M.K. : 3-9-18:01

Description of Site: The site is mostly barren with the exception of some low dry brush, a few scattered small kiawe trees and a few discarded vehicles/miscellaneous.

Plan of Action:

- The dry brush will be grubbed and hauled to a properly permitted recycling facility such as Campaign Recycle Maui.
- The kiawes will be offered to various individuals for use as firewood. Any remaining kiawe waste will be composite on site for future landscape use or will be deposited to a properly recycling facility.
- Any discarded vehicles or miscellaneous items will be taken to Maui Scrap Metal or any properly permitted recycling facility.
- We will at all times try to recycle any materials found during site construction. There will be no exporting of soil as the sitework requires importing fill material.

cc: Warren Unemori Engineering, Inc.
file

Printed: 03/06/00 at 12:32 PM
Solid Waste Management

SPENCER HOMES, INC.

Building in Hawaii Since 1964

P.O. Box 97
Kihei , HI 96753
Telephone (808) 891-8770
Fax (808) 891-8771

March 6, 2000

To Whom It May Concern:

This letter confirms that we are contracting Bugman, Inc. for the vector control of the proposed Ke Alii Subdivision, located at Ke Alii Alanui Rd., in Kihei, Maui, with TMK No. 3-9-18:01.

Sincerely yours,

Mark Spencer
Project Manager

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

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

'00 FEB -9 P1:04

In reply, please refer to:
File:

February 3, 2000

99-262/epo

Mr. John E. Min, Director
Planning Department
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Dear Mr. Min:

Subject: Special Management Area Permit Application
(SM1-990022)
Ke Ali`I Subdivision (Spencer Homes)
Kihei, Maui
TMK: 3-9-18: 1

Thank you for allowing us to review and comment on the subject permit application. We have the following comments to offer:

Wastewater

All buildings generating wastewater shall connect to the municipal sewer system serving the area.

Solid Waste

The Department of Health suggests that the applicant/developer create a solid waste management plan prior to construction. A solid waste management plan should address opportunities for waste reduction and recycling during construction and use of the facility. Essential elements of such a plan are, at a minimum:

1) A Waste Audit - to determine what types of waste may be generated;

2) A Community Recycling Service Assessment - to investigate what materials are recoverable in the community surrounding that facility; what recycling programs are

mandatory; and how recycling companies in the area prefer to collect the recyclable materials.

3) A Feasibility Study - to examine what recycling and waste minimization programs could be put in place to minimize waste generation and maximize recycling at the project, and to accommodate the necessary recycling and waste minimization infrastructure in the design and planning stage. Some waste minimization suggestions are attached for your review and consideration.

4) A Recycled Content Building Materials Assessment - to determine which recycled content materials could be used in the construction of the project or during its use to support recycled material markets and to "close the loop." Plastic lumber, compost for landscaping, glasphalt for paving, etc., could all be specified for use in the project.

Should you have any questions on these comments, please contact Ms. Carrie McCabe or Mr. Lane Otsu of the Office of Solid Waste Management at 586-4240.

Polluted Runoff Control

We recommend that nonpoint source pollution control concerns be addressed and that there be no increase in polluted runoff from the project. The construction of the subject project will greatly increase the acreage of impervious area, thereby increasing storm water runoff volumes. The State has developed *Hawaii's Coastal Nonpoint Pollution Control Program Management Plan*. This management plan addresses proper planning, design, and use of Best Management Practices to substantially reduce polluted runoff (nonpoint source pollution) generated by different activities. Please refer to the management plan (pages III-101 to III-162) for urban management measures. The management plan can be obtained from the Coastal Zone Management Program (587-2877) in the Office of Planning, Department of Business and Economic Development and Tourism.

The following are suggested management measures to consider:

1. For New Development

Please refer to *Hawaii's Coastal Nonpoint Pollution Control Program Management Plan* (pages III-104 to III-108). The New Development Management Measure should

be achieved by reducing total suspended solid loadings by 80% once the site is permanently stabilized.

2. For Site Development

   a) Please refer to the management plan, pages III-112 to III-117;

   b) Within the conceptual landscape plan, include open "green areas" that will slow down and retain stormwater runoff. For example, the lands set aside for parks could be constructed as sediment basins which would retain and prevent polluted runoff from entering coastal waters; and

   c) Limit disturbance of natural drainage features and vegetation.

3. For Construction Site Erosion and Sediment Control

   a) Please refer to the management plan, pages III-117 to III-123;

   b) Conduct grubbing and grading activities during the low rainfall months (April-October);

   c) Grub areas sequentially so that only a small portion of the site is bare at any time;

   d) Use vegetation, mulch, gravel, and porous pavement wherever feasible to maximize the acreage of pervious areas; and

   e) Replant or cover bare areas as soon as grading or construction is completed. New plantings will require soil amendments, fertilizers and temporary irrigation to become established. Use high planting and/or seeding rates to ensure rapid stand establishment.

4. Pollution Prevention

   a) We encourage the implementation of pollution prevention and education programs to reduce nonpoint source pollution. The City and State can be assisted in their efforts in environmental education by providing new homeowners educational packets that contain information on reducing nonpoint source pollution; proper storage, use, and disposal of

household chemicals; and proper disposal of pet excrement; and

b) We encourage large developments to imprint the message "Dump No Waste, Goes to Ocean" over storm drains to remind homeowners not to illegally dump materials in the storm drain system.

Any questions concerning these polluted runoff control comments should be directed to the Clean Water Branch, Polluted Runoff Control Program at 586-4309.

Vector Control

The property may be harboring rodents which will be dispersed to the surrounding areas when any buildings are demolished or the site is cleared. The applicant is required by Hawaii Administrative Rules, Chapter 11-26, "Vector Control" to eradicate any rodents prior to demolition or site clearing activities and to notify the Department of Health by submitting Form VC-12 to the local Vector Control Branch when such action is taken. Rodent traps and/or rodenticides should be set out on the project site for at least a week or until the rodent activity ceases.

The Vector Control Branch phone numbers are as follows:

Oahu: 831-6767
Kauai: 241-3306
Hawaii--Hilo: 974-4238, Kona: 322-7011
Maui (includes Molokai and Lanai): 873-3560

Water Pollution

1. The applicant should contact the Army Corps of Engineers to identify whether a federal permit (including a Department of Army permit) is required for this project. If a federal permit is required, then a Section 401 Water Quality Certification is required from the State Department of Health, Clean Water Branch.

2. A National Pollutant Discharge Elimination System (NPDES) general permit is required for the following discharges to waters of the State:

   a. Storm water discharges relating to construction activities, such as clearing, grading, and excavation, for projects equal to or greater than five acres;

b. Storm water discharges from industrial activities;

c. Construction dewatering activities;

d. Noncontact cooling water discharges less than one million gallons per day;

e. Treated groundwater from underground storage tank remedial activities;

f. Hydrotesting water;

g. Treated effluent from petroleum bulk stations and terminals; and

h. Treated effluent from well drilling activities.

Any person requesting to be covered by a NPDES general permit for any of the above activities should file a Notice of Intent with the Department's Clean Water Branch at least 30 days prior to commencement of any discharge to waters of the State.

Any questions regarding these comments should be directed to Mr. Denis Lau, Branch Chief, Clean Water Branch at 586-4309.

Control of Fugitive Dust

There is a significant potential for fugitive dust emissions during the construction activities. Implementation of adequate dust control measures during all phases of construction is warranted.

Construction activities must comply with provisions of Hawaii Administrative Rules, Chapter 11-60.1, "Air Pollution Control," Section 11-60.1-33, Fugitive Dust.

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

a. Planning the different phases of construction, focusing on minimizing the amount of dust generating materials and activities, centralizing on-site vehicular traffic routes, and locating potentially dusty equipment in areas of the least impact;

b. Providing an adequate water source at the site prior to start up of construction activities;

c. Landscaping and rapid covering of bare areas, including slopes, starting from the initial grading phase;

d. Controlling of dust from shoulders and access roads;

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

f. Controlling of dust from debris being hauled away from project site.

If you have any questions regarding these issues on fugitive dust, please contact the Clean Air Branch at 586-4200.

Noise Concerns

1. Activities associated with the construction phase of the project must comply with the Department of Health's Administrative Rules, Chapter 11-46, "Community Noise Control."

   a. The contractor must obtain a noise permit if the noise levels from the construction activities are expected to exceed the allowable levels of the rules as stated in Section 11-46-6(a).

   b. Construction equipment and on-site vehicles requiring an exhaust of gas or air must be equipped with mufflers as stated in Section 11-46-6(b)(1)(A).

   c. The contractor must comply with the requirements pertaining to construction activities as specified in the rules and the conditions issued with the permit as stated in Section 11-46-7(d)(4).

2. Heavy vehicles travelling to and from the project site must comply with the provisions of the Administrative Rules, Chapter 11-42, "Vehicular Noise Control for Oahu."

Should there be any questions on this matter, please call Mr. Jerry Haruno, Environmental Health Program Manager of the Noise, Radiation and Indoor Air Quality Branch at 586-4701.

General Comments

The Department of Health recommends that the developer and/or contractor be required to hold a public informational meeting in the surrounding community to describe the project and

potential environmental impacts and to respond to concerns relating to the project.

Sincerely,

GARY GILL
Deputy Director for
Environmental Health

Attachment

c: WWB
OSWM
CWB
VCB
CAB
NR&IAQB
MDHO

ATTACHMENT

1) WASTE REDUCTION OPPORTUNITIES DURING CONSTRUCTION/DEMOLITION

GREENWASTE COMPOSTING
CONCRETE OR ASPHALT RECYCLING--ROCK & BOULDER SEPARATION
SALVAGE OF DIMENSIONAL LUMBER
METALS RECOVERY
SALVAGE BY LOCAL NON-PROFIT
HAZWASTE MINIMIZATION--ESPECIALLY FOR SUB-CONTRACTORS

2) WASTE REDUCTION DURING USE OF FACILITY

Include in the design and layout of the facility

DESIGN AND OPERATIONAL REQUIREMENTS

CONSIDER SPACIAL REQUIREMENTS FOR RECYCLING AT INTERNAL COLLECTION AND EXTERNAL STORAGE AREAS

REVIEW OPERATIONAL REQUIREMENTS WITH MAINTENANCE AND CUSTODIAL STAFF

PROVIDE COLLECTION, MULCHING AND/OR COMPOSTING CAPABILITIES FOR SEPARATED GREENWASTE

DISCUSS EQUIPMENT AND CONTAINER REQUIREMENTS WITH HAULERS AND VENDORS

CONSIDER MULTI-MATERIAL CHUTES IN HIGH RISES

GREENWASTE COMPOSTING - allocate space for baler, or extra bin, or recycling containers, composting area, etc.

ENJAMIN J. CAYETANO
GOVERNOR

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

ALFRED M. ARENSDORF, M.D.
DISTRICT HEALTH OFFICER

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, MAUI, HAWAII 96793

'00 JAN 26 P2:59

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

January 24, 2000

Mr. John E. Min
Director of Planning
Planning Department
County of Maui
250 South High Street
Wailuku, Hawai'i 96793

Dear Mr. Min:

Subject: Ke Alii Subdivision – Spencer Homes
TMK: (2) 3-9-018:001
SM1 990022

Thank you for the opportunity to comment on the special management area permit.

Comments from this office were transmitted to our Honolulu Office. A coordinated response is forthcoming.

Should you have any questions, please call me at 984-8230.

Sincerely,

HERBERT S. MATSUBAYASHI
District Environmental Health Program Chief

cc: Art Bauckham, Env Planning Office

12. Department of Accounting and General Services

BENJAMIN J. CAYETANO
GOVERNOR

2000 JAN 14 P12:49

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

RAYMOND H. SATO
COMPTROLLER

RESPONSE REFER TO:

FILE NO. _____

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

January 13, 2000

MEMORANDUM

TO: Mr. John E. Min, Planning Director
Maui County Planning Department

ATTN.: Mr. Clayton Yoshida, Staff Planner

FROM: Randall M. Hashimoto, State Land Surveyor

SUBJECT: I.D.: SM1 990022
TMK: 3-9-018:001
Project Name: Ke Alii Subdivision - Spencer Homes
Applicant: Warren Unemori Engineering, Inc.

The subject proposal has been reviewed and confirmed that no Government Survey Triangulation Stations and Benchmarks are affected. The Survey Division has no objections to the proposed project.

Should you have any questions, please call me at 586-0390.

Randall M. Hashimoto

RANDALL M. HASHIMOTO
State Land Surveyor

13. Maui Electric Company, Ltd.

Maui Electric Company, Ltd. • 210 West Kamehameha Avenue • PO Box 398 • Kahului, Maui, ...

'00 JAN -4 P4:12

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

January 3, 2000

Mr. John E. Min
County of Maui
Department of Planning
250 South High Street
Wailuku, Maui, Hawaii 96793

Subject: Application for State Special Management Area Permit for Ke Ali'i Subdivision
Kihei, Maui, Hawaii
TMK: 3-9-018: 001

Dear Mr. Min,

Thank you for the opportunity to review and comment on the subject project.

Maui Electric Company's distribution facilities are located in the vicinity of the proposed project area. As stated in Chapter 5 Section IV Item 7, the electrical infrastructure must be installed to meet the power requirements of this proposed project as confirmed per Chapter 5 Section V Subsection D Item 5.

We have no further comments at this time. However, we suspect that our review of the subject project's power requirements must be obtained to complete this project. We would like to take this opportunity to mention that a design submittal and project timeframe from the project's consultant would be greatly appreciated to provide our electrical requirements.

Should you have any further questions, please contact me at (808) 871-2366.

Sincerely,

Gregorysenn Kauhi
Distribution Engineering Supervisor

GK:gk

14. Office of Hawaiian Affairs

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

'00 JAN -7 P1:01

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

January 3, 2000

Mr. John E. Min, Director
Dept. of Planning
County of Maui
250 South High Street
Wailuku, Maui, Hawai'i 96793

PA# 349

Subject: Application for Special Management Area Permit for Ke Ali'i Subdivision – Spencer Homes (96-Lot Single Family Subdivision on 24 acres on Kanakanui Road and Ke Ali'i Alanui)
TMK: 3-9-018: 001

Dear Mr. Min,

Thank you for the opportunity to review the above-referenced application. At this time the Office of Hawaiian Affairs has no comment on this project. We acknowledge the findings of the State Historic Preservation Division of the Department of Land and Natural Resources in preserving site 3541 and monitoring any land alterations in the northwest part of the parcel.

If you have any questions, please contact Ken R. Salva Cruz, Policy Analyst, at 594-1847.

Sincerely,

Colin C. Kippen, Jr.
Deputy Administrator

cc: Board of Trustees
Maui CAC

15. Department of Water Supply

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

January 14, 2000

Mr. David Craddick
Director
Department of Water Supply
COUNTY OF MAUI
P. O. Box 1109
Wailuku, HI 96793

Re: Ke Alii Subdivision - Spencer Homes, TMK: 3-9-018:001, SMA Application, SM1 9900022

Dear Mr. Craddick:

Thank you for your comments on the Ke Alii Subdivision encouraging consideration of water conservation measures as outlined in your letter dated January 6, 2000, to Mr. John Min, Director, Planning Department.

Your letter has been forwarded to Mr. Jesse Spencer of Spencer Homes, and he has informed us that your recommendations will be included as part of the Homeowners' CC&Rs. Thank you.

Very truly yours,

Warren S. Unemori
President

cc John Min, Planning Department
Jesse Spencer, Spencer Homes

134

'00 JAN 10 P3:10

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
Telephone (808) 270-7816 • Fax (808) 270-7833

1949 - 1999 Celebrating 50 Years of Service

January 6, 2000

Mr. John Min, Director
County of Maui
Planning Department
250 South High Street
Wailuku, Maui, Hawaii 96793

Re: I.D.: SM1 9900022
TMK: 3-9-018:001
Project Name: Ke Alii Subdivision - Spencer Homes

Dear Mr. Min,

Thank you for the opportunity to comment on this project. The Department of Water Supply has the following comments:

The project will encompass 96 single-family residential units. Using State per unit standards, total consumption would be approximately 57,600 gpd. However, consumption in Kihei tends to be higher than State standards. Based on empirical data for Kihei area total consumption would be approximately 80,700 gpd. Domestic, fire, and irrigation calculations will be reviewed in detail during the development process.

The applicant is required to provide fire and domestic service according to standards. Actual fire demand for structures is determined by fire flow calculations performed by a certified engineer. DWS-approved fire flow calculation methods include:"Fire Flow" - Hawaii Insurance Bureau, 1991. The applicant is encouraged to contact our engineering division as soon as possible at 270-7835 with respect to required system improvements.

This project is served by the Central Maui System. The major source of water for this system is the Iao Aquifer. Rolling annual average groundwater withdrawals from the Iao Aquifer as of December 1, 1999 were 18.655 MGD. The regulatory sustainable yield of this aquifer is 20 mgd. On August 13, 1997, the State Commission on Water Resource Management (CWRM) elected not to designate Iao Aquifer as a State Groundwater Management Area. However, if rolling annual average withdrawals exceed 20 mgd, CWRM will designate Iao Aquifer. Two wells in North Waihee, pumping at a combined rate of 1.5 mgd, were brought on-line in July 1997. We anticipate completion of another well to produce about 1 MGD by the first quarter of

2000. The Department is continuing to implement a plan to bring new sources on-line and to mitigate withdrawals. No guarantee of water is granted or implied as a result of these comments. Water availability will be reviewed at the time of application for meter or meter reservation.

The applicant is encouraged to consider utilizing brackish and/or reclaimed water for irrigation of landscaping purposes. This measure would significantly reduce demand on the potable water system. To further conserve water resources, the applicant should refer to the attached documents and consider these measures:
Eliminate Single-Pass Cooling: Single-pass, water-cooled systems should be eliminated per Maui County Code Subsection 14.21.20. Although prohibited by code, single-pass water cooling is still manufactured into some models of air conditioners, freezers, and commercial refrigerators.
Utilize Low-Flow Fixtures and Devices: Maui County Code Subsection 16.20A.680 requires the use of low flow water fixtures and devices in faucets, showerheads, urinals, water closets and hose bibs. Water conserving washing machines, ice-makers and other units are also available.
Maintain Fixtures to Prevent Leaks: A simple, regular program of repair and maintenance can prevent the loss of hundreds or even thousands of gallons a day. Refer to the attached handout, "The Costly Drip". The applicant should establish a regular maintenance program.
Use Climate-adapted Plants: The project site is located in "Maui County Planting Plan" - Plant Zones 3 and 5. Please refer to the "Maui County Planting Plan", and to the attached documents. We encourage the applicants to consider using climate-adapted and salt-tolerant native plants. Native plants adapted to the area, conserve water and further protect the watershed from degradation due to invasive alien species.
Prevent Over-Watering By Automated Systems: For all common areas, provide rain-sensors on all automated irrigation controllers. Check and reset controllers at least once a month to reflect the monthly changes in evapotranspiration rates at the site. As an alternative, provide the more automated, soil-moisture sensors on controllers.

Should you have any questions, please call our Water Resources and Planning Division at 270-7199.

Sincerely,

David Craddick
Director

cmb

C:\WPdocs\Permcomm\KeAlii.wpd

cc: engineering division
applicant, with attachments:

1) "The Costly Drip"
2) "Maui County Planting Plan."
3) Ordinance 2108 - "An ordinance amending Chapter 16.20 of the Maui County Code, pertaining to the plumbing code"

By Water All Things Find Life

16. Department of Education

BENJAMIN J. CAYETANO
GOVERNOR

PAUL G. LeMAHIEU, Ph.D.
SUPERINTENDENT

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

January 13, 2000

Mr. John E. Min
Planning Director
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Dear Mr. Min:

Subject: Ke Alii Subdivision – SMi 990022

The Department of Education has no comment on the subject Special Management Area permit application.

Thank you for the opportunity to respond.

Very truly yours,

Paul G. LeMahieu, Ph.D.
Superintendent of Education

PLeM:hy

cc: C. Ito, OBS
P. Brown, MDO

XI. COMMENTS RECEIVED ON THE DRAFT EA

XI. COMMENTS RECEIVED ON THE DRAFT EA

A. ENVIRONMENTAL CENTER, UNIVERSITY of HAWAII (at Manoa)

A letter from the Environmental Center, University of Hawaii at Manoa was received by fax on May 8, 2000, and responded to on May 9, 2000. Copies of both letters follow.

University of Hawai'i at Mānoa

Environmental Center
A Unit of Water Resources Research Center
2550 Campus Road • Crawford 317 • Honolulu, Hawai'i 96822
Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

May 2, 2000
EA: 00208

Mark Spencer
Spencer Homes, Inc.
4372 W. Waiola Street
Kihei, Hawaii 96753

Dear Mr. Spencer:

Ke Ali'i Subdivision
Draft Environmental Assessment
Kihei, Hawaii

Spencer Homes, Inc. proposes to subdivide an undeveloped and vacant 24 acre lot at the northwest corner of Kanakanui Road and Ke Ali'i Alanui into 95 single family residential lots. Included in the development plans is the widening of the existing Ke Ali'i Alanui right of way to provide bike lanes and shoulders, and the widening of Kanaknui Road along the property. In addition, A 22-foot wide strip of land along the makai boundary will be set aside for a future road. The existing culvert on Kanakanui Road will be expanded to handle runoff for a 100-year recurrence, and a park/detention basin will be constructed to maintain runoff at current levels. New infrastructure is also planned. Within the subdivision, a street loop will be constructed.

This review was prepared with the assistance of Paul Eckern, Agron. and Soil Science, Emeritus, Karl Kim, DURP, and Jolie Wanger, Environmental Center.

Specific Major Comments

Alternatives

The alternatives section, which includes only two alternatives (Action and No-Build), is inadequate. HAR section 11-200-10(6) requires the identification and discussion of alternatives in the EA. We believe that other, reasonable uses for this property or alternative options for design could be considered. For this reason, we believe that this EA should not be accepted, until a more thorough discussion of alternatives is included.

Impacts to Infrastructure (Drainage)

In general, we would like to see a more thorough discussion on the impacts of the drainage channel to neighboring (downstream) properties.

Concerns over the discrepancy between design discharge capacity between FEMA (3,200 cfs) and Warren S. Unemori Engineering, Inc. (1,209 cfs) from the Engineering Branch (in their correspondence) seem to have been adequately addressed in the correspondence section with the compromise requiring that "the portion of the drainage channel within the FEMA study limits" has a 100-year flow capacity of at least 3,200 cfs, and "the portion of the drainage channel between the FEMA study area and Piilani Highway shall be required to provide a 100-year flow capacity of at least 1,200 cfs..." (Letter to John Min from Warren Unemori.) This change needs to be made in the document itself, not merely in the correspondence section. Our reviewers believe it is important to use FEMA numbers, as these are the legally recognized figures. Our reviewers were unable to make determinations based on the topographic information, and suggested that one possibility would be to consider reshaping the topography to assure for the lower flow levels. Regardless how it is accomplished, we feel it is necessary to disclose in the document exactly how the applicant plans to maintain the required flow capacities.

Adverse Environmental Effects Which Cannot Be Avoided

This is quite a large project involving county road improvements and the development of 24 acres of undeveloped land. It seems reasonable to include as one of the long-term unavoidable impacts, the loss of land for other purposes. Additionally, there will surely be impacts on schools, and other public facilities by an increase of residents in the area.

Specific Minor Comments

Project Overview

This section should include specific mention of how many lots will be developed (95) and their average size.

Impacts and Mitigation Measures (Air Quality)

There is no information to back up the prediction that impacts to air quality will be Insignificant; how much more air pollution will be generated by automobile and other sources? If some projected numbers are included, we can then determine what is significant or not.

Impacts to Community Setting

There is no information on the cost of lots and who will likely buy them. Additionally, there is no discussion about the impact on schools. How many new students can the current schools accommodate?

Traffic Study

Our reviewers feel that the EA provides adequate information on traffic generated by the project site and contains what appears to be a competent analysis of some of the site-specific impacts. The document, however, is deficient in terms of identifying overall regional effects and cumulative impacts on the transportation system. More attention to safety and capacity issues as well as broader discussion of trip generators and attractors in Kihei as well as other parts of Maui should be included. Additional detail on non-motorized forms of transportation (especially pedestrian and bicycle transport) in terms of access and safety should be provided. Neighborhood generators as well as travel routes and crossing areas for pedestrians and bicyclists should also be analyzed. Opportunities for traffic calming, speed control, and enhanced intersection control should also be reviewed. In particular, travel routes to the

CORRECTION

THE PRECEDING DOCUMENT(S) HAS BEEN REPHOTOGRAPHED TO ASSURE LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

Concerns over the discrepancy between design discharge capacity between FEMA (3,200 cfs) and Warren S. Unemori Engineering, Inc. (1,209 cfs) from the Engineering Branch (in their correspondence) seem to have been adequately addressed in the correspondence section with the compromise requiring that "the portion of the drainage channel within the FEMA study limits" has a 100-year flow capacity of at least 3,200 cfs, and "the portion of the drainage channel between the FEMA study area and Piilani Highway shall be required to provide a 100-year flow capacity of at least 1,200 cfs..." (Letter to John Min from Warren Unemori.) This change needs to be made in the document itself, not merely in the correspondence section. Our reviewers believe it is important to use FEMA numbers, as these are the legally recognized figures. Our reviewers were unable to make determinations based on the topographic information, and suggested that one possibility would be to consider reshaping the topography to assure for the lower flow levels. Regardless how it is accomplished, we feel it is necessary to disclose in the document exactly how the applicant plans to maintain the required flow capacities.

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Our reviewers feel that the EA provides adequate information on traffic generated by the project site and contains what appears to be a competent analysis of some of the site-specific impacts. The document, however, is deficient in terms of identifying overall regional effects and cumulative impacts on the transportation system. More attention to safety and capacity issues as well as broader discussion of trip generators and attractors in Kihei as well as other parts of Maui should be included. Additional detail on non-motorized forms of transportation (especially pedestrian and bicycle transport) in terms of access and safety should be provided. Neighborhood generators as well as travel routes and crossing areas for pedestrians and bicyclists should also be analyzed. Opportunities for traffic calming, speed control, and enhanced intersection control should also be reviewed. In particular, travel routes to the

Elementary School and other neighborhood destinations should be analyzed. Lastly, more careful attention should be directed to issues related to speeding and safety.

Conclusion

We believe this EA to be incomplete because it fails to discuss reasonable alternatives. The Maui Planning Department should not accept this document until a more robust discussion of alternatives is presented. We believe that the EA is underestimating the long-term impacts of the project at best or ignoring them at worst. If the subdivision generates 380 additional people in the area, how many will be school aged children, and how will this impact the schools, recreational facilities etc.? What is the capacity of the local schools to handle additional students?

We commend the consultants for their thorough reports on archeology and traffic, and on the clear maps, but wish the other sections could have been as complete.

Thank you for the opportunity to review the Environmental Assessment.

Sincerely,

Peter Rappa
Environmental Review Coordinator

CC. OEQC
James Moncur, WRRC
Paul Eckern
Karl Kim, DURP
Julie Higa, County of Maui Planning Dept.
Alan Unemori, Warren S. Unemori Engineering, Inc.
Jolie Wanger, EC

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

May 9, 2000

Mr. Peter Rappa
Environmental Review Coordinator
Environmental Center
UNIVERSITY OF HAWAII AT MANOA
2550 Campus Road, Crawford 317
Honolulu, HI 96822
Fax: (808) 958-3980

Re: Response to Your Letter to Mark Spencer, SPENCER HOMES, Inc., Dated May 2, 2000

Dear Mr. Rappa:

I received a copy of your letter to Mark Spencer on Tuesday, May 2, 2000. I am writing this letter to respond to your reviewers' comments on behalf of Mark Spencer as I am the author of the Draft EA Report. The following are my item-by-item responses to your reviewers "**Specific Major Comments**":

Comment

"Alternatives:

> *The alternatives section, which includes only two alternatives (Action and No-Build), is inadequate. HAR section 11-200-10(6) requires the identification and discussion of alternatives in the EA. We believe that other, reasonable uses for this property or alternative options for design could be considered. For this reason, we believe that this EA should not be accepted until a more thorough discussion of alternatives is included."*

Response

It is quite obvious that your reviewers are unfamiliar with Maui County Zoning and the Kihei-Makena Community Plan Designation Laws. The subject property is classified by the State Land Use Commission as "Urban", by the Kihei-Makena Community Plan Designation as "Single Family (SF)", and the Maui County Zoning (General Plan) as "R-2 Residential". It is therefore, in fact, not possible to build anything other than an R-2 Single-Family Residential Subdivision on this property. Cognizant of these zoning restrictions, Spencer Homes, Inc., purchased the property with the sole objective of developing the proposed Single Family R-2 Residential Subdivision. There are no other "reasonable uses" for this property that the State, Maui County, or the Kihei-Makena

Community Association will allow.

Comment

"Impacts to Infrastructure (Drainage)

In general, we would like to see a more thorough discussion on the impacts of the drainage channel to neighboring (downstream) properties.

Concerns over the discrepancy between design discharge capacity between FEMA (3,200 cfs) and Warren S. Unemori Engineering, Inc., (1,209 cfs) from the Engineering Branch (in their correspondence) seem to have been adequately addressed in the correspondence section with the compromise requiring that "the portion of the drainage channel within the FEMA study limits" has a 100-year flow capacity of at least 3,200 cfs, and the "portion of the drainage channel between the FEMA study area and Piilani Highway shall be required to provide a 100-year flow capacity of at least 1,200 cfs.." (Letter to John Min from Warren Unemori). This change needs to be made in the document itself, not merely in the correspondence section. Our reviewers believe it is important to use FEMA numbers, as these are the legally recognized figures. Our reviewers were unable to make determinations based on the topographic information, and suggested that one possibility would be to consider reshaping the topography to assure for the lower flow levels. Regardless of how it is accomplished, we feel it necessary to disclose in the document exactly how the applicant plants to maintain the required flow capacities."

Response

The FEMA numbers come from an outdated source which was superseded by a study for the Department of Transportation by an independent party, Transmeridian Engineers & Surveyors, Inc., in January, 1978. Transmeridian published its findings in"Hydrology Report for Piilani Highway, Island of Maui, Prepared for the State of Hawaii Department of Transportation". On the basis of these findings, the culverts beneath Piilani Highway itself were sized and designed. On the other hand, FEMA changes it's zoning ***only after someone petitions it to do so*** when more accurate information (e.g., the Transmeridian study) becomes available. (Refer to FEMA "Amendments and Revisions to National Flood Insurance Program Maps", Application/Certification Forms for Conditional and Final Letters of Map Amendment and Letter of Map Revision Based on Fill" to details on this quite cumbersome and time-consuming process) In the case at hand, the Transmeridian estimates were accepted by the State DOT as being the more accurate. Perhaps at a future date someone will have the time and resources to update the FEMA data. In the meantime, as a compromise to the situation at hand, the letter you refer to above was submitted.

With respect to the impacts to downstream properties, it is the County of Maui's policy

that the developer *mitigate the additional flow created on-site* as the result of the development; after all, *the developer has no control over what enters his property from outside the boundaries of his property, and that off-site flow through the property will happen with or without the proposed development.*. In the project at hand, the additional estimated on-site flow due to the proposed development will be well contained in the subsurface drainage structures and park/detention basin, while great care is being taken to maintain the existing drainage system in its natural condition. A drainage easement will be created at the calculated inundation limits for the postulated 100-year design flood, within which no improvements will be made, and beyond which the channel will be strengthened at selected locations to mitigate erosion of the drainage channel banks usable to the homeowners whose lots border the channel.

With respect to your reviewers' comment that the document be changed to reflect the comments in the body of the report, as preparer of the EA Report, and consistent with the structure of the Final EA Report, I believe it is more effective to place all comments from reviewing agencies, and the responses to those comments together in the same chapter. It is a matter of opinion, and is not mandated in the structure of the Draft EA Report.

Comment

"Adverse Environmental Effects Which Cannot Be Avoided

This is quite a large project involving county road improvements and the development of 24 acres of undeveloped land. It seems reasonable to include as one of the long-term unavoidable impacts, the loss of land for other purposes. Additionally, there will surely be impacts on schools, and other public facilities by an increase of residents in the area."

Response

As I mention in my response to your "Alternatives" comments, the land cannot be used for any other purpose than what is being proposed. As to the impacts to schools and other public facilities, these have all been addressed in the Comments Section of the Draft EA Report.

The following are my item-by-item comments to your *"Specific Minor Comments"*:

Comment

"Project Overview

This section should include specific mention of how many lots will be developed (95) and their average size"

Response

As mentioned above, the project is in an "R2" Single Family Residential District. The "R2" designation requires that the lots be at least 7,500 square feet in size and a minimum of 65 feet in width. This is clearly shown in the lower left corner on Figure 2, "Preliminary Subdivision Map". Again, interpreting subdivision maps may be unfamiliar to your reviewers.

Comment

"Impacts and Mitigation Measures (Air Quality)

There is no information to back up the prediction that impacts to air quality will be insignificant; how much more air pollution will be generated by automobile and other sources? If some projected numbers are included, we can then determine what is significant or not."

Response

Given the number of households that will be added (95) to the de facto resident population in Kihei (31,444 in 1990), plus the daily visitors from other communities in Maui, the fact that the Kihei-Wailea-Makena is a world-class vacation destination, and that the air is current well above standards, I think it's a "no-brainer" to estimate that the additional residents will not have a significant adverse effect on Air Quality.

Comment

"Impacts to Community Setting

There is no information on the cost of lots and who will likely buy them. Additionally there is no discussion about the impact on schools. How many new students can the current schools accommodate?"

Response

The cost of lots had not been determined at the time that the Draft EA was prepared, and cannot be set until the subdivision is fully designed, cost of construction estimated and the final subdivision approval is granted by the County of Maui.

For your information, the Department of Education had no concerns over the proposed subdivision (see Section X(L)(16) of the Draft EA Report for letter from Paul LeMahieu, Superintendent of Education for the State of Hawaii). Also in the Draft EA Report, as stated in Sections X(L)(2) in the response to the Land Use Commission on this very issue, the following was written:

"The Department of Education was contacted on February 24, 2000. Mr. Alan Honma of the DOE stated that the current enrollment in Kamalii Elementary School is 872 students in the 1999-2000 academic year. He further stated that since Kamalii Elementary School was designed as a 'Year-Round' facility, it can accommodate 1051 students per year. Therefore there is adequate room to accommodate the projected 20 additional students".

Please have your reviewers read the Draft EA Report more thoroughly before commenting on information that is already contained in the Draft EA Report.

Comment

"Traffic Study

Our reviewers feel that the EA provides adequate information on traffic generated by the project site and contains what appears to be a competent analysis of some of the site-specific impacts. The document, however, is deficient in terms of identifying overall regional effects and cumulative impacts on the transportation system. More attention to safety and capacity issues as well as broader discussion of trip generators and attractors in Kihei as well as other parts of Maui should be included. Additional detail on non-motorized forms of transportation (especially pedestrian and bicycle transport) in terms of access and safety should be provided. Neighborhood generators as well as travel routes and crossing areas for pedestrians and bicyclists should also be analyzed. Opportunities for traffic calming, speed control, and enhanced intersection control should also be reviewed. In particular, travel routes to the Elementary School and other neighborhood destinations should be analyzed. Lastly, more careful attention should be directed to issues related to speed and safety."

Response

The improvements to Ke Alii Alanui on the south side of the property include each of two 6-foot wide bicycle lanes adjacent to each of the mauka-bound and makai-bound traffic lanes. In addition, the Kihei-Makena Community Master Plan includes a North-South Collector Road which will eventually support two 6-foot wide bicycle lanes and two traffic lanes. The North-South Collector Road will eventually provide bicycle lanes going from Uwapo Road in North Kihei to Kilohana Drive at the Wailea border - a distance of approximately 6 miles. The 22-foot wide strip at the western border of the Ke Alii Subdivision will be donated by Spencer Homes to the County of Maui for this purpose.

In addition, two significant improvements to the traffic flow entering and existing Kamalii Elementary School are proposed as part of this project. First, the existing makai-bound left-hand turn lane into Kamalii Elementary School will be lengthened to accommodate more cars turning into Kamalii Elementary School. Second, in the mauka-

bound direction, a second lane will be added on Ke Alii Parkway. This will eliminate the bottleneck that currently exists at the start and end of classes as parents queue to take a right-hand turn into the Kamalii Elementary School parking lot from the one available lane on Ke Alii Parkway. Both of these proposed improvements are shown in the attached figure entitled, "Ke Alii Subdivision Proposed Improvements to Ke Alii Parkway/Kanakanui Road Intersection".

I believe that your reviewers have missed a major point in the review of this Draft EA Report -- that point being that the Kihei-Makena Community Plan was designed to guide the anticipated development of the Kihei-Makena Community in a way that would be most beneficial to the current and future residents and visitors there. A primary objective of this Plan (backed by the Maui County General Plan and Zoning Designations) is to ensure that any new developments meet all standards and maintain the setting of the Community in order to maintain it's attraction as a world class resort destination.

For your information, the subdivision is located in a "Special Management Area". Standards for development in the Special Management Area are much more stringent than areas not designated as a Special Management Area, and a separate SMA Application must be submitted for review and approval before any subdivision within such an area can be built.
The proposed Ke Alii Subdivision will be built by a very conscientious, successful and respected developer who is himself a permanent resident in the Kihei area on Maui.

I would appreciate any effort on your part to make this point clearer to the reviewers of this Draft EA Report.

Please call me if you have any technical questions on the subdivision that I can help you or your reviewers with.

Very truly yours,

Alan L. Unemori
Vice-President

cc Mark Spencer, Spencer Homes
Julie Higa, Maui Planning Department.
Jeyan Thirugnanam, OEQC

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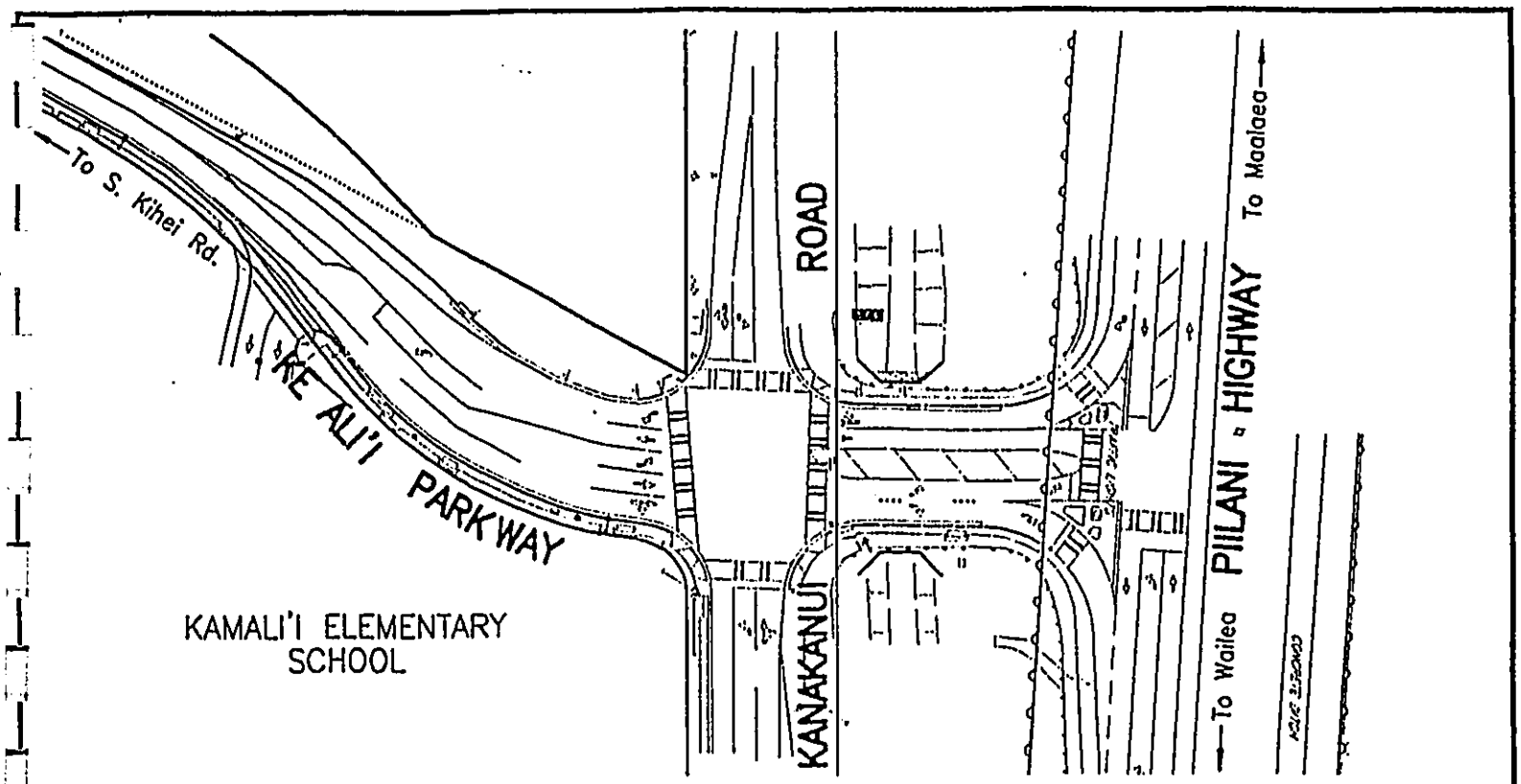

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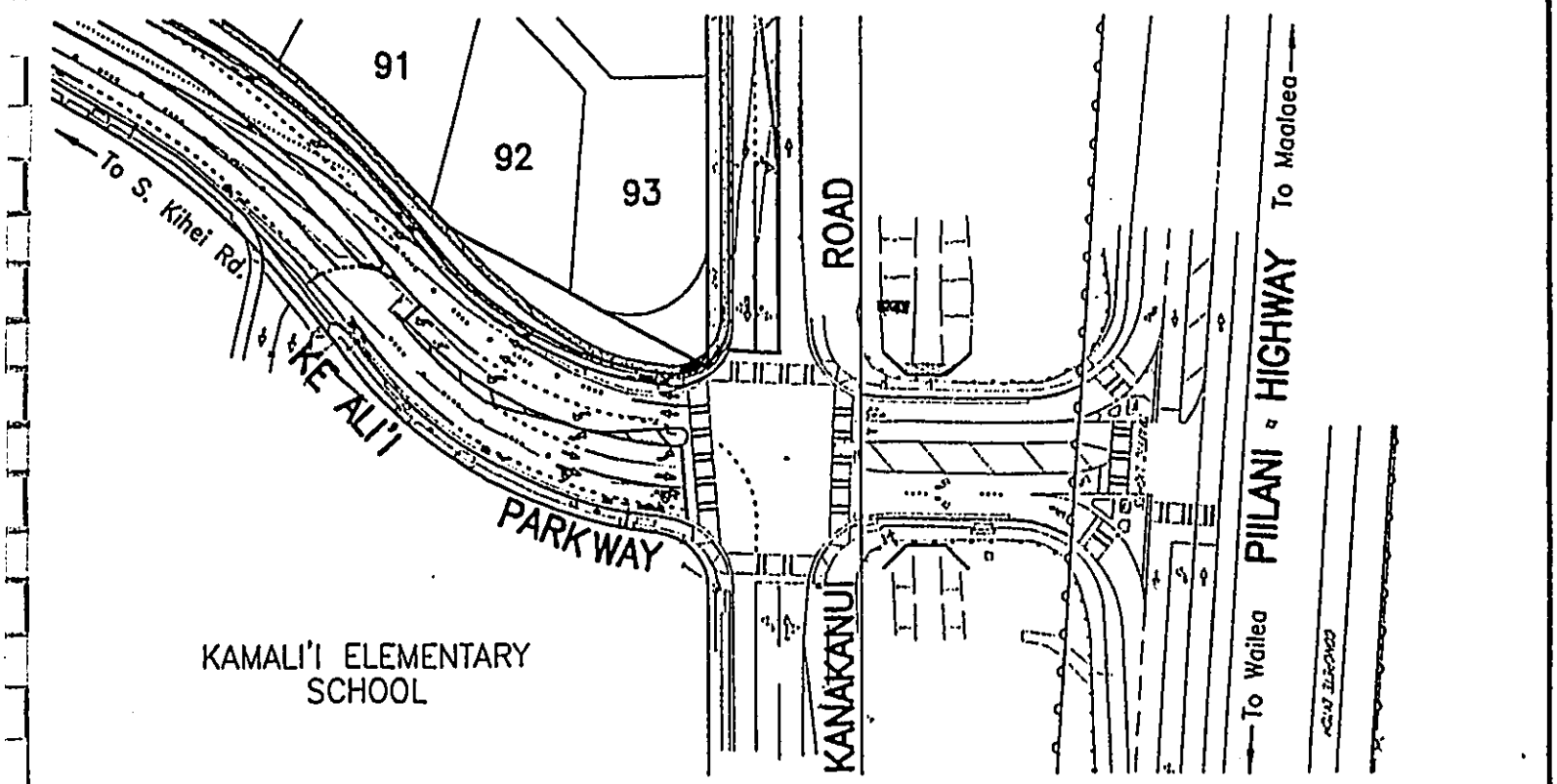

PROPOSED

KE ALI'I SUBDIVISION PROPOSED IMPROVEMENTS TO KE ALI'I PARKWAY / KANAKANUI ROAD INTERSECTION

SCALE: 1 IN. = 100 FT.

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

May 8, 2000

99proj/99054/dwas/exhibits/exb-intr.dwg

B. PLANNING DEPARTMENT

The letter confirming the use of FEMA's 100-year design discharge, dated July 3, 2000, follows.

JAMES "KIMO" APANA
Mayor

JOHN E. MIN
Director

CLAYTON I. YOSHIDA
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

July 3, 2000

Mr. Warren S. Unemori
Warren S. Unemori Engineering, Inc.
2145 Wells Street, Suite 403
Wailuku, Hawaii 96793

Dear Mr. Unemori:

SUBJECT: KE ALII SUBDIVISION SMA APPLICATION, USE OF FEMA'S 100-YEAR DESIGN DISCHARGE, TMK: 3-9-018:001; SM1 990022

Thank you for a copy of your May 31, 2000 letter to Mr. Charles Jencks.

Your letter stated that you will be designing "the natural drainage channel and drainage structure beneath the roadway crossing at the northwest corner of the property to handle the FEMA 100-year design discharge level of 3200 cfs, as requested by the County." Mr. Alan Unemori of your office has clarified that the "natural drainage channel" noted above includes the entire drainage channel (Kamaole Gulch) within your project limits. This satisfies the Planning Department's drainage concerns relative to the subject permit application.

If you have any questions regarding this letter, please call Francis Cerizo, Staff Planner, of this office at 270-7253.

Very truly yours,

JOHN E. MIN
Planning Director

FAC:nsg
xc: Clayton I. Yoshida, AICP, Deputy Planning Director
Aaron H. Shinmoto, Planning Program Administrator
Charles Jencks, Director, DPWWM
Julie Higa, Staff Planner
Project File
00/ZAED File
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REFERENCES

REFERENCES

- Community Resources, Inc., "Maui County Community Plan Update Program Socio-Economic Forecast Report", January, 1994
- "Kihei-Makena Community Plan (1998)"
- Maui Economic Development Board, Inc., "Maui County Data Book", December, 1994
- Warren S. Unemori Engineering, Inc., "Preliminary Engineering Report for Ke Alii Subdivision", prepared for Spencer Homes, August, 1999
- State of Hawaii, Department of Business, Economic Development and Tourism, "Data Book", March, 1993
- U. S. Department of Agriculture, Soil Conservation Service, "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii", 1972
- University of Hawaii at Hilo, Department of Geography, "Atlas of Hawaii", Third Edition, 1998
- University of Hawaii, Land Study Bureau, "Detailed Land Classification-Island of Maui", May 1967
- Warren S. Unemori Engineering, Inc., "Application for Special Management Area Permit, Ke Ali'i Subdivision", October, 1999
- Warren S. Unemori Engineering, Inc., "Drainage Report, Ke Alii Subdivision", Revised June, 2000.

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APPENDICES

Appendix A

Letter from State Historic Preservation Division, DLNR, approving Archaeological Inventory Survey Report

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

September 7, 1999

Demaris Fredorickson
Xamanek Researches
P.O. Box 131
Pukalani, Hawaii 96788

LOG NO: 24066
DOC NO: 9909RC05

Dear Ms. Fredorickson:

SUBJECT: Review of Archaeological Inventory Survey
Kama'ole, Wailuku (Kula Moku), Maui
TMK: 3-09-18: 1

This letter reviews the survey report which our staff received on August 24, 1999 (Erik Fredericksen et al. 1994. An Archaeological Inventory Survey of a 24-Acre Parcel, Kama'ole Ahupua'a ... Xamanek ms.).

The survey has adequately covered the project area, finding a total of 11 historic sites. The background review is good, indicating that this area might have a few temporary habitations and small agricultural sites. Site descriptions are very good, and interpretations are acceptable.. Several late 1800s-1900s ranch walls are present, but only one clearly pre-contact site (a temporary habitation site: a small rockshelter, 3541, in Kama'ole Gulch). Several of the sites may actually be less than 50 years in age, and may not technically be historic sites.

We agree with your significance evaluations -- all sites are significant for their information content.

We also agree with your proposed mitigation actions. You recommend that site 3541 (the rockshelter of precontact age) be preserved. You indicate that the other 10 sites have had reasonable and adequate amounts of their significant information recorded/collected in the survey and need no further work or protection. We agree, since these are walls, small features with very shallow, surface shell scatters of possibly recent age, or structures with deposits of very recent age.

You further suggest that the northwest part of the parcel with deeper sand deposits be archaeologically monitored when any land alteration occurs, just in case burials might be found. Test trenching in this area found no burials or archaeological deposits, but we agree that there is the possibility that a few burials might be found and that monitoring is reasonable.

In sum, the report is acceptable. With the commitment to preserve site 3541 and to monitor any land alteration in the deeper sands in the northwest part of the parcel, we believe that any development of this parcel will have "no adverse effect" on significant historic sites.

Prior to any land alteration, we will need to approve a preservation plan for site 3541 (or minimally the interim protection component of such a plan) and to approve the scope of work for monitoring (which can be very brief). We will recommend those two steps as conditions to any approved County of Maui permits

If there are any questions, please have your client call Dr. Ross Cordy, our Branch Chief for Archaeology (692-8025).

Aloha,

Don Hibbard, Administrator
State Historic Preservation Division

RC:jen

c: Jesse Spencer [fax 891-8771 & fax 875-1312]
County of Maui, Planning Department
County of Maui, Public Works Department

An Archaeological Mitigation Plan for a c. 24-acre Parcel of Land in Kama'ole *Ahupua'a*, Wailuku District, Kihei, Maui (TMK: 3-09-18: 1)

Prepared for:

Mr. Mark Spencer, Spencer Homes
Kihei, Maui

Prepared by:

Xamanek Researches
Pukalani, Maui

Erik Fredericksen

9 March 2000

INTRODUCTION

Xamanek Researches conducted an archaeological inventory survey on a c. 24-acre parcel of land in Kihei, Maui (TMK: 3-09-18: 1) in the spring of 1994. This property is located near the Kihei coastline in Kama'ole *ahupua'a* (Figure 1). During the course of our archaeological inventory survey, a total of 11 sites were found (Sites 50-50-10-3531 through 3541). Identified sites included 3 post-contact animal containment walls, 3 surface midden scatters, a remnant of an old foot trail, 2 post-contact rock enclosures with associated midden deposits, an oval rock feature of relatively recent origin, and a rock overhang shelter. In addition, relatively deep dune sand deposits were identified in the northwestern section of the project area.

A draft report of our findings was prepared in June 1994, but not sent to the State Historic Preservation Division (SHPD) for review. The report was not submitted at the time, because the former owner failed to pay for the survey and subsequently declared bankruptcy. At the request of Mr. Jesse Spencer of Spencer Homes, Inc., we submitted our draft inventory survey to SHPD for review in the late summer of 1999. The report was subsequently accepted in a 7 September 1999 letter (Doc. No: 9909RC05). Spencer Homes, Inc. purchased the subject parcel in the early part of 2000. Current plans call for the development of over 80 residential lots.

The following archaeological mitigation plan has been prepared to address State Historic Preservation Division requirements set forth in the above review letter. This plan consists of a preservation plan for the Site 3541 rock shelter and a monitoring plan for the northwestern portion of the parcel.

PRESERVATION PLAN FOR THE SITE 50-50-10-3541 ROCK SHELTER, KAMA'OLE *AHUPUA'A*, WAILUKU DISTRICT, ISLAND OF MAUI (TMK: 3-09-18: 1)

The plan outlined here follows suggestions in the SHPD rules (HAR Title 13, Subtitle 6, Chapter 148, pp. 2-5).

IDENTIFICATION OF SITE TO BE PRESERVED

Site 50-50-10-3541 is located in Kama'ole Gulch c. 400-m *mauka* (east) of the Kihei coast line (Figure 2). This site is interpreted as a precontact rock overhang shelter (Fredericksen et al., June 1994). The site lies on the southern portion of the gulch at about 56 – 58 ft. AMSL. This shelter represents one of the few surviving rock overhang shelters in the developed Kihei area.

SHORT-TERM PRESERVATION OF SITE 3541

It is recommended that an interim buffer be established around the rock shelter prior to project construction. Given the site's location in the gulch, we recommend that orange construction fencing be placed along the southern top of the gulch in the vicinity of the shelter. This placement will help to ensure that this site is not impacted by bulldozer push from above during the development of the overall residential project. A c. 25-m. (75-ft.) long length of fence is recommended for the southern side of the gulch. It is also recommended that a buffer area around the site itself be marked with construction fencing. This buffer zone should be c. 10 m. (30 ft.) in diameter.

LONG-TERM PRESERVATION OF SITE 3541

It is recommended that Site 3541 be preserved in the gulch. The location of this site should be shot in and placed on the topographic map of the proposed subdivision. The long-term preservation plan for Site 3541 consists of 3 components:

1) interpretive signage
2) maintenance
3) public access

Signage

The Site 3541 rock overhang shelter has limited interpretive value. However, the site should be clearly marked, in order to help ensure its long-term integrity. The proposed heading and text of the sign are as follows:

a. **Heading of sign:**

Site 50-50-10-3541
Kama'ole Gulch Rock Overhang Shelter
Kama'ole *Ahupua'a*, Wailuku District,
Island of Maui

b. **Text of sign** (A brown background with black lettering is recommended):

"This rock overhang shelter was likely used for temporary habitation by native Hawaiians in the late precontact period (i.e. 1500 to 1700's). The presence of this site further indicates the importance of the sea and its resources to the early inhabitants of the area.

Damage to this site is punishable under Chapter 6E-11, Hawaii Revised Statutes"

b. **Size of sign:**
The recommended size for the Site 3541 sign is 1.5-ft. (0.45 m.) by 1-ft. (0.3 m.).

Maintenance

The Site 3541 preservation area lies near the bottom of the southern side of the gulch. Given the arid nature of the area, no landscaping is planned for the gulch.

However, in the event that maintenance does need to occur in the vicinity of the site, it is recommended that only hand held equipment be utilized.

Public Access

Given the relative isolation of this site in the gulch, formal access may not be practical, due to safety considerations. Informal access would most likely occur from the bottom of the gulch itself.

ARCHAEOLOGICAL MONITORING PLAN

Scope of monitoring

The scope of this monitoring plan includes having an archaeological monitor present during all subsurface disturbances in the northwestern portion of the subject parcel (Figure 2). Actual on-site time and specific actions to be followed in the event of inadvertent discoveries will be discussed and agreed upon by the general contractor, Mark Spencer of Spencer Homes, and Erik Fredericksen of Xamanek Researches, during a pre-construction meeting held for this purpose. Additional meetings may be called, if either the archaeologist or contractor believes that other relevant information should be disseminated.

Monitoring methodology

There is a possibility that significant material culture remains may be discovered during earthmoving activities on the portion of the property that contains sand dune deposits. Human burials and/or skeletal materials have been found in this general coastal area, especially in sand dunes.

Close cooperation between the monitoring archaeologist and construction personnel is important to a successful monitoring program. Topics for discussion should include, but not necessarily be limited to the following:

1) The contractor will be responsible for ensuring that the monitor(s) is aware of construction schedules and that they are present at all earth-moving activities designated for monitoring.

2) Both Xamanek Researches and the contractor are responsible for ensuring that on-site work is halted in an area of significant findings and to protect the find from any further damage (i.e., fencing, protective covering, etc.). The State Historic Preservation Division (SHPD) will recommend appropriate mitigation actions. Both SHPD and the Maui/Lana'i Islands Burial Council (MLIBC) will be consulted in the event that human remains are found.

3) In the event of the discovery of human remains, work shall cease in the immediate find area. The monitoring archaeologist will be responsible for notifying the Historic Preservation Division Burials Program (UPDBP), which, in consultation with the Maui/Lana'i Islands Burial Council, will determine the appropriate mitigation measures. The notification will include accurate information regarding the context and composition of the find.

4) Xamanek Researches will work in compliance with Hawaii Revised Statutes Chapter 6E (procedures Relating to Inadvertent Discoveries).

5) The archaeologist will have the authority to closedown construction activities in areas where potentially significant discoveries have been made until they have been properly evaluated. Normally, construction activities may continue in unaffected project areas.

6) Field procedures to be followed for documentation of discovered cultural features or human skeletal remains: a) standard field methods including recording of profiles showing stratigraphy, cultural layers, etc.; b) mapping; photographing of finds other than human remains; d) and excavation of cultural materials and/or exposed features.

7) The SHPD Maui Archaeologist will be notified and consulted with regarding treatment of identified features such as cultural layers, artifact or midden concentrations, structural remains, etc., considered to be of significance under S13-279-2 (definitions)

8) The contractor should take into account the necessity for machine excavation at a speed slow enough to allow for reasonable visual inspection of the work. The monitoring archaeologist must make a "best effort" to search for significant material culture remains (i.e. artifacts, features, midden, skeletal materials, etc.).

9) Significant archaeological discoveries, if they occur, should be protected and identified by construction "caution" tape, fencing, or other reasonable means, until mitigation is decided upon by SHPD.

10) One monitor in most instances will carry out fieldwork. Tasks will include observation of grubbing and earth-moving activities.

11) The MLIBC requests that one archaeological monitor be assigned to each piece of major earth-moving equipment in the dune area.

Field methods utilized will include photographic recording (where appropriate), artifact excavation (recovery and recording), profile documentation of cultural layers and

stratigraphy, excavation and recording of exposed features, and mapping of all pertinent features on an appropriate site map. A daily log (field notes) of activities and findings will also be kept. Gathered information will be utilized in the preparation of the monitoring report to be submitted to the SHPD.

In the event human skeletal materials are inadvertently discovered, notification of SHPD (HPDBP) and/or Maui/Lana'i Islands Burial Council will be made, and appropriate mitigation determined (Note: photographs of human skeletal materials will not be taken).

A supervisory archaeologist will regularly visit the monitoring site, or as often as is necessitated by the nature of the construction activities and archaeological findings. If significant discoveries are made, appropriate mitigation measures will be negotiated with SHPD.

Any cultural materials, other than human remains recovered from the monitoring project, will be curated by the monitoring organization until analysis is completed and then turned over to the appropriate parties. Long-term curation arrangements of such materials shall be approved by the SHPD.

When fieldwork for the required archaeological monitoring project has been completed, preparation and publication of a draft monitoring report will be undertaken. The draft report will be submitted to the State Historic Preservation Division within 180 days of the completion of fieldwork, for comment and approval. Approved final changes and corrections will result in the final monitoring report for the project.

Reference

Fredericksen, Erik M., Fredericksen, Demaris L., and Fredericksen Walter M.
June 1994 An Archaeological Inventory Survey of a 24-Acre Parcel, Kama'ole *Ahupua'a*, Wailuku, Wailuku District, Island of Maui (TMK: 3-09-18: 1). Prepared for Grant Y. M. Chun, Esq., Wailuku, Maui. Prepared by Xamanek Researches, Pukalani, Maui.

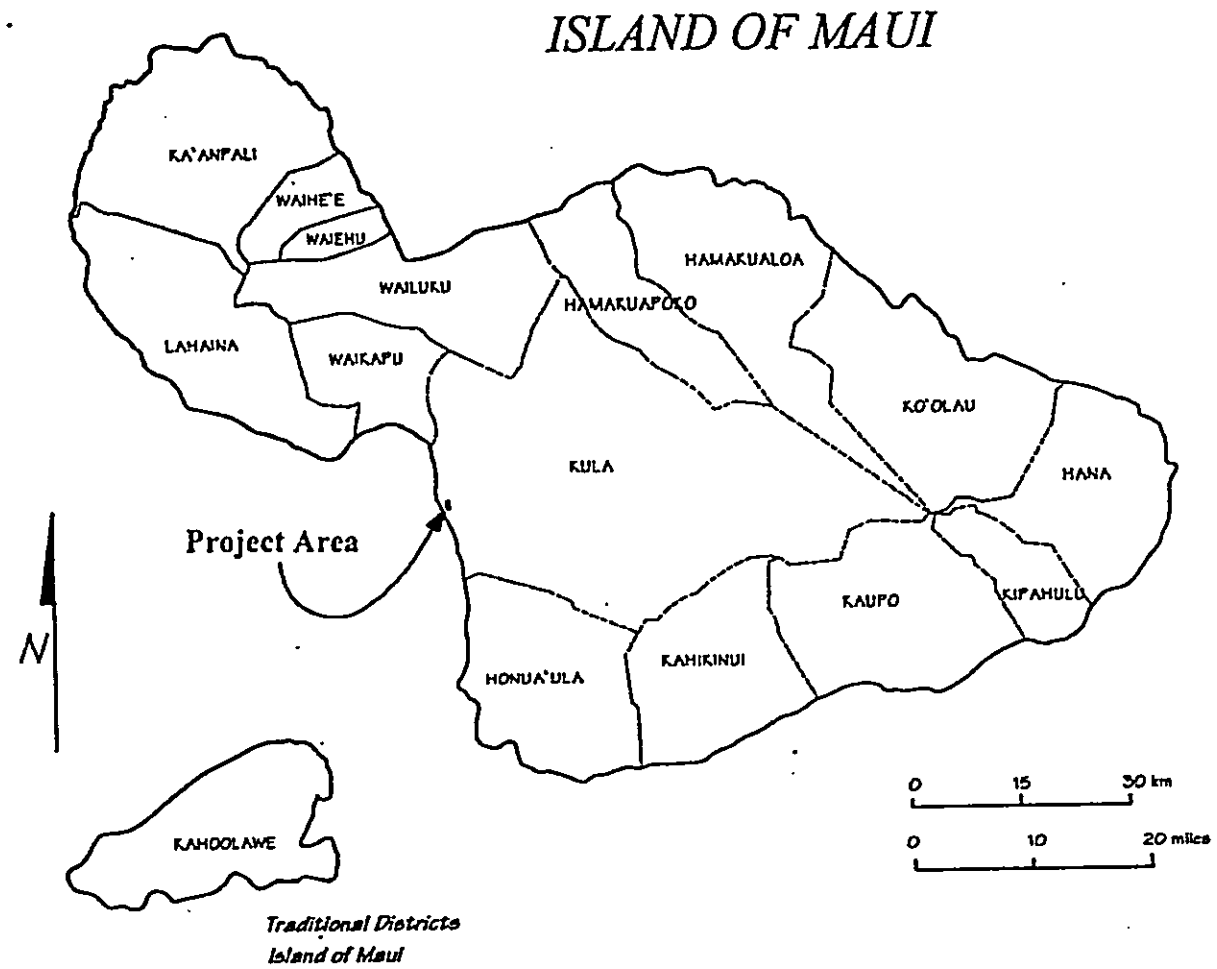

Figure 1: General location of the project area.

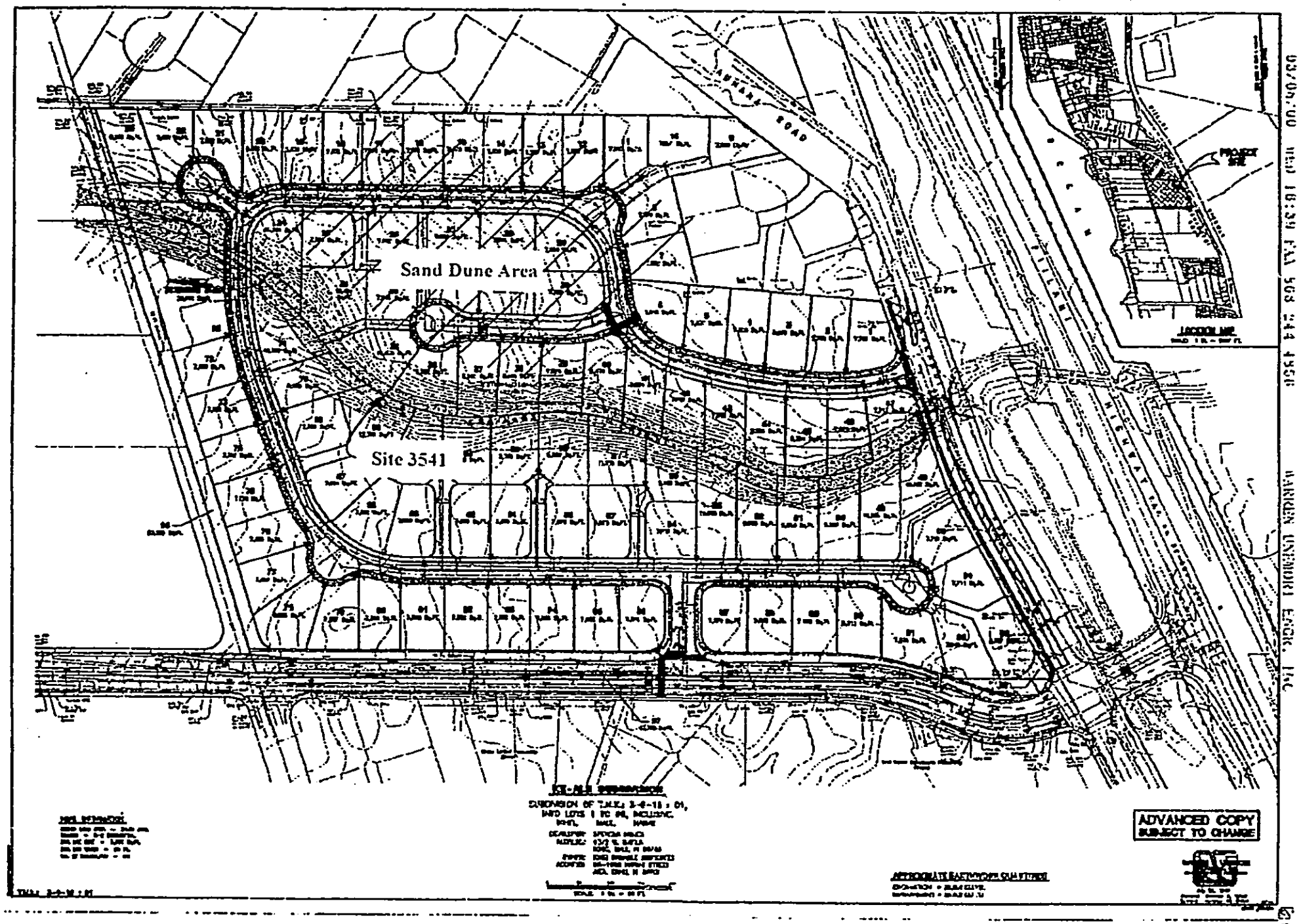

Figure 2: Project area, including locations of Site 3541 and the dune area.

Appendix B

Preliminary Engineering Report and Drainage Report

Established 1969

Preliminary Engineering Report for

KE ALI'I SUBDIVISION

Kihei, Maui, Hawaii
TMK: (2) 3-9-18: 01

Prepared For: Spencer Homes
4372 W. Waiola St.
Kihei, Maui, HI 96753

WARREN S. UNEMORI
LICENSED PROFESSIONAL ENGINEER
NO. 1569-C
HAWAII, U.S.A.

Date: August, 1999

WARREN S. UNEMORI ENGINEERING, INC.
Civil and Structural Engineers - Land Surveyors
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2145 Wells Street
Wailuku, Maui, Hawaii 96793

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PRELIMINARY ENGINEERING REPORT
FOR
KE ALII SUBDIVISION

1.0 INTRODUCTION

The 24 acre project site is being purchased by Spencer Homes Inc. from Kihei-Kamaole Associates. Spencer Homes Inc. (SHI) plan to subdivide the property into approximately 96 single family home sites ranging in size from 7,500 square feet to 11,000 square feet.

This report briefly describes and evaluates the existing infrastructure in the vicinity of the project site. It also provides a brief summary of probable infrastructural improvements needed to support the proposed project.

2.0 EXISTING INFRASTRUCTURE

2.1 Water System

The project site, which is located at the northwest corner of the intersection of Kanakanui Road and Ke Alii Alanui, is situated in the Kihei mid-level service area. Storage for this area in upper Kamaole is provided by the recently installed 2.0 MG Kamaole reservoir at elevation 311 feet.

The sources of water for this mid-level service area (MLS) are wells located in Upper Waiehu and North Waihee. The North Waihee wells were recently developed by the Department of Water Supply to augment the Upper Waiehu wells. These wells draw water from the heretofore undeveloped Waihee aquifer. Each well has a pumping capacity of 1.0 to 1.5 MGD. Two more wells in North Waihee referred to as Kupaa Wells 1 and 2 have also been drilled, tested, and are

scheduled to be operational later this year or early next year pending acquisition of appropriate easements from the land owner.

A 24-inch transmission line, 1.0 MG storage tank, and a pair of booster pumps have been installed to interconnect this new source to the Upper Waiehu well source and transmission system. Water from the Upper Waiehu and North Waihee well sources is transported by gravity to the Kamaole area via a series of 42", 36" and 30" transmission lines. The 2.0 MG Kamaole tank is fed by this 30-inch transmission line on Kanakanui Road and conveyed back to the vicinity of Ke Alii Alanui and project site by means of a 12-inch distribution system.

2.2 Sewer System

There is an 8-inch sewer line on Ke Alii Alanui. This line was installed when Ke Alii Alanui and Kamalii Intermediate School were constructed a few years ago. There also is an 8-inch sewer line at the northwest corner of the project site. This line is located within a sewer easement that runs along the south boundary of The Maui Vista's property and connects to the 10-inch gravity interceptor on Kihei Road.

A series of gravity collectors, pump stations and force mains then transport wastewater collected on Kihei Road to the Kihei Wastewater Reclamation Facility (KWRF) located above Piilani Highway south of Silversword Golf Course for processing and disposal.

2.3 Drainage

The project site generally slopes from an elevation of 56 feet at the makai boundary to about 112 feet at the southeast corner. This translates to an approximate cross slope of around 5%. A drainage gully bisects the property in an east to west direction. According to the "Hydrology Report for Piilani Highway" prepared by Trans-Meridian Engineers and Surveyors, Inc., there are three tributary areas 21, 22, and 22A, located above Piilani Highway that drain into the existing gully. The 50-year recurrence interval storm runoffs from areas 21, 22, and 22-A were computed to be 399 cfs, 363 cfs, and 91 cfs, respectively, for a total of 853 cfs. The 50-year storm runoff was adopted by the State to design their drainage structures across Piilani Highway. Using the NRCS (SCS) Method our calculation indicate that for a 50-year recurrence interval storm, runoff from the same three basins is approximately 769 cfs. The existing 48-inch diameter culvert on Kanakanui Road is obviously too small to handle this flow.

Peak runoff from the 24 acre project site under its present undeveloped condition for a 50 year storm totals approximately 21 cfs.

According to FEMA's Flood Insurance Map, the Ke Alii project site is located above the flood boundaries investigated by the National Flood Insurance program. Exhibit A shows the upper limits of the flood plain study in the Kamaole area of Kihei.

2.4 Roadway

Piilani Highway is the main north/south arterial highway linking Kihei to other urban areas of Maui. Piilani Highway is a two-lane undivided highway owned and maintained by the State. It contains

12-foot travel lanes in each direction with 10 feet wide paved shoulders. Kihei Road is a two-lane collector that parallels Piilani Highway along a more coastal route.

Ke Alii Alanui was recently constructed by the County and abuts the south boundary of the project site. It serves as a major east-west collector road that connects Piilani Highway and Kihei Road. Ke Alii Alanui along the project frontage consist of a 40-foot right-of-way, two 12-foot lanes, curb and gutter on both sides, and a four feet wide sidewalk on the south side. The intersection of Piilani Highway and Ke Alii Alanui is presently signalized with appropriate turn lanes and approaches.

Kanakanui Road is a narrow substandard County road that parallels Piilani Highway along the easterly boundary of the project site. The intersection of Kanakanui Road and Ke Alii Alanui is stop controlled and is not signalized.

2.5 Electricity and Telephone

There are overhead electrical and telephone distribution systems along Kanakanui Road. The distribution system along Ke Alii Alanui were installed underground when this road was constructed. It presently serves the subdivision on the south side of Ke Alii Alanui.

3.0 PROBABLE INFRASTRUCTURAL IMPROVEMENTS

3.1 Water System

Based on DWS's consumption rate per lot, the domestic water demand for the proposed 96 lot subdivision is expected to total

around 57,600 gpd. Fire flow rate required for this type of project is 1,000 gpm.

The distribution system for the project will be extended from the existing line on Ke Alii Alanui and looped to interconnect with the new line that will be extended along Kanakanui Road from its present terminus at the intersection of Ke Alii Alanui. Fire hydrants will be installed within the subdivision streets at intervals of 300 to 350 feet. Source development, storage and transmission line fees will be paid for as part of the comprehensive meter fee of $3,385 per lot.

The existing storage and transmission system to the project site is adequate to meet the project's domestic and fire flow demands.

3.2 Sewer System

The 96 lot subdivision project is expected to generate 33,600 to 38,000 gpd of wastewater when fully built out. The existing collection, transmission and treatment facilities have ample capacity to handle this flow. Since these facilities were recently upgraded, the developer will be fulfilling his obligation for this upgrade by paying a one-time assessment of approximately $7.80 per gallon of additional wastewater generated by the project.

3.3 Drainage

After development peak runoff from the project site is expected to total 44 cfs for a net increase of 23 cfs over current flow. This additional runoff will be intercepted by an onsite storm drain system and directed into a subsurface detention facility located at the northwest corner of the project site. This subsurface system, in combination with storage in the proposed park site, will be designed

to keep the post development flow equal to or less than the current runoff from the project site. The park site will be bermed at the perimeter to serve as a detention basin. The release line from the subsurface facility will be sized to limit the release into the channel equal to or less than current runoff volumes from the entire project site. The park area itself will be fully grassed, provided with a sprinkler system to keep it usable as a mini-park, except during periods of heavy and prolonged rainstorms.

The existing drainage channel bisecting the project site will be retained and designed to accommodate 1082 cfs of flow from a 100-year storm. Side slopes outside the 100 year flood inundation limits will be reshaped utilizing rocky material from rock excavation on site. The existing 48-inch culvert on Kanakanui Road will be replaced with a larger culvert to handle the total offsite runoff for a 50-year recurrence storm, which is the same criteria used for Piilani Highway.

3.4 Roadway

The present 40-foot right-of-way for Ke Alii Alanui will be widened by 24 to 64 feet. The pavement along the project frontage will also be widened by 24 feet to provide three (3) 12-foot lanes (including a turn lane) and two 6-foot bike lanes (including gutter) and 8-foot shoulders. Curb, gutter, and a 4-foot sidewalk will also be added on the north side of Ke Alii Alanui.

Kanakanui Road will also be widened along the project frontage. Curb and gutter and a four-feet wide sidewalk will also be added along the project frontage.

In addition to the above the developer will be dedicating a 22-feet wide strip of land along the makai or westerly boundary of the project site for a future two lane road with bike lanes. None of the subdivision streets will be connected to this future road.

Access to the project site will be provided from Kanakanui Road and Ke Alii Alanui. Left turn storage lanes will be provided at these two access points. These two subdivision streets will be interconnected near the northwest corner of the project forming a continuous loop. Subdivision streets will have a right-of-way of 44 feet with a curb to curb travelway of 28 feet (including gutter) and eight (8) foot shoulders on both sides. A four feet wide sidewalk will be installed on one side.

3.5 Electricity/Telephone/CATV

These facilities will be installed underground and extended into the subdivision along the shoulders of the subdivision streets. Street lights will also be installed along the subdivision streets at intervals deemed appropriate by the electrical engineer and the County.

4.0 CONCLUSION

Based on the foregoing, it is our professional opinion that project-related impacts on existing infrastructure will be minimal and can be readily mitigated with the installation of improvements proposed.

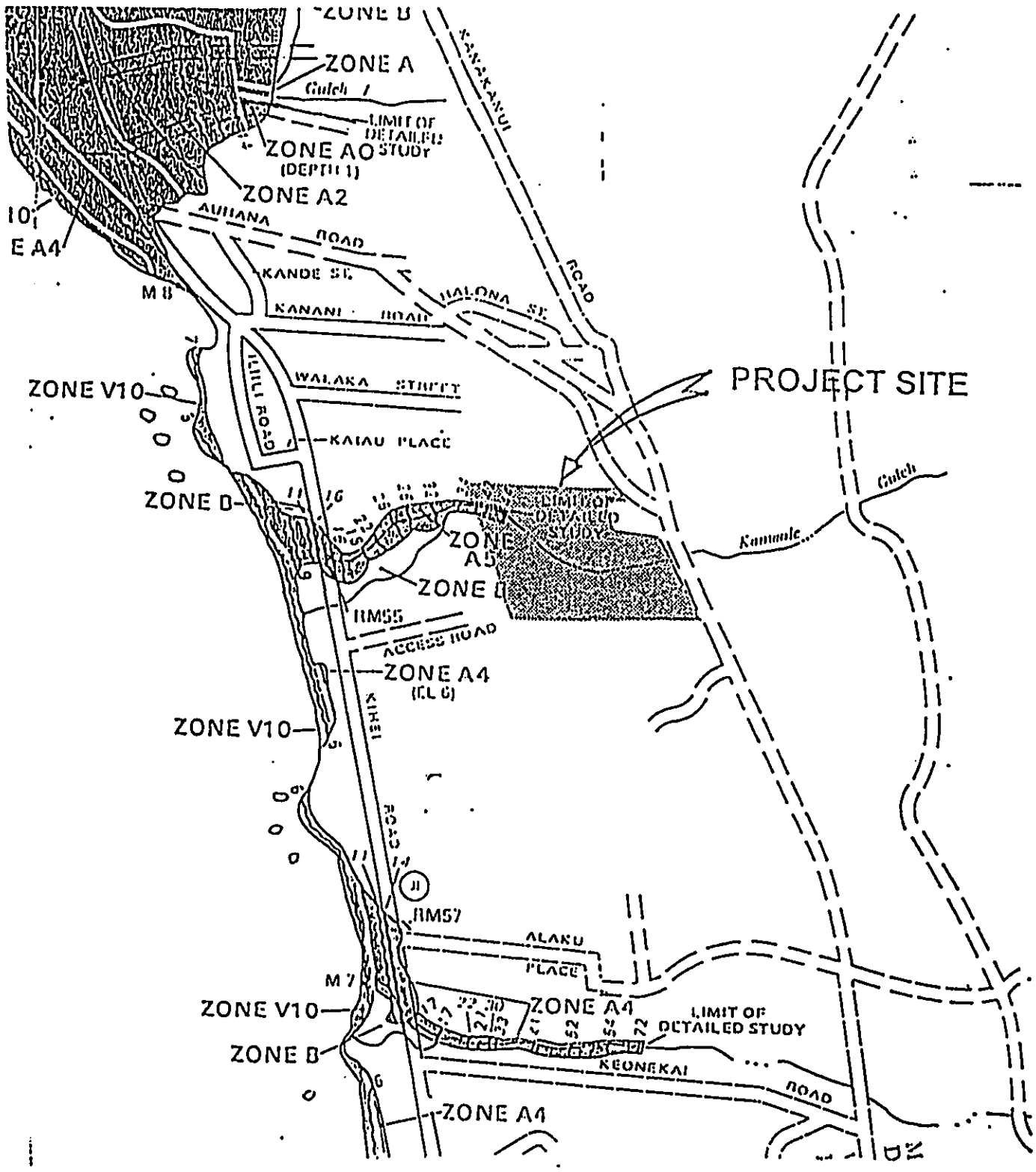


EXHIBIT "A"

FLOOD INSURANCE RATE MAP

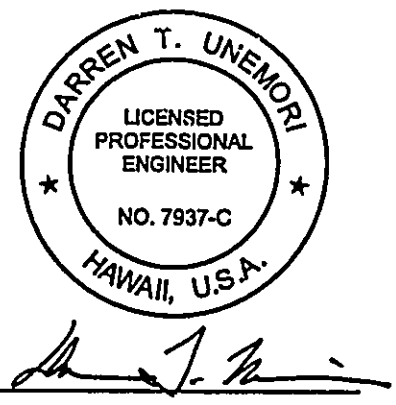
Established 1969

Drainage Report

KE ALI'I SUBDIVISION

Kihei, Maui, Hawaii
TMK: (2) 3-9-18: 01

Prepared For: Spencer Homes
4372 W. Waiola St.
Kihei, Maui, HI 96753



Date: April, 2000
Revised: June, 2000

WARREN S. UNEMORI ENGINEERING, INC.
Civil and Structural Engineers - Land Surveyors
Wells Street Professional Center - Suite 403
2145 Wells Street
Wailuku, Maui, Hawaii 96793

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Drainage Report
for
Ke Ali'i Subdivsion

I. INTRODUCTION

This report has been prepared to examine both the existing drainage conditions and the proposed drainage plan for the subject development.

II. PROPOSED PROJECT

A. Site Location:

The project site is located in Kihei, on the island of Maui, and in the State of Hawaii. It is situated approximately 200 feet west of Piilani Highway and approximately 1200 feet east of Kihei Road. Kanakanui Road and Ke Ali'i Alanui borders its easterly and southerly boundary, respectively. (see Exhibit 1).

The project site encompasses an area of approximately 24.09 acres.

B. Project Description:

The proposed plan for Ke Ali'i Subdivision is to develop the project site into a single family residential subdivision consisting of ninety-five (95) house lots with a minimum lot size of 7,500 sq. ft. Proposed improvements include asphalt paved roadways, concrete curb and gutter, concrete sidewalks and landscaping. Utility improvements will consist of underground sewer, drainage and water distribution systems and underground electrical, telephone and cable-television distribution systems.

II. EXISTING CONDITIONS:

A. Topography and Soil Conditions:

The project site is undeveloped and not being used for any particular purpose. The project site generally slopes from an elevation of approximately (+) 112± feet M.S.L. to approximately (+) 56± feet M.S.L. in an easterly to westerly direction.

According to the *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii* [1], prepared by the United States Department of Agriculture, Soil Conservation Service, the soil classification found on the project site is the Puuone sand, 7 to 30 percent slopes (PZUE). The Puuone sand is characterized as having rapid permeability and slow runoff. (see Exhibit 2).

B. Drainage:

According to our calculations, approximately 21 cfs of onsite surface runoff is currently being generated by the project site. This surface runoff sheet flows across the site in an easterly to westerly direction.

According to the "Hydrology Report for Piilani Highway" prepared by Trans-Meridian Engineers and Surveyors, Inc., three (3) offsite drainage basins (basins 21, 22 and 22A) flow into the project site by means of existing culverts crossing under Piilani Highway. This offsite runoff is conveyed to the project site by means of an existing 48-inch drainage culvert located along the easterly portion of the project site which crosses under Kanakanui Road. The offsite surface runoff is then discharged into an existing natural drainageway which bisects the project site in an easterly to westerly direction and conveys the offsite and onsite runoff downstream near the

Maui Coast Hotel. From there, existing drainage culverts direct the surface runoff to Kihei Road via an existing natural drainageway and eventually into the ocean.

According to the "Hydrology Report for Piilani Highway", the 100-year recurrence interval 6-hour duration storm runoff for the offsite drainage basins 21 and 22, was computed to be 624 cfs and 585 cfs, respectively, for a total runoff volume of 1,209 cfs. The 100-year recurrence interval 6-hour duration storm runoff for the offsite drainage basin 22A was computed to be 125 cfs. Using the NRCS (SCS) TR-20 Hydrograph Method for a 100 year-24 hour recurrence interval storm, our calculations indicate that for the same drainage basins, the total runoff was calculated to be approximately 1,082 cfs.

Presently, the existing drainage culverts which conveys offsite surface runoff under Piilani Highway has the required capacity to convey the designed surface runoff based on a 50-year 6-hour recurrence interval storm. However, the existing 48-inch drainage culvert crossing Kanakanui Road does not have adequate capacity for the total offsite surface runoff volume currently being conveyed to the existing natural drainageway.

C. Flood and Tsunami Zone:

According to Panel Number 150003 0265C of the Flood Insurance Rate Map [2], dated September 6, 1989, prepared by the United States Federal Emergency Management Agency, the majority of the project site is situated within Zone C, which is designated as an area subject to minimal flooding. A small portion of the project site located on the northwesterly boundary is situated in Zone A5, where

areas of 100-yr. flood, base flood elevations and flood hazard factors have been determined. All habitable structures within Zone A5 will be built above the designated flood elevation. (See Exhibit 3).

IV. DRAINAGE PLAN

A. General:

The design criteria that will be utilized to minimize the impact of increased surface runoff on the existing downstream properties are as follows:

a. There will be no significant change to the natural drainage pattern of the project site. The natural shape and slope of the location of the existing natural drainageway will be maintained and will continue to direct onsite and offsite surface runoff to the adjoining downstream properties, as it is presently doing.

b. It is expected that an increase in onsite surface runoff will be generated due to the proposed development. As part of our design criteria, a subsurface drainage system will be constructed which will allow for the control of the volume of discharged runoff such that the post-development surface runoff volume will not exceed the pre-development surface runoff volume.

According to our calculations, the post development runoff from the project site is expected to be approximately 44 cfs for a 50 year recurrence interval - 1 hour duration storm. Therefore, a net increase of approximately 23 cfs is expected to be generated by the development of the project site. The majority of the surface runoff

will be intercepted by new curb inlet type catch basins and then conveyed by means of an underground drainage system into a subsurface detention facility located within the proposed park site for the project. This subsurface system which consists of a large diameter perforated pipe, will be designed to accommodate the increase in surface runoff volume while allowing a small diameter pipe to release the pre-development surface runoff volume into the existing natural drainageway located within the project site. The park site which will be bermed at the perimeter and fully grassed with an irrigation system will also serve as a detention basin during periods of heavy and prolonged rainstorms. The remaining onsite surface runoff will be intercepted by new curb inlet type catch basins and conveyed by means of a new underground drainage system to an outlet located within the existing natural drainageway.

The existing natural drainageway bisecting the project site will be preserved as a drainageway. The approximate location of the 100-year flood inundation limits was determined by using the US Army Corps of Engineers HEC-RAS River Analysis System software while using the design flow as calculated in the "Hydrology Report for Piilani Highway". It is expected that fill material will be placed at or beyond the edge of the 100-year flood inundation limits so as not to disturb the natural stream bed. A drainage easement will be created to encompass the 100-year flood inundation limits based on the design flow of 1,334 cfs as calculated by the "Hydrology Report for Piilani Highway" and 3,200 cfs as calculated by the Federal Emergency Management Agency (FEMA). The parcels beyond the drainage

easement will be graded such that there will be adequate freeboard to keep the lot elevation above the 100-year flood elevation.

As requested by the County of Maui Planning Department, the drainage culvert within the proposed subdivision will be designed to accommodate the storm runoff flow as determined by FEMA. As stated above, the design flow as calculated by FEMA for the existing natural drainageway is 3,200 cfs.

The existing 48-inch culvert crossing under Kanakanui Road will be replaced with a new multi barrel 78-inch culvert which will convey the design flow into the existing natural drainageway as calculated by the "Hydrology Report for Piilani Highway". The multi barrel 78-inch drainage culvert under Kanakanui Road will be designed to convey a design flow of 1,334 cfs as calculated in the "Hydrology Report for Piilani Highway".

B. Hydrologic Calculations:

The onsite hydrologic calculations are based on the "Rules for the Design of Storm Drainage Facilities in the County of Maui", Title MC-15, Chapter 4 and the "Rainfall Frequency Atlas of the Hawaiian Islands", Technical Paper No. 43, U. S. Department of Commerce, Weather Bureau.

Rational Formula used:

$$Q = CIA$$

Where
- Q = Rate of Flow (cfs)
- C = Runoff Coefficient
- I = Rainfall Intensity (inches/hour)
- A = Area (Acres)

The offsite hydrologic calculations are based on procedures by the U.S. Department of Agriculture, Soil Conservation Service (SCS). This procedure is described in detail in the SCS National Engineering Handbook, Section 4, Hydrology (NEH-4). The 100-year inundation limits was determined by using the US Army Corps of Engineers HEC-RAS River Analysis System Version 2.2 software.

C. Conclusion:

The proposed development is not expected to have a significant adverse effect on the existing downstream properties. This is accomplished by maintaining the natural drainage pattern of the onsite drainage areas. The anticipated increase in surface runoff volume will be temporarily stored in the subsurface system located in the park site so no increase in surface runoff volume is expected to be released downstream of the project site.

VII. REFERENCES

1. *Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii.* August 1972. United States Department of Agriculture, Soil Conservation Service.

2. *Flood Insurance Rate Map, Maui County, Hawaii.* Community-Panel Number 150003 0265C. September 6, 1989. Federal Emergency Management Agency, Federal Insurance Administration.

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

4. *Rules for the Design of Storm Drainage Facilities in the County of Maui.* July 1995. Department of Public Works and Waste Management, County of Maui.

5. *Drainage Master Plan for Kihei, Maui, Hawaii.* September 1994. Norman Saito Engineering Consultants, Inc.

6. *Hydrology Report for Piilani Highway.* Trans-Meridian Engineers & Surveyors, Inc

7. *Flood Insurance Study, County of Maui.* August 3, 1998. Federal Emergency Management Agency.

EXHIBITS

1 Location Map

2 Soil Survey Map

3 Flood Insurance Rate Map

4 Pre-Development Onsite Drainage Area Map

5 Post-Development Onsite Drainage Area Map

6 Offsite Drainage Area Map

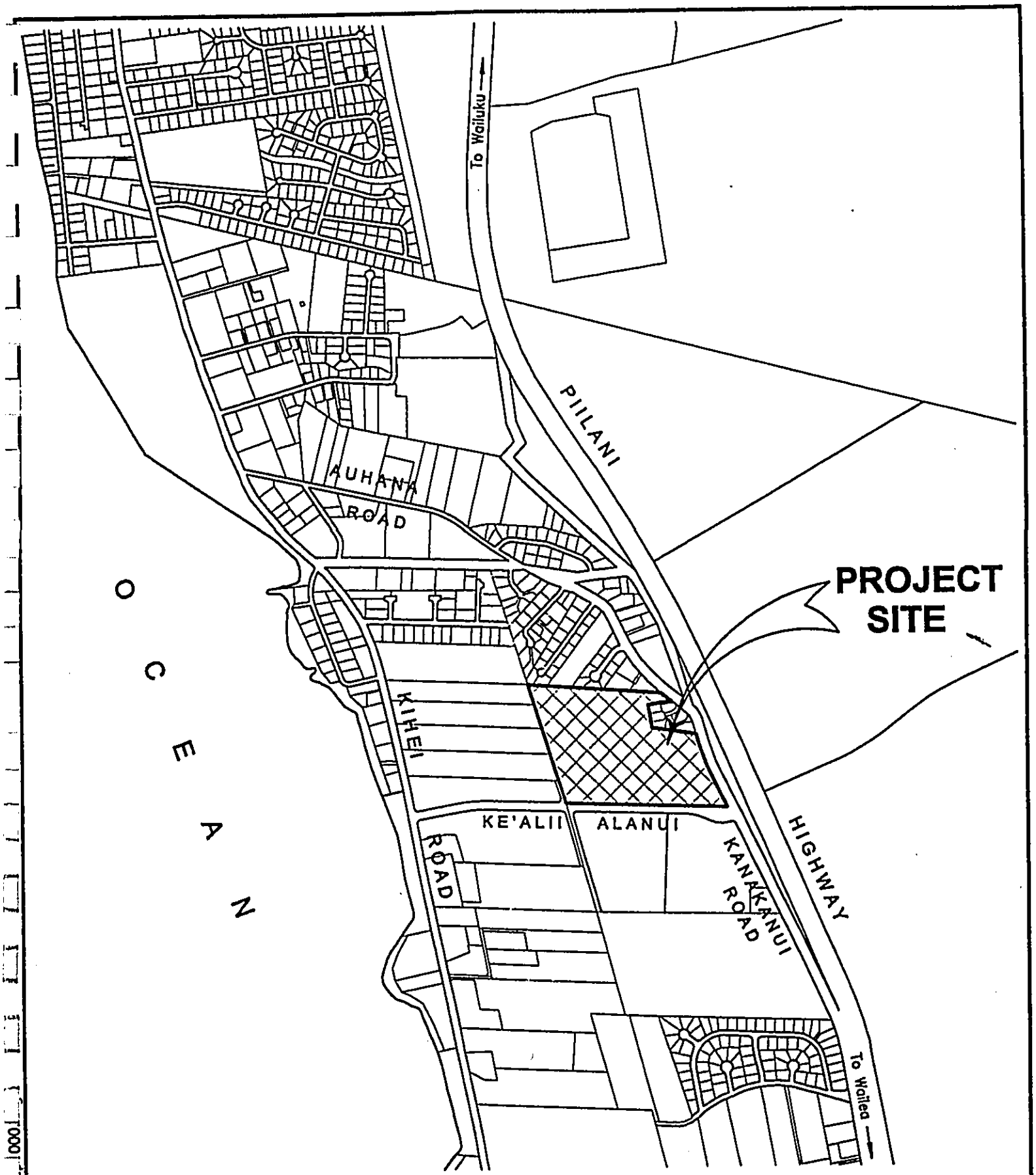


FIGURE 1
LOCATION MAP

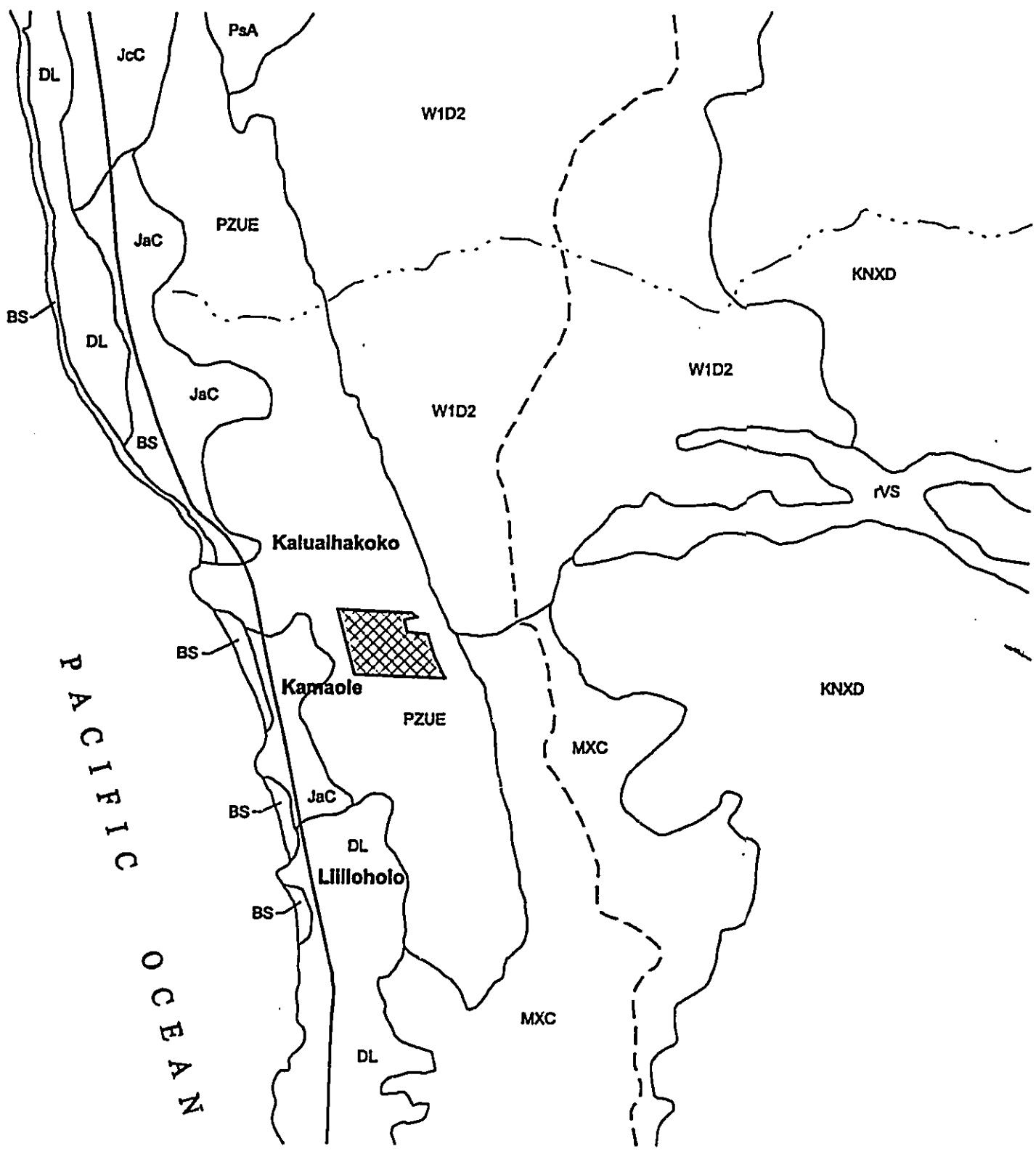
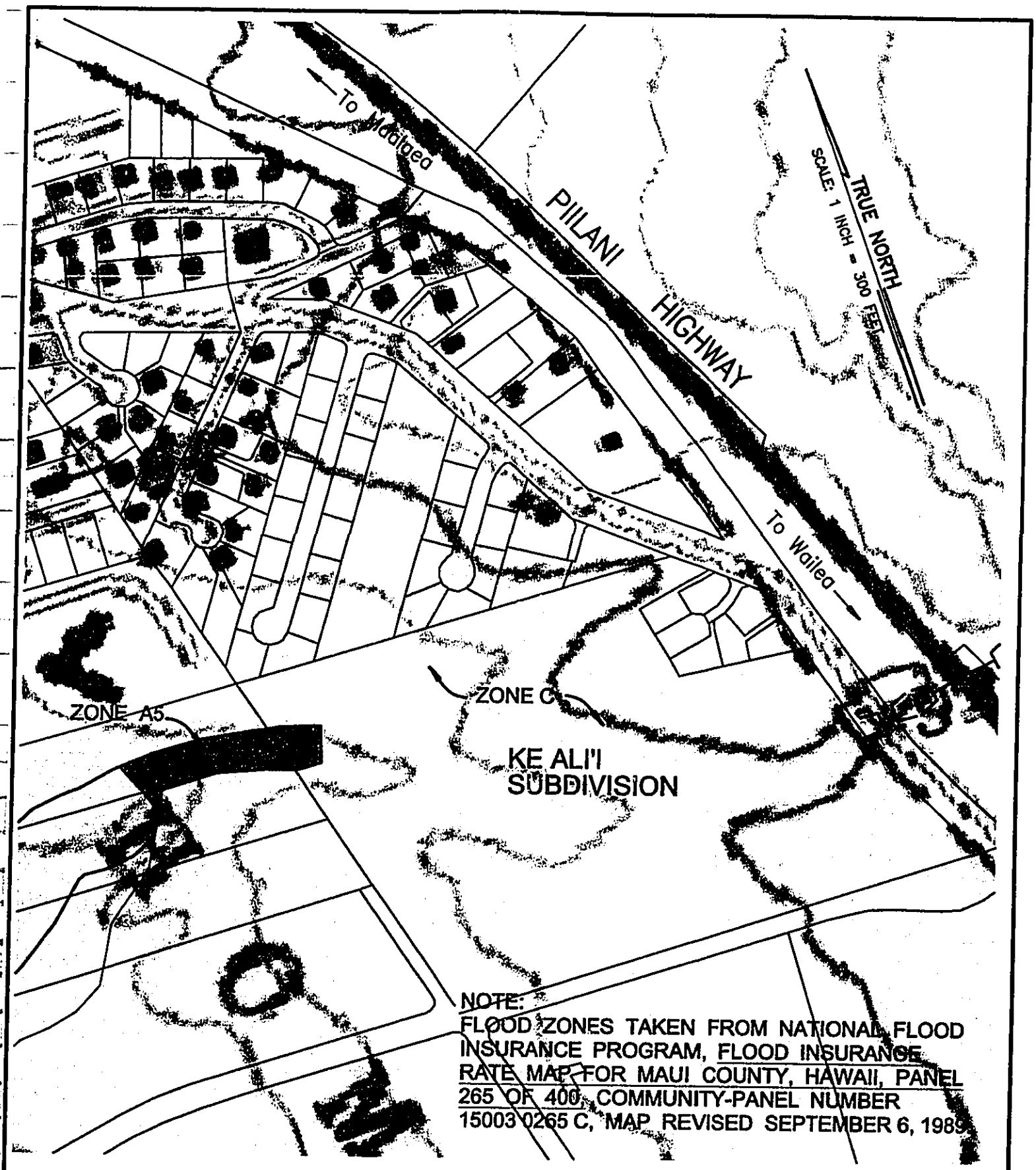


EXHIBIT 2

SITE SPECIFIC SOIL CLASSIFICATION MAP

WARREN S. UNEMORI ENGINEERING, INC.

February 29, 2000



NOTE:
FLOOD ZONES TAKEN FROM NATIONAL FLOOD INSURANCE PROGRAM, FLOOD INSURANCE RATE MAP FOR MAUI COUNTY, HAWAII, PANEL 265 OF 400, COMMUNITY-PANEL NUMBER 15003 0265 C, MAP REVISED SEPTEMBER 6, 1989.

EXHIBIT 3

FLOOD INSURANCE
RATE MAP

WARREN S. UNEMORI ENGINEERING, INC.

April 6, 2000

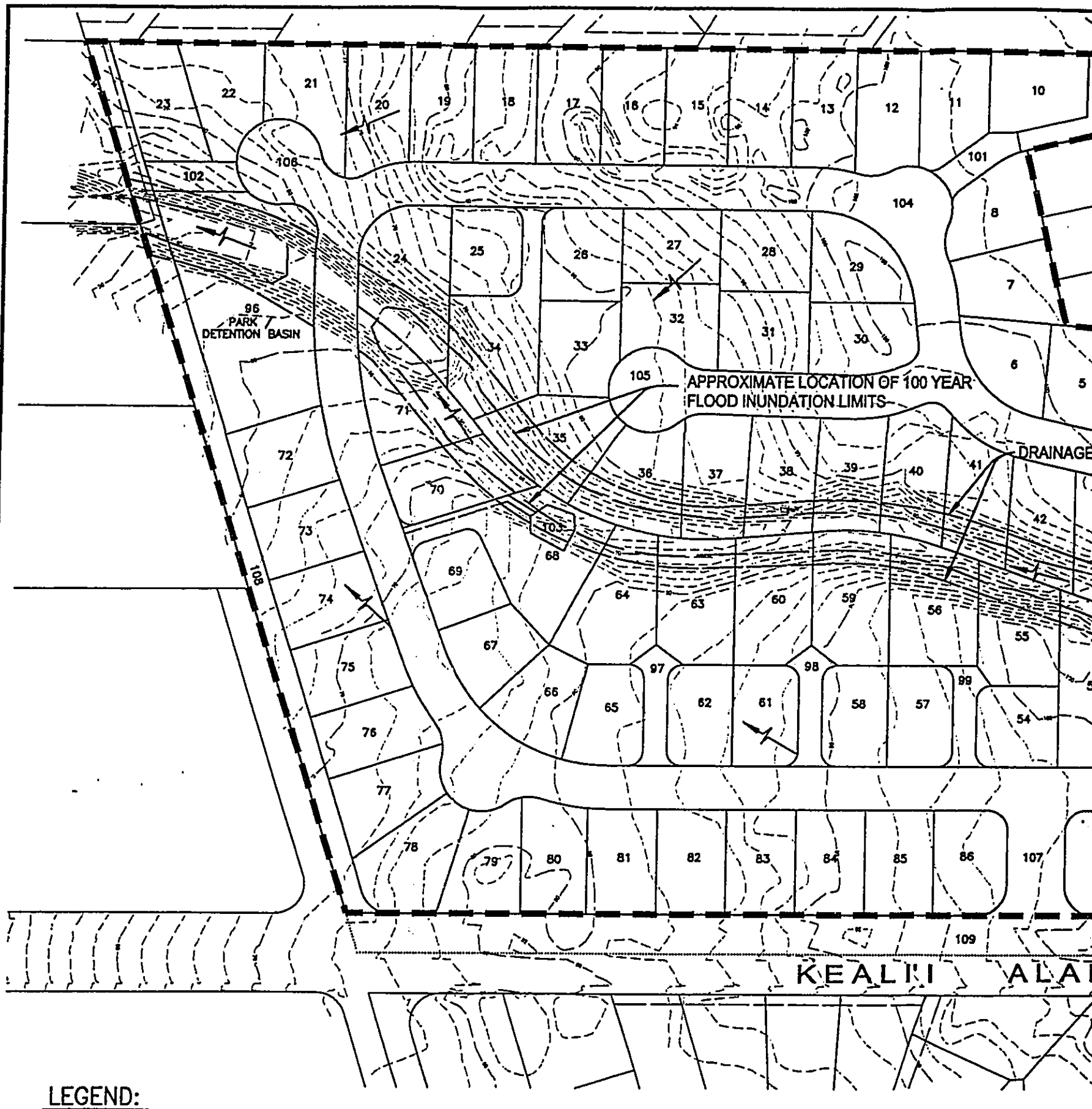
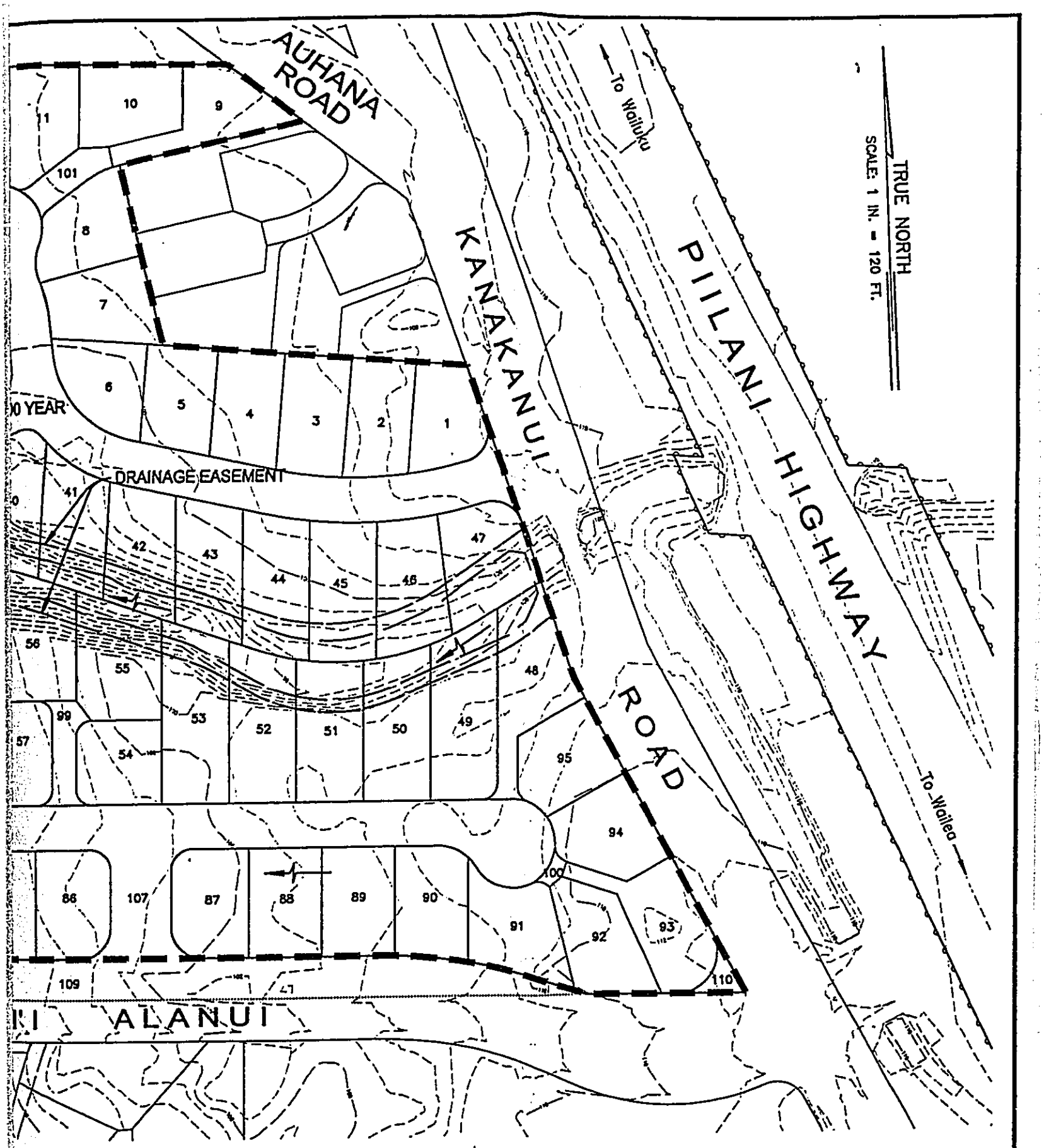


EXHIBIT 4

PRE - DEVELOPMENT ONSITE DRAINAGE

SCALE: 1 IN. = 120 FT.

99proj/99054/dwg/exhibits/drn-pre0.dwg



4

DRAINAGE AREA MAP

20 FT.

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

April 4, 2000

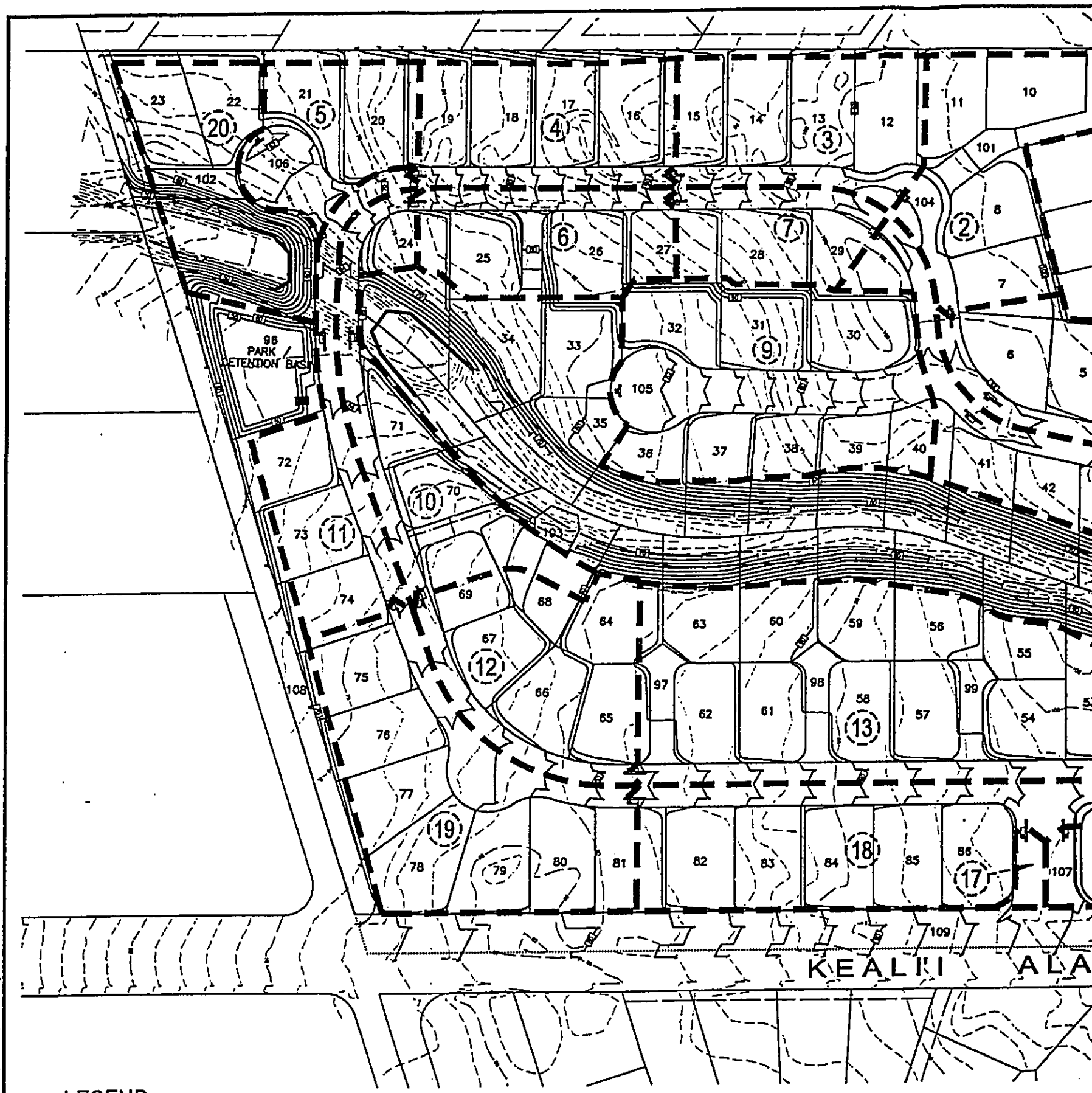
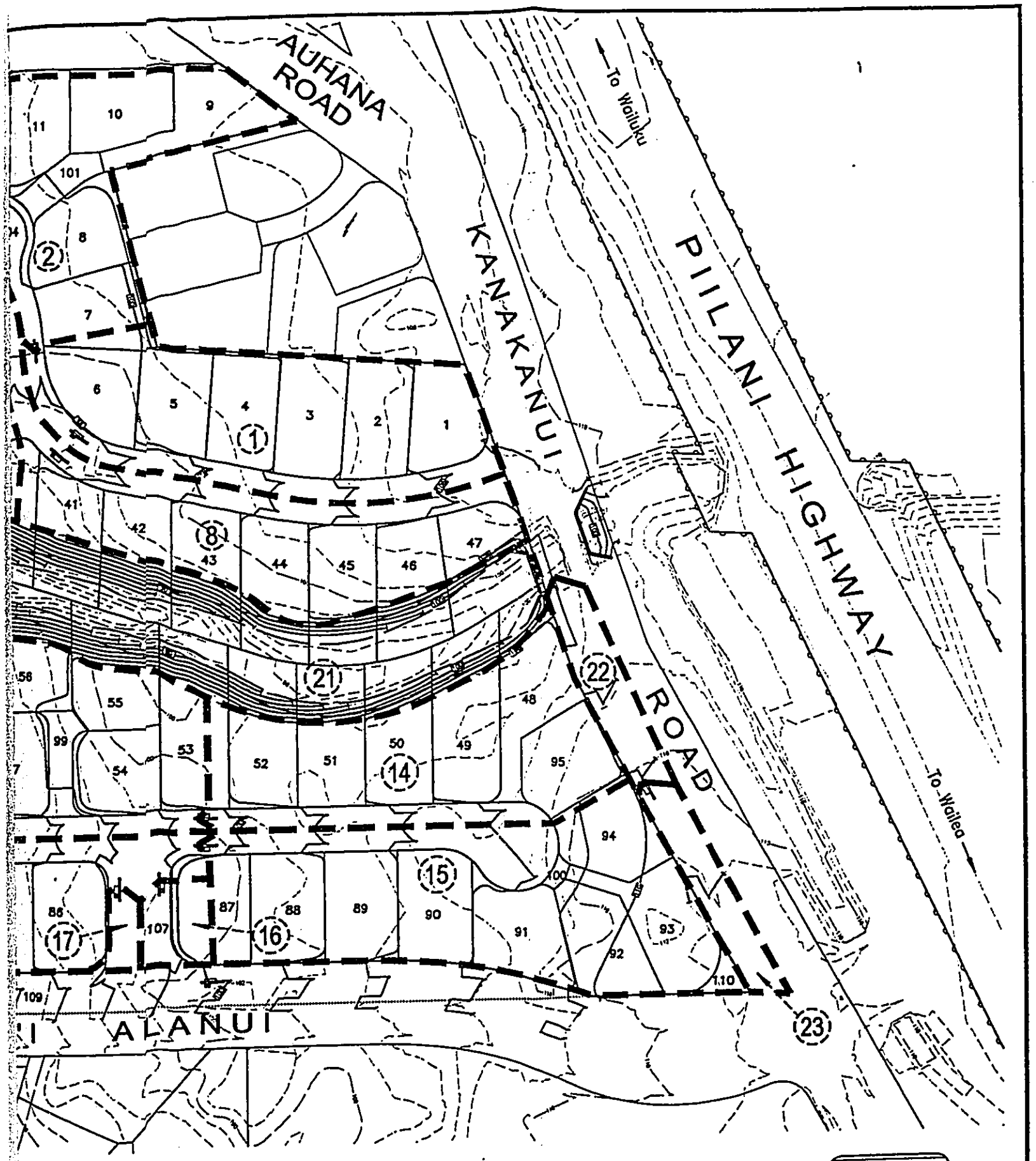


EXHIBIT 5

POST - DEVELOPMENT ONSITE DRAINAGE

SCALE: 1 IN. = 120 FT.

99proj/99054/dwg/exhibits/drn-post.dwg



WARREN S. UNEMORI ENGINEERING, INC.

DRAINAGE AREA MAP

April 4, 2000

0 FT.

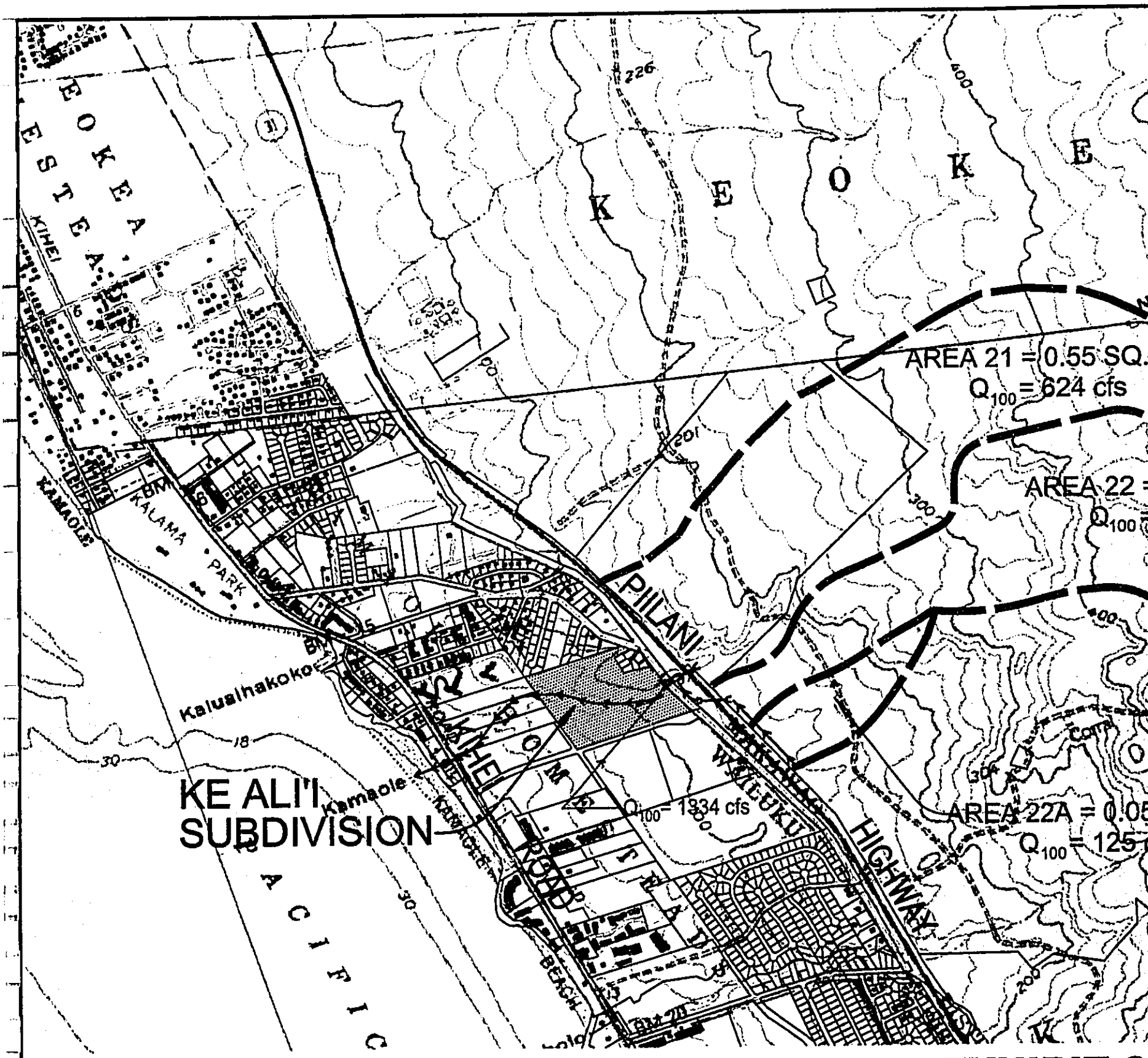


EXHIBIT 6

OFFSITE DRAINAGE AREAS ABOVE

SCALE: 1 IN. = 2500 F

LEGEND:

INFORMATION IN RED:

DRAINAGE INFORMATION TAKEN FROM HYDROLOGY REPORT FOR PIILANI HIGHWAY, ISLAND OF MAUI, PREPARED FOR THE STATE OF HAWAII DEPARTMENT OF TRANSPORTATION, HIGHWAYS DIVISION BY TRANSMERIDIAN ENGINEERS & SURVEYORS, INC., JANUARY 1978.

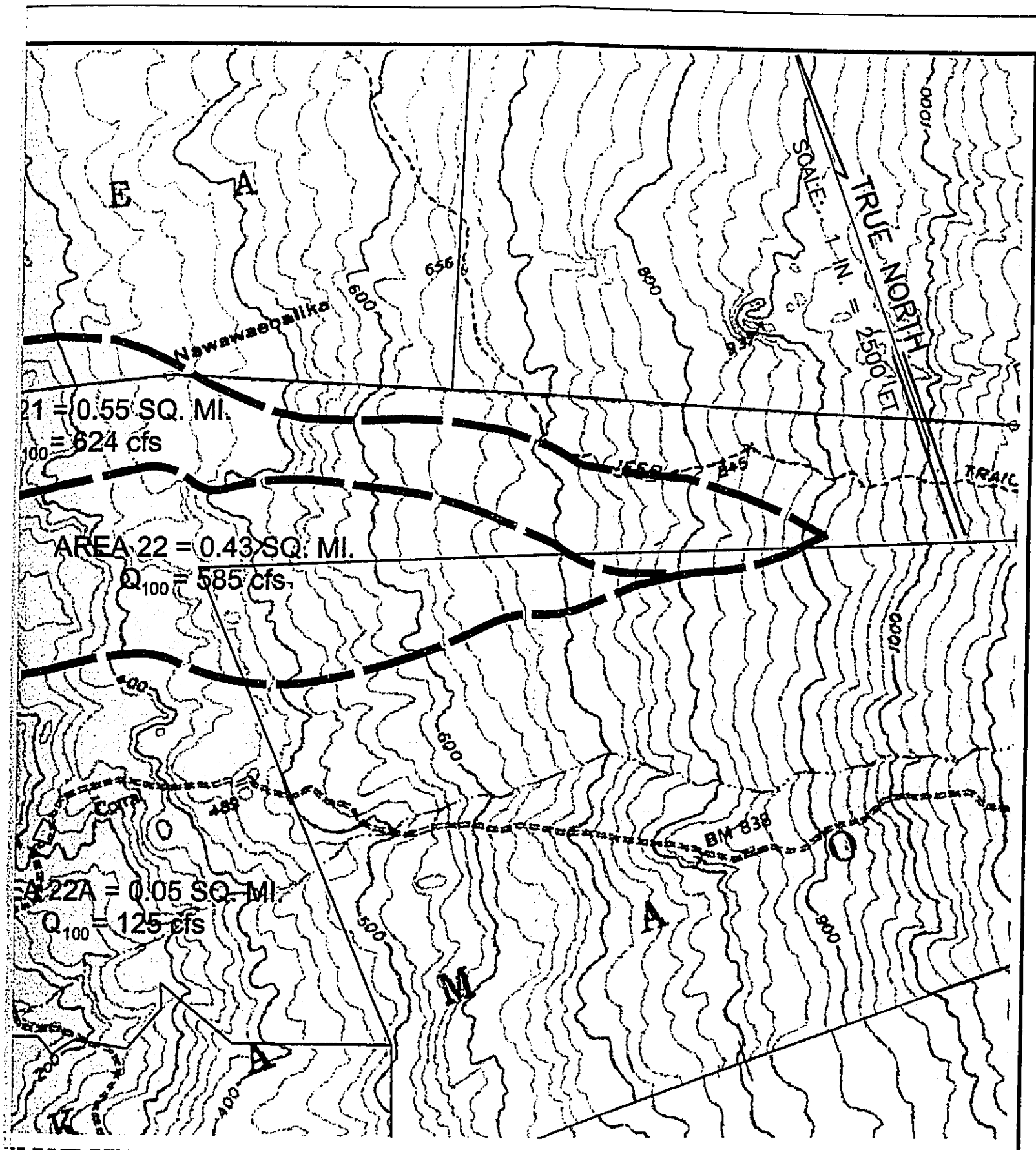


EXHIBIT 6

AREAS ABOVE KE ALI'I SUBDIVISION

SCALE: 1 IN. = 2500 FT.

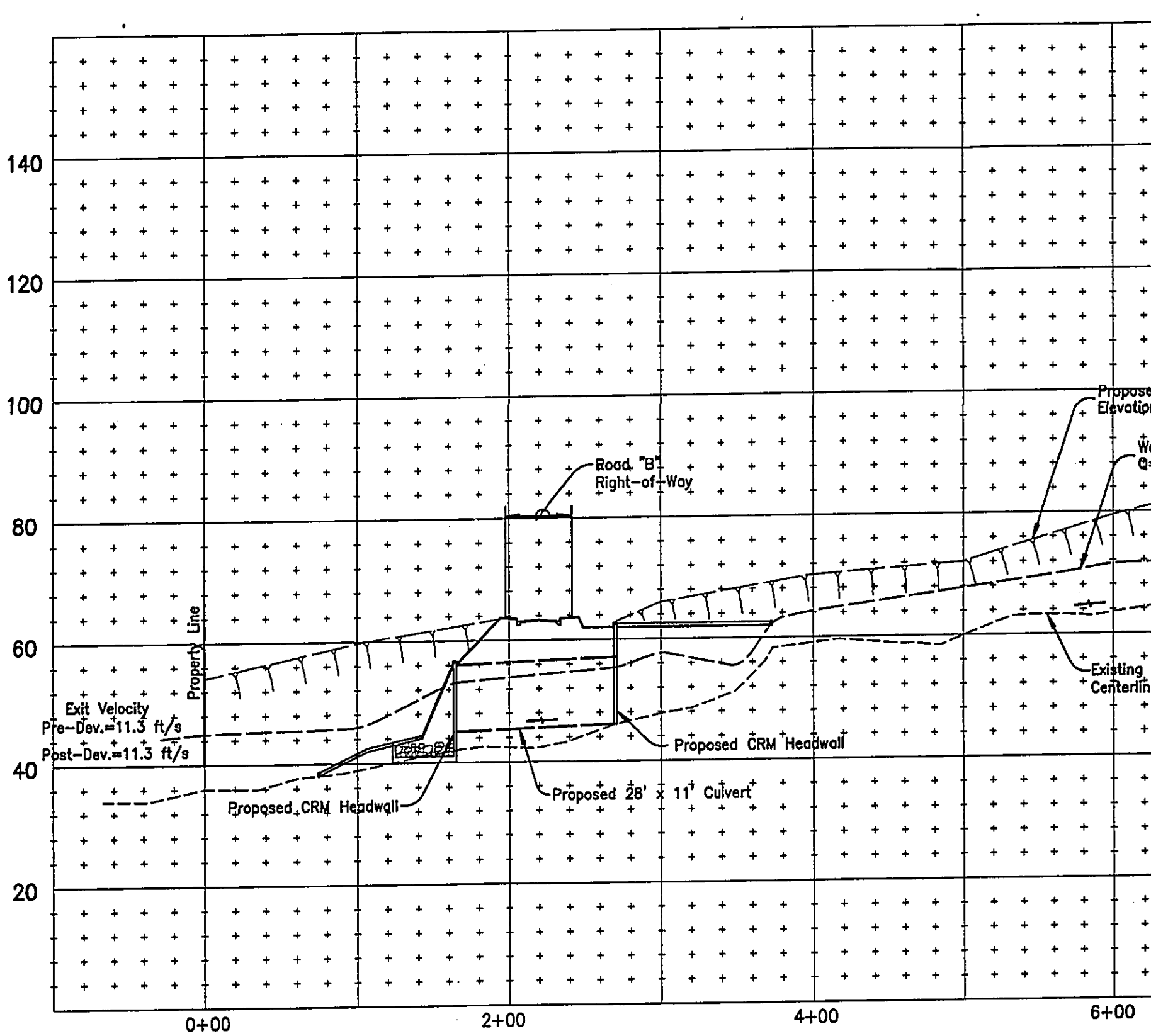
WAY,

TRANSPORTATION,

JANUARY 1978.

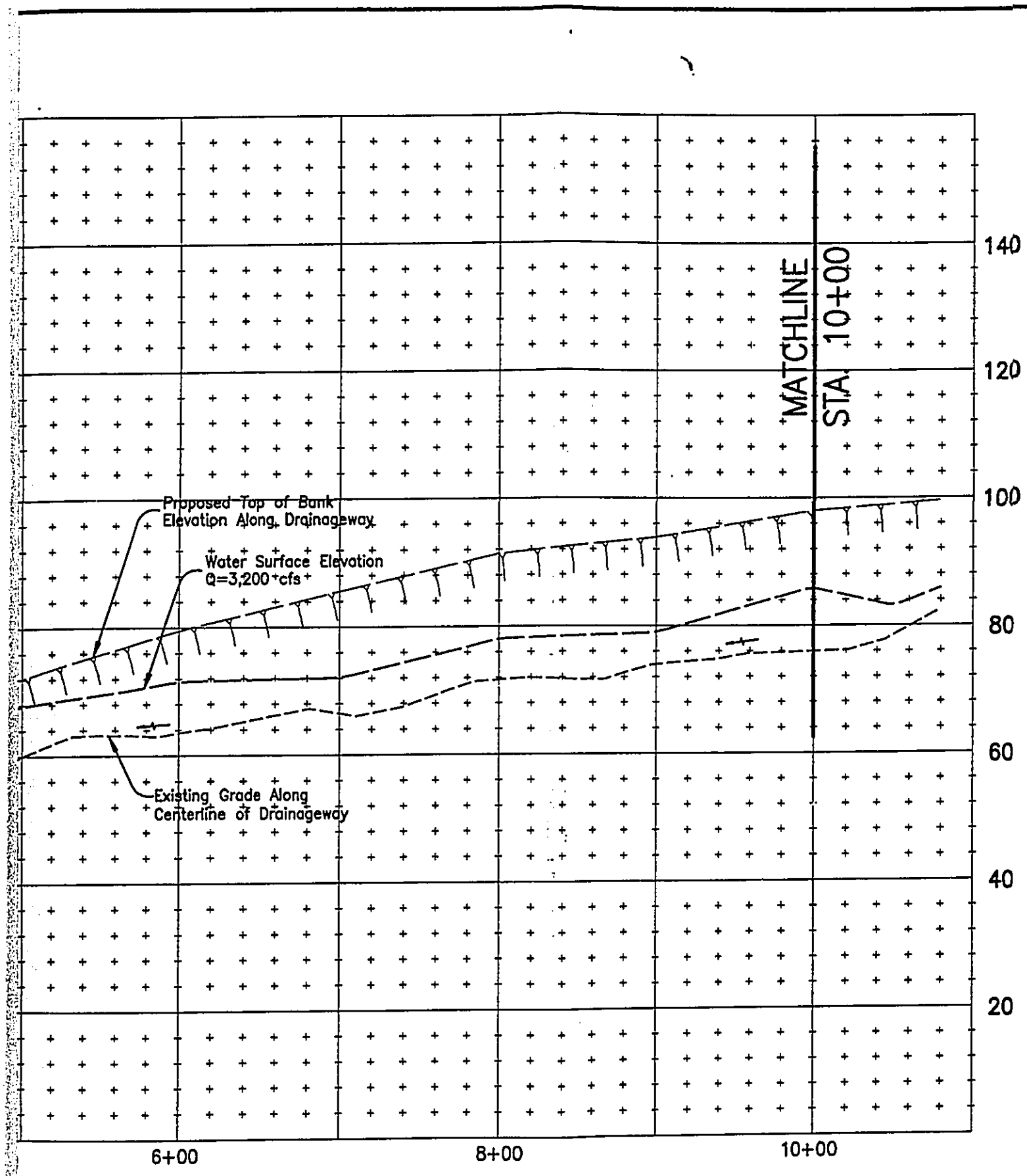
WARREN S. UNEMORI ENGINEERING, INC.

April 6, 2000



PROFILE – EXISTING DRAINAGE

Scale: Horiz. 1" = 80'
Vert. 1" = 20'



ING DRAINAGEWAY

1" = 80'
1" = 20'

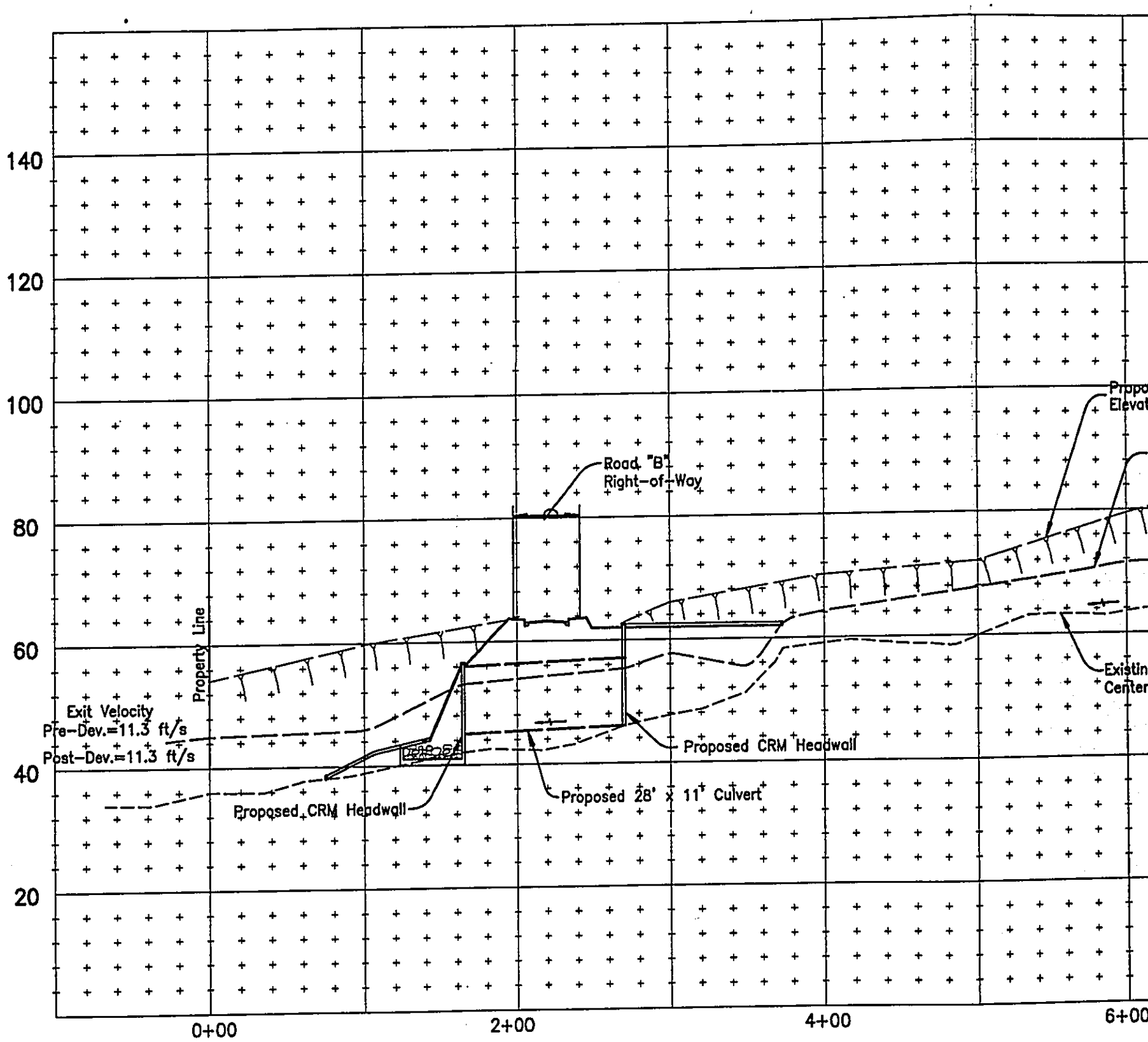
LEGEND:

Water Surface Elevation Q=3,200 cfs

Proposed Top of Bank Elevation Along Drainageway

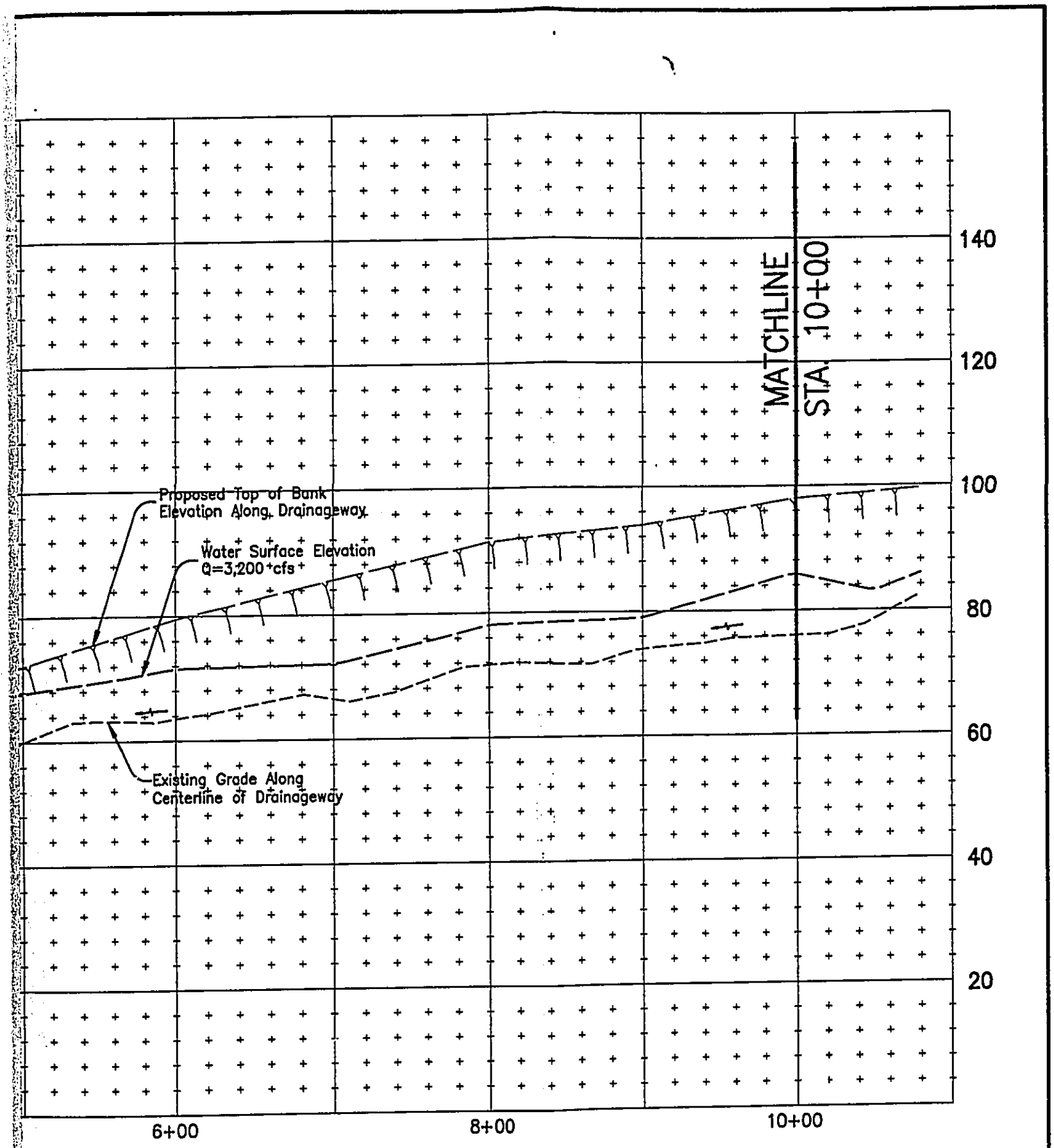
CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING



PROFILE – EXISTING DRAINA

Scale: Horiz. 1" = 80'
Vert. 1" = 20'



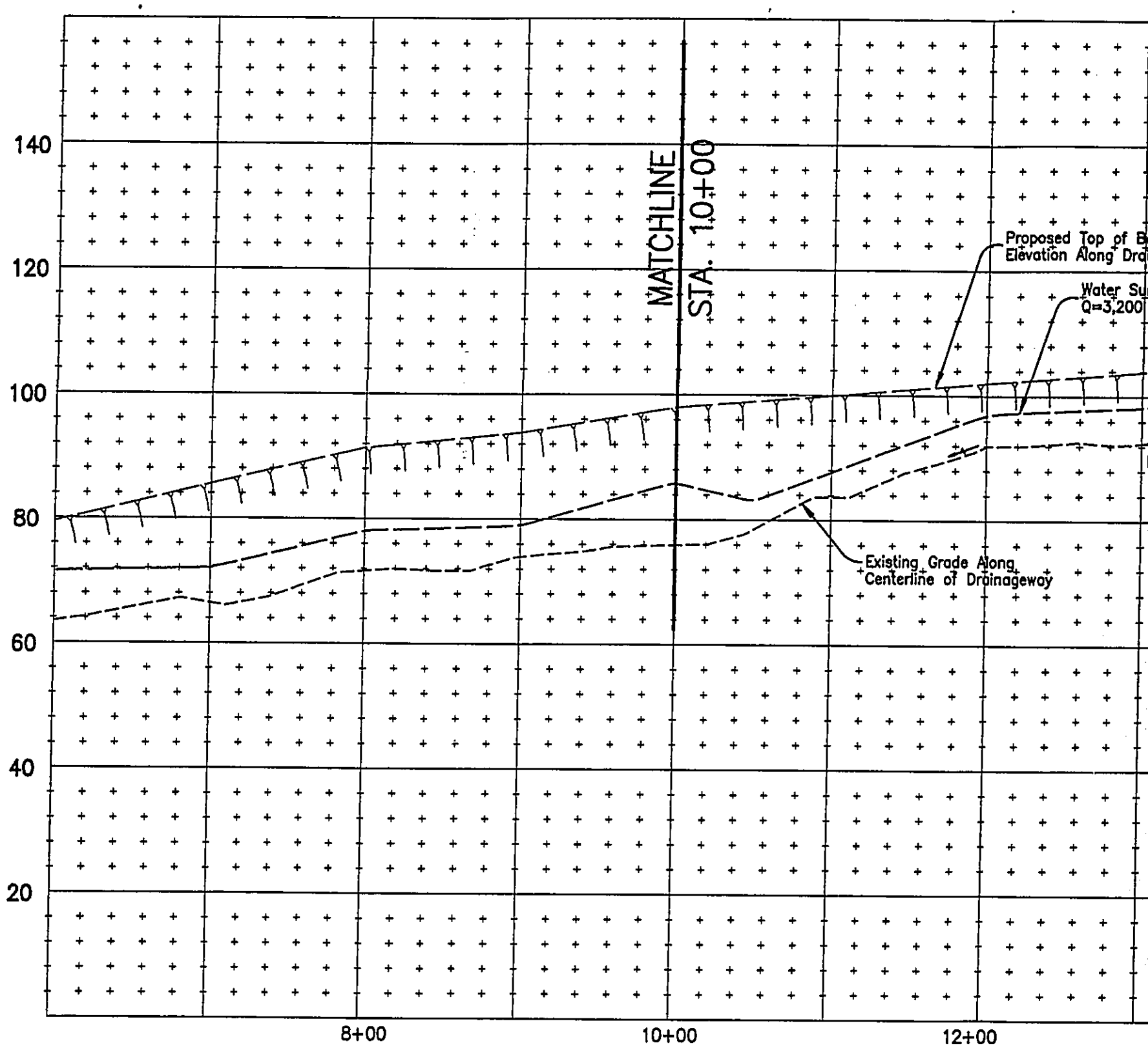
ING DRAINAGEWAY

1" = 80'
1" = 20'

LEGEND:

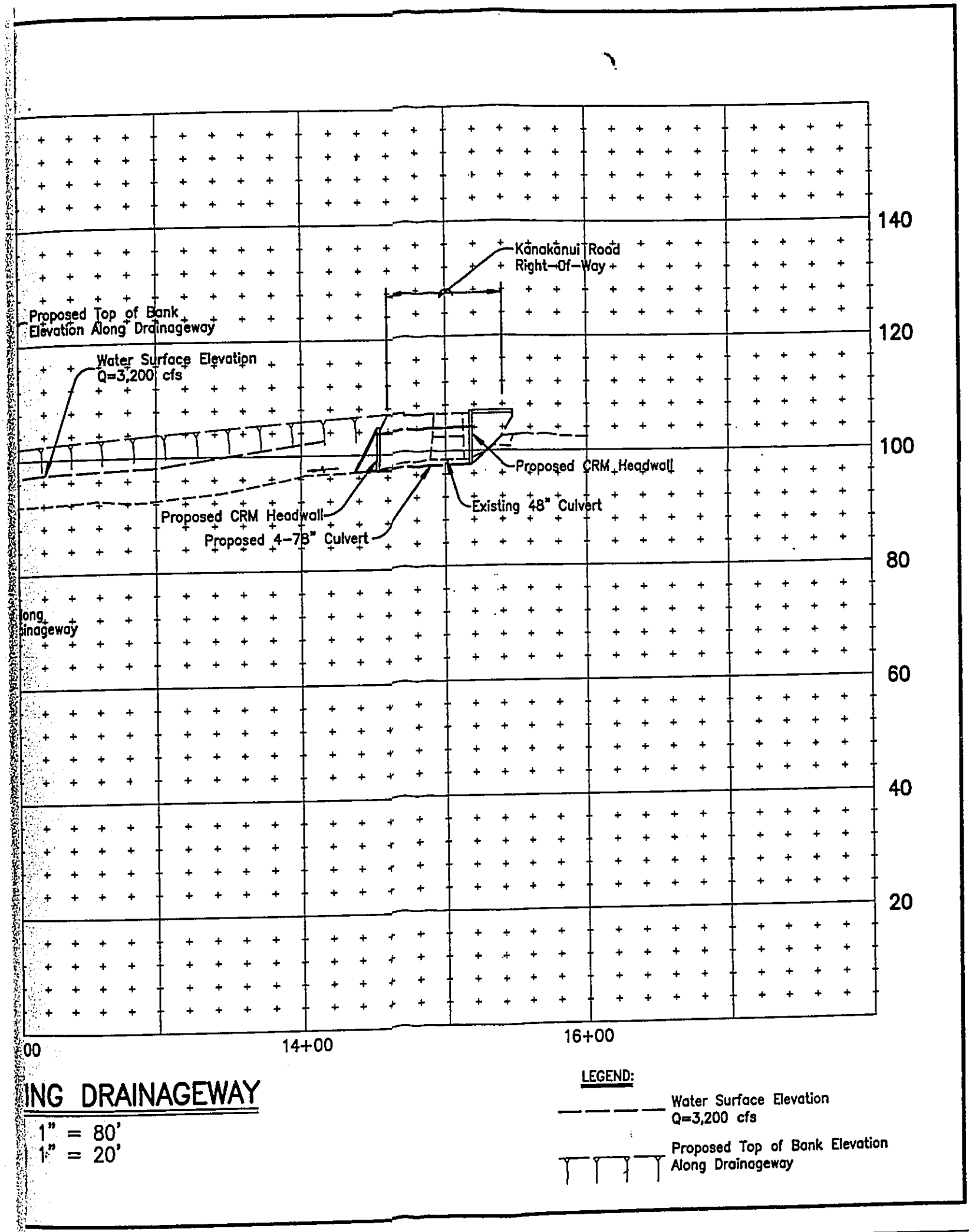
Water Surface Elevation Q=3,200 cfs

Proposed Top of Bank Elevation Along Drainageway



PROFILE – EXISTING DRAINA

Scale: Horiz. 1" = 80'
Vert. 1" = 20'



ING DRAINAGEWAY

1" = 80'
1" = 20'

APPENDIX A

HYDROLOGIC CALCULATIONS

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui, Hawaii 96793

Date: August 10, 1999

HYDROLOGIC CALCULATIONS: PRE-DEVELOPMENT

Objective: To determine the pre-development runoff of the project site

1. 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Kihei, Maui,
R(50 Yr.-1Hr.) = 2.30 inches

2. Total Area:

Area (Ac.):		24.09

3. Runoff Coefficents:

Infiltration:	Medium	0.07
Relief:	Rolling (5-15%)	0.03
Vegetal Cover:	Good (10-50%)	0.03
Development Type:	Agricultural	0.15
	Runoff Coeff't., C:	0.28

4. Time of Concentration:

Approx. Elev. Diff'l. (ft.)		56
Higher Elev. (ft.):	112	
Lower Elev. (ft.):	56	
Approx. Runoff Length (ft.):		1,100
Average Slope:		5.09%
Time of Concentration (min.):		31

5. Intensity:

Intensity (in./hr.):	3.2

6. Total Runoff:

Q = C x I x A (cfs):	21.58

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui, Hawaii 96793

Date: August 10, 1999

HYDROLOGIC CALCULATIONS: POST-DEVELOPMENT

Objective: To determine the post-development runoff of the project site

1. 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Kihei, Maui,
R(50 Yr.-1Hr.) = 2.30 inches

2. Total Area:

Area (Ac.):		24.09

3. Runoff Coefficents:

Infiltration:	Medium	0.07
Relief:	Rolling (5-15%)	0.03
Vegetal Cover:	Good (10-50%)	0.03
Development Type:	Residential	0.40
	Runoff Coeff't., C:	0.53

4. Time of Concentration:

Approx. Elev. Diff'l. (ft.)		56
Higher Elev. (ft.):	112	
Lower Elev. (ft.):	56	
Approx. Runoff Length (ft.):		1,700
Average Slope:		3.29%
Time of Concentration (min.):		23

5. Intensity:

Intensity (in./hr.):	3.5

6. Total Runoff:

Q = C x I x A (cfs):	44.69

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street , Suite 403
Wailuku, Maui , Hawaii 96793

Date: January 31, 2000 SRA

SUBSURFACE DRAINAGE SYSTEM ANALYSIS AND DESIGN

Project: Ke Ali'i Subdivision

Location: Kihei, Maui, Hawaii

Job Number: 99054

Objective: To determine the storage requirements for partial attenuation of the anticipated increase in onsite surface runoff attributable to the project development. A recurrence interval of fifty (50) years is used.

I. Determine 50-Yr. - 1 Hr. Rainfall:

From "Rainfall Frequency Atlas of the Hawaiian Islands", for Kihei, Maui,
R(50 Yr.-1Hr.) = 2.30 inches

II. Determine Pre-Development Runoff:

Pre-Development Component Areas:

Total Area (Ac.):		15.96

Pre-Development Runoff Coefficents:

Infiltration:	Medium	0.07
Relief:	Rolling (5-15%)	0.03
Vegetal Cover:	Good (10-50%)	0.03
Development Type:	Agricultural	0.15
	Composite Runoff Coeff't., C:	0.28

Pre-Development Time of Concentration:

Approx. Elev. Diff'l. (feet):		56.00
Higher Elev. (ft.):	112.0	
Lower Elev. (ft.):	56.0	
Approx. Runoff Length (ft.):		1,100
Average Slope:		5.1%
Ground Character:		rocky
Time of Concentration (min.):		31

Pre-Development Intensity:

Intensity (in./hr.):	3.2

Pre-Development Runoff:

Q (pre-dev.) = C x I x A (cfs):	**14.30**
Allowable Release Volume (cfs):	**9.33**

III. Determine Post-Development Runoff:

Total Area (Ac.):	15.96

Post-Development Runoff Coefficent:

Weighted Runoff Coeff't., *C:	0.54
C x A (post development):	**8.62**

IV. Establish Initial Trench Cross Section Parameters:

Cover Over Pipe (ft.):	1.00
Pipe Diameter (ft.):	6.00
Cradle Depth Below Pipe (ft.):	2.00
Cradle Thickness on Sides of Pipe (ft.):	2.00
Total Trench Depth (ft.):	9.0
Total Trench Width (ft.):	10.0
Gross Trench Cross Sectional Area (sf/lf):	90.0
Pipe Cross Sectional Area (sf/lf):	28.3
Trench Aggreg. Cross Sectional Area (sf/lf):	61.7

V. Determine Exfiltration:

Assume Exfiltration Limited to Sides of Trench Only:

Assumed Initial Length of Pipe / Trench (ft.):	70.00

VI. Determine Adequacy of Storage Volume Provided:

Determine Required Storage Volume:

Analytical procedures are based on methods prescribed in "Modern Sewer Design" (dated 1980, by the American Iron and Steel Institute).

Intensity values are obtained from the the Intensity-Duration Curves found page 122 of the "Drainage Master Plan for the County of Maui" (dated 1971, by R.M. Towill Corp.).

for the County of Maui" (dated 1971, by R.M. Towill Corp.).

Time (min.)	I (in/hr)	Post-Dev. C x A (ac)	Accum. Runoff Vol. (cf)	Allow. Release (cf)	Storage Required. (cf)	Comments
(1)	(2)	(3)	(4)	(5)	(6)	
5	5.90	8.62	15,255	2,799	12,456	
10	4.70	8.62	24,304	5,598	18,706	
15	4.20	8.62	32,578	8,397	24,181	
20	3.80	8.62	39,300	11,196	28,104	
30	3.20	8.62	49,642	16,794	32,848	
40	2.85	8.62	58,950	22,392	36,558	
60	2.30	8.62	71,360	33,588	37,772	
80	2.00	8.62	82,737	44,784	37,953	Peak Storage
100	1.80	8.62	93,079	55,980	37,099	
120	1.60	8.62	99,284	67,176	32,108	
180	1.20	8.62	111,694	100,764	10,930	

(COL 4) = (COL 1) x (COL 2) x (COL 3) x (60 sec./min.)
(COL 5) = Q(allowable) x (COL 1) x (60 sec./min.)
(COL 6) = (COL 4) - (COL 5)

Maximum Storage Required (cf): 37953

Determine Provided Storage Volume:

Pipe Storage Capacity (cf):	1,979.2
Net Aggregate Cradle Storage Capacity (cf):	6,300.0
Gross Aggregate Cradle Volume (40% void ratio) (cf):	1,728.3
50% of void volume (cf):	864.2
Total Storage Capacity Provided (cf):	2,843.4

{Storage Provided = 2,843 cf} > {Storage Required = 2,153 cf}; therefore initial assumptions based on 70 l.f. of 72-inch diameter pipe are acceptable.

```
**********                              * TR 20 S/N     :
*                                       * HMVersion     :  3.40
*                                       * Date          :  9/29/99
*                TR 20                  * Time          : 12:09:19
*
*
*    Project Formulation Hydrology      * Input file    :
V:\PROJDATA\99PROJ\9905*                * Output file   :
*
V:\PROJDATA\99PROJ\9905*                *
*
*                                       *
*
*********************************************************************
*********
```

```
xxxxxxx  xxxxxx     xxxxx     xxxxx
   x     x     x  x     x  x     xx
   x     x     x        x  x    x x
   x     xxxxxx        x     x  x  x
   x     x    x      x        x x   x
   x     x     x    x         xx    x
   x     x      x  xxxxxxx    xxxxx
```

```
::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
:::                                        :::
:::   Full Microcomputer Implementation   :::
:::                  by                    :::
:::          Haestad Methods, Inc.         :::
:::                                        :::
::::::::::::::::::::::::::::::::::::::::::::
::::::::::::::::::::::::::::::::::::::::::::
```

37 Brookside Road * Waterbury, Connecticut 06708 * (203) 755-1666

□□

```
********************80-80 LIST OF INPUT DATA FOR TR-20
HYDROLOGY*******************

JOB TR-20
TITLE 001 KEALII SUBDIVISION OFFSITE DRAINAGE AREAS 21, 22 & 22A (100-
YR.)
TITLE 002 FILE: V:/PROJDATA/99PROJ/99054/TR20/KEALII4.DAT
 6 RUNOFF 1 001        1 0.98         68.0         0.97         1 1   1   1
   ENDATA
 7 INCREM 6              0.10
 7 COMPUT 7 001   001    0.0          10.0          1.0         1 2  01  01
   ENDCMP 1
   ENDJOB 2

*********************************END OF 80-80
LIST*********************************
□□
```

```
TR20 XEQ  9/29/99              KEALII SUBDIVISION OFFSITE DRAINAGE AREAS
21, 22 & 22A (100-YR.)                    JOB  1   PASS   1
     REV 09/01/83              FILE:
V:/PROJDATA/99PROJ/99054/TR20/KEALII4.DAT
PAGE   1


FILE NO.  1

                                        COMPUTER PROGRAM FOR PROJECT
FORMULATION - HYDROLOGY    USER NOTES

                THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF
TR-20.  CHANGES FROM THE 2/14/74 VERSION INCLUDE:

                REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE
REPLACES THE CONVEX METHOD.  INPUT DATA PREPARED FOR
                PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING
COEFFICIENTS WILL NOT RUN ON THIS VERSION.

                THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA
REPRESENTATIVE OF A REACH.  IT IS RECOMMENDED THAT
                THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE
OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED.
                THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND
ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M"
                VALUES USED IN THE ROUTING PROCEDURE.

                GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS
AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS
                MANUAL.  SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS
AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

                HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE
INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT
                HYDROGRAPH HAVE BEEN IMPROVED.  PEAK DISCHARGES AND
TIMES MAY DIFFER FROM THE PREVIOUS VERSION.  OUTPUT
```

HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NB (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD
CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION
5/02/83 - CORRECT COMPUTATIONS FOR ---
1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT
PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS
ENHANCEMENTS ---
1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S
09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS
CORRECT COMBINATION OF RATING TABLES FOR DIVERT
CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS
ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

EXECUTIVE CONTROL OPERATION INCREM
RECORD ID □ MAIN TIME
INCREMENT = .10 HOURS

EXECUTIVE CONTROL OPERATION COMPUT
RECORD ID □ FROM XSECTION
1□ TO XSECTION
1

STARTING TIME = .00 RAIN DEPTH = 10.00 RAIN DURATION= 1.00 RAIN TABLE NO.= 1 ANT. MOIST. COND= 2
ALTERNATE NO.= 1 STORM NO.= 1 MAIN TIME INCREMENT = .10 HOURS

OPERATION RUNOFF CROSS SECTION 1

	PEAK TIME(HRS)	PEAK DISCHARGE(CFS)	PEAK ELEVATION(FEET)
(RUNOFF)	10.45	1082.28	
(RUNOFF)	19.31	127.08	

TIME(HRS) FIRST HYDROGRAPH POINT = .00 HOURS TIME INCREMENT = .10 HOURS DRAINAGE AREA = .98 SQ.MI.

4.00	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.01
5.00	DISCHG	.05	.15	.35	.71	1.25	1.99	2.93	4.06	5.35
6.00	DISCHG	6.78	8.32	9.94	11.61	13.32	15.05	16.79	18.56	20.39
7.00	DISCHG	22.33	24.40	26.61	28.95	31.40	34.00	36.75	39.62	42.58
8.00	DISCHG	45.64	48.83	52.16	55.61	59.23	63.15	67.50	72.46	77.89
9.00	DISCHG	83.93	90.79	98.76	108.04	118.49	130.07	142.98	157.56	174.01
10.00	DISCHG	193.29	221.90	268.70	347.81	466.79	616.16	773.65	916.14	1021.91
11.00	DISCHG	1077.97	1038.64	974.21	897.03	816.38	740.00	674.75	617.73	566.81
12.00	DISCHG	480.42	446.06	416.63	391.20	369.19	350.35	334.40	320.66	308.58
13.00	DISCHG	288.05	279.49	271.68	264.50	257.87	251.92	246.64	241.89	237.40
14.00	DISCHG	228.76	224.72	220.81	216.90	212.86	208.90	205.14	201.60	198.25
15.00	DISCHG	192.18	189.55	187.12	184.79	182.52	180.33	178.35	176.59	175.10
		172.96	172.19	171.44	170.57	169.51				

16.00	DISCHG	168.26	166.87	165.37	163.75	161.99
160.18	158.38	156.56	154.67	152.68		
17.00	DISCHG	150.70	148.85	147.17	145.72	144.51
143.55	142.75	141.96	141.05	139.93		
18.00	DISCHG	138.63	137.18	135.60	133.89	132.03
130.16	128.47	127.12	126.22	125.87		
19.00	DISCHG	126.01	126.43	126.86	127.08	126.92
126.35	125.45	124.30	122.91	121.30		
20.00	DISCHG	119.60	117.93	116.38	115.01	113.85
112.93	112.26	111.75	111.37	111.09		
21.00	DISCHG	110.88	110.73	110.62	110.55	110.51
110.46	110.33	110.04	109.50	108.65		
22.00	DISCHG	107.55	106.33	105.11	104.00	103.05
102.30	101.74	101.32	101.00	100.76		
23.00	DISCHG	100.57	100.44	100.35	100.28	100.24
100.21	100.10	99.82	99.27	98.37		
24.00	DISCHG	97.05	94.87	91.25	85.60	77.63
67.80	57.17	46.68	37.03	28.70		
25.00	DISCHG	22.06	17.13	13.33	10.37	8.04
6.23	4.81	3.71	2.85	2.19		
26.00	DISCHG	1.68	1.27	.96	.72	.53
.38	.27	.19	.12	.06		
27.00	DISCHG	.03	.01	.00		

RUNOFF VOLUME ABOVE BASEFLOW = 5.95 WATERSHED INCHES, 3765.76 CFS-HRS, 311.20 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP COMPUTATIONS
RECORD ID
COMPLETED FOR PASS 1

EXECUTIVE CONTROL OPERATION ENDJOB
RECORD ID

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL

INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE
(CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK
AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD PRECIPITATION OPERATION	DRAINAGE AREA (SQ MI)	TABLE #	RAIN MOIST COND RATE	ANTEC INCREM RATE (HR)	MAIN PEAK DISCHARGE TIME BEGIN RATE (HR)	AMOUNT (IN)
DURATION (HR)	AMOUNT (IN)	ELEVATION (FT)	TIME (HR)	(CFS)		(CSM)	
ALTERNATE 1 STORM 1[]							
XSECTION 1	RUNOFF	.98	1	2	.10	.0	10.00
24.00	5.95	---	10.45	1082.28		1104.4	

TR20 XEQ 9/29/99 KEALII SUBDIVISION OFFSITE DRAINAGE AREAS
21, 22 & 22A (100-YR.) JOB 1 SUMMARY
REV 09/01/83 FILE:
V:/PROJDATA/99PROJ/99054/TR20/KEALII4.DAT

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 1
XSECTION 1	.98	
ALTERNATE 1		1082.28

END OF 1 JOBS IN THIS RUN
Stop - Program terminated.

APPENDIX B

HYDRAULIC CALCULATIONS

POST-DEVELOPMENT ONSITE SURFACE RUNOFF
DRAINAGE AREAS FLOWING INTO CATCH BASINS
50 Year - 1 Hour Rainfall = 2.3 inches

Drainage Area No.	Area (acres)	Length (feet)	Slope (%)	Runoff Coeff. C	Time of Conc. Tc, (minutes)	Intensity i, (inches/hour)	Surface Runoff Q (cubic feet per second)
1	1.37	500	2.2	0.54	18	4	2.96
2	0.95	430	1.4	0.52	18	4	1.98
3	0.79	360	2.78	0.54	17	4.1	1.75
4	0.76	390	5.13	0.54	15	4.25	1.74
5	0.53	240	2.5	0.56	14	4.3	1.28
6	0.62	350	6	0.55	14	4.3	1.47
7	0.43	0.43	2.67	0.56	16	4.2	1.01
8	1.12	500	2	0.56	17	4.1	2.57
9	1.40	400	4.25	0.55	15	4.25	3.27
10	0.75	420	2.6	0.58	17	4.1	1.78
11	0.65	400	1.8	0.59	17	4.1	1.57
12	0.88	400	13	0.54	18	4	1.90
13	2.07	595	3.36	0.52	20	3.8	4.09
14	1.15	500	1.4	0.53	21	3.7	2.26
15	1.63	590	2.2	0.52	20	3.8	3.22
16	0.12	130	2.69	0.61	7	5.3	0.39
17	0.06	115	1	0.71	3	6.3	0.27
18	1.24	510	2.9	0.54	20	3.8	2.54
19	1.37	520	2.5	0.53	20	3.8	2.76
20	0.72	180	6.7	0.41	14	4.3	1.27
21	4.12	1260	3.5	0.35	31	3.2	4.61
22	0.22	210	1.85	0.67	5	6	0.88
23	0.23	220	1.5	0.68	5	6	0.94

CORRECTION

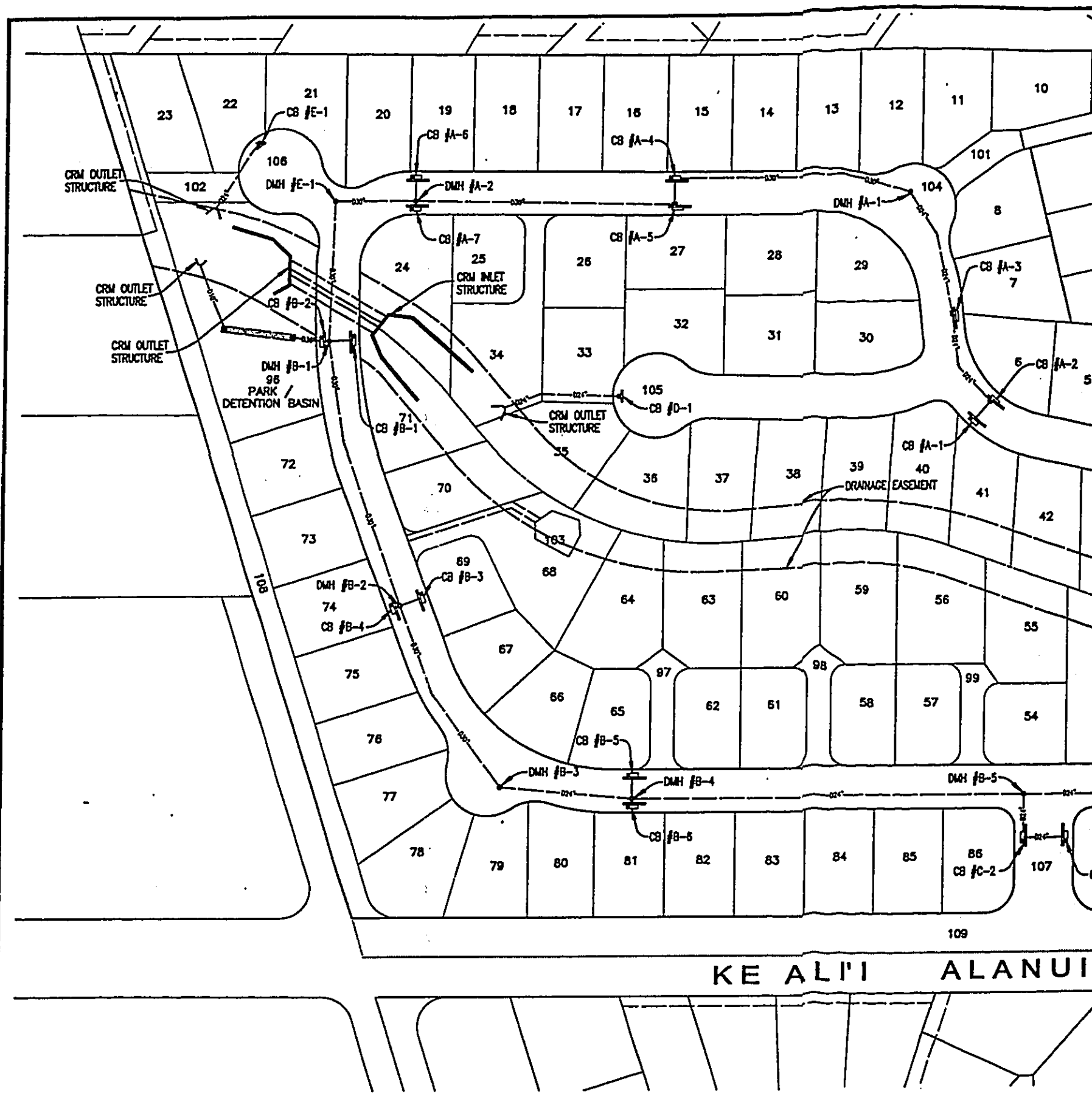
THE PRECEDING DOCUMENT(S) HAS BEEN REPHOTOGRAPHED TO ASSURE LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

POST-DEVELOPMENT ONSITE SURFACE RUNOFF
DRAINAGE AREAS FLOWING INTO CATCH BASINS
50 Year - 1 Hour Rainfall = 2.3 inches

Drainage Area No.	Area (acres)	Length (feet)	Slope (%)	Runoff Coeff. C	Time of Conc. Tc, (minutes)	Intensity i, (inches/hour)	Surface Runoff Q (cubic feet per second)
1	1.37	500	2.2	0.54	18	4	2.96
2	0.95	430	1.4	0.52	18	4	1.98
3	0.79	360	2.78	0.54	17	4.1	1.75
4	0.76	390	5.13	0.54	15	4.25	1.74
5	0.53	240	2.5	0.56	14	4.3	1.28
6	0.62	350	6	0.55	14	4.3	1.47
7	0.43	0.43	2.67	0.56	16	4.2	1.01
8	1.12	500	2	0.56	17	4.1	2.57
9	1.40	400	4.25	0.55	15	4.25	3.27
10	0.75	420	2.6	0.58	17	4.1	1.78
11	0.65	400	1.8	0.59	17	4.1	1.57
12	0.88	400	13	0.54	18	4	1.90
13	2.07	595	3.36	0.52	20	3.8	4.09
14	1.15	500	1.4	0.53	21	3.7	2.26
15	1.63	590	2.2	0.52	20	3.8	3.22
16	0.12	130	2.69	0.61	7	5.3	0.39
17	0.06	115	1	0.71	3	6.3	0.27
18	1.24	510	2.9	0.54	20	3.8	2.54
19	1.37	520	2.5	0.53	20	3.8	2.76
20	0.72	180	6.7	0.41	14	4.3	1.27
21	4.12	1260	3.5	0.35	31	3.2	4.61
22	0.22	210	1.85	0.67	5	6	0.88
23	0.23	220	1.5	0.68	5	6	0.94

Combined Pipe/Node Report

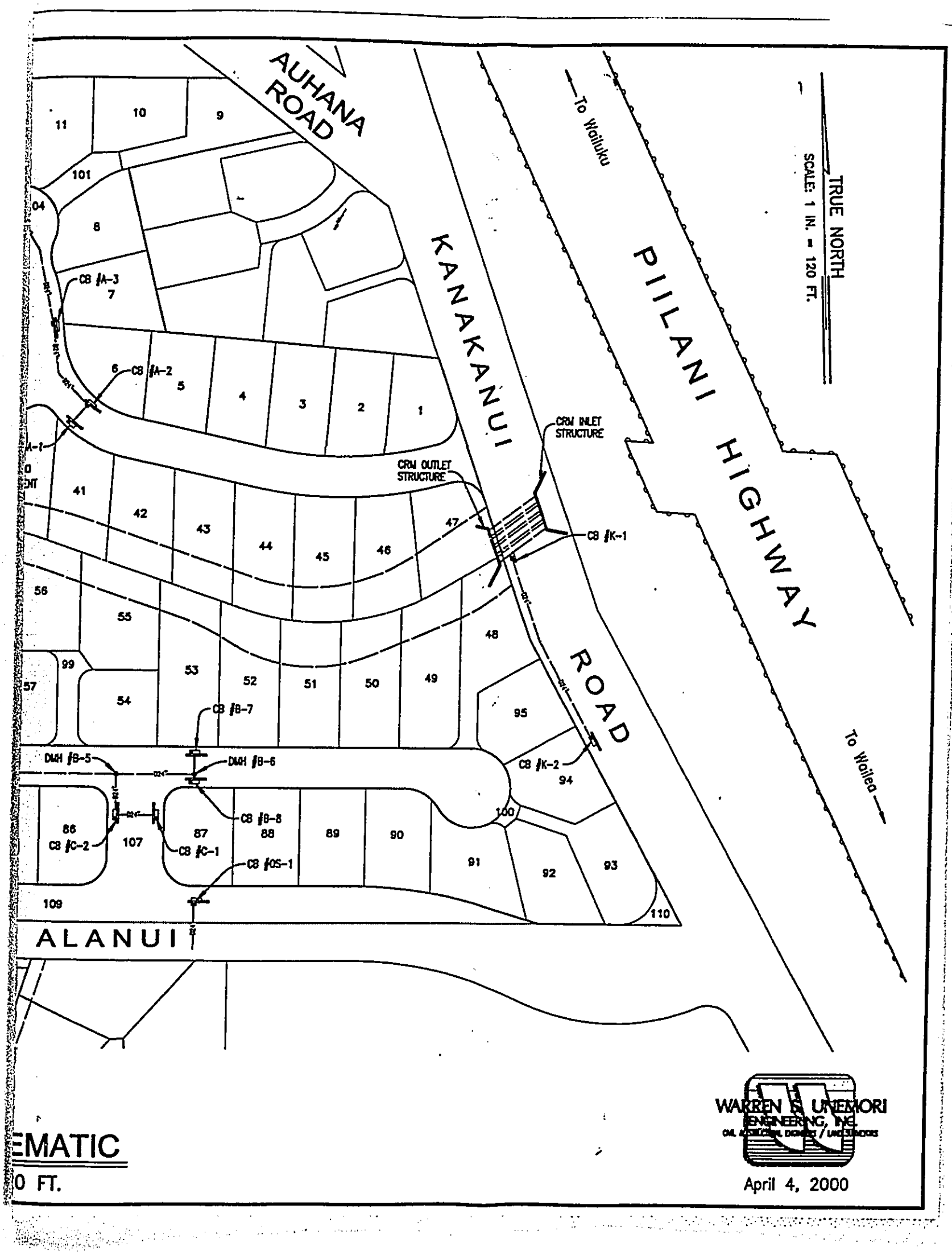
Upstream Node	Downstream Node	Length (ft)	Section Size	Constructed Slope (ft/ft)	Discharge (cfs)	Capacity (cfs)	Average Velocity (ft/s)	Upstream Invert Elevation (ft)	Upstream HGL (ft)	Upstream Ground Elevation (ft)	Downstream Invert Elevation (ft)	Downstream HGL (ft)	Downstream Ground Elevation (ft)
CB A-1	CB A-2	23.00	24 inch	0.011304	2.57	18.39	1.64	92.95	93.84	96.95	92.69	93.84	96.95
CB A-2	24" FB1	51.00	24 inch	0.010000	5.53	17.30	4.03	92.70	93.53	96.95	92.19	93.18	97.80
24" FB1	CB A-3	61.00	24 inch	0.010000	5.53	17.30	3.46	92.19	93.02	97.80	91.58	92.93	98.85
CB A-3	24" FB2	82.00	24 inch	0.010000	7.51	17.30	4.62	91.58	92.55	98.85	90.76	91.85	99.80
CB B-8	DMH B-6	6.00	24 inch	0.040000	3.22	34.60	2.13	94.53	95.39	98.53	94.29	95.43	98.99
CB B-7	DMH B-6	24.00	24 inch	0.010000	2.26	17.30	1.44	94.53	95.42	98.53	94.29	95.43	98.99
CB C-1	CB C-2	41.00	24 inch	0.010488	0.37	17.72	0.42	91.48	91.99	95.48	91.05	91.99	95.48
24" FB2	DMH A-1	51.00	24 inch	0.010000	7.51	17.30	5.13	90.76	91.73	99.80	90.25	91.17	99.91
DMH B-6	DMH B-5	83.00	24 inch	0.044337	5.48	36.42	3.43	94.29	95.12	98.99	90.61	91.98	96.14
CB C-2	DMH B-5	44.00	24 inch	0.010000	0.63	17.30	0.36	91.05	91.98	95.48	90.61	91.98	96.14
DMH A-1	30" FB1	69.00	30 inch	0.010145	7.51	28.27	4.34	89.75	90.66	99.91	89.05	90.06	99.80
DMH B-5	DMH B-4	99.00	24 inch	0.035088	6.11	32.40	3.29	90.61	91.48	96.14	76.61	78.73	81.30
CB B-6	DMH B-4	7.00	24 inch	0.034286	2.54	32.03	0.82	76.85	78.73	80.85	76.61	78.73	81.30
CB B-5	DMH B-4	23.00	24 inch	0.010435	4.09	17.67	1.32	76.85	78.74	80.85	76.61	78.73	81.30
30" FB1	CB A-4	73.00	30 inch	0.014855	7.51	34.20	3.59	89.05	89.96	99.80	86.48	87.94	90.98
DMH B-4	DMH B-3	34.00	24 inch	0.032239	12.74	31.06	7.69	76.61	77.89	81.30	72.29	73.18	76.29
CB A-4	CB A-5	27.00	30 inch	0.009630	9.26	27.54	3.47	86.48	87.70	90.98	86.22	87.70	90.98
DMH B-3	30" FB3	19.00	30 inch	0.030504	12.74	49.01	5.12	71.79	72.99	76.29	68.16	69.50	72.80
CB A-7	DMH A-2	6.00	24 inch	0.040000	1.47	34.60	0.67	67.70	68.92	71.70	67.46	68.92	72.15
CB A-6	DMH A-2	23.00	24 inch	0.010435	1.74	17.67	0.79	67.70	68.92	71.70	67.46	68.92	72.15
CB A-5	DMH A-2	63.00	30 inch	0.073232	10.27	75.94	3.80	86.22	87.29	90.98	66.96	68.92	72.15
30" FB3	DMH B-2	96.00	30 inch	0.037396	12.74	54.27	4.10	68.16	69.36	72.80	64.57	66.85	69.76
CB B-4	DMH B-2	7.00	24 inch	0.034286	2.76	32.03	1.00	65.31	66.84	69.31	65.07	66.85	69.76
CB B-3	DMH B-2	21.00	24 inch	0.011429	1.90	18.49	0.69	65.31	66.85	69.31	65.07	66.85	69.76
DMH A-2	DMH E-1	79.00	30 inch	0.069241	13.48	73.84	8.51	66.96	68.19	72.15	61.49	62.21	65.99
DMH B-2	30" FB2	76.00	30 inch	0.024034	17.40	43.51	5.70	64.57	65.98	69.76	60.34	61.92	65.00
DMH E-1	DMH B-1	42.00	30 inch	0.021268	13.48	40.93	4.16	60.49	61.72	65.99	57.47	60.55	62.67
30" FB2	DMH B-1	04.00	30 inch	0.027596	17.40	46.62	4.82	60.34	61.75	65.00	57.47	60.55	62.67
CB B-1	DMH B-1	22.00	24 inch	0.010909	1.78	18.07	0.57	58.21	60.56	62.21	57.97	60.55	62.67
DMH B-1	CB B-2	7.00	36 inch	0.037143	32.66	83.55	5.10	57.47	59.88	62.67	57.21	59.93	62.21
CB B-2	Outlet	22.00	36 inch	0.373182	34.23	264.83	14.43	57.21	59.11	62.21	49.00	49.83	57.00



99proj/99054/dwg/exhibits/drn-schm.dwg

DRAINLINE SCHEMATIC

SCALE: 1 IN. = 120 FT.


AUHANA ROAD
KANAKANUI
PIILANI HIGHWAY
KILOHANA ROAD
To Wailuku
To Wailea
TRUE NORTH
SCALE: 1 IN. = 120 FT.
CRM INLET STRUCTURE
CRM OUTLET STRUCTURE
CB #A-3
CB #A-2
CB #A-1
CB #K-1
CB #K-2
CB #B-7
CB #B-8
CB #C-1
CB #C-2
CB #OS-1
DMH #B-5
DMH #B-6
ALANUI
EMATIC
0 FT.
WARREN S. UNEMORI ENGINEERING, INC.
April 4, 2000

PIPE CULVERT ANALYSIS
COMPUTATION OF CULVERT PERFORMANCE CURVE

March 30, 2000
KE ALI'I SUBDIVISION
4-78" CULVERT

PROGRAM INPUT DATA:

DESCRIPTION	VALUE
Culvert Diameter (feet)	6.50
FHWA Chart Number (1,2 or 3)	2
Scale Number on Chart (Type of Culvert Entrance)	1
Manning's Roughness Coefficient (n-value)	0.0210
Entrance Loss Coefficient of Culvert Opening	0.50
Culvert Length (feet)	66.0
Culvert Slope (feet per foot)	0.0075

PROGRAM RESULTS:

Flow Rate (cfs)	Tailwater Depth (ft)	Headwater (ft) Inlet Control	Headwater (ft) Outlet Control	Normal Depth (ft)	Critical Depth (ft)	Depth at Outlet (ft)	Outlet Velocity (fps)
333.5	6.50	8.37	9.05	6.50	4.90	6.50	10.05

Appendix C

Traffic Impact Assessment Study

TRAFFIC IMPACT ANALYSIS UPDATE

Ke Alii
Single-Family Units

KIHEI, MAUI, HAWAII

September 1999

PARSONS BRINCKERHOFF

Over a Century of Engineering Excellence

TRAFFIC IMPACT ANALYSIS UPDATE

Ke Alii
Single-Family Units
Kihei, Maui, Hawaii

September 1999

Prepared For:

Warren S. Unemori Engineering, Inc.
Wells Street Professional Center
2145 Wells Street, Suite 403
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Prepared By:

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(808) 531-7094

PBQD Reference Number:
16301A.01

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I. INTRODUCTION

Ke Alii Single Family Units development is located in Kihei, Maui, Hawaii. This proposed development is located between Piilani Highway and South Kihei Road on the north side of Alanui Ke Alii. Figure 1 shows the project location.

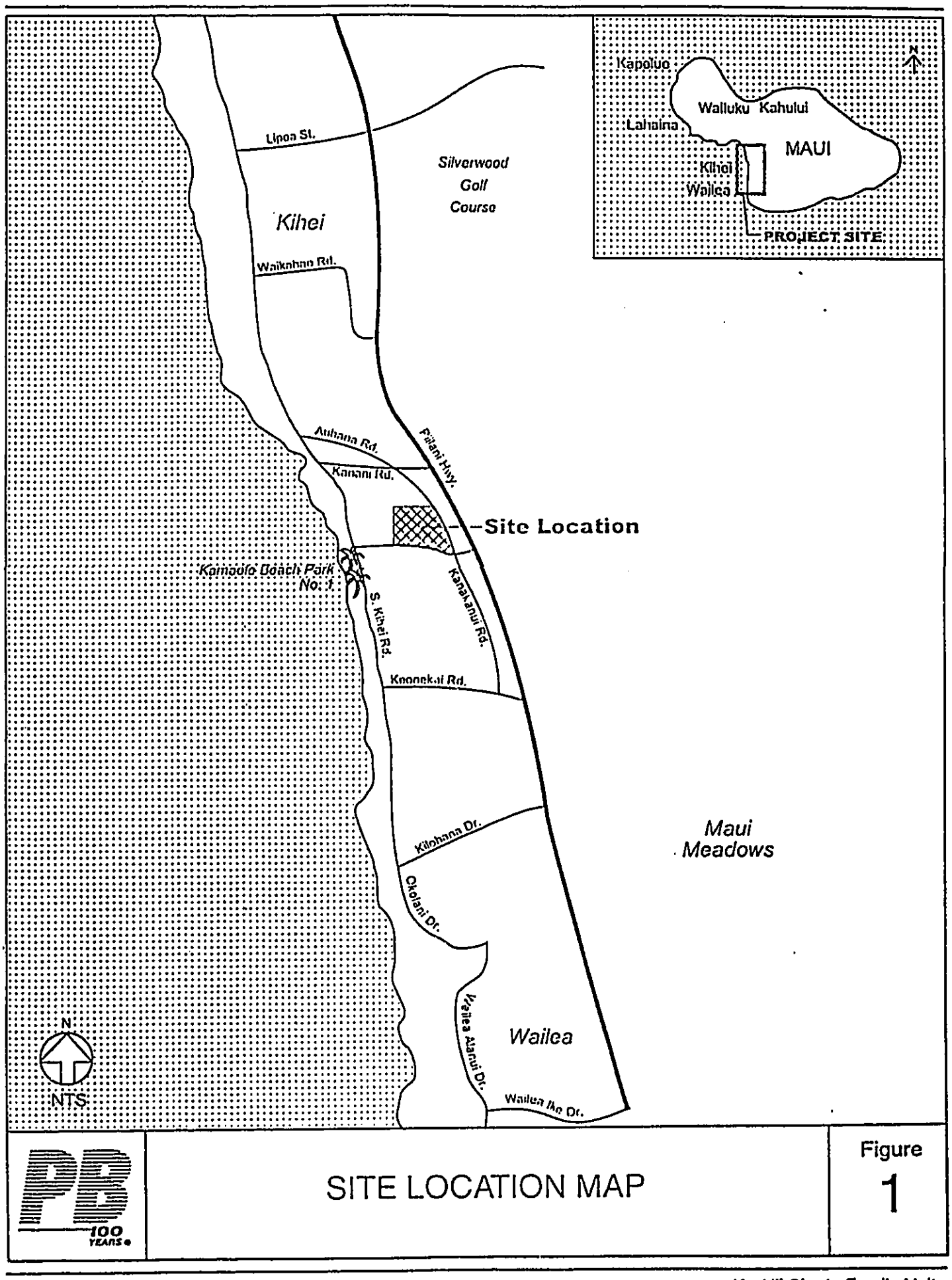
The parcel of land proposed for development is currently undeveloped and is bordered by Kanakanui Road to the east, the planned North-South Connector to the west, an existing residential community to the north and Alanui Ke Alii to the south. The site is proposed for 96 single-family units.

Both access points will form "T" intersections with the existing roadways. Figure 2 illustrates the proposed site plan for the single-family site.

Access to the proposed single-family development will be via driveways onto Alanui Ke Alii and Kanakanui Road. The driveway onto Alanui Ke Alii will be located approximately 700 feet makai of Kanakanui Road. The driveway onto Kanakanui Road will be located approximately 600 feet north of Alanui Ke Alii. It is currently proposed for both driveways to be unsignalized intersections with STOP-sign control on the driveway approach.

The study area will include four intersections on Alanui Ke Alii and two intersections on Kanani Road. The Kanani Road intersections are included to assess the traffic impacts of using these intersections to access points north on Piilani Highway and South Kihei Road.

This traffic analysis focuses on the future traffic impacts of the single-family development at its projected buildout. A two year implementation period corresponds to the Year 2001. Traffic conditions at key intersections along Alanui Ke Alii and along Kanani Road are evaluated. Based on the findings of the evaluation, recommendations are made on access design and intersection improvements that would benefit roadway operations in the study area.



PB 100 YEARS	SITE LOCATION MAP	Figure 1

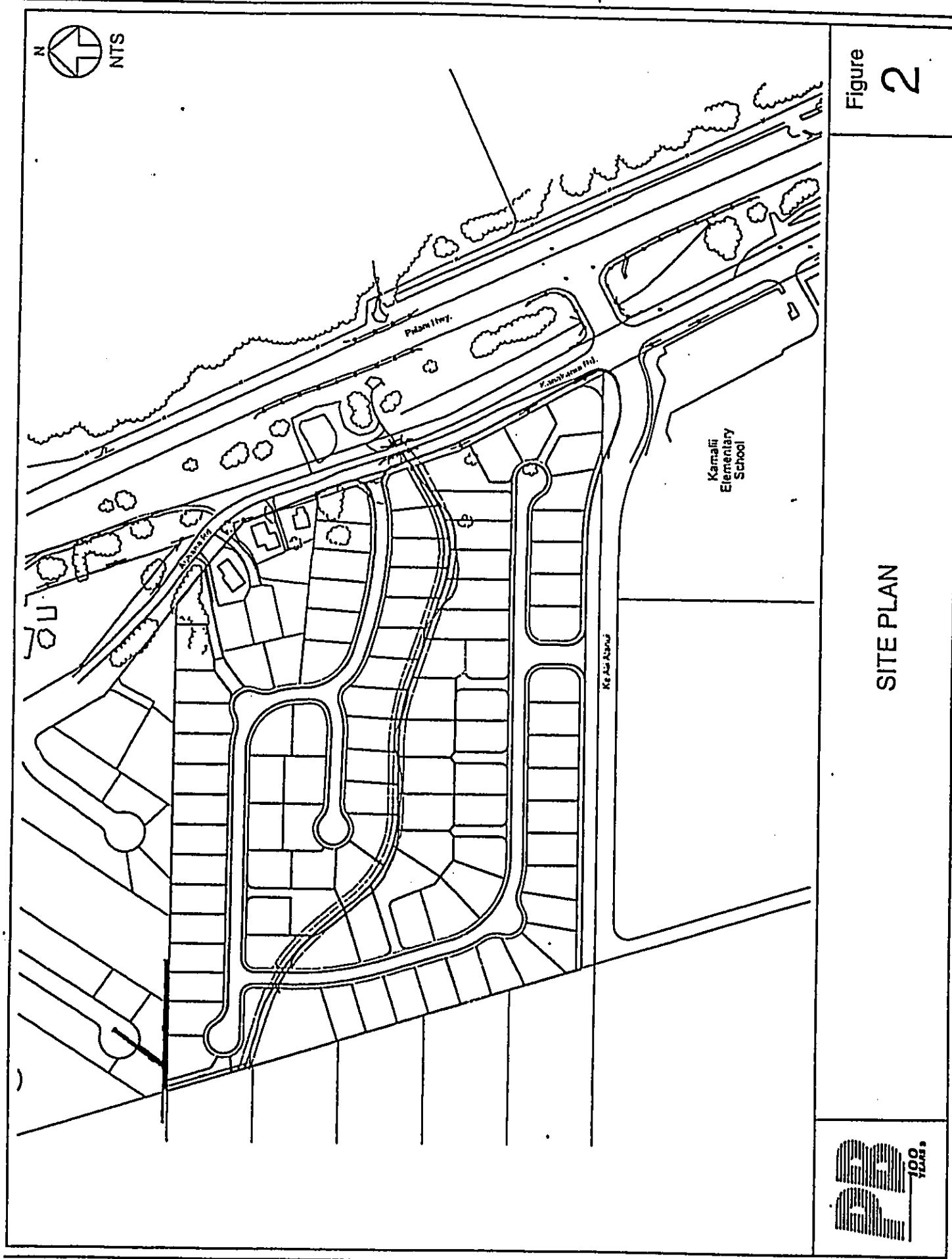


Figure 2

SITE PLAN

II. EXISTING CONDITIONS

A. EXISTING ROADWAY SYSTEM

1. Alanui Ke Alii

Alanui Ke Alii is a collector road oriented in the mauka-makai direction. It provides access to the adjacent residential community and the Kamalii Elementary School. The roadway runs from Piilani Highway to South Kihei Road and is part of the overall roadway network providing mobility in the Kihei area. The western segment of Alanui Ke Alii is configured as a divided roadway with 2 travel lanes, parking lanes and bike lanes. A portion of Alanui Ke Alii has an interim roadway cross-section consisting of two-lanes with no shoulders. This is the roadway configuration in the vicinity of the proposed site access. The posted speed limit is 30 miles per hour (mph).

All intersections on Alanui Ke Alii are unsignalized except at Piilani Highway, where a traffic signal controls traffic movement. All cross streets approaching Alanui Ke Alii are STOP-sign controlled and Alanui Ke Alii is STOP-sign controlled at South Kihei Road. A traffic signal is proposed for this intersection. At the Kanakanui Road intersection, separate left-turn lane channelization is provided in the mauka-bound direction, but left turns in the makai-bound direction are prohibited.

The Kamalii Elementary School has an entrance only driveway on Alanui Ke Alii just west of Kanakanui Road. A channelized left-turn lane is provided in the makai-bound direction. Access to the new Kamaole Heights residential community on the south side of Alanui Ke Alii is provided via the North-South Connector roadway. The future North-South Connector will be located at the western property line for the proposed Ke Alii Single Family Units.

The Worldmark, The Club development will also access Alanui Ke Alii at a point west of both the proposed Ke Alii Single Family Units and the North-South Connector.

2. Piilani Highway

Piilani Highway is a principal arterial roadway that runs parallel to the coastline of Maui and provides the primary north-south mobility for the Kihei area. It is a two-lane, undivided roadway with paved shoulders and turn lane channelization at most intersections. Piilani

Highway forms a signalized "T" intersection with Alanui Ke Alii. The Kanani Road intersection has four approaches and is unsignalized with STOP-sign control on Kanani Road. Exclusive left and right turn lanes are provided on Piilani Highway at both intersections. Piilani Highway has a posted speed limit of 45 mph.

3. South Kihei Road

South Kihei Road is a north-south two-lane roadway oriented parallel to Piilani Highway. It is a major collector roadway that provides access and traffic circulation to development within Kihei. The roadway forms an unsignalized "T" intersection with Alanui Ke Alii with STOP-sign control on Alanui Ke Alii. Its posted speed limit is 30 mph.

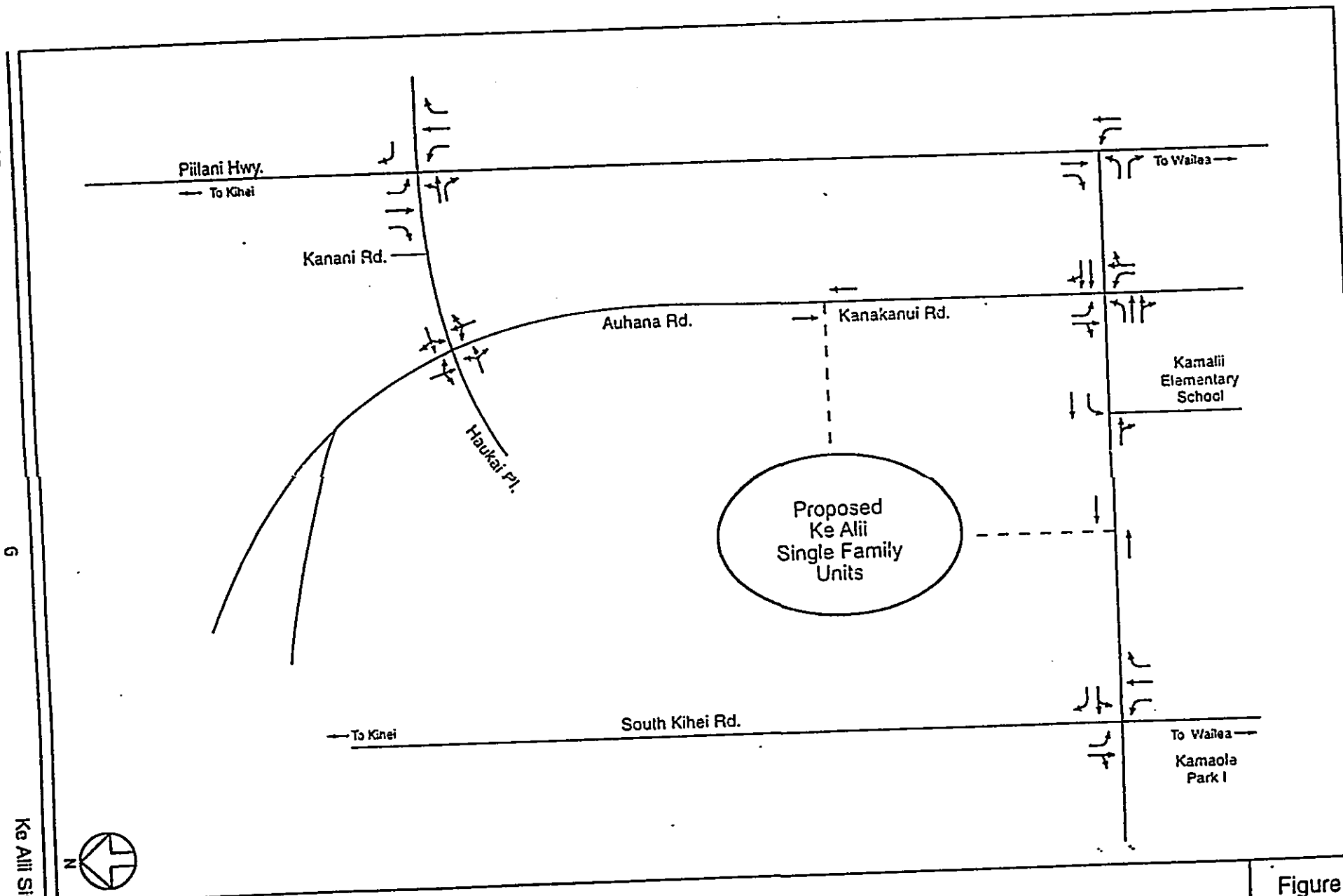
4. Kanakanui Road

Kanakanui Road is a two-lane collector roadway located between and oriented parallel to South Kihei Road and Piilani Highway. It currently begins at Keonekai Road to the south, continues north through Alanui Ke Alii, and transitions into Auhana Road north of Alanui Ke Alii. Kanakanui Road provides access and traffic circulation to development along its corridor. The intersection with Alanui Ke Alii is unsignalized with STOP-sign control on Kanakanui Road. Left-turn lane channelization is provided on Kanakanui Road approaches. The posted speed limit is 25 mph.

5. Kanani Road

Kanani Road is a two-lane local roadway north of Alanui Ke Alii that provides access to development located makai of Piilani Highway. It begins at Piilani Highway, east of Auhana Road and continues west, crossing Auhana Road and terminating at South Kihei Road. It intersects Auhana Road at an unsignalized "two-way stop" intersection with STOP-sign control on Kanani Road. The posted speed limit is 20 mph.

Figure 3 illustrates the existing lane configurations at the intersection of the roadways.



EXISTING INTERSECTION LANE CONFIGURATIONS

Figure 3

B. EXISTING TRAFFIC VOLUMES

Manual turning movement traffic counts were conducted during the afternoon peak periods on Wednesday, July 28, 1999, and during the morning peak periods on Thursday, July 29, 1999, at the following four intersections:

- Alanui Ke Alii and Piilani Highway,
- Alanui Ke Alii and Kanakanui Road,
- Kanani Road and Piilani Highway, and
- Kanani Road and Auhana Road

The morning and afternoon peak hours were found to occur from 7:30 to 8:30 AM and 3:45 to 4:45 PM.

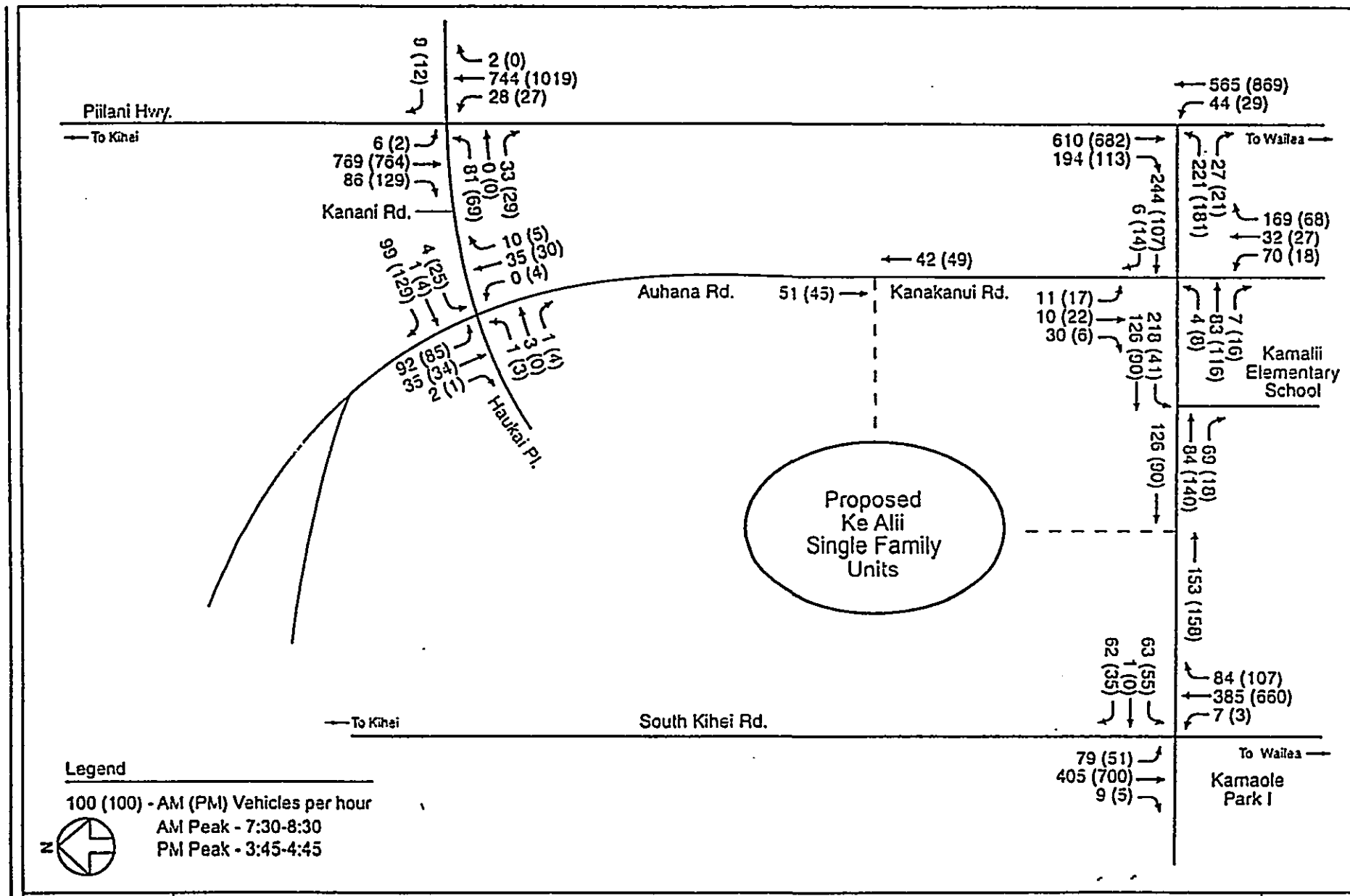
The traffic volumes for the entrance to the Kamalii Elementary School and the intersection with South Kihei Road were taken from the Traffic Impact Assessment Report (TIAR) for the Worldmark, The Club development. The traffic volumes entering the Kamalii Elementary School were held constant and the traffic volumes on Alanui Ke Alii were adjusted based on the intersection count with Kanakanui Road.

The intersection turning movement traffic volumes for the intersection with South Kihei Road were held constant with 3% growth added to through traffic on South Kihei Road to update the traffic volumes from 1997 to 1999. The 3% annual growth rate is based on a comparison of the 1997 and 1999 traffic counts.

The existing traffic volumes are shown in Figure 4, and the traffic data are included in Appendix A of this report.

C. EXISTING INTERSECTION OPERATIONS

Traffic operations at each intersection were evaluated based on the existing roadway conditions and traffic volumes. All intersections were analyzed using the 1994 Highway Capacity Manual methodology for unsignalized intersections. Intersection operating conditions are expressed as the qualitative measure Level-of-Service (LOS). LOS is represented by a letter designation ranging from A to F. LOS A represents free-flow



EXISTING AM/PM PEAK HOUR TRAFFIC VOLUMES

Figure 4

operating conditions, while LOS F represents congested conditions. More detailed LOS definitions are included in Appendix B.

Unsignalized Intersections

Table 1 summarizes the results of the analysis of existing unsignalized intersections.

As shown in Table 1, the overall intersection LOS at all unsignalized intersections operate acceptably in both peak hours, although the Alanui Ke Alii approach to South Kihei Road does experience notable delay in the PM peak hour. The notable delays along with the approved and unconstructed developments in the Alanui Ke Alii corridor are the reason for the ongoing design of a traffic signal at this intersection.

The other intersections on Alanui Ke Alii operate well in both peak hours. All intersection approaches experience minimal delays.

The overall intersections on Kanani Road operate well in both peak hours, although the Kanani Road approach onto Piilani Highway does experience some delay in both peak hours. The large traffic volumes on Piilani Highway does limit the number of acceptable gaps in traffic for vehicles entering from Kanani Road. The traffic signals at the adjacent intersections on Piilani Highway help to create more than acceptable gaps in Piilani Highway traffic flow allowing more than one vehicle to enter Piilani Highway traffic flow. This helps to reduce the delay experienced by Kanani Road traffic.

A check for traffic signal warrant using the left turn volume onto Piilani Highway from Kanani Road did not meet guidelines in the Manual on Uniform Traffic Control Devices, for Traffic Signal Warrant 11, Peak Hour Volume Warrant. Although the traffic volumes on Piilani Highway are large enough, the left turn traffic volumes for both peak hours do not meet the traffic signal warrant.

Signalized Intersections

Table 2 summarizes the results of the analysis of the existing signalized intersection. The results show that overall intersection operations are acceptable in both peak hours. The Alanui Ke Alii approach experiences some delay in both peak hours.

Copies of the intersection analysis worksheets for both unsignalized and signalized intersections are in Appendix C.

Table 1

Existing Conditions Level of Service
Unsignalized Intersections

Intersection	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Kanakanui Road	**A**	**3.0**	**A**	**1.7**
NB Kanakanui Road Approach	B	6.1	A	4.2
SB Kanakanui Road Approach	B	5.8	B	5.2
EB Alanui Ke Alii Approach	A	0.1	A	0.1
WB Alanui Ke Alii Approach	A	0.0	A	0.0
Alanui Ke Alii/Kamalii Elem. Sch.	**A**	**1.6**	**A**	**0.4**
WB Alanui Ke Alii Approach	A	2.4	A	0.9
Alanui Ke Alii/South Kihei Road	**A**	**1.6**	**A**	**1.9**
WB Alanui Ke'Alii Approach	C	11.5	E	30.7
NB South Kihei Road Approach	A	0.1	A	0.0
SB South Kihei Road Approach	A	0.6	A	0.3
Kanani Road/Piilani Highway	**A**	**1.3**	**A**	**1.1**
EB Kanani Road Approach	C	17.0	C	19.9
WB Approach	B	7.5	C	11.5
NB Piilani Highway Approach	A	0.3	A	0.2
SB Piilani Highway Approach	A	0.1	A	0.1
Auhana Road/Kanani Road	**A**	**2.1**	**A**	**2.6**
EB Haukai Road Approach	A	4.8	A	4.5
WB Kanani Road Approach	A	3.4	A	3.9
NB Auhana Road Approach	A	0.0	A	0.2
SB Auhana Road Approach	A	1.8	A	1.7

Note: NB= northbound, SB= southbound, EB= eastbound, WB= westbound

Table 2

Existing Conditions Level of Service
Signalized Intersections

Intersection	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Piilani Highway	**B**	**11.5**	**B**	**11.3**
EB Alanui Ke Alii Approach	D	26.6	D	25.6
NB Piilani Highway Approach	B	8.5	B	10.6
SB Piilani Highway Approach	B	8.5	B	8.3

Note: NB= northbound, SB= southbound, EB= eastbound, WB= westbound

The existing left turn storage length on Alanui Ke Alii between Piilani Highway and Kanakanui Road stores between 6 and 7 vehicles. In the 30 minutes prior to Kamalii Elementary School starting, the surge in traffic leaving the school increases the demand for the left turn from Alanui Ke Alii to Piilani Highway. Vehicle queues on Alanui Ke Alii seldom crossed the intersection, instead queues were observed extending on northbound Kanakanui Road while waiting for the green phase on Alanui Ke Alii. Sufficient green time is provided at the traffic signal to process the vehicles queued on both Alanui Ke Alii and Kanakanui Road.

D. SUMMARY

As shown in Table 1, all the unsignalized intersections in the study area operate well overall with only the South Kihei Road/Alanui Ke Alii intersection having an approach experiencing significant delays. The traffic signal prepared for this intersection will reduce the delay experienced by traffic on Alanui Ke Alii. The signalized intersection of Piilani Highway and Alanui Ke Alii operates well in both AM and PM peak hours. The Alanui Ke Alii approach experiences some delay due to signal phasing but has sufficient green time to clear queued vehicles.

III. FUTURE TRAFFIC CONDITIONS

This traffic impact analysis focuses on the projected Year 2001 buildout of the single-family residential development. The Year 2001 roadway conditions were assumed to be the same as the existing roadway conditions except for the installation of the traffic signal at the South Kihei Road/Alanui Ke Alii intersection and at the access driveways to the proposed site. Background traffic was factored to reflect this future time period. The single-family residential site will be accessed from both Alanui Ke Alii and Kanakanui Road.

Vehicular traffic generated by the proposed single-family residential development was based on the forecasting methodology of trip generation, trip distribution, and trip assignment.

A. TRIP GENERATION

Traffic generated by the multi-family development was estimated using trip generation rates documented in the Institute of Transportation Engineers (ITE) publication entitled, Trip Generation, 6th Edition. ITE Code 210 was utilized for the single-family trip generation rate.

The proposed development will consist of 96 single-family, residential units, and the projected trip generation from this development is summarized in Table 3.

Table 3

Trip Generation Summary

Land Use Type	No. of Units	Morning Peak Hour			Evening Peak Hour		
		Enter	Exit	Total	Enter	Exit	Total
Single-Family	96 sfdu	20	58	78	68	36	104

B. TRIP DISTRIBUTION

The traffic generated by the single-family development was directionally distributed and assigned to the surrounding roadway network. Trips were distributed 40 percent to the

north on Piilani Highway, 30 percent to the north on South Kihei Road, 15 percent to the south on Piilani Highway and 15 percent to the south on South Kihei Road.

Based on the site plan and the location of access driveways, a 50 percent split between driveways was assumed for all destinations except for the traffic to the north on Piilani Highway. It was assumed that half of the exiting traffic to the north on Piilani Highway would travel north using Auhana Road to Kanani Road and to Piilani Highway. This traffic volume was assumed to use the Kanakanui Road driveway. The remaining half would use the Alanui Ke Alii driveway to access Piilani Highway. The traffic entering from the north on Piilani Highway was assumed to use only Alanui Ke Alii as access is easier and quicker via Alanui Ke Alii.

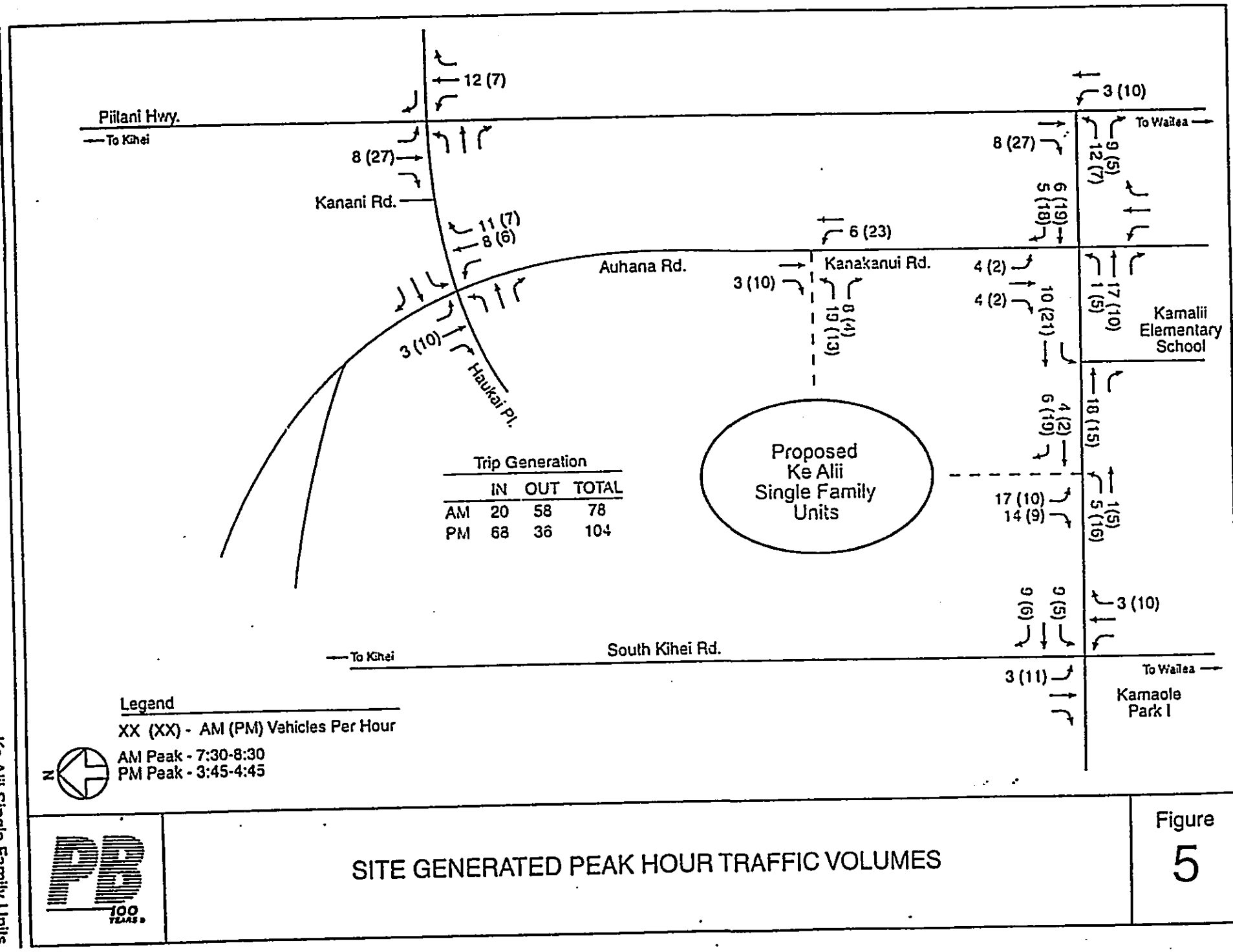
The same 50 percent split in traffic oriented to the north on South Kihei Road was assumed. Half of the traffic would use the Kanakanui Road driveway to Auhana Road to South Kihei Road and the other half would use the Alanui Ke Alii driveway to South Kihei Road.

Traffic oriented to the south was split even between both site access driveways. This trip distribution pattern was applied to the trips generated, and the resulting assignment is shown in Figure 5.

C. YEAR 2001 TRAFFIC VOLUMES WITHOUT PROJECT

The Year 2001 Without Project traffic volumes were estimated by factoring existing traffic by annual growth rates estimated from 1997 *Hawaii State Department of Transportation (SDOT) Traffic Counts* and comparisons between the 1997 traffic counts in the Worldmark, The Club TIAR and the 1999 counts performed for this study. A 3.0 percent annual growth rate was applied to through traffic volumes on Piilani Highway and South Kihei Road. No growth in through traffic volumes was assumed for all other roadways.

In addition to through traffic growth, additional traffic volumes were added for known approved developments within the study area. The developments include the Kamaole Heights single-family units and the Worldmark, The Club timeshare apartments.



SITE GENERATED PEAK HOUR TRAFFIC VOLUMES

Figure 5

The Kamaole Heights is currently under construction and the Worldmark, The Club was recently approved. Traffic volumes generated by both developments were also added to the background traffic volumes.

The traffic volumes for Kamaole Heights were generated and distributed in a similar procedure as the proposed development. The traffic volumes for the Worldmark, The Club were taken from the 1997 TIAR.

The resulting peak hour traffic volumes are shown in Figure 6. They represent Year 2001 Without Project peak hour traffic volumes.

D. YEAR 2001 WITH PROJECT

The site generated traffic (see Figure 5) was added to the Year 2001 Without Project traffic (see Figure 6) to obtain the Year 2001 With Project peak hour traffic volumes with the Ke Alii single-family residential site. Figure 7 presents the projected Year 2001 With Project AM and PM peak hour turning movement volumes.

E. INTERSECTION OPERATIONS ANALYSIS RESULTS

The study area intersections were analyzed using projected traffic volumes both with and without the project. The *1994 Highway Capacity Manual* methods for unsignalized and signalized intersections. Tables 4 and 5 show the results of the Year 2001 Without Project analyses, and the analysis worksheets are in Appendix C.

1. Year 2001 Without Project

The summary shows that all the intersections analyzed will operate well overall in both AM and PM peak hours in the Year 2001 Without Project condition. The additional traffic volumes generated by through traffic growth, the Kamaole Heights single-family units and the Worldmark, The Club timeshare apartments can be accommodated by the roadway network in the Year 2001 Without Project condition. The new traffic signal at the intersection of South Kihei Road and Alanui Ke Alii will help to reduce the delay experienced by the Alanui Ke Alii approach.

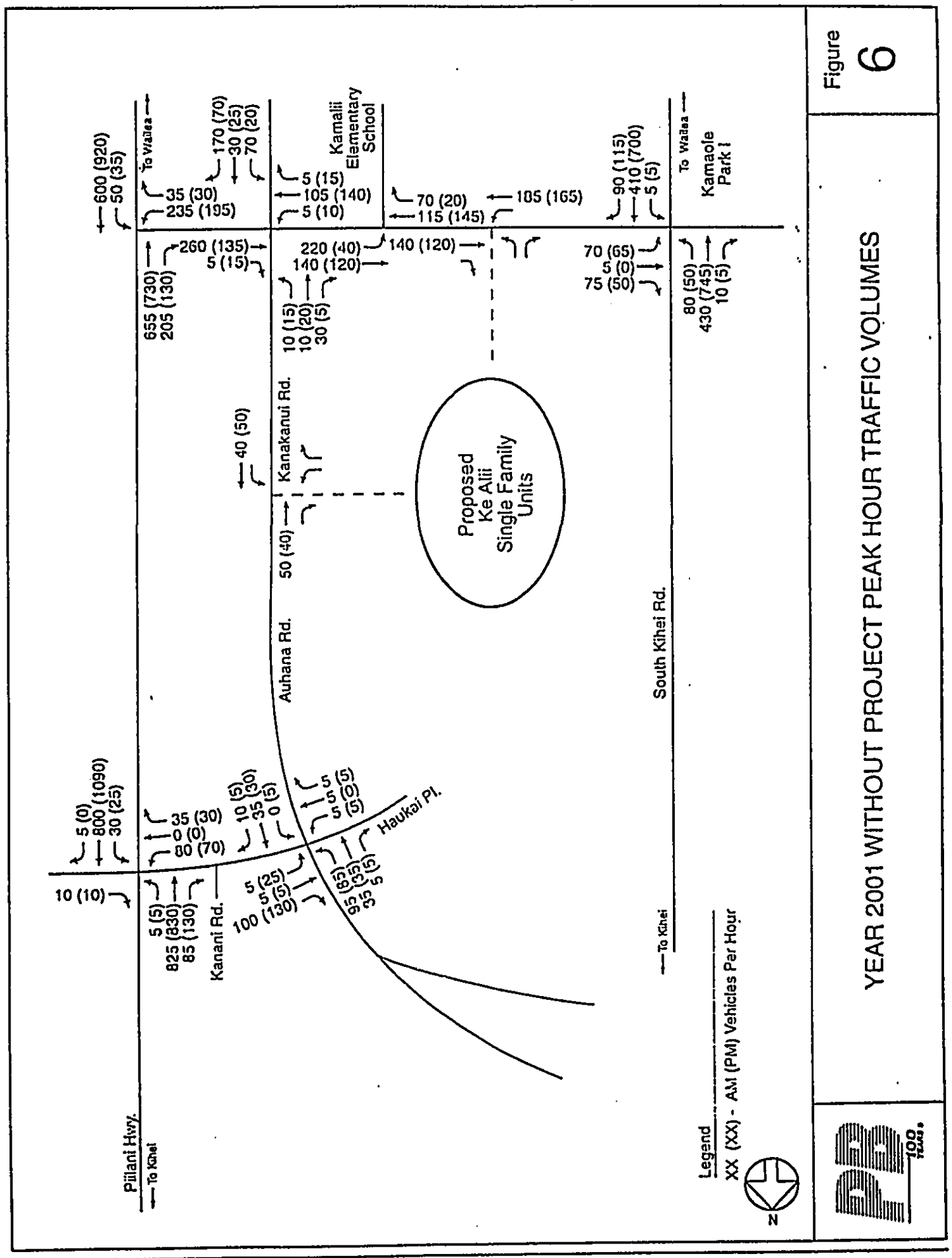


Figure 6

YEAR 2001 WITHOUT PROJECT PEAK HOUR TRAFFIC VOLUMES

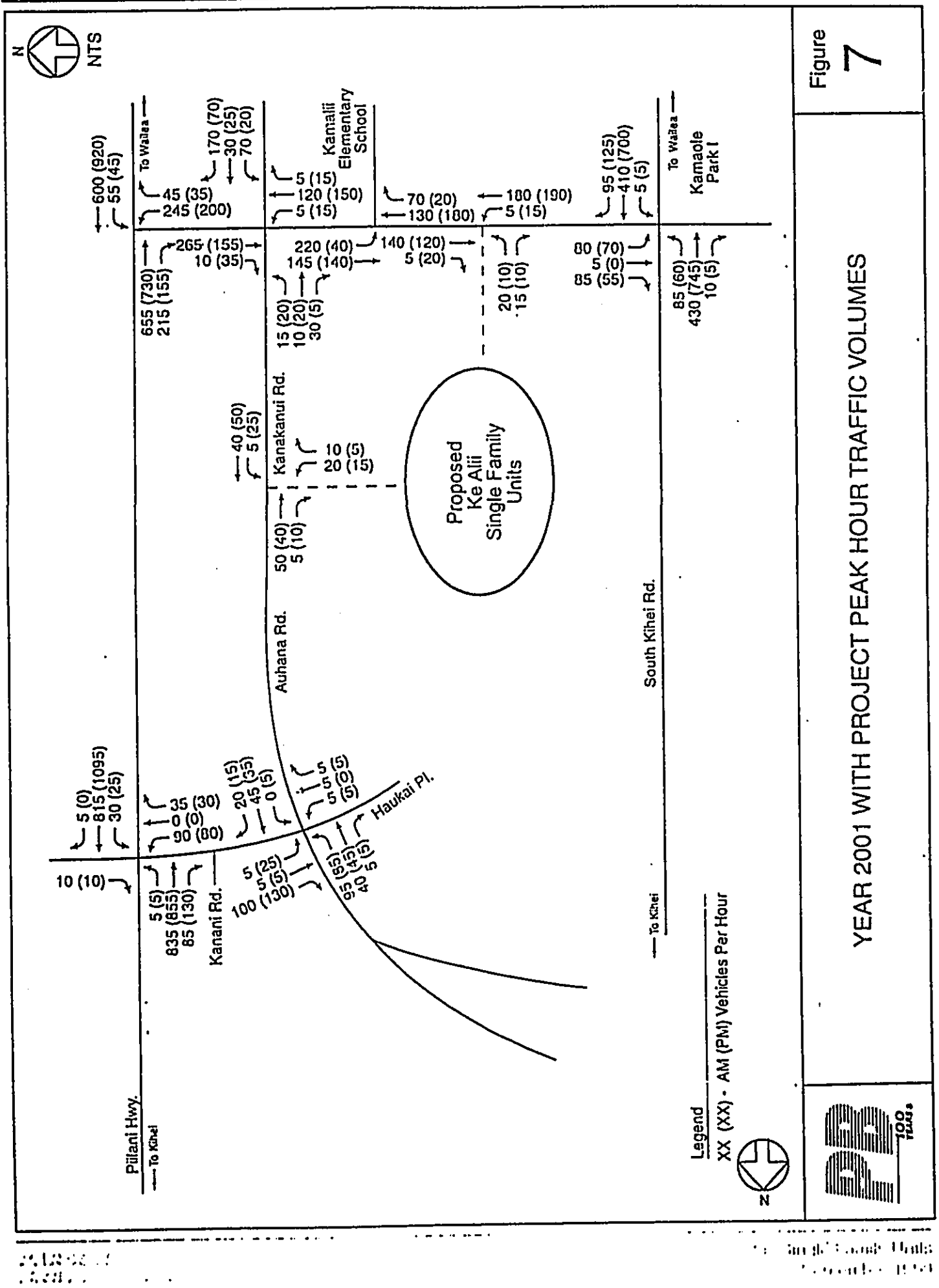


Figure 7

YEAR 2001 WITH PROJECT PEAK HOUR TRAFFIC VOLUMES

The computed queue for the left turns from Alanui Ke Alii to Piilani Highway will remain at 10 vehicles. The added left turning traffic volume is not expected to increase the queue above the existing 95% confidence queue length.

Table 4

Year 2001 Without Project Conditions
Level of Service - Unsignalized Intersections

Intersection	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Kanakanui Road	**A**	**3.0**	**A**	**1.7**
NB Kanakanui Road Approach	B	6.6	A	4.5
SB Kanakanui Road Approach	B	6.0	B	5.7
EB Alanui Ke Alii Approach	A	0.2	A	0.2
WB Alanui Ke Alii Approach	A	0.0	A	0.0
Alanui Ke Alii/Kamalii Elem. Sch.	**A**	**1.6**	**A**	**0.4**
WB Alanui Ke Alii Approach	A	2.4	A	0.9
Alanui Ke Alii/South Kihei Road	**Assume Signalized**			
WB Alanui Ke Alii Approach				
NB South Kihei Road Approach				
SB South Kihei Road Approach				
Kanani Road/Piilani Highway	**A**	**1.5**	**A**	**1.3**
EB Kanani Road Approach	D	20.3	D	23.6
WB Approach	B	8.1	C	12.6
NB Piilani Highway Approach	A	0.4	A	0.2
SB Piilani Highway Approach	A	0.1	A	0.1
Auhana Road/Kanani Road	**A**	**2.4**	**A**	**2.7**
EB Haukai Road Approach	B	5.0	A	4.9
WB Kanani Road Approach	A	3.8	A	4.0
NB Auhana Road Approach	A	0.0	A	0.3
SB Auhana Road Approach	A	1.8	A	1.7

Note: NB= northbound, SB= southbound, EB= eastbound, WB= westbound

Table 5

Year 2001 Without Project Conditions
Level-of-Service - Signalized Intersections

Intersection	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Piilani Highway	**B**	**12.4**	**B**	**12.7**
EB Alanui Ke Alii Approach	D	29.0	D	27.6
NB Piilani Highway Approach	B	8.9	B	12.1
SB Piilani Highway Approach	B	9.4	B	9.3
Alanui Ke Alii/South Kihei Road	**B**	**9.8**	**B**	**12.8**
WB Alanui Ke Alii Approach	C	16.3	C	17.0
NB South Kihei Road Approach	B	10.6	C	15.8
SB South Kihei Road Approach	B	7.8	B	9.8

Note: NB= northbound, SB= southbound, EB= eastbound, WB= westbound

2. Year 2001 With Project

Tables 6 and 7 show the results of the Year 2001 With Project analyses, and the analysis worksheets are in Appendix C. The tables show that the traffic generated by the proposed development is not projected to result in changes to levels of service at intersections analyzed. The average overall intersection delays are not projected to increase by more than one second per vehicle. The two new intersections are projected to operate at the highest level of service overall.

The computed 95% confidence queue length for the left turns from Alanui Ke Alii to Piilani Highway will remain at the existing 10 vehicles. The added left turning traffic volume from the single-family units is not expected to increase the queue above the existing conditions.

There is very little change in traffic operations between the without and with proposed single-family development. This is attributable to the relatively small amount of traffic

generated by the proposed single-family development and the available capacity in the roadway system.

Table 6

Year 2001 With Project Conditions
Level of Service - Unsignalized Intersections

Intersection	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Kanakanui Road	**A**	**3.1**	**A**	**1.7**
NB Kanakanui Road Approach	B	6.8	A	4.7
SB Kanakanui Road Approach	B	6.8	B	6.5
EB Alanui Ke Alii Approach	A	0.2	A	0.2
WB Alanui Ke Alii Approach	A	0.0	A	0.0
Alanui Ke Alii/Kamalii Elem. Sch.	**A**	**1.6**	**A**	**0.4**
WB Alanui Ke Alii Approach	A	2.5	A	0.9
Alanui Ke Alii/South Kihei Road	**Assume Signalized**			
WB Alanui Ke Alii Approach				
NB South Kihei Road Approach				
SB South Kihei Road Approach				
Kanani Road/Piilani Highway	**A**	**1.9**	**A**	**1.7**
EB Kanani Road Approach	D	25.7	D	30.1
WB Approach	B	8.3	C	12.8
NB Piilani Highway Approach	A	0.4	A	0.2
SB Piilani Highway Approach	A	0.1	A	0.1
Auhana Road/Kanani Road	**A**	**2.4**	**A**	**2.7**
EB Haukai Road Approach	B	5.3	B	5.1
WB Kanani Road Approach	A	3.9	A	4.1
NB Auhana Road Approach	A	0.0	A	0.3
SB Auhana Road Approach	A	1.8	A	1.7

Note: NB= northbound, SB= southbound, EB= eastbound, WB= westbound

Table 7

Year 2001 With Project Conditions
Level-of-Service - Signalized Intersections

Intersection	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Piilani Highway	**B**	**12.9**	**B**	**12.8**
EB Alanui Ke Alii Approach	D	30.6	D	28.1
NB Piilani Highway Approach	B	9.2	B	12.3
SB Piilani Highway Approach	B	9.4	B	9.3
Alanui Ke Alii/South Kihei Road	**B**	**10.0**	**B**	**12.8**
WB Alanui Ke Alii Approach	C	16.4	C	17.0
NB South Kihei Road Approach	B	10.6	C	15.8
SB South Kihei Road Approach	B	7.9	B	9.9

IV. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSION

Tables 8 and 9 summarize the intersection operational analysis for the existing, Year 2001 Without Project and Year 2001 With Project conditions. The results of the traffic analysis show that the proposed development will not change any intersection levels of service within the study area. The Kanani Road approach to Piilani Highway is projected to experience some delay with or without the proposed development. The proposed development is not projected to increase intersection approach delay significantly on Kanani Road.

The intersection of Alanui Ke Alii and Piilani Highway is projected to operate well with and without the proposed development. The additional traffic volume is not projected to change future intersection levels of service. The queue on Alanui Ke Alii at Piilani Highway is not projected to increase the expected queue beyond the existing queue length.

It is, therefore, concluded that the single-family parcel can be accommodated by the roadway system anticipated to be in place at its buildout.

B. RECOMMENDATIONS

The following recommendations identify specific improvements that help to enhance traffic operations and to protect existing development in the vicinity of the proposed single-family parcel.

1. Site Access to Alanui Ke Alii

The driveway to Alanui Ke Alii is proposed to be located approximately 425 feet west of the Kamalii Elementary School entrance. Figure 8 shows the approximate intersection spacing on Alanui Ke Alii. It will be a full-movement intersection with STOP-sign control at the single-family parcel driveway. This intersection spacing exceeds the minimum spacing usually required by the Maui County Department of Public Works & Waste Management.

Table 8

Level of Service Summary
Unsignalized Intersections

Intersections	Existing Condition				Yr 2001 w/o Project				Yr 2001 w/ Project			
	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM		AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM		AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Kanakanui Road	**A**	**3.0**	**A**	**1.7**	**A**	**3.0**	**A**	**1.7**	**A**	**3.1**	**A**	**1.7**
NB Kanakanui Road Approach	B	6.1	A	4.2	B	6.6	A	4.5	B	6.8	A	4.7
SB Kanakanui Road Approach	B	5.8	B	5.2	B	6.0	B	5.7	B	6.8	B	6.5
EB Alanui Ke Alii Approach	A	0.1	A	0.1	A	0.2	A	0.2	A	0.2	A	0.2
WB Alanui Ke Alii Approach	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0	A	0.0
Alanui Ke Alii/Kamalii Elem.	**A**	**1.6**	**A**	**0.4**	**A**	**1.6**	**A**	**0.4**	**A**	**1.6**	**A**	**0.4**
WB Alanui Ke Alii Approach	A	2.4	A	0.9	A	2.4	A	0.9	A	2.5	A	0.9
Alanui Ke Alii/South Kihei Road	**A**	**1.6**	**A**	**1.9**	Assume Signalized				Assume Signalized			
WB Alanui Ke Alii Approach	C	11.5	E	30.7								
NB South Kihei Road Approach	A	0.1	A	0.0								
SB South Kihei Road Approach	A	0.6	A	0.3								
Kanani Road/Piilani Highway	**A**	**1.3**	**A**	**1.1**	A	1.5	A	1.3	A	1.9	A	1.7
EB Kanani Road Approach	C	17.0	C	19.9	D	20.3	D	23.6	D	25.7	D	30.1
WB Approach	B	7.5	C	11.5	B	8.1	C	12.6	B	8.3	C	12.8
NB Piilani Highway Approach	A	0.3	A	0.2	A	0.4	A	0.2	A	0.4	A	0.2
SB Piilani Highway Approach	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1	A	0.1
Auhana Road/Kanani Road	**A**	**2.1**	**A**	**2.6**	**A**	**2.4**	**A**	**2.7**	**A**	**2.4**	**A**	**2.7**
EB Haukai Road Approach	A	4.8	A	4.5	B	5.0	A	4.9	B	5.3	B	5.1
WB Kanani Road Approach	A	3.4	A	3.9	A	3.8	A	4.0	A	3.9	A	4.1
NB Auhana Road Approach	A	0.0	A	0.2	A	0.0	A	0.3	A	0.0	A	0.3
SB Auhana Road Approach	A	1.8	A	1.7	A	1.8	A	1.7	A	1.8	A	1.7

NB – Northbound, SB – Southbound, EB – Eastbound, WB – Westbound

Table 8 – Con't.

Level of Service Summary
Unsignalized Intersections

Intersections	Existing Condition				Yr 2001 w/o Project				Yr 2001 w/ Project			
	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM		AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM		AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Site Access/Alanui Ke Alii	Not Constructed				Not Constructed				A	0.5	A	0.4
SB Site Access Approach									B	5.2	A	4.9
EB Alanui Ke Alii Approach									A	0.1	A	0.2
Site Access/Kanakanui Road									A	3.4	A	3.6
NB Kanakanui Road Approach									A	3.9	A	4.0
SB Kanakanui Road Approach									A	4.1	A	3.7
EB Site Access Approach									A	1.4	A	1.6

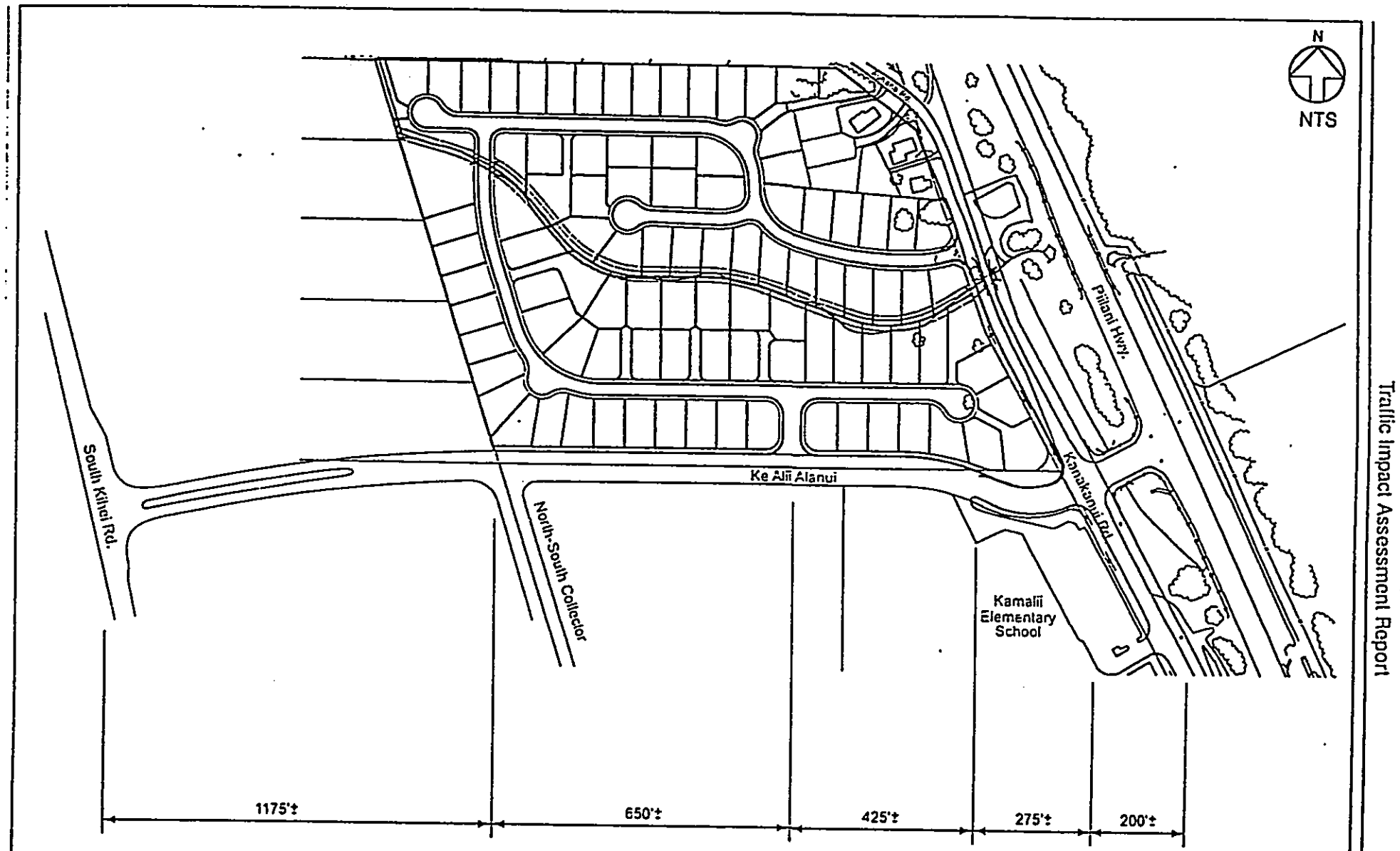
NB – Northbound, SB – Southbound, EB – Eastbound, WB – Westbound

Table 9

Level of Service Summary
Signalized Intersections

Intersection	Existing Condition				Yr 2001 w/o Project				Yr 2001 w/ Project			
	AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM		AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM		AM Peak Hour 7:30-8:30 AM		PM Peak Hour 3:45-4:45 PM	
	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)	LOS	Delay (sec/veh)
Alanui Ke Alii/Piilani Highway	B	11.5	B	11.3	B	12.4	B	12.7	B	12.9	B	12.8
EB Alanui Ke Alii Approach	D	26.6	D	25.6	D	29.0	D	27.6	D	30.6	D	28.1
NB Piilani Highway Approach	B	8.5	B	10.6	B	8.9	B	12.1	B	9.2	B	12.3
SB Piilani Highway Approach	B	8.5	B	8.3	B	9.4	B	9.3	B	9.4	B	9.3
Alanui Ke Alii/South Kihei Road	Existing Condition is Unsignalized				B	9.8	B	12.8	B	10.0	B	12.8
WB Alanui Ke Alii Approach					C	16.3	C	17.0	C	16.4	C	17.0
NB South Kihei Road Approach					B	10.6	C	15.8	B	10.6	C	15.8
SB South Kihei Road Approach					B	7.8	B	9.8	B	7.9	B	9.9

NB – Northbound, SB – Southbound, EB – Eastbound, WB – Westbound



INTERSECTION SPACING ON ALANUI KE ALII

Figure 8

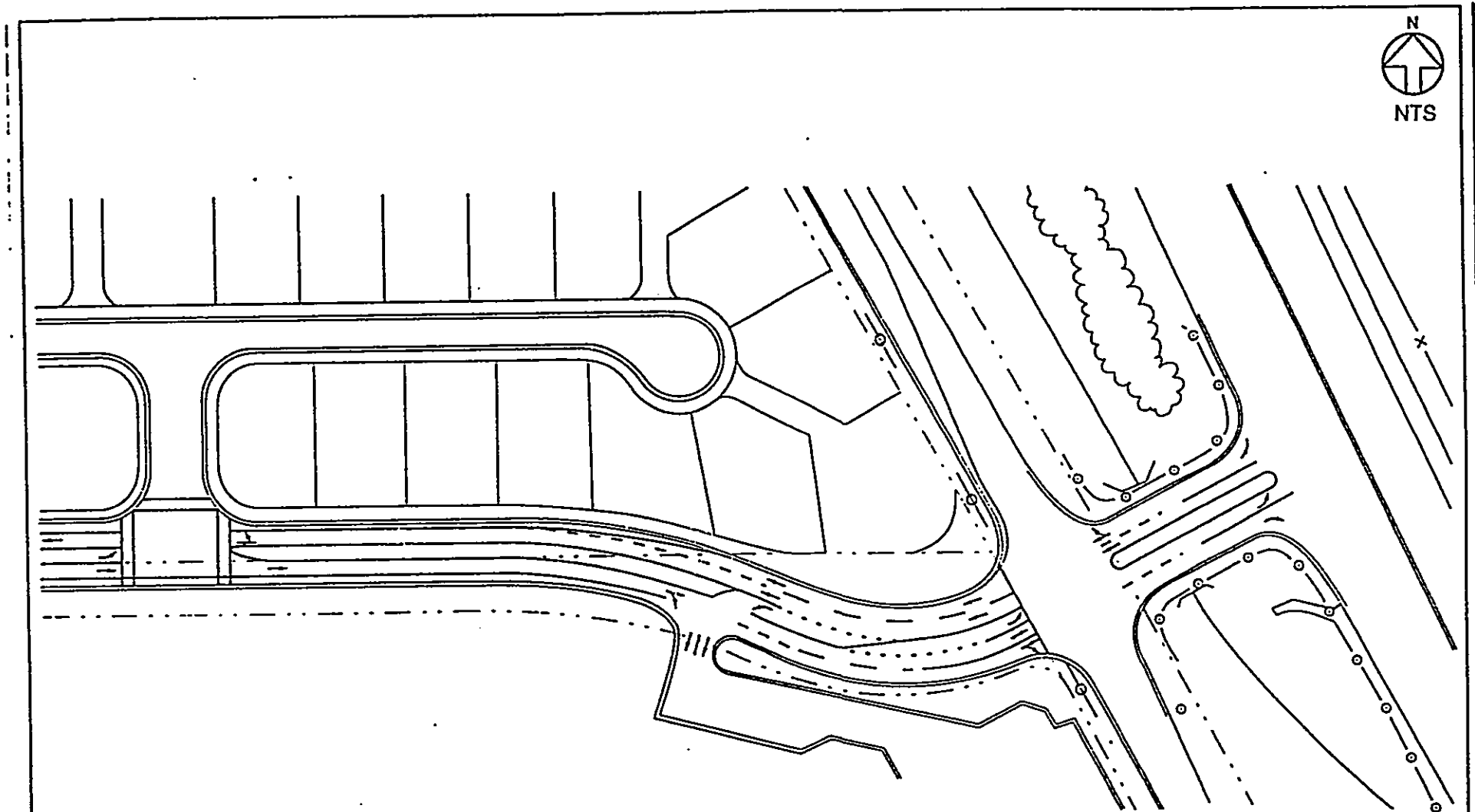
As part of the single-family development, Alanui Ke Alii will be widened and improved on its north side along the frontage of the single-family parcel. Curb and gutter will be installed along this frontage. The improved roadway will be 48-feet wide measured from face of curb to face of curb along the frontage of the proposed single-family parcel. This will provide enough roadway width to allow the installation of a median left-turn lane for traffic turning into the single-family development along with 6 foot bike lanes in both directions.

Figure 9 illustrates the recommended configuration of the site access intersection.

2. Site Access to Kanakanui Road

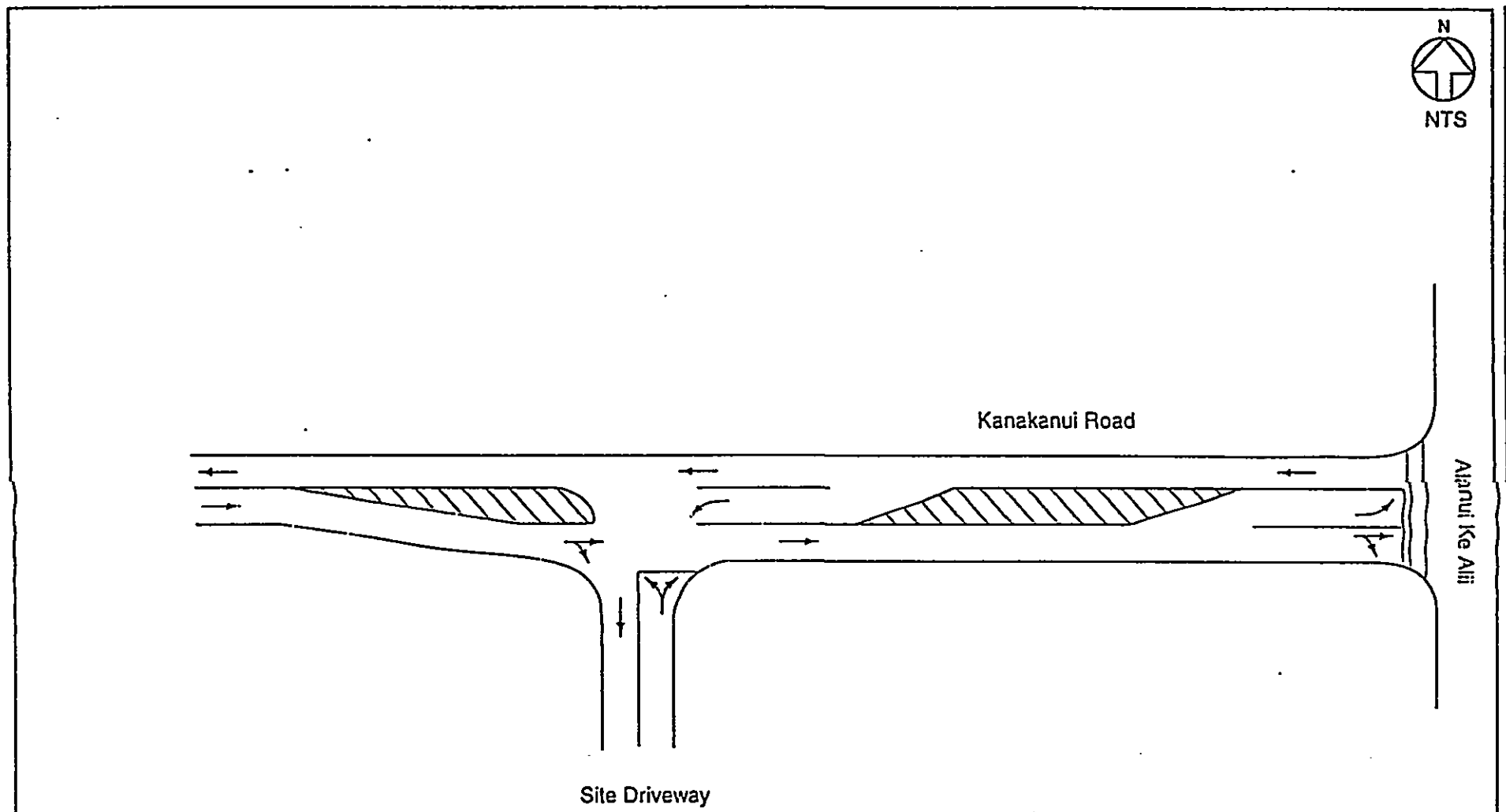
The second access to the single-family parcel is located on Kanakanui Road and is proposed approximately 600 feet north of the Alanui Ke Alii. It will be a full-movement intersection with STOP-sign control at the single-family parcel driveway.

As part of the single-family development, Kanakanui Road will be widened and improved on its west side along the frontage of the single-family parcel. Curb and gutter will be installed along this frontage. The improved roadway will be 36-feet wide measured from face of curb to edge of pavement along the frontage of the proposed single-family parcel. This will provide enough roadway width to allow the installation of a median left-turn lane for traffic turning into the single-family. Figure 10 illustrates the recommended configuration of the site access intersection.



PROPOSED LANE CONFIGURATIONS ON ALANUI KE ALII

Figure 9



Traffic Impact Assessment Report

PB 100 YEARS

PROPOSED SITE ACCESS TO KANAKANUI ROAD

Figure 10

APPENDIX

Appendix A Traffic Count Data

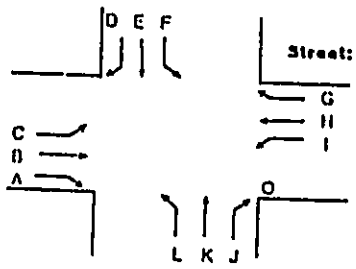
AM COUNT SHEET

Intersection: Kanakanui-Alanui Ke Alii

Date: 07/28-29/09

By: Sharon (Aloha)

Weather: Clear

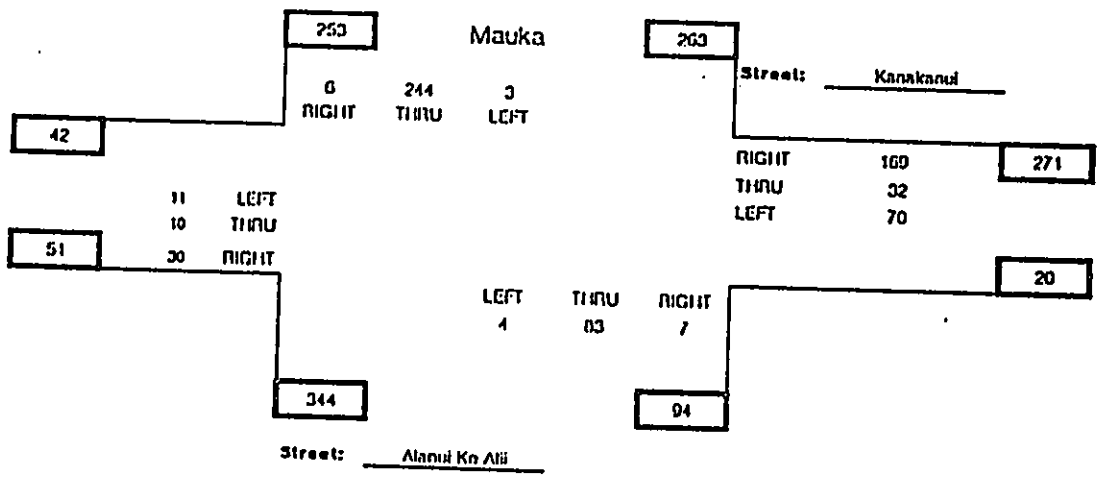


Street Alanui Ke Alii

TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 - 6:45	0	3	3	0	14	1	6	1	2	0	16	0	46	234
6:45 - 7:00	0	2	3	1	20	3	12	2	2	1	16	0	62	279
7:00 - 7:15	2	0	4	0	13	1	9	2	1	3	14	0	49	350
7:15 - 7:30	1	2	2	2	19	1	22	4	3	4	16	1	77	408
7:30 - 7:45	4	0	1	1	35	2	23	5	5	1	14	0	91	669
7:45 - 8:00	4	1	0	1	42	1	34	8	14	1	20	1	133	
8:00 - 8:15	13	5	3	2	74	0	47	8	10	2	23	1	187	
8:15 - 8:30	0	4	1	2	93	0	65	11	32	3	20	2	240	
Pkf	0.577	0.500	0.458	0.750	0.656	0.375	0.650	0.727	0.547	0.583	0.700	0.500	Peak	Pkf
7:30 - 8:30	30	10	11	6	244	3	169	32	70	7	83	4	669	0.674

Peak Hour

7:00 - 8:30



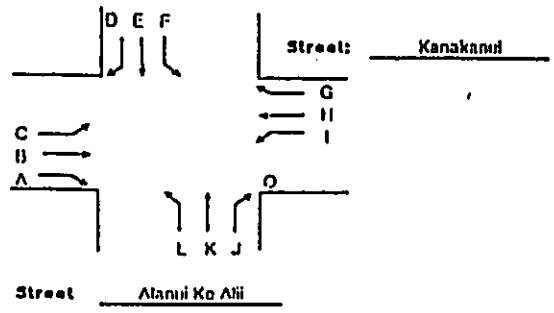
PM COUNT SHEET

Intersection: Kanakanui-Alanui Ke Alii

Date: 07/26-29/99

By: Sharon (Akina)

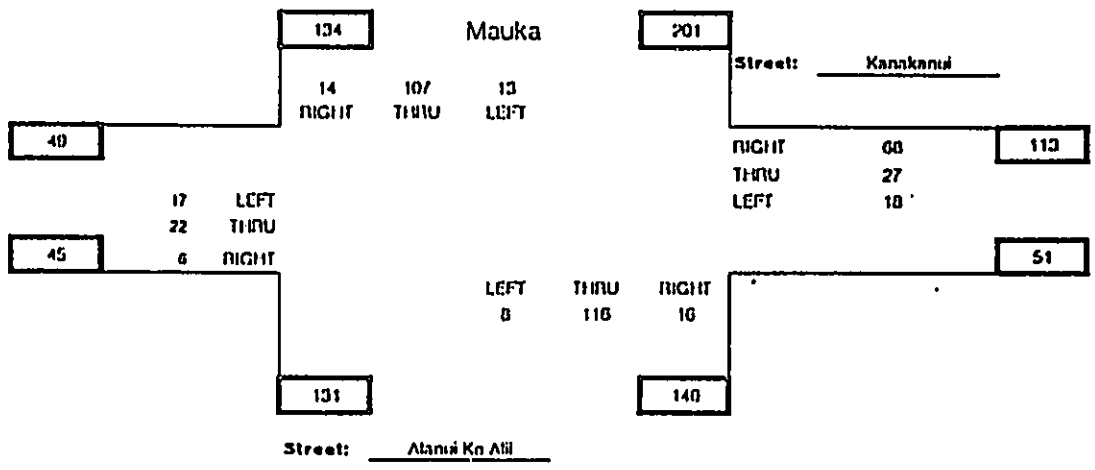
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 - 3:45	2	6	0	1	23	0	10	4	3	5	32	1	104	420
3:45 - 4:00	1	0	1	1	24	1	13	6	5	5	37	1	103	432
4:00 - 4:15	1	0	7	5	25	7	13	6	0	6	26	1	111	416
4:15 - 4:30	0	2	7	4	28	1	23	7	5	3	28	3	111	423
4:30 - 4:45	4	4	2	4	30	4	10	0	2	2	25	3	107	420
4:45 - 5:00	1	7	4	1	27	1	15	8	2	4	15	2	87	
5:00 - 5:15	1	14	5	1	30	0	20	7	6	4	28	2	118	
5:15 - 5:30	1	13	3	0	23	10	15	5	0	0	28	1	100	
PM	0.375	0.608	0.607	0.700	0.892	0.464	0.739	0.844	0.750	0.667	0.784	0.667	Peak	PM
3:45 - 4:45	6	22	17	14	107	13	60	27	18	18	118	6	432	0.973

Peak Hour

3:45 - 4:45



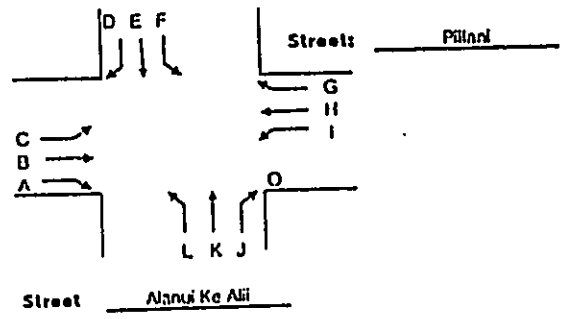
AM COUNT SHEET

Intersection: Pilani/Alanui Ke Alii

Date: 07/28-29/09

By: Sue (Aloha)

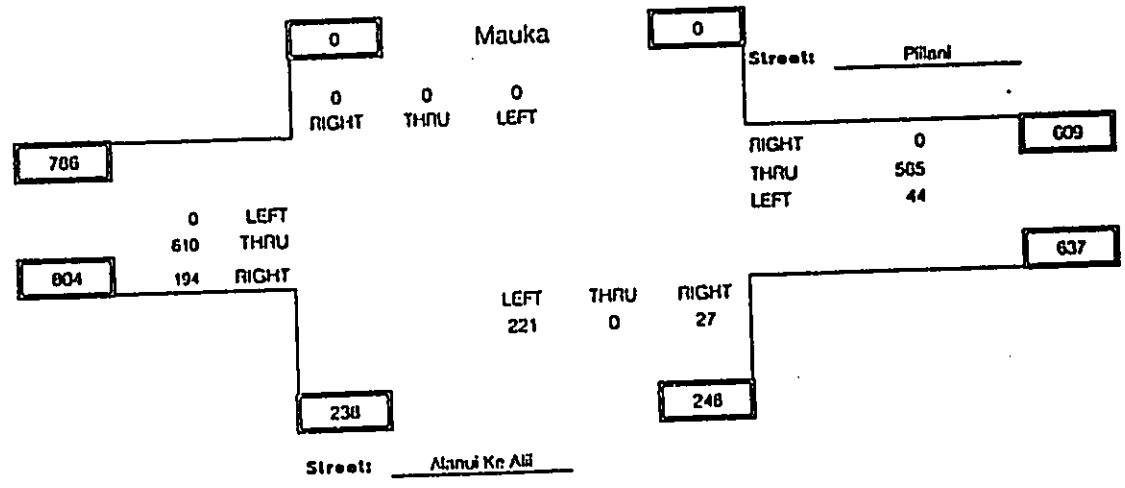
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 - 6:45	4	98						98	2	2		20	224	1150
6:45 - 7:00	22	113						96	6	5		21	263	1346
7:00 - 7:15	13	130						128	4	2		26	303	1491
7:15 - 7:30	17	150						150	3	5		35	360	1569
7:30 - 7:45	33	203						130	2	4		40	420	1661
7:45 - 8:00	35	167						147	8	7		44	408	
8:00 - 8:15	50	107						140	12	7		65	381	
8:15 - 8:30	76	133						140	22	9		72	452	
PhF	0.638	0.751						0.961	0.500	0.750		0.787	Peak	Phf
7:30 - 8:30	194	610						565	44	27		221	1661	0.919

Peak Hour

7:30 - 8:30



CORRECTION

THE PRECEDING DOCUMENT(S) HAS BEEN REPHOTOGRAPHED TO ASSURE LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

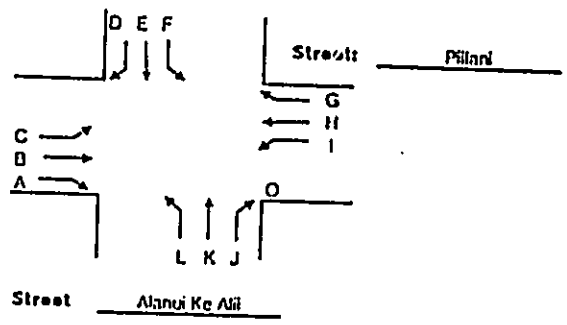
AM COUNT SHEET

Intersection: Piilani/Alanui Ke Alii

Date: 07/28-29/99

Dy: Sue (Aloha)

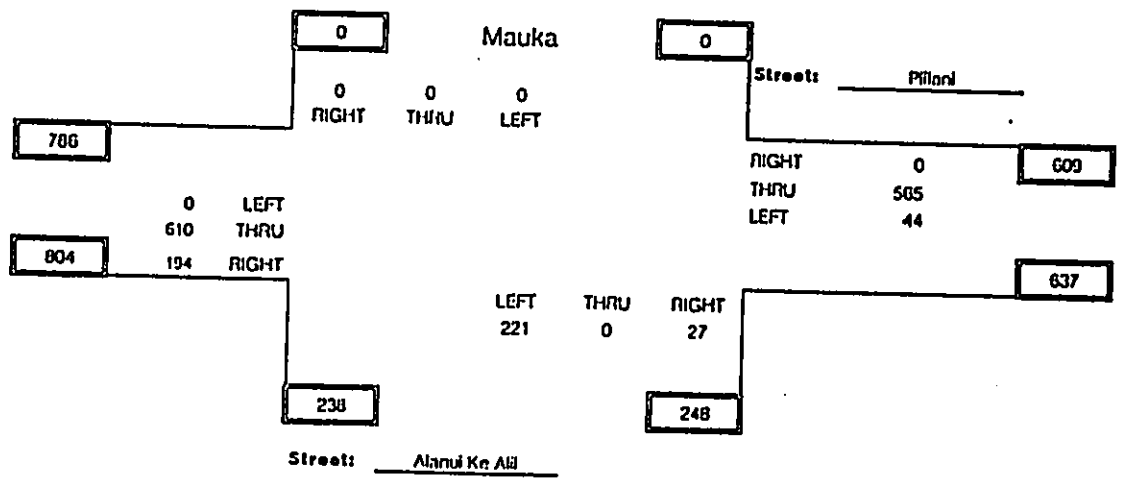
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 - 6:45	4	98						98	2	2		20	224	1150
6:45 - 7:00	22	113						90	6	5		21	263	1346
7:00 - 7:15	13	130						128	4	2		26	303	1491
7:15 - 7:30	17	150						150	3	5		35	360	1569
7:30 - 7:45	33	203						130	2	4		40	420	1661
7:45 - 8:00	35	167						147	8	7		44	408	
8:00 - 8:15	50	107						140	12	7		65	381	
8:15 - 8:30	76	133						140	22	9		72	452	
Phf	0.638	0.751						0.961	0.500	0.750		0.787	Peak	Phf
7:30 - 8:30	194	610						565	44	27		221	1661	0.919

Peak Hour

7:30 - 8:30



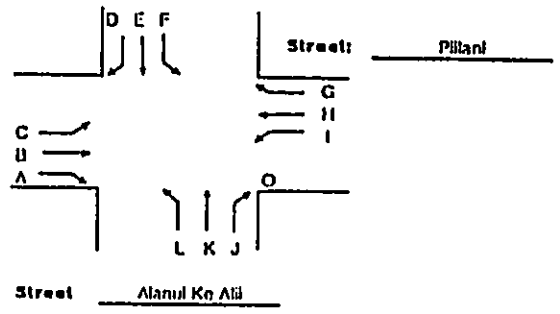
PM COUNT SHEET

Intersection: Pilani/Alanui Ke Alii

Date: 07/20-20/00

By: Sio (Aloha)

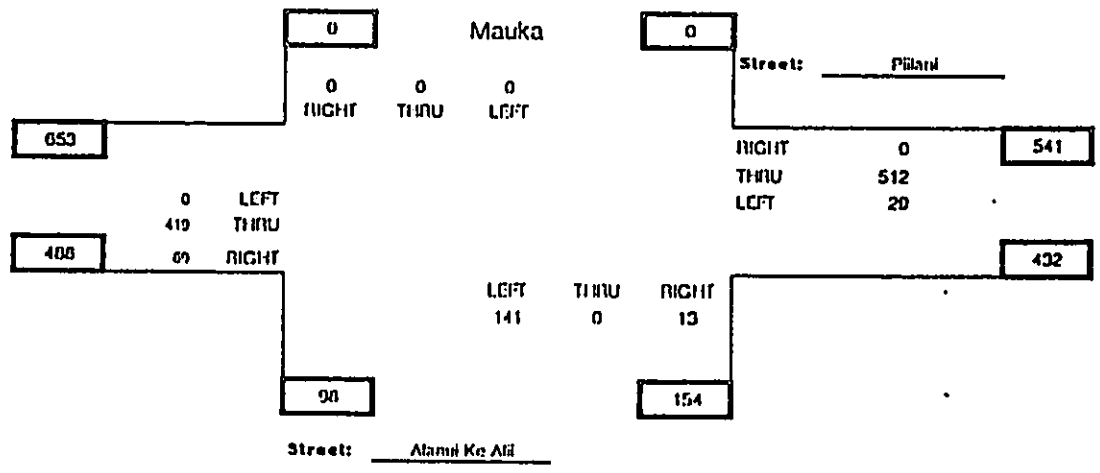
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 - 3:45	21	185						102	15	0		53	465	1251
3:45 - 4:00	15	119						115	0	8		35	200	1183
4:00 - 4:15	7	57						80	3	2		17	166	1363
4:15 - 4:30	26	116						126	8	3		43	322	1750
4:30 - 4:45	21	127						191	12	0		48	397	2056
4:45 - 5:00	35	100						100	13	8		53	478	
5:00 - 5:15	34	236						220	11	6		55	562	
5:15 - 5:30	44	247						247	0	12		60	610	
Phf	0.683	0.825						0.670	0.604	0.406		0.766	Peak	Phf
3:45 - 4:45	69	419						512	20	13		141	1183	0.745

Peak Hour

3:45 - 4:45



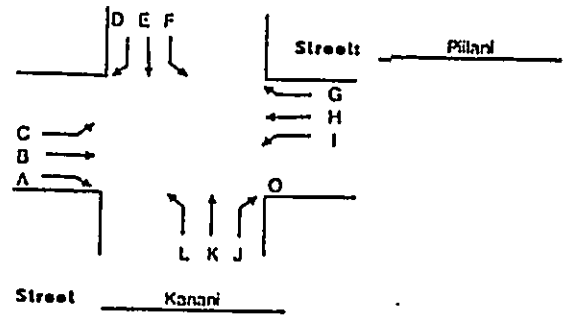
AM COUNT SHEET

Intersection: Pilani/Kanani

Date: 07/28-29/09

By: Francine (Aloha)

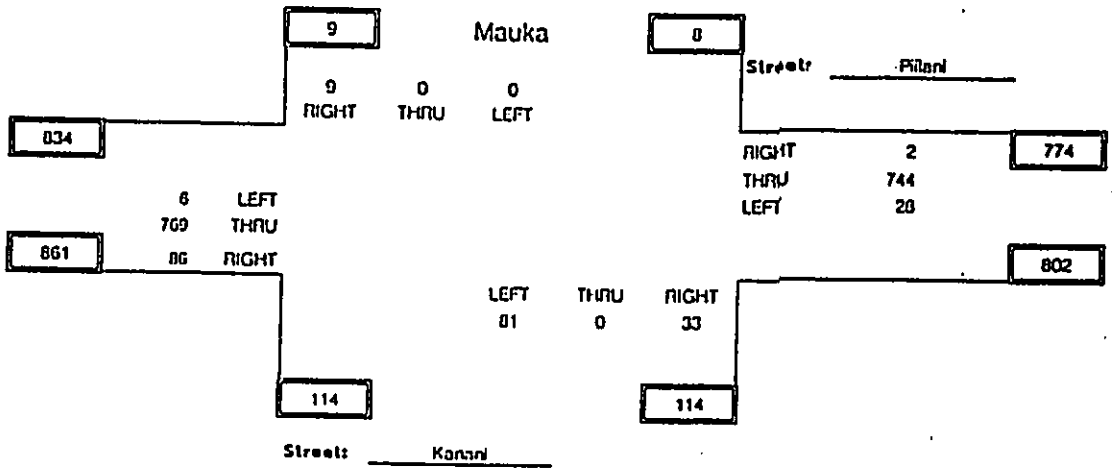
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 - 6:45	9	133	19	1	0	0	1	140	4	2	1	12	322	1406
6:45 - 7:00	14	142	17	6	0	0	1	121	5	0	0	19	325	1544
7:00 - 7:15	11	144	5	3	0	1	0	159	5	4	0	24	356	1649
7:15 - 7:30	13	210	2	2	0	0	0	157	2	2	0	15	403	1727
7:30 - 7:45	23	234	0	2	0	0	0	164	11	6	0	20	460	1758
7:45 - 8:00	23	200	4	2	0	0	1	171	3	9	0	17	430	
8:00 - 8:15	20	149	0	4	0	0	0	218	7	8	0	28	434	
8:15 - 8:30	20	186	2	1	0	0	1	191	7	10	0	16	434	
PhF	0.035	0.022	0.375	0.563	0.000	0.000	0.500	0.853	0.636	0.625	0.000	0.723	Peak	Phf
7:30 - 8:30	86	709	8	9	0	0	2	744	28	33	0	81	1758	0.955

Peak Hour

7:30 - 8:30



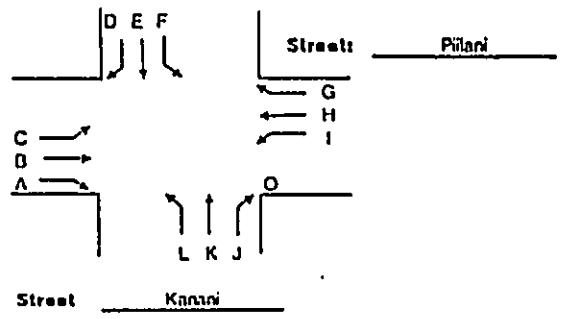
PM COUNT SHEET

Intersection: Pilani/Kanani

Date: 07/28-29/09

By: Francine (Aloha)

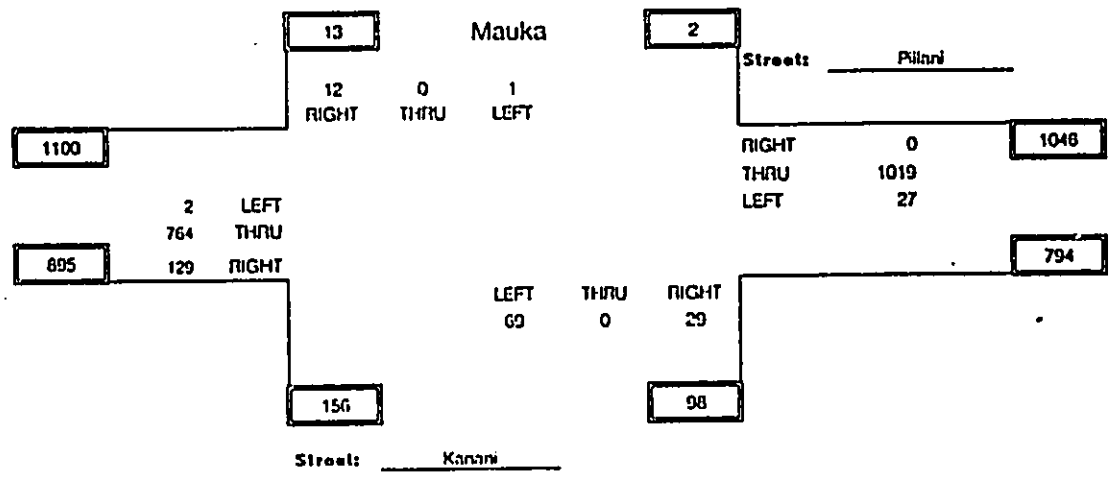
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 - 3:45	19	192	3	33	0	1	0	201	8	7	1	26	491	2015
3:45 - 4:00	26	174	1	0	0	0	0	234	7	7	0	16	471	2052
4:00 - 4:15	34	170	0	2	0	1	0	256	8	9	0	20	500	1993
4:15 - 4:30	32	182	1	1	0	0	0	303	7	8	0	19	553	2012
4:30 - 4:45	37	238	0	3	0	0	0	226	5	5	0	14	520	1869
4:45 - 5:00	35	171	0	3	0	0	0	170	5	10	0	18	412	
5:00 - 5:15	43	197	0	2	0	1	1	236	9	13	0	17	519	
5:15 - 5:30	32	187	1	1	0	0	0	163	4	5	0	17	410	
PhF	0.872	0.803	0.500	0.500	0.000	0.250	0.000	0.841	0.844	0.806	0.000	0.863	Peak	PhF
3:45 - 4:45	129	764	2	12	0	1	0	1019	27	29	0	69	2052	0.928

Peak Hour

3:45 - 4:45



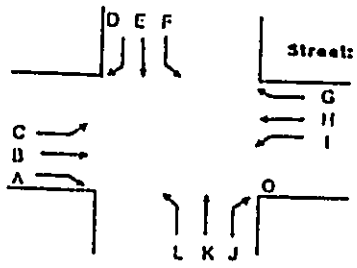
AM COUNT SHEET

Intersection: Haukel/Kanani/Auhana

Date: 07/26-29/00

By: Diane (Aloha)

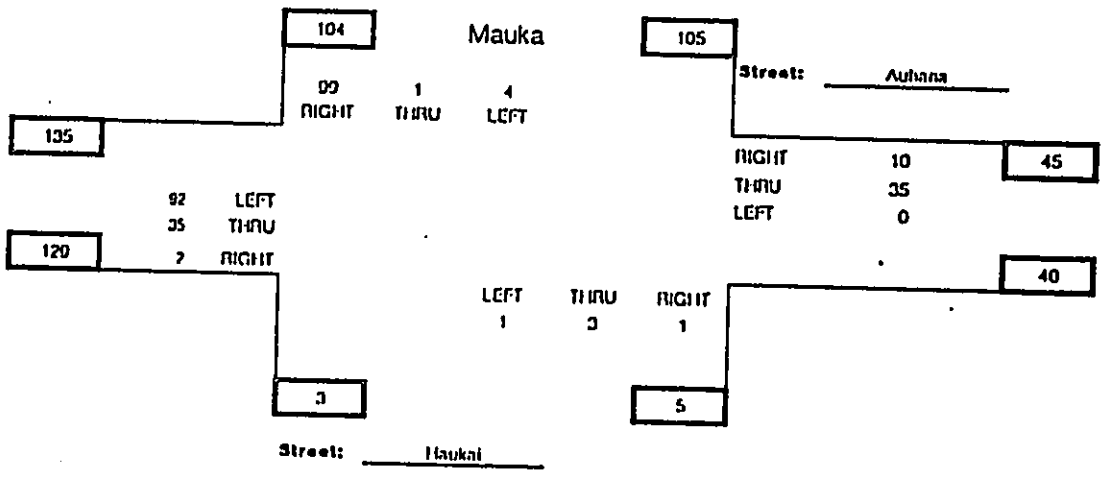
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
6:30 - 6:45	1	3	10	13	0	2	3	3	0	2	0	1	38	177
6:45 - 7:00	0	3	14	17	1	1	2	3	0	0	1	1	43	186
7:00 - 7:15	0	5	24	16	0	1	2	5	0	0	0	2	55	220
7:15 - 7:30	0	3	17	15	0	1	1	3	0	0	0	1	41	250
7:30 - 7:45	0	2	20	27	0	2	3	4	0	0	0	1	59	203
7:45 - 8:00	0	0	16	23	0	0	2	13	0	0	2	0	65	
8:00 - 8:15	0	15	33	25	1	2	1	8	0	0	0	0	85	
8:15 - 8:30	2	9	23	24	0	0	4	10	0	1	1	0	74	
PH	0.250	0.563	0.607	0.917	0.250	0.500	0.625	0.673	0.000	0.250	0.375	0.250	Peak	PH
7:30 - 8:30	2	35	92	99	1	4	10	35	0	1	3	1	283	0.932

Peak Hour

7:30 - 8:30



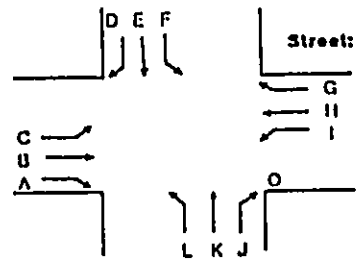
PM COUNT SHEET

Intersection: Haukal/Kanani/Auhana

Date: 07/20-20/00

By: Diane (Aloha)

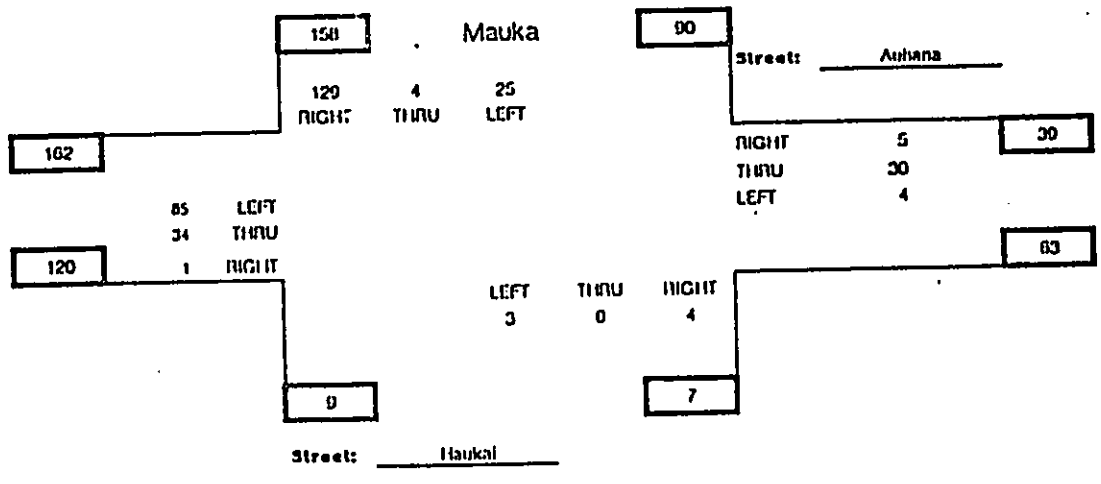
Weather: Clear



TIME	A	B	C	D	E	F	G	H	I	J	K	L	Total Mvmt	Total Hour
3:30 - 3:45	1	0	31	28	0	1	2	0	0	0	2	1	81	324
3:45 - 4:00	0	0	19	30	0	0	3	4	0	1	0	0	74	324
4:00 - 4:15	0	11	20	35	0	6	0	0	2	2	0	0	84	328
4:15 - 4:30	1	7	26	26	3	7	1	11	1	1	0	1	85	337
4:30 - 4:45	0	7	20	30	1	4	1	7	1	0	0	2	81	337
4:45 - 5:00	1	10	16	32	2	4	0	11	0	0	0	2	78	
5:00 - 5:15	0	12	20	35	0	4	5	0	0	0	0	0	93	
5:15 - 5:30	1	16	17	33	2	4	2	7	0	1	0	2	85	
Phf	0.250	0.773	0.817	0.849	0.333	0.781	0.417	0.682	0.500	0.500	0.000	0.375	Peak	Phf
3:45 - 4:45	1	34	85	120	4	25	5	30	4	4	0	3	324	0.953

Peak Hour

3:45 - 4:45



Appendix B Levels of Service Definitions

The *Highway Capacity Manual* defines six Levels of Service (LOS), labeled A through F, from best to worst conditions. Levels of Service for signalized and unsignalized intersections are defined in terms of average user delays. Delay is a measure of driver discomfort, frustration, fuel consumption, and lost travel time.

For unsignalized intersections, the *Highway Capacity Manual* evaluates gaps in the major street traffic flow and calculates available gaps for left-turns across oncoming traffic and for the left and right-turns onto the major roadway from the minor street.

LEVEL-OF-SERVICE A: Little or no delay.

LEVEL-OF-SERVICE B: Short traffic delays.

LEVEL-OF-SERVICE C: Average traffic delays.

LEVEL-OF-SERVICE D: Long traffic delays.

LEVEL-OF-SERVICE E: Very long traffic delays.

LEVEL-OF-SERVICE F: Demand volume exceeds capacity, resulting in extreme delays with queuing that may cause severe congestion and affect other movements at the intersection.

Appendix C Intersection Capacity Analysis Worksheets

Center For Microcomputers In Transportation
University of Florida
512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) Kanakanui Road (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Existing 1999 AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	< 0	0	2	< 0	1	1	< 0	1	1	< 0
Stop/Yield			N			N						
Volumes	4	83	7		244	6	70	32	169	11	10	30
PHF	.5	.8	.58		.66	.75	.55	.73	.65	.46	.5	.58
Grade		0			0			0			0	
MC's (%)	0						0	0	0	0	0	0
SU/RV's (%)	0						0	0	0	0	0	0
CV's (%)	0						0	0	0	0	0	0
PCE's	1.00						1.00	1.00	1.00	1.00	1.00	1.00

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	58	189
Potential Capacity: (pcph)	1294	1111
Movement Capacity: (pcph)	1294	1111
Prob. of Queue-Free State:	0.80	0.95

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		378
Potential Capacity: (pcph)		1074
Movement Capacity: (pcph)		1074
Prob. of Queue-Free State:		0.99

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	496	498
Potential Capacity: (pcph)	559	558
Capacity Adjustment Factor due to Impeding Movements	0.99	0.99
Movement Capacity: (pcph)	555	554
Prob. of Queue-Free State:	0.92	0.96

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	498	508
Potential Capacity: (pcph)	509	501
Major LT, Minor TH Impedance Factor:	0.96	0.91
Adjusted Impedance Factor:	0.97	0.93
Capacity Adjustment Factor due to Impeding Movements	0.92	0.75
Movement Capacity: (pcph)	469	374

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB L	127	469		10.5	1.3	C	
NB T	44	555 >					6.1
NB R	260	1294 >	1085	4.6	1.3	A	
SB L	24	374		10.3	0.1	C	
SB T	20	554 >					5.8
SB R	52	1111 >	868	4.5	0.2	A	
EB L	8	1074		3.4	0.0	A	0.1

Intersection Delay = 3.0 sec/veh

Center For Microcomputers In Transportation
University of Florida
512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) Kanakanui Road (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Existing 1999 PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	< 0	0	2	< 0	1	1	< 0	1	1	< 0
Stop/Yield			N			N						
Volumes	8	116	16		107	14	18	27	68	17	22	6
PHF	.67	.78	.67		.89	.7	.75	.84	.74	.61	.69	.38
Grade		0			0			0			0	
MC's (%)	0						0	0	0	0	0	0
SU/RV's (%)	0						0	0	0	0	0	0
CV's (%)	0						0	0	0	0	0	0
PCE's	1.00						1.00	1.00	1.00	1.00	1.00	1.00

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	86	70
Potential Capacity: (pcph)	1252	1276
Movement Capacity: (pcph)	1252	1276
Prob. of Queue-Free State:	0.93	0.99

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		140
Potential Capacity: (pcph)		1442
Movement Capacity: (pcph)		1442
Prob. of Queue-Free State:		0.99

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	313	315
Potential Capacity: (pcph)	716	714
Capacity Adjustment Factor due to Impeding Movements	0.99	0.99
Movement Capacity: (pcph)	710	708
Prob. of Queue-Free State:	0.95	0.95

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	309	307
Potential Capacity: (pcph)	672	674
Major LT, Minor TH Impedance Factor:	0.95	0.95
Adjusted Impedance Factor:	0.96	0.96
Capacity Adjustment Factor due to Impeding Movements	0.95	0.89
Movement Capacity: (pcph)	637	599

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB	L	24	637		5.9	0.0	B	
NB	T	32	710	>				4.2
NB	R	92	1252	> 1046	3.9	0.4	A	
SB	L	28	599		6.3	0.0	B	
SB	T	32	708	>				5.2
SB	R	16	1276	> 831	4.6	0.0	A	
EB	L	12	1442		2.5	0.0	A	0.1

Intersection Delay = 1.7 sec/veh

Center For Microcomputers In Transportation
University of Florida
512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) Elem. School Ent. (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/3/99
Other Information.....Existing 1999 AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1 <	0	1	1	0	0	0	0	0	0	0
Stop/Yield			N			N						
Volumes		94	69	218	126							
PHF		.87	.51	.64	.69							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	243	
Potential Capacity: (pcph)	1313	
Movement Capacity: (pcph)	1313	
Prob. of Queue-Free State:	0.71	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	375	1313		3.8	1.4	A	2.4

Intersection Delay = 1.6 sec/veh

Center For Microcomputers In Transportation
University of Florida
512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) Elem. School Ent. (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/3/99
Other Information.....Existing 1999 PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	< 0	1	1	0	0	0	0	0	0	0
Stop/Yield			N			N						
Volumes		140	18	41	90							
PHF		.81	.64	.79	.76							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	201	
Potential Capacity: (pcph)	1375	
Movement Capacity: (pcph)	1375	
Prob. of Queue-Free State:	0.96	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	57	1375		2.7	0.0	A	0.9

Intersection Delay = 0.4 sec/veh

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Streets: (N-S) S. Kihei Road (E-W) Ke Alii Alanui Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Existing 1999 AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	< 0	0	0	0	0	> 1	1
Stop/Yield			Y			N						
Volumes	7	385	84	79	405	9				63	1	62
PHF	.88	.91	.77	.8	.92	.56				.74	.25	.58
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10			1.10						1.10	1.10	1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	*3.30
Left Turn Minor Road	*6.00	*3.30

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	423	
Potential Capacity: (pcph)	845	
Movement Capacity: (pcph)	845	
Prob. of Queue-Free State:	0.86	

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	423	456
Potential Capacity: (pcph)	1078	1039
Movement Capacity: (pcph)	1078	1039
Prob. of Queue-Free State:	0.90	0.99

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	986	
Potential Capacity: (pcph)	331	
Capacity Adjustment Factor due to Impeding Movements	0.89	
Movement Capacity: (pcph)	295	
Prob. of Queue-Free State:	0.99	

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	978	
Potential Capacity: (pcph)	335	
Major LT, Minor TH Impedance Factor:	0.89	
Adjusted Impedance Factor:	0.89	
Capacity Adjustment Factor due to Impeding Movements	0.89	
Movement Capacity: (pcph)	299	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	94	299 >	299	17.9	1.6	C	
WB T	4	295 >					11.5
WB R	118	845		5.0	0.5	A	
NB L	9	1039		3.5	0.0	A	0.1
SB L	109	1078		3.7	0.3	A	0.6

Intersection Delay = 1.6 sec/veh

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Streets: (N-S) S. Kihei Road (E-W) Ke Alii Alanui Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 10/28/97
Other Information.....Existing 1999 PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	< 0	0	0	0	0	> 1	1
Stop/Yield			Y			N						
Volumes	3	660	107	51	700	5				55	0	35
PHF	.38	.96	.85	.82	.88	.63				.83	1	.71
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10			1.10						1.10	1.10	1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	*3.30
Left Turn Minor Road	*6.00	*3.30

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	688	
Potential Capacity: (pcph)	620	
Movement Capacity: (pcph)	620	
Prob. of Queue-Free State:	0.91	

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	688	803
Potential Capacity: (pcph)	806	710
Movement Capacity: (pcph)	806	710
Prob. of Queue-Free State:	0.92	0.99

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	1561	
Potential Capacity: (pcph)	165	
Capacity Adjustment Factor due to Impeding Movements	0.90	
Movement Capacity: (pcph)	149	
Prob. of Queue-Free State:	1.00	

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	1557	
Potential Capacity: (pcph)	166	
Major LT, Minor TH Impedance Factor:	0.90	
Adjusted Impedance Factor:	0.90	
Capacity Adjustment Factor due to Impeding Movements	0.90	
Movement Capacity: (pcph)	150	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	73	150	>	150	46.2	2.8	F	
WB T	0	149	>					30.7
WB R	54	620			6.4	0.2	B	
NB L	9	710			5.1	0.0	B	0.0
SB L	68	806			4.9	0.2	A	0.3

Intersection Delay = 1.9 sec/veh

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Streets: (N-S) Piilani Highway (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Existing 1999 AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	0	> 1	1	0	0	1
Stop/Yield			N			N						
Volumes	28	744	2	6	769	86	81	0	33			9
PHF	.64	.85	.5	.5	.82	.94	.72	.25	.83			.56
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0			0
SU/RV's (%)	1			1			1	1	1			1
CV's (%)	1			1			1	1	1			1
PCE's	1.02			1.02			1.02	1.02	1.02			1.02

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	875	938
Potential Capacity: (pcph)	499	464
Movement Capacity: (pcph)	499	464
Prob. of Queue-Free State:	0.97	0.91

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	879	1029
Potential Capacity: (pcph)	653	554
Movement Capacity: (pcph)	653	554
Prob. of Queue-Free State:	0.98	0.92

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		1873
Potential Capacity: (pcph)		113
Capacity Adjustment Factor due to Impeding Movements		0.90
Movement Capacity: (pcph)		102
Prob. of Queue-Free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		1876
Potential Capacity: (pcph)		87
Major LT, Minor TH Impedance Factor:		0.90
Adjusted Impedance Factor:		0.90
Capacity Adjustment Factor due to Impeding Movements		0.87
Movement Capacity: (pcph)		76

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	114	76 >	76	* 20.0	~~23.1~~	~~F~~ D	
EB	T	0	102 >					~~764.3~~
EB	R	41	464		8.5	0.2	B	
WB	R	16	499		7.5	0.0	B	7.5
NB	L	45	554		7.1	0.2	B	0.3
SB	L	12	653		5.6	0.0	B	0.0

ADJUSTED BASED ON DELAY SURVEY DATA SEE ATTACHED WORKSHEET

Intersection Delay = ~~19.7~~ sec/veh

~~* The calculated value was greater than 999.9.~~

TRAFFIC IMPACT ASSESSMENT REPORT

Unsignalized Intersection Analysis

Level-Of-Service Adjustment

WEIGHTED AVERAGE OF INTERSECTION DELAY (UNSIGNALIZED)
ADJUSTMENTS BASED ON FIELD OBSERVATIONS

Intersection: Kanani Road Approaching Piilani Highway (AM Peak Hour)

Approach	Lane Movement	Volume	Phf	Movement Delay	Adjusted Volume	Volume * Delay	Approach Delay	App Del * App Vol	Intersection Delay
NB	1	28	0.64	7.1	43.75	310.63	0.34	260.47	
	2	744	0.85	0	875.29	0.00			
	3	2	0.5	0	4.00	0.00			
	4				0.00	0.00			
SB	1	6	0.5	5.6	12.00	67.20	0.06	55.56	
	2	769	0.82	0	937.80	0.00			
	3	86	0.94	0	91.49	0.00			1.32
	4				0.00	0.00			
WB	1	9	0.56	7.5	16.07	120.54	7.50	67.50	
	2				0.00	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
EB	1	81	0.72	20	112.50	2250.00	17.00	1937.66	
	2	33	0.83	8.5	39.76	337.95			
	3				0.00	0.00			
	4				0.00	0.00			

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Streets: (N-S) Piilani Highway (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Existing 1999 PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	0	> 1	1	0	0	1
Stop/Yield			N			N						
Volumes	27	1019	0	2	764	129	69	0	29			12
PHF	.84	.84	.25	.5	.8	.87	.86	.25	.81			.5
Grade		0			0			0		0		
MC's (%)	0			0			0	0	0			0
SU/RV's (%)	1			1			1	1	1			1
CV's (%)	1			1			1	1	1			1
PCE's	1.02			1.02			1.02	1.02	1.02			1.02

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	1213	955
Potential Capacity: (pcph)	336	454
Movement Capacity: (pcph)	336	454
Prob. of Queue-Free State:	0.93	0.92

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	1213	1103
Potential Capacity: (pcph)	453	511
Movement Capacity: (pcph)	453	511
Prob. of Queue-Free State:	0.99	0.94

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		2204
Potential Capacity: (pcph)		76
Capacity Adjustment Factor due to Impeding Movements		0.93
Movement Capacity: (pcph)		71
Prob. of Queue-Free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		2216
Potential Capacity: (pcph)		55
Major LT, Minor TH Impedance Factor:		0.93
Adjusted Impedance Factor:		0.93
Capacity Adjustment Factor due to Impeding Movements		0.86
Movement Capacity: (pcph)		47

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	81	47 >	47	~~*~~ 25.0	~~20.1~~	~~F~~ D	*
EB	T	0	71 >					
EB	R	37	454		8.6	0.2	B	
WB	R	24	336		11.5	0.1	C	11.5
NB	L	32	511		7.5	0.1	B	0.2
SB	L	4	453		8.0	0.0	B	0.0

ADJUSTED BASED ON DELAY SURVEY DATA SEE ATTACHED WORKSHEET

Intersection Delay = ~~52.1~~ sec/veh

~~* The calculated value was greater than 999.9.~~

TRAFFIC IMPACT ASSESSMENT REPORT

Unsignalized Intersection Analysis

Level-Of-Service Adjustment

WEIGHTED AVERAGE OF INTERSECTION DELAY (UNSIGNALIZED)
ADJUSTMENTS BASED ON FIELD OBSERVATIONS

Intersection: Kanani Road Approaching Piilani Highway (PM Peak Hour)

Approach	Lane Movement	Volume	Phf	Movement Delay	Adjusted Volume	Volume * Delay	Approach Delay	App Del * App Vol	Intersection Delay
NB	1	27	0.84	7.5	32.14	241.07	0.19	202.50	
	2	1019	0.84	0	1213.10	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
SB	1	2	0.5	8	4.00	32.00	0.03	25.87	
	2	764	0.8	0	955.00	0.00			
	3	129	0.87	0	148.28	0.00			1.13
	4				0.00	0.00			
WB	1	12	0.5	11.5	24.00	276.00	11.50	138.00	
	2				0.00	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
EB	1	69	0.86	25	80.23	2005.81	19.94	1954.10	
	2	29	0.81	8.6	35.80	307.90			
	3				0.00	0.00			
	4				0.00	0.00			

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Streets: (N-S) Auhana Road (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Existing 1999 AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0
Stop/Yield			N			N						
Volumes	0	35	10	92	35	2	1	3	1	4	1	99
PHF	.25	.67	.63	.7	.58	.25	.25	.38	.25	.5	.25	.92
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0	0	0	0
SU/RV's (%)	0			1			0	0	0	0	0	1
CV's (%)	0			0			0	0	0	0	0	0
PCE's	1.00			1.01			1.00	1.00	1.00	1.00	1.00	1.01

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	60	64
Potential Capacity: (pcph)	1291	1285
Movement Capacity: (pcph)	1291	1285
Prob. of Queue-Free State:	0.92	1.00
Step 2: LT from Major Street	**SB**	**NB**
Conflicting Flows: (vph)	68	68
Potential Capacity: (pcph)	1591	1591
Movement Capacity: (pcph)	1591	1591
Prob. of Queue-Free State:	0.92	1.00
TH Saturation Flow Rate: (pcphpl)	1700	1700
RT Saturation Flow Rate: (pcphpl)	1700	1700
Major LT Shared Lane Prob. of Queue-Free State:	0.91	1.00
Step 3: TH from Minor Street	**WB**	**EB**
Conflicting Flows: (vph)	259	263
Potential Capacity: (pcph)	798	794
Capacity Adjustment Factor due to Impeding Movements	0.91	0.91
Movement Capacity: (pcph)	729	725
Prob. of Queue-Free State:	0.99	0.99
Step 4: LT from Minor Street	**WB**	**EB**
Conflicting Flows: (vph)	261	311
Potential Capacity: (pcph)	748	699
Major LT, Minor TH Impedance Factor:	0.90	0.91
Adjusted Impedance Factor:	0.93	0.93
Capacity Adjustment Factor due to Impeding Movements	0.92	0.85
Movement Capacity: (pcph)	691	595

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	4	595	>					
EB	T	8	725	>	767	4.8	0.0	A	4.8
EB	R	4	1285	>					
WB	L	8	691	>					
WB	T	4	729	>	1192	3.4	0.3	A	3.4
WB	R	109	1291	>					
NB	L	0	1591			2.3	0.0	A	0.0
SB	L	132	1591			2.5	0.2	A	1.8

Intersection Delay = 2.1 sec/veh

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Streets: (N-S) Auhana Road (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Existing 1999 PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0
Stop/Yield			N			N						
Volumes	4	30	5	85	34	1	3	0	4	25	4	129
PHF	.5	.68	.42	.82	.77	.25	.38	.25	.5	.78	.33	.85
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0	0	0	0
SU/RV's (%)	0			1			0	0	0	0	0	1
CV's (%)	0			0			0	0	0	0	0	0
PCE's	1.00			1.01			1.00	1.00	1.00	1.00	1.00	1.01

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	50	46
Potential Capacity: (pcph)	1306	1312
Movement Capacity: (pcph)	1306	1312
Prob. of Queue-Free State:	0.88	0.99

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	56	48
Potential Capacity: (pcph)	1612	1626
Movement Capacity: (pcph)	1612	1626
Prob. of Queue-Free State:	0.93	1.00
TH Saturation Flow Rate: (pcphpl)	1700	1700
RT Saturation Flow Rate: (pcphpl)	1700	1700
Major LT Shared Lane Prob. of Queue-Free State:	0.93	0.99

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	210	214
Potential Capacity: (pcph)	846	842
Capacity Adjustment Factor due to Impeding Movements	0.93	0.93
Movement Capacity: (pcph)	785	782
Prob. of Queue-Free State:	0.98	1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	212	290
Potential Capacity: (pcph)	798	719
Major LT, Minor TH Impedance Factor:	0.93	0.91
Adjusted Impedance Factor:	0.95	0.93
Capacity Adjustment Factor due to Impeding Movements	0.94	0.82
Movement Capacity: (pcph)	750	593

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	8	593 >					
EB	T	0	782 >	817	4.5	0.0	A	4.5
EB	R	8	1312 >					
WB	L	32	750 >					
WB	T	12	785 >	1125	3.9	0.7	A	3.9
WB	R	153	1306 >					
NB	L	8	1626		2.2	0.0	A	0.2
SB	L	105	1612		2.4	0.1	A	1.7

Intersection Delay = 2.6 sec/veh

Center for Microcomputers in Transportation

Streets: (E-W) Alanui Ke Alii (N-S) Piilani Highway
Analyst: Miyamoto File Name: ALAEAM.HC9
Area Type: Other 8-2-99 Morning
Comment: Existing 1999 Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
Volumes	221		27				44	565			610	194
PHF or PK15	0.80		0.80				0.80	0.96			0.80	0.80
Lane W (ft)	12.0		12.0				12.0	12.0			12.0	12.0
Grade		0						0			0	
% Heavy Veh	2		2				2	2			2	2
Parking	N		N				N		N	N		
Bus Stops			0						0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N					(Y/N)	N		(Y/N)	N	
Arr Type	3		3				3	3			3	3
RTOR Vols			27						0		194	
Lost Time	3.00		3.00				3.00	3.00			3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	*				NB Left	*		
	Thru					Thru		*	
	Right	*				Right			
	Peds					Peds			
WB	Left					SB Left			
	Thru					Thru		*	
	Right					Right		*	
	Peds					Peds			
NB	Right					EB Right			
SB	Right					WB Right			
Green		17.0A				Green	5.0A	53.0A	
Yellow/AR		5.0				Yellow/AR	5.0	5.0	

Cycle Length: 90 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	374	1770	0.739	0.211	26.6	D	26.6	D
	R	393	1863	0.000	0.211	0.0	A		
NB	L	138	1770	0.400	0.078	26.6	D	8.5	B
	T	1138	1863	0.517	0.611	6.8	B		
SB	T	1138	1863	0.669	0.611	8.5	B	8.5	B
	R	1138	1863	0.000	0.611	0.0	A		

Intersection Delay = 11.5 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.662

Streets: (E-W) Alanui Ke Alii (N-S) Piilani Highway
Analyst: Miyamoto File Name: ALAEPM.HC9
Area Type: Other 8-2-99 Evening
Comment: Existing 1999 Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
Volumes	181		21				29	869			682	113
PHF or PK15	0.80		0.80				0.80	0.95			0.83	0.80
Lane W (ft)	12.0		12.0				12.0	12.0			12.0	12.0
Grade		0						0			0	
% Heavy Veh	2		2				2	2			2	2
Parking	N	N					N	N		N	N	
Bus Stops			0						0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N					(Y/N)	N		(Y/N)	N	
Arr Type	3		3				3	3			3	3
RTOR Vols			21						0			113
Lost Time	3.00		3.00				3.00	3.00			3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	*				NB Left	*		
Thru					Thru		*	
Right	*				Right			
Peds					Peds			
WB Left					SB Left			
Thru					Thru		*	
Right					Right		*	
Peds					Peds			
NB Right					EB Right			
SB Right					WB Right			
Green	15.0A				Green	5.0A	55.0A	
Yellow/AR	5.0				Yellow/AR	5.0	5.0	

Cycle Length: 90 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	334	1770	0.676	0.189	25.6	D	25.6	D
	R	352	1863	0.000	0.189	0.0	A		
NB	L	138	1770	0.262	0.078	25.5	D	10.6	B
	T	1180	1863	0.776	0.633	10.0	B		
SB	T	1180	1863	0.697	0.633	8.3	B	8.3	B
	R	1180	1863	0.000	0.633	0.0	A		

Intersection Delay = 11.3 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.710

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Streets: (N-S) Kanakanui Road (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 Without Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	< 0	0	2	< 0	1	1	< 0	1	1	< 0
Stop/Yield			N			N						
Volumes	5	105	5		260	5	70	30	170	10	10	30
PHF	.5	.8	.58		.66	.75	.55	.73	.65	.46	.5	.58
Grade		0			0			0			0	
MC's (%)	0						0	0	0	0	0	0
SU/RV's (%)	0						0	0	0	0	0	0
CV's (%)	0						0	0	0	0	0	0
PCE's	1.00						1.00	1.00	1.00	1.00	1.00	1.00

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	70	200
Potential Capacity: (pcph)	1276	1096
Movement Capacity: (pcph)	1276	1096
Prob. of Queue-Free State:	0.79	0.95

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		401
Potential Capacity: (pcph)		1044
Movement Capacity: (pcph)		1044
Prob. of Queue-Free State:		0.99

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	546	548
Potential Capacity: (pcph)	523	521
Capacity Adjustment Factor due to Impeding Movements	0.99	0.99
Movement Capacity: (pcph)	518	516
Prob. of Queue-Free State:	0.92	0.96

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	550	559
Potential Capacity: (pcph)	471	465
Major LT, Minor TH Impedance Factor:	0.95	0.91
Adjusted Impedance Factor:	0.96	0.93
Capacity Adjustment Factor due to Impeding Movements	0.92	0.74
Movement Capacity: (pcph)	432	345

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB	L	127	432			11.8	1.4	C	
NB	T	41	518	>					6.6
NB	R	262	1276	>	1065	4.7	1.4	A	
SB	L	22	345			11.1	0.1	C	
SB	T	20	516	>					6.0
SB	R	52	1096	>	835	4.7	0.2	A	
EB	L	10	1044			3.5	0.0	A	0.2

Intersection Delay = 3.0 sec/veh

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Streets: (N-S) Kanakanui Road (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 Without Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	< 0	0	2	< 0	1	1	< 0	1	1	< 0
Stop/Yield			N			N						
Volumes	10	140	15		135	15	20	25	70	15	20	5
PHF	.67	.78	.67		.89	.7	.75	.84	.74	.61	.69	.38
Grade		0			0			0			0	
MC's (%)	0						0	0	0	0	0	0
SU/RV's (%)	0						0	0	0	0	0	0
CV's (%)	0						0	0	0	0	0	0
PCE's	1.00						1.00	1.00	1.00	1.00	1.00	1.00

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	100	86
Potential Capacity: (pcph)	1232	1252
Movement Capacity: (pcph)	1232	1252
Prob. of Queue-Free State:	0.92	0.99

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		173
Potential Capacity: (pcph)		1384
Movement Capacity: (pcph)		1384
Prob. of Queue-Free State:		0.99

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	378	378
Potential Capacity: (pcph)	656	656
Capacity Adjustment Factor due to Impeding Movements	0.99	0.99
Movement Capacity: (pcph)	649	649
Prob. of Queue-Free State:	0.95	0.96

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	372	372
Potential Capacity: (pcph)	612	612
Major LT, Minor TH Impedance Factor:	0.94	0.94
Adjusted Impedance Factor:	0.96	0.96
Capacity Adjustment Factor due to Impeding Movements	0.95	0.88
Movement Capacity: (pcph)	580	540

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB L	27	580		6.5	0.0	B	
NB T	30	649 >					
NB R	95	1232 >	1013	4.1	0.4	A	4.5
SB L	25	540		7.0	0.0	B	
SB T	29	649 >					
SB R	13	1252 >	763	5.0	0.0	A	5.7
EB L	15	1384		2.6	0.0	A	0.2

Intersection Delay = 1.6 sec/veh

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Streets: (N-S) Elem. School Ent. (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/3/99
Other Information.....Yr 2001 Without Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	< 0	1	1	0	0	0	0	0	0	0
Stop/Yield			N			N						
Volumes		115	70	220	140							
PHF		.87	.51	.64	.69							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	269	
Potential Capacity: (pcph)	1276	
Movement Capacity: (pcph)	1276	
Prob. of Queue-Free State:	0.70	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	378	1276		4.0	1.4	A	2.4

Intersection Delay = 1.6 sec/veh

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Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/3/99
Other Information.....Yr 2001 Without Project PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	< 0	1	1	0	0	0	0	0	0	0
Stop/Yield			N			N						
Volumes		145	20	40	120							
PHF		.81	.64	.79	.76							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	210	
Potential Capacity: (pcph)	1361	
Movement Capacity: (pcph)	1361	
Prob. of Queue-Free State:	0.96	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	56	1361		2.8	0.0	A	0.7

Intersection Delay = 0.3 sec/veh

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Streets: (N-S) Piilani Highway (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 Without Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	0	> 1	1	0	0	1
Stop/Yield			N			N						
Volumes	30	800	5	5	825	85	80	0	35			10
PHF	.64	.85	.5	.5	.82	.94	.72	.25	.83			.56
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0			0
SU/RV's (%)	1			1			1	1	1			1
CV's (%)	1			1			1	1	1			1
PCE's	1.02			1.02			1.02	1.02	1.02			1.02

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	941	1006
Potential Capacity: (pcph)	462	428
Movement Capacity: (pcph)	462	428
Prob. of Queue-Free State:	0.96	0.90

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	951	1096
Potential Capacity: (pcph)	604	515
Movement Capacity: (pcph)	604	515
Prob. of Queue-Free State:	0.98	0.91

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		2014
Potential Capacity: (pcph)		96
Capacity Adjustment Factor due to Impeding Movements		0.89
Movement Capacity: (pcph)		86
Prob. of Queue-Free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		2013
Potential Capacity: (pcph)		72
Major LT, Minor TH Impedance Factor:		0.89
Adjusted Impedance Factor:		0.89
Capacity Adjustment Factor due to Impeding Movements		0.86
Movement Capacity: (pcph)		62

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	113	62 >	62	~~*~~	~~28.5~~	~~F~~	~~*~~
EB	T	0	86 >					
EB	R	43	428		9.4	0.3	B	8.1
WB	R	18	462		8.1	0.0	B	
NB	L	48	515		7.7	0.3	B	0.3
SB	L	10	604		6.1	0.0	B	0.0

ADJUSTED BASED ON DELAY STUDY DATA SEE ATTACHED WORKSHEET

Intersection Delay = ~~71.1 sec/veh~~

~~* The calculated value was greater than 999.9.~~

TRAFFIC IMPACT ASSESSMENT REPORT

Unsignalized Intersection Analysis

Level-Of-Service Adjustment

WEIGHTED AVERAGE OF INTERSECTION DELAY (UNSIGNALIZED)
ADJUSTMENTS BASED ON FIELD OBSERVATIONS

Intersection: Kanani Road Approaching Piilani Highway (AM Peak Hour) (Yr 2001 Without Project)

Approach	Lane Movement	Volume	Phf	Movement Delay	Adjusted Volume	Volume * Delay	Approach Delay	App Del * App Vol	Intersection Delay
NB	1	30	0.64	7.7	46.88	360.94	0.36	301.97	
	2	800	0.85	0	941.18	0.00			
	3	5	0.5	0	10.00	0.00			
	4				0.00	0.00			
SB	1	5	0.5	6.1	10.00	61.00	0.06	50.44	
	2	825	0.82	0	1006.10	0.00			
	3	85	0.94	0	90.43	0.00			1.47
	4				0.00	0.00			
WB	1	10	0.56	8.1	17.86	144.64	8.10	81.00	
	2				0.00	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
EB	1	80	0.72	24.4	111.11	2711.11	20.27	2331.44	
	2	35	0.83	9.4	42.17	396.39			
	3				0.00	0.00			
	4				0.00	0.00			

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Streets: (N-S) Piilani Highway (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 Without Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	0	> 1	1	0	0	1
Stop/Yield			N			N						
Volumes	25	1090	0	5	830	130	70	0	30			10
PHF	.84	.84	.25	.5	.8	.87	.86	.25	.81			.5
Grade		0			0			0		0		
MC's (%)	0			0			0	0	0			0
SU/RV's (%)	1			1			1	1	1			1
CV's (%)	1			1			1	1	1			1
PCE's	1.02			1.02			1.02	1.02	1.02			1.02

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	1298	1037
Potential Capacity: (pcph)	305	413
Movement Capacity: (pcph)	305	413
Prob. of Queue-Free State:	0.93	0.91

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	1298	1186
Potential Capacity: (pcph)	413	467
Movement Capacity: (pcph)	413	467
Prob. of Queue-Free State:	0.98	0.94

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		2375
Potential Capacity: (pcph)		62
Capacity Adjustment Factor due to Impeding Movements		0.91
Movement Capacity: (pcph)		57
Prob. of Queue-Free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		2386
Potential Capacity: (pcph)		44
Major LT, Minor TH Impedance Factor:		0.91
Adjusted Impedance Factor:		0.91
Capacity Adjustment Factor due to Impeding Movements		0.85
Movement Capacity: (pcph)		38

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	82	38 >	38	*	~~21.1~~	~~F~~	*
EB	T	0	57 >					
EB	R	38	413		9.6	0.2	B	
WB	R	20	305		12.6	0.1	C	12.6
NB	L	30	467		8.2	0.1	B	0.2
SB	L	10	413		8.9	0.0	B	0.0

Adjusted based on Delay Study Data See Attached Worksheet

Intersection Delay = ~~75.2 sec/veh~~

~~* The calculated value was greater than 999.9.~~

TRAFFIC IMPACT ASSESSMENT REPORT

Unsignalized Intersection Analysis

Level-Of-Service Adjustment

WEIGHTED AVERAGE OF INTERSECTION DELAY (UNSIGNALIZED)
ADJUSTMENTS BASED ON FIELD OBSERVATIONS

Intersection: Kanani Road Approaching Piilani Highway (PM Peak Hour) (Yr 2001 Without Project)

Approach	Lane Movement	Volume	Phf	Movement Delay	Adjusted Volume	Volume * Delay	Approach Delay	App Del * App Vol	Intersection Delay
NB	1	25	0.84	8.2	29.76	244.05	0.18	205.00	
	2	1090	0.84	0	1297.62	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
SB	1	5	0.5	8.9	10.00	89.00	0.07	71.75	
	2	830	0.8	0	1037.50	0.00			
	3	130	0.87	0	149.43	0.00			1.26
	4				0.00	0.00			
WB	1	10	0.5	12.6	20.00	252.00	12.60	126.00	
	2				0.00	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
EB	1	70	0.86	30	81.40	2441.86	23.62	2362.04	
	2	30	0.81	9.6	37.04	355.56			
	3				0.00	0.00			
	4				0.00	0.00			

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Ph: (352) 392-0378

Streets: (N-S) Auhana Road (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 Without Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0
Stop/Yield			N			N						
Volumes	0	35	10	95	35	5	5	5	5	5	5	100
PHF	.25	.67	.63	.7	.58	.25	.25	.38	.25	.5	.25	.92
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0	0	0	0
SU/RV's (%)	0			1			0	0	0	0	0	1
CV's (%)	0			0			0	0	0	0	0	0
PCE's	1.00			1.01			1.00	1.00	1.00	1.00	1.00	1.01

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	60	70
Potential Capacity: (pcph)	1291	1276
Movement Capacity: (pcph)	1291	1276
Prob. of Queue-Free State:	0.91	0.98

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	68	80
Potential Capacity: (pcph)	1591	1570
Movement Capacity: (pcph)	1591	1570
Prob. of Queue-Free State:	0.91	1.00
TH Saturation Flow Rate: (pcphpl)	1700	1700
RT Saturation Flow Rate: (pcphpl)	1700	1700
Major LT Shared Lane Prob. of Queue-Free State:	0.91	1.00

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	276	274
Potential Capacity: (pcph)	782	783
Capacity Adjustment Factor due to Impeding Movements	0.91	0.91
Movement Capacity: (pcph)	711	712
Prob. of Queue-Free State:	0.97	0.98

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	282	330
Potential Capacity: (pcph)	727	682
Major LT, Minor TH Impedance Factor:	0.89	0.88
Adjusted Impedance Factor:	0.92	0.91
Capacity Adjustment Factor due to Impeding Movements	0.90	0.83
Movement Capacity: (pcph)	657	568

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	20	568	>					
EB	T	13	712	>	767	5.0	0.1	B	5.0
EB	R	20	1276	>					
WB	L	10	657	>					
WB	T	20	711	>	1089	3.8	0.5	A	3.8
WB	R	110	1291	>					
NB	L	0	1570			2.3	0.0	A	0.0
SB	L	137	1591			2.5	0.2	A	1.7

Intersection Delay = 2.4 sec/veh

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Streets: (N-S) Auhana Road (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 Without Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0
Stop/Yield			N			N						
Volumes	5	30	5	85	35	5	5	0	5	25	5	130
PHF	.5	.68	.42	.82	.77	.25	.38	.25	.5	.78	.33	.85
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0	0	0	0
SU/RV's (%)	0			1			0	0	0	0	0	1
CV's (%)	0			0			0	0	0	0	0	0
PCE's	1.00			1.01			1.00	1.00	1.00	1.00	1.00	1.01

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	50	55
Potential Capacity: (pcph)	1306	1299
Movement Capacity: (pcph)	1306	1299
Prob. of Queue-Free State:	0.88	0.99

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	56	65
Potential Capacity: (pcph)	1612	1596
Movement Capacity: (pcph)	1612	1596
Prob. of Queue-Free State:	0.93	0.99
TH Saturation Flow Rate: (pcphpl)	1700	1700
RT Saturation Flow Rate: (pcphpl)	1700	1700
Major LT Shared Lane Prob. of Queue-Free State:	0.93	0.99

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	229	225
Potential Capacity: (pcph)	827	831
Capacity Adjustment Factor due to Impeding Movements	0.93	0.93
Movement Capacity: (pcph)	766	770
Prob. of Queue-Free State:	0.98	1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	224	303
Potential Capacity: (pcph)	785	707
Major LT, Minor TH Impedance Factor:	0.93	0.91
Adjusted Impedance Factor:	0.94	0.93
Capacity Adjustment Factor due to Impeding Movements	0.94	0.82
Movement Capacity: (pcph)	735	580

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move. Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	13	580 >					
EB	T	0	770 >	764	4.9	0.0	A	4.9
EB	R	10	1299 >					
WB	L	32	735 >					
WB	T	15	766 >	1110	4.0	0.7	A	4.0
WB	R	154	1306 >					
NB	L	10	1596		2.3	0.0	A	0.3
SB	L	105	1612		2.4	0.1	A	1.6

Intersection Delay = 2.7 sec/veh

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-05-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) Piilani Highway
Analyst: Miyamoto File Name: ALAAM.HC9
Area Type: Other 8-2-99 Morning
Comment: Yr2001 Without Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
Volumes	235		35				50	600			655	205
PHF or PK15	0.80		0.80				0.80	0.96			0.80	0.80
Lane W (ft)	12.0		12.0				12.0	12.0			12.0	12.0
Grade		0						0			0	
% Heavy Veh	2		2				2	2			2	2
Parking	N	N					N	N		N	N	
Bus Stops			0						0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N					(Y/N)	N		(Y/N)	N	
Arr Type	3		3				3	3			3	3
RTOR Vols			35						0			205
Lost Time	3.00		3.00				3.00	3.00			3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination		1	2	3	4	5	6	7	8
EB	Left	*							
	Thru								
	Right	*							
	Peds								
WB	Left								
	Thru								
	Right								
	Peds								
NB	Right								
SB	Right								
Green		17.0A				5.0A	53.0A		
Yellow/AR		5.0				5.0	5.0		
NB	Left					*			
	Thru						*		
	Right								
	Peds								
SB	Left								
	Thru						*		
	Right						*		
	Peds								
EB	Right								
WB	Right								

Cycle Length: 90 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	374	1770	0.787	0.211	29.0	D	29.0	D
	R	393	1863	0.000	0.211	0.0	A		
NB	L	138	1770	0.450	0.078	27.2	D	8.9	B
	T	1138	1863	0.549	0.611	7.1	B		
SB	T	1138	1863	0.719	0.611	9.4	B	9.4	B
	R	1138	1863	0.000	0.611	0.0	A		

Intersection Delay = 12.4 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.712

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-04-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) Piilani Highway
Analyst: Miyamoto File Name: ALAPM.HC9
Area Type: Other 8-2-99 Evening
Comment: Yr 2001 Without Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
Volumes	195		30				35	920			730	130
PHF or PK15	0.80		0.80				0.80	0.95			0.83	0.80
Lane W (ft)	12.0		12.0				12.0	12.0			12.0	12.0
Grade		0						0			0	
% Heavy Veh	2		2				2	2			2	2
Parking	N	N					N	N		N	N	
Bus Stops			0						0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N					(Y/N)	N		(Y/N)	N	
Arr Type	3		3				3	3			3	3
RTOR Vols			30						0		130	
Lost Time	3.00		3.00				3.00	3.00			3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	*							
Thru								
Right	*							
Peds								
WB Left								
Thru								
Right								
Peds								
NB Right								
SB Right								
Green	15.0A				5.0A	55.0A		
Yellow/AR	5.0				5.0	5.0		

Cycle Length: 90 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	334	1770	0.730	0.189	27.6	D	27.6	D
	R	352	1863	0.000	0.189	0.0	A		
NB	L	138	1770	0.320	0.078	25.8	D	12.1	B
	T	1180	1863	0.821	0.633	11.5	B		
SB	T	1180	1863	0.746	0.633	9.3	B	9.3	B
	R	1180	1863	0.000	0.633	0.0	A		

Intersection Delay = 12.7 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.758

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-05-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) South Kihei Road
Analyst: Miyamoto File Name: SOKAM.HC9
Area Type: Other 8-2-99 Morning
Comment: Yr2001 Without Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0	> 1	1	1	1	1	1	1	< 0
Volumes				70	5	75	5	410	90	80	430	10
PHF or PK15				0.74	0.25	0.58	0.88	0.91	0.77	0.80	0.92	0.56
Lane W (ft)					12.0	12.0	12.0	12.0	12.0	12.0	12.0	
Grade					0			0			0	
% Heavy Veh				0	0	0	0	2	0	0	2	0
Parking				N	N		N	N		N	N	
Bus Stops						0			0			0
Con. Peds			25			25			25			25
Ped Button				(Y/N)	Y	11.5 s	(Y/N)	Y	8.5 s	(Y/N)	Y	7.0
Arr Type					3	3	3	3	3	3	3	
RTOR Vols						75			70			0
Lost Time				3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination		1	2	3	4	5	6	7	8
EB	Left					NB Left	*		
	Thru					Thru		*	
	Right					Right		*	
	Peds		*			Peds		*	
WB	Left		*			SB Left	*	*	
	Thru		*			Thru		*	*
	Right		*			Right		*	*
	Peds		*			Peds		*	*
NB	Right					EB Right			
SB	Right					WB Right			
Green			14.0A			Green	5.0A	5.0A	31.0A
Yellow/AR			5.0			Yellow/AR	5.0	5.0	5.0

Cycle Length: 75 secs Phase combination order: #1 #5 #6 #7

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
WB	LT	351	1646	0.328	0.213	16.3	C	16.3	C
	R	405	1900	0.000	0.213	0.0	A		
NB	L	168	1805	0.036	0.093	20.0	C	10.6	B
	T	820	1863	0.550	0.440	10.6	B		
	R	701	1592	0.037	0.440	7.7	B		
SB	L	409	1805	0.244	0.227	15.4	C	7.8	B
	TR	1062	1852	0.457	0.573	6.2	B		

Intersection Delay = 9.8 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.417

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-05-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) South Kihei Road
Analyst: Miyamoto File Name: SOKPM.HC9
Area Type: Other 8-2-99 Evening
Comment: Yr2001 Without Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0	> 1	1	1	1	1	1	1	< 0
Volumes				65	1	50	5	700	115	50	745	5
PHF or PK15				0.83	0.25	0.71	0.38	0.96	0.85	0.82	0.88	0.63
Lane W (ft)					12.0	12.0	12.0	12.0	12.0	12.0	12.0	
Grade					0			0			0	
% Heavy Veh				0	0	0	0	2	0	0	2	0
Parking				N	N		N	N		N	N	
Bus Stops						0			0			0
Con. Peds			25			25			25			25
Ped Button				(Y/N)	Y	11.5 s	(Y/N)	Y	8.5 s	(Y/N)	Y	7.0
Arr Type					3	3	3	3	3	3	3	
RTOR Vols						50			65			0
Lost Time				3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination		1	2	3	4	5	6	7	8
EB	Left					NB Left	*		
	Thru					Thru		*	
	Right					Right		*	
	Peds		*			Peds		*	
WB	Left		*			SB Left	*	*	
	Thru		*			Thru		*	
	Right		*			Right		*	
	Peds		*			Peds		*	
NB	Right					EB Right			
SB	Right					WB Right			
Green		12.0A				Green	5.0A	5.0A	33.0A
Yellow/AR		5.0				Yellow/AR	5.0	5.0	5.0

Cycle Length: 75 secs Phase combination order: #1 #5 #6 #7

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
WB	LT	300	1607	0.273	0.187	17.0	C	17.0	C
	R	355	1900	0.000	0.187	0.0	A		
NB	L	168	1805	0.077	0.093	20.1	C	15.8	C
	T	869	1863	0.839	0.467	16.5	C		
	R	743	1592	0.079	0.467	7.2	B		
SB	L	409	1805	0.149	0.227	15.0	B	9.8	B
	TR	1116	1860	0.766	0.600	9.4	B		

Intersection Delay = 12.8 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.589

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Streets: (N-S) Kanakanui Road (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 With Project, AM Peak Hour .
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	< 0	0	2	< 0	1	1	< 0	1	1	< 0
Stop/Yield			N			N						
Volumes	5	120	5		265	10	70	30	170	15	10	30
PHF	.5	.8	.58		.66	.75	.55	.73	.65	.46	.5	.58
Grade		0			0			0			0	
MC's (%)	0						0	0	0	0	0	0
SU/RV's (%)	0						0	0	0	0	0	0
CV's (%)	0						0	0	0	0	0	0
PCE's	1.00						1.00	1.00	1.00	1.00	1.00	1.00

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	80	208
Potential Capacity: (pcph)	1261	1086
Movement Capacity: (pcph)	1261	1086
Prob. of Queue-Free State:	0.79	0.95

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		415
Potential Capacity: (pcph)		1026
Movement Capacity: (pcph)		1026
Prob. of Queue-Free State:		0.99

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	580	578
Potential Capacity: (pcph)	499	501
Capacity Adjustment Factor due to Impeding Movements	0.99	0.99
Movement Capacity: (pcph)	494	496
Prob. of Queue-Free State:	0.92	0.96

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	576	589
Potential Capacity: (pcph)	453	445
Major LT, Minor TH Impedance Factor:	0.95	0.91
Adjusted Impedance Factor:	0.96	0.93
Capacity Adjustment Factor due to Impeding Movements	0.92	0.74
Movement Capacity: (pcph)	415	328

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB L	127	415		12.5	1.5	C	
NB T	41	494	>				6.8
NB R	262	1261	> 1042	4.9	1.4	A	
SB L	33	328		12.2	0.3	C	
SB T	20	496	>				6.8
SB R	52	1086	> 816	4.8	0.2	A	
EB L	10	1026		3.5	0.0	A	0.1

Intersection Delay = 3.1 sec/veh

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Ph: (352) 392-0378

Streets: (N-S) Kanakanui Road (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 With Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	2	< 0	0	2	< 0	1	1	< 0	1	1	< 0
Stop/Yield			N			N						
Volumes	15	150	15		155	35	20	25	70	20	20	5
PHF	.67	.78	.67		.89	.7	.75	.84	.74	.61	.69	.38
Grade		0			0			0			0	
MC's (%)	0						0	0	0	0	0	0
SU/RV's (%)	0						0	0	0	0	0	0
CV's (%)	0						0	0	0	0	0	0
PCE's	1.00						1.00	1.00	1.00	1.00	1.00	1.00

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)	107	112
Potential Capacity: (pcph)	1222	1215
Movement Capacity: (pcph)	1222	1215
Prob. of Queue-Free State:	0.92	0.99

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		224
Potential Capacity: (pcph)		1300
Movement Capacity: (pcph)		1300
Prob. of Queue-Free State:		0.98

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	449	435
Potential Capacity: (pcph)	596	607
Capacity Adjustment Factor due to Impeding Movements	0.98	0.98
Movement Capacity: (pcph)	586	597
Prob. of Queue-Free State:	0.95	0.95

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	414	428
Potential Capacity: (pcph)	576	564
Major LT, Minor TH Impedance Factor:	0.94	0.93
Adjusted Impedance Factor:	0.95	0.95
Capacity Adjustment Factor due to Impeding Movements	0.94	0.87
Movement Capacity: (pcph)	542	493

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB L	27	542			7.0	0.0	B	
NB T	30	586	>					4.7
NB R	95	1222	>	969	4.3	0.5	A	
SB L	33	493			7.8	0.1	B	
SB T	29	597	>					6.5
SB R	13	1215	>	709	5.4	0.1	B	
EB L	22	1300			2.8	0.0	A	0.2

Intersection Delay = 1.7 sec/veh

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Streets: (N-S) Elem. School Ent. (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/3/99
Other Information.....Yr 2001 With Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	< 0	1	1	0	0	0	0	0	0	0
Stop/Yield			N			N						
Volumes		130	70	220	145							
PHF		.87	.51	.64	.69							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	286	
Potential Capacity: (pcph)	1253	
Movement Capacity: (pcph)	1253	
Prob. of Queue-Free State:	0.70	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	378	1253		4.1	1.5	A	2.5

Intersection Delay = 1.6 sec/veh

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Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/3/99
Other Information.....Yr 2001 With Project PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	1	< 0	1	1	0	0	0	0	0	0	0
Stop/Yield			N			N						
Volumes		180	20	40	140							
PHF		.81	.64	.79	.76							
Grade		0			0							
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's				1.10								

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)	253	
Potential Capacity: (pcph)	1299	
Movement Capacity: (pcph)	1299	
Prob. of Queue-Free State:	0.96	

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
WB L	56	1299		2.9	0.0	A	0.6

Intersection Delay = 0.3 sec/veh

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Streets: (N-S) Piilani Highway (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 With Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	0	> 1	1	0	0	1
Stop/Yield			N			N						
Volumes	30	815	5	5	835	85	90	0	35			10
PHF	.64	.85	.5	.5	.82	.94	.72	.25	.83			.56
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0			0
SU/RV's (%)	1			1			1	1	1			1
CV's (%)	1			1			1	1	1			1
PCE's	1.02			1.02			1.02	1.02	1.02			1.02

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	959	1018
Potential Capacity: (pcph)	452	422
Movement Capacity: (pcph)	452	422
Prob. of Queue-Free State:	0.96	0.90

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	969	1108
Potential Capacity: (pcph)	592	508
Movement Capacity: (pcph)	592	508
Prob. of Queue-Free State:	0.98	0.91

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		2044
Potential Capacity: (pcph)		92
Capacity Adjustment Factor due to Impeding Movements		0.89
Movement Capacity: (pcph)		82
Prob. of Queue-Free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		2043
Potential Capacity: (pcph)		69
Major LT, Minor TH Impedance Factor:		0.89
Adjusted Impedance Factor:		0.89
Capacity Adjustment Factor due to Impeding Movements		0.85
Movement Capacity: (pcph)		59

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	127	59	>	59	*	~~36.3~~	~~F~~	*
EB	T	0	82	>					
EB	R	43	422			9.5	0.3	B	8.3
WB	R	18	452			8.3	0.0	B	
NB	L	48	508			7.8	0.3	B	0.3
SB	L	10	592			6.2	0.0	B	0.0

ADJUSTED BASED ON DELAY STUDY DATA SEE ATTACHED WORKSHEET

Intersection Delay = ~~106.1 sec/veh~~

* ~~This movement is~~

TRAFFIC IMPACT ASSESSMENT REPORT

Unsignalized Intersection Analysis

Level-Of-Service Adjustment

WEIGHTED AVERAGE OF INTERSECTION DELAY (UNSIGNALIZED)
ADJUSTMENTS BASED ON FIELD OBSERVATIONS

Intersection: Kanani Road Approaching Piilani Highway (AM Peak Hour) (Yr 2001 With Project)

Approach	Lane Movement	Volume	Phf	Movement Delay	Adjusted Volume	Volume * Delay	Approach Delay	App Del * App Vol	Intersection Delay
NB	1	30	0.64	7.8	46.88	365.63	0.36	305.98	
	2	815	0.85	0	958.82	0.00			
	3	5	0.5	0	10.00	0.00			
	4				0.00	0.00			
SB	1	5	0.5	6.2	10.00	62.00	0.06	51.26	
	2	835	0.82	0	1018.29	0.00			
	3	85	0.94	0	90.43	0.00			1.91
	4				0.00	0.00			
WB	1	10	0.56	8.3	17.86	148.21	8.30	83.00	
	2				0.00	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
EB	1	90	0.72	31.1	125.00	3887.50	25.65	3206.42	
	2	35	0.83	9.5	42.17	400.60			
	3				0.00	0.00			
	4				0.00	0.00			

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Streets: (N-S) Piilani Highway (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 With Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	1	1	1	1	0	> 1	1	0	0	1
Stop/Yield			N			N						
Volumes	25	1095	0	5	855	130	80	0	30			10
PHF	.84	.84	.25	.5	.8	.87	.86	.25	.81			.5
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0			0
SU/RV's (%)	1			1			1	1	1			1
CV's (%)	1			1			1	1	1			1
PCE's	1.02			1.02			1.02	1.02	1.02			1.02

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	1304	1069
Potential Capacity: (pcph)	302	398
Movement Capacity: (pcph)	302	398
Prob. of Queue-Free State:	0.93	0.90

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	1304	1218
Potential Capacity: (pcph)	410	450
Movement Capacity: (pcph)	410	450
Prob. of Queue-Free State:	0.98	0.93

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)		2413
Potential Capacity: (pcph)		59
Capacity Adjustment Factor due to Impeding Movements		0.91
Movement Capacity: (pcph)		54
Prob. of Queue-Free State:		1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)		2424
Potential Capacity: (pcph)		42
Major LT, Minor TH Impedance Factor:		0.91
Adjusted Impedance Factor:		0.91
Capacity Adjustment Factor due to Impeding Movements		0.85
Movement Capacity: (pcph)		36

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)		Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	94	36	>	36	*	~~30.6~~	~~F~~	*
EB	T	0	54	>					
EB	R	38	398			10.0	0.3	B	
									12.8
WB	R	20	302			12.8	0.1	C	
NB	L	30	450			8.6	0.1	B	0.2
SB	L	10	410			9.0	0.0	B	0.0

Intersection Delay = ~~113.5 sec/veh~~

~~* The calculated value was greater than 999.9....~~

ADJUSTED BASED ON DELAY STUDY DATA SEE ATTACHED WORKSHEET

TRAFFIC IMPACT ASSESSMENT REPORT

Unsignalized Intersection Analysis

Level-Of-Service Adjustment

WEIGHTED AVERAGE OF INTERSECTION DELAY (UNSIGNALIZED)
ADJUSTMENTS BASED ON FIELD OBSERVATIONS

Intersection: Kanani Road Approaching Pilani Highway (PM Peak Hour) (Yr 2001 With Project)

Approach	Lane Movement	Volume	Phf	Movement Delay	Adjusted Volume	Volume * Delay	Approach Delay	App Del * App Vol	Intersection Delay
NB	1	25	0.84	8.6	29.76	255.95	0.19	215.00	
	2	1095	0.84	0	1303.57	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
SB	1	5	0.5	9	10.00	90.00	0.07	72.55	
	2	855	0.8	0	1068.75	0.00			
	3	130	0.87	0	149.43	0.00			1.67
	4				0.00	0.00			
WB	1	10	0.5	12.8	20.00	256.00	12.80	128.00	
	2				0.00	0.00			
	3				0.00	0.00			
	4				0.00	0.00			
EB	1	80	0.86	36.1	93.02	3344.19	30.10	3310.78	
	2	30	0.81	10	37.04	370.37			
	3				0.00	0.00			
	4				0.00	0.00			

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Streets: (N-S) Auhana Road (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 With Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0
Stop/Yield			N			N						
Volumes	0	45	20	95	40	5	5	5	5	5	5	100
PHF	.25	.67	.63	.7	.58	.25	.25	.38	.25	.5	.25	.92
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0	0	0	0
SU/RV's (%)	0			1			0	0	0	0	0	1
CV's (%)	0			0			0	0	0	0	0	0
PCE's	1.00			1.01			1.00	1.00	1.00	1.00	1.00	1.01

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	83	79
Potential Capacity: (pcph)	1257	1263
Movement Capacity: (pcph)	1257	1263
Prob. of Queue-Free State:	0.91	0.98

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	99	89
Potential Capacity: (pcph)	1538	1555
Movement Capacity: (pcph)	1538	1555
Prob. of Queue-Free State:	0.91	1.00
TH Saturation Flow Rate: (pcphpl)	1700	1700
RT Saturation Flow Rate: (pcphpl)	1700	1700
Major LT Shared Lane Prob. of Queue-Free State:	0.91	1.00

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	308	314
Potential Capacity: (pcph)	752	746
Capacity Adjustment Factor due to Impeding Movements	0.91	0.91
Movement Capacity: (pcph)	681	676
Prob. of Queue-Free State:	0.97	0.98

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	314	362
Potential Capacity: (pcph)	697	653
Major LT, Minor TH Impedance Factor:	0.89	0.88
Adjusted Impedance Factor:	0.91	0.91
Capacity Adjustment Factor due to Impeding Movements	0.90	0.83
Movement Capacity: (pcph)	627	541

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	20	541 >					
EB	T	13	676 >	736	5.3	0.1	B	5.3
EB	R	20	1263 >					
WB	L	10	627 >					
WB	T	20	681 >	1054	3.9	0.5	A	3.9
WB	R	110	1257 >					
NB	L	0	1555		2.3	0.0	A	0.0
SB	L	137	1538		2.6	0.2	A	1.7

Intersection Delay = 2.3 sec/veh

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Streets: (N-S) Auhana Road (E-W) Kanani Road
Major Street Direction.... NS
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/2/99
Other Information.....Yr 2001 With Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Northbound			Southbound			Eastbound			Westbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0	0	> 1	< 0
Stop/Yield			N			N						
Volumes	5	35	15	85	45	5	5	0	5	25	5	130
PHF	.5	.68	.42	.82	.77	.25	.38	.25	.5	.78	.33	.85
Grade		0			0			0			0	
MC's (%)	0			0			0	0	0	0	0	0
SU/RV's (%)	0			1			0	0	0	0	0	1
CV's (%)	0			0			0	0	0	0	0	0
PCE's	1.00			1.01			1.00	1.00	1.00	1.00	1.00	1.01

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	WB	EB
Conflicting Flows: (vph)	69	68
Potential Capacity: (pcph)	1278	1279
Movement Capacity: (pcph)	1278	1279
Prob. of Queue-Free State:	0.88	0.99

Step 2: LT from Major Street	SB	NB
Conflicting Flows: (vph)	87	78
Potential Capacity: (pcph)	1558	1574
Movement Capacity: (pcph)	1558	1574
Prob. of Queue-Free State:	0.93	0.99
TH Saturation Flow Rate: (pcphpl)	1700	1700
RT Saturation Flow Rate: (pcphpl)	1700	1700
Major LT Shared Lane Prob. of Queue-Free State:	0.93	0.99

Step 3: TH from Minor Street	WB	EB
Conflicting Flows: (vph)	261	269
Potential Capacity: (pcph)	796	788
Capacity Adjustment Factor due to Impeding Movements	0.92	0.92
Movement Capacity: (pcph)	735	727
Prob. of Queue-Free State:	0.98	1.00

Step 4: LT from Minor Street	WB	EB
Conflicting Flows: (vph)	256	335
Potential Capacity: (pcph)	753	677
Major LT, Minor TH Impedance Factor:	0.92	0.90
Adjusted Impedance Factor:	0.94	0.93
Capacity Adjustment Factor due to Impeding Movements	0.93	0.82
Movement Capacity: (pcph)	703	552

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
EB	L	13	552 >					
EB	T	0	727 >	733	5.1	0.0	B	5.1
EB	R	10	1279 >					
WB	L	32	703 >					
WB	T	15	735 >	1078	4.1	0.8	A	4.1
WB	R	154	1278 >					
NB	L	10	1574		2.3	0.0	A	0.2
SB	L	105	1558		2.5	0.1	A	1.6

Intersection Delay = 2.6 sec/veh

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-04-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) Piilani Highway
Analyst: Miyamoto File Name: ALAAM.HC9
Area Type: Other 8-2-99 Morning
Comment: Yr2001 With Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
Volumes	245		45				55	600			655	215
PHF or PK15	0.80		0.80				0.80	0.96			0.80	0.80
Lane W (ft)	12.0		12.0				12.0	12.0			12.0	12.0
Grade		0						0			0	
% Heavy Veh	2		2				2	2			2	2
Parking	N	N					N	N		N	N	
Bus Stops			0						0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N					(Y/N)	N		(Y/N)	N	
Arr Type	3		3				3	3			3	3
RTOR Vols			35						0			205
Lost Time	3.00		3.00				3.00	3.00			3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	*							
Thru								
Right	*							
Peds								
WB Left								
Thru								
Right								
Peds								
NB Right								
SB Right								
Green	17.0A				5.0A	53.0A		
Yellow/AR	5.0				5.0	5.0		
NB Left					*			
Thru						*		
Right								
Peds								
SB Left								
Thru						*		
Right						*		
Peds								
EB Right								
WB Right								

Cycle Length: 90 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	374	1770	0.819	0.211	31.1	D	30.6	D
	R	334	1583	0.036	0.211	18.2	C		
NB	L	138	1770	0.501	0.078	28.1	D	9.2	B
	T	1138	1863	0.549	0.611	7.1	B		
SB	T	1138	1863	0.719	0.611	9.4	B	9.3	B
	R	968	1583	0.013	0.611	4.4	A		

Intersection Delay = 12.9 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.724

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-04-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) Piilani Highway
Analyst: Miyamoto File Name: ALAPM.HC9
Area Type: Other 8-2-99 Evening
Comment: Yr 2001 With Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	0	1	0	0	0	1	1	0	0	1	1
Volumes	200		35				45	920			730	155
PHF or PK15	0.80		0.80				0.80	0.95			0.83	0.80
Lane W (ft)	12.0		12.0				12.0	12.0			12.0	12.0
Grade		0						0			0	
% Heavy Veh	2		2				2	2			2	2
Parking	N	N					N	N		N	N	
Bus Stops			0						0			0
Con. Peds			0			0			0			0
Ped Button	(Y/N)	N					(Y/N)	N		(Y/N)	N	
Arr Type	3		3				3	3			3	3
RTOR Vols			30						0			130
Lost Time	3.00		3.00				3.00	3.00			3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left	*							
Thru								
Right	*							
Peds								
WB Left								
Thru								
Right								
Peds								
NB Right								
SB Right								
Green	15.0A				5.0A	55.0A		
Yellow/AR	5.0				5.0	5.0		
NB Left					*			
Thru						*		
Right								
Peds								
SB Left								
Thru						*		
Right						*		
Peds								
EB Right								
WB Right								

Cycle Length: 90 secs Phase combination order: #1 #5 #6

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
EB	L	334	1770	0.748	0.189	28.4	D	28.1	D
	R	299	1583	0.023	0.189	19.2	C		
NB	L	138	1770	0.407	0.078	26.6	D	12.3	B
	T	1180	1863	0.821	0.633	11.5	B		
SB	T	1180	1863	0.746	0.633	9.3	B	9.1	B
	R	1003	1583	0.032	0.633	4.0	A		

Intersection Delay = 12.8 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.770

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-05-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) South Kihei Road
Analyst: Miyamoto File Name: SOKAM.HC9
Area Type: Other 8-2-99 Morning
Comment: Yr2001 With Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0	> 1	1	1	1	1	1	1	< 0
Volumes				80	5	85	5	410	95	85	430	10
PHF or PK15				0.74	0.25	0.58	0.88	0.91	0.77	0.80	0.92	0.56
Lane W (ft)					12.0	12.0	12.0	12.0	12.0	12.0	12.0	
Grade					0			0			0	
% Heavy Veh				0	0	0	0	2	0	0	2	0
Parking				N	N		N	N		N	N	
Bus Stops						0			0			0
Con. Peds			25			25			25			25
Ped Button				(Y/N)	Y	11.5 s	(Y/N)	Y	8.5 s	(Y/N)	Y	7.0
Arr Type					3	3	3	3	3	3	3	
RTOR Vols						75			70			0
Lost Time				3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left								
Thru								
Right								
Peds		*						
WB Left		*						
Thru		*						
Right		*						
Peds		*						
NB Right								
SB Right								
Green		14.0A						
Yellow/AR		5.0						
NB Left					*			
Thru							*	
Right							*	
Peds							*	
SB Left					*		*	
Thru							*	*
Right							*	*
Peds							*	*
EB Right								
WB Right								
Green					5.0A	5.0A	31.0A	
Yellow/AR					5.0	5.0	5.0	

Cycle Length: 75 secs Phase combination order: #1 #5 #6 #7

Intersection Performance Summary

	Lane Mvmts	Group: Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
WB	LT	350	1640	0.366	0.213	16.6	C	16.4	C
	R	340	1592	0.053	0.213	15.2	C		
NB	L	168	1805	0.036	0.093	20.0	C	10.6	B
	T	820	1863	0.550	0.440	10.6	B		
	R	701	1592	0.046	0.440	7.8	B		
SB	L	409	1805	0.259	0.227	15.5	C	7.9	B
	TR	1062	1852	0.457	0.573	6.2	B		

Intersection Delay = 10.0 sec/veh Intersection LOS = B
Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.431

HCM: SIGNALIZED INTERSECTION SUMMARY Version 2.4g 08-05-1999
Center For Microcomputers In Transportation

Streets: (E-W) Alanui Ke Alii (N-S) South Kihei Road
Analyst: Miyamoto File Name: SOKPM.HC9
Area Type: Other 8-2-99 Evening
Comment: Yr2001 With Project Conditions

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	0	0	0	> 1	1	1	1	1	1	1	< 0
Volumes				70	1	55	5	700	125	60	745	5
PHF or PK15				0.83	0.25	0.71	0.38	0.96	0.85	0.82	0.88	0.63
Lane W (ft)					12.0	12.0	12.0	12.0	12.0	12.0	12.0	
Grade					0			0			0	
% Heavy Veh				0	0	0	0	2	0	0	2	0
Parking				N	N		N	N		N	N	
Bus Stops						0			0			0
Con. Peds			25			25			25			25
Ped Button				(Y/N)	Y	11.5 s	(Y/N)	Y	8.5 s	(Y/N)	Y	7.0
Arr Type					3	3	3	3	3	3	3	
RTOR Vols						50			65			0
Lost Time				3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
Prop. Share												
Prop. Prot.												

Signal Operations

Phase Combination	1	2	3	4	5	6	7	8
EB Left								
Thru								
Right								
Peds		*						
WB Left		*						
Thru		*						
Right		*						
Peds		*						
NB Left					*			
Thru							*	
Right							*	
Peds							*	
SB Left					*	*		
Thru						*	*	
Right						*	*	
Peds						*	*	
NB Right								
SB Right								
Green		12.0A				5.0A	5.0A	33.0A
Yellow/AR		5.0				5.0	5.0	5.0

Cycle Length: 75 secs Phase combination order: #1 #5 #6 #7

Intersection Performance Summary

	Lane Group: Mvmts	Cap	Adj Sat Flow	v/c Ratio	g/C Ratio	Delay	LOS	Approach: Delay	LOS
WB	LT	300	1606	0.293	0.187	17.1	C	17.0	C
	R	297	1592	0.024	0.187	16.1	C		
NB	L	168	1805	0.077	0.093	20.1	C	15.7	C
	T	869	1863	0.839	0.467	16.5	C		
	R	743	1592	0.096	0.467	7.2	B		
SB	L	409	1805	0.178	0.227	15.1	C	9.9	B
	TR	1116	1860	0.766	0.600	9.4	B		

Intersection Delay = 12.8 sec/veh Intersection LOS = B

Lost Time/Cycle, L = 9.0 sec Critical v/c(x) = 0.593

Center For Microcomputers In Transportation
University of Florida
512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) Site Access (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/5/99
Other Information.....Yr 2001 With Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	0	1	< 0	0	0	0	1	0	1
Stop/Yield			N			N						
Volumes	5	180			145	5				20		15
PHF	.5	.87			.69	.5				.5		.5
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10									1.10		1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)		215
Potential Capacity: (pcph)		1077
Movement Capacity: (pcph)		1077
Prob. of Queue-Free State:		0.97

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		220
Potential Capacity: (pcph)		1347
Movement Capacity: (pcph)		1347
Prob. of Queue-Free State:		0.99

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)		432
Potential Capacity: (pcph)		595
Major LT, Minor TH Impedance Factor:		0.99
Adjusted Impedance Factor:		0.99
Capacity Adjustment Factor due to Impeding Movements		0.99
Movement Capacity: (pcph)		590

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
SB	L	44	590		6.6	0.2	B	5.2
SB	R	33	1077		3.4	0.0	A	
EB	L	11	1347		2.7	0.0	A	0.1

Intersection Delay = 0.5 sec/veh

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Streets: (N-S) Site Access (E-W) Alanui Ke Alii
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/5/99
Other Information.....Yr 2001 With Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	1	1	0	0	1	< 0	0	0	0	1	0	1
Stop/Yield			N			N						
Volumes	15	190			120	20				10		10
PHF	.5	.81			.76	.5				.5		.5
Grade		0			0						0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10									1.10		1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.00	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.00	3.30
Left Turn Minor Road	6.50	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)		178
Potential Capacity: (pcph)		1125
Movement Capacity: (pcph)		1125
Prob. of Queue-Free State:		0.98

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		198
Potential Capacity: (pcph)		1380
Movement Capacity: (pcph)		1380
Prob. of Queue-Free State:		0.98

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)		443
Potential Capacity: (pcph)		587
Major LT, Minor TH Impedance Factor:		0.98
Adjusted Impedance Factor:		0.98
Capacity Adjustment Factor due to Impeding Movements		0.98
Movement Capacity: (pcph)		573

Intersection Performance Summary

Movement	Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
SB L	22	573		6.5	0.0	B	
SB R	22	1125		3.3	0.0	A	4.9
EB L	33	1380		2.7	0.0	A	0.2

Intersection Delay = 0.4 sec/veh

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University of Florida
512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) Kanakanui Road (E-W) Site Access
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/5/99
Other Information.....Yr 2001 With Project, AM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 0	< 0	0	0	0	1	1	0	0	1	< 0
Stop/Yield			N			N						
Volumes	20		10				5	40			50	5
PHF	.5		.5				.5	.73			.5	.5
Grade		0						0			0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10						1.10	1.10			1.10	1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)		0
Potential Capacity: (pcph)		1385
Movement Capacity: (pcph)		1385
Prob. of Queue-Free State:		0.99

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		0
Potential Capacity: (pcph)		1714
Movement Capacity: (pcph)		1714
Prob. of Queue-Free State:		0.97
TH Saturation Flow Rate: (pcphpl)		0
RT Saturation Flow Rate: (pcphpl)		1700
Major LT Shared Lane Prob. of Queue-Free State:		0.97

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	50	60
Potential Capacity: (pcph)	1020	1006
Capacity Adjustment Factor due to Impeding Movements	0.97	0.97
Movement Capacity: (pcph)	994	980
Prob. of Queue-Free State:	0.94	0.89

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	105	
Potential Capacity: (pcph)	907	
Major LT, Minor TH Impedance Factor:	0.86	
Adjusted Impedance Factor:	0.90	
Capacity Adjustment Factor due to Impeding Movements	0.89	
Movement Capacity: (pcph)	806	

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB	L	11	806		4.5	0.0	A	
NB	T	61	994		3.9	0.1	A	3.9
SB	T	110	980	>				4.1
SB	R	11	1385	> 1007	4.1	0.4	A	
EB	L	44	1714		2.2	0.0	A	1.4

Intersection Delay = 3.4 sec/veh

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512 Weil Hall
Gainesville, FL 32611-6585
Ph: (352) 392-0378

Streets: (N-S) Kanakanui Road (E-W) Site Access
Major Street Direction.... EW
Length of Time Analyzed... 60 (min)
Analyst..... Miyamoto
Date of Analysis..... 8/5/99
Other Information.....Yr 2001 With Project, PM Peak Hour
Two-way Stop-controlled Intersection

	Eastbound			Westbound			Northbound			Southbound		
	L	T	R	L	T	R	L	T	R	L	T	R
No. Lanes	0	> 0	< 0	0	0	0	1	1	0	0	1	< 0
Stop/Yield			N			N						
Volumes	15		5				25	50			45	10
PHF	.5		.5				.5	.84			.65	.5
Grade		0						0			0	
MC's (%)												
SU/RV's (%)												
CV's (%)												
PCE's	1.10						1.10	1.10			1.10	1.10

Adjustment Factors

Vehicle Maneuver	Critical Gap (tg)	Follow-up Time (tf)
Left Turn Major Road	5.50	2.10
Right Turn Minor Road	5.50	2.60
Through Traffic Minor Road	6.50	3.30
Left Turn Minor Road	7.00	3.40

Worksheet for TWSC Intersection

Step 1: RT from Minor Street	NB	SB
Conflicting Flows: (vph)		0
Potential Capacity: (pcph)		1385
Movement Capacity: (pcph)		1385
Prob. of Queue-Free State:		0.98

Step 2: LT from Major Street	WB	EB
Conflicting Flows: (vph)		0
Potential Capacity: (pcph)		1714
Movement Capacity: (pcph)		1714
Prob. of Queue-Free State:		0.98
TH Saturation Flow Rate: (pcphpl)		0
RT Saturation Flow Rate: (pcphpl)		1700
Major LT Shared Lane Prob. of Queue-Free State:		0.98

Step 3: TH from Minor Street	NB	SB
Conflicting Flows: (vph)	35	40
Potential Capacity: (pcph)	1041	1034
Capacity Adjustment Factor due to Impeding Movements	0.98	0.98
Movement Capacity: (pcph)	1021	1014
Prob. of Queue-Free State:	0.94	0.93

Step 4: LT from Minor Street	NB	SB
Conflicting Flows: (vph)	80	
Potential Capacity: (pcph)	941	
Major LT, Minor TH Impedance Factor:	0.91	
Adjusted Impedance Factor:	0.93	
Capacity Adjustment Factor due to Impeding Movements	0.91	
Movement Capacity: (pcph)	860	

Intersection Performance Summary

Movement		Flow Rate (pcph)	Move Cap (pcph)	Shared Cap (pcph)	Avg. Total Delay (sec/veh)	95% Queue Length (veh)	LOS	Approach Delay (sec/veh)
NB	L	55	860		4.5	0.1	A	
NB	T	66	1021		3.8	0.1	A	4.0
SB	T	76	1014	>				3.7
SB	R	22	1385	> 1079	3.7	0.2	A	
EB	L	33	1714		2.1	0.0	A	1.6

Intersection Delay = 3.6 sec/veh

FIGURES

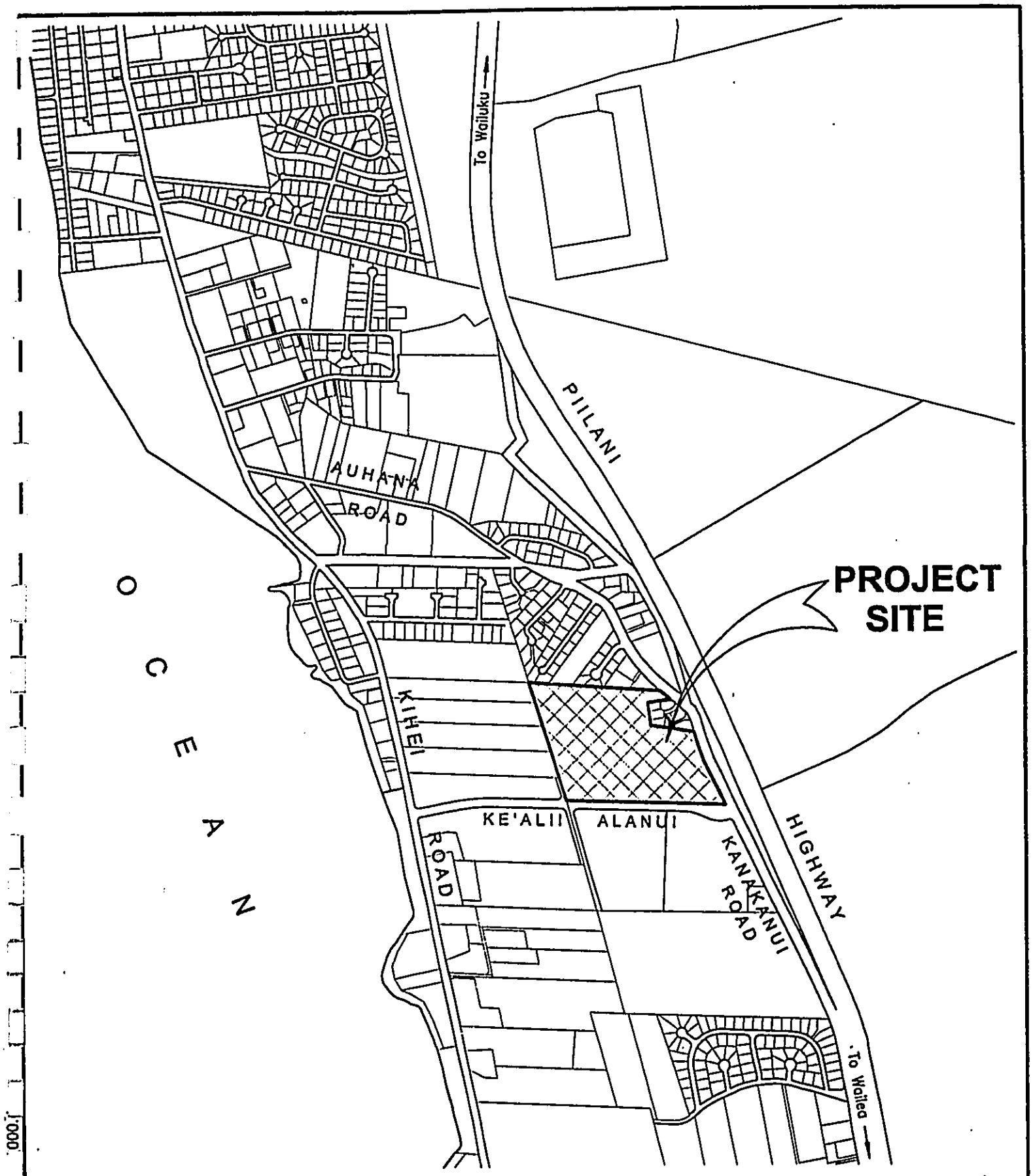
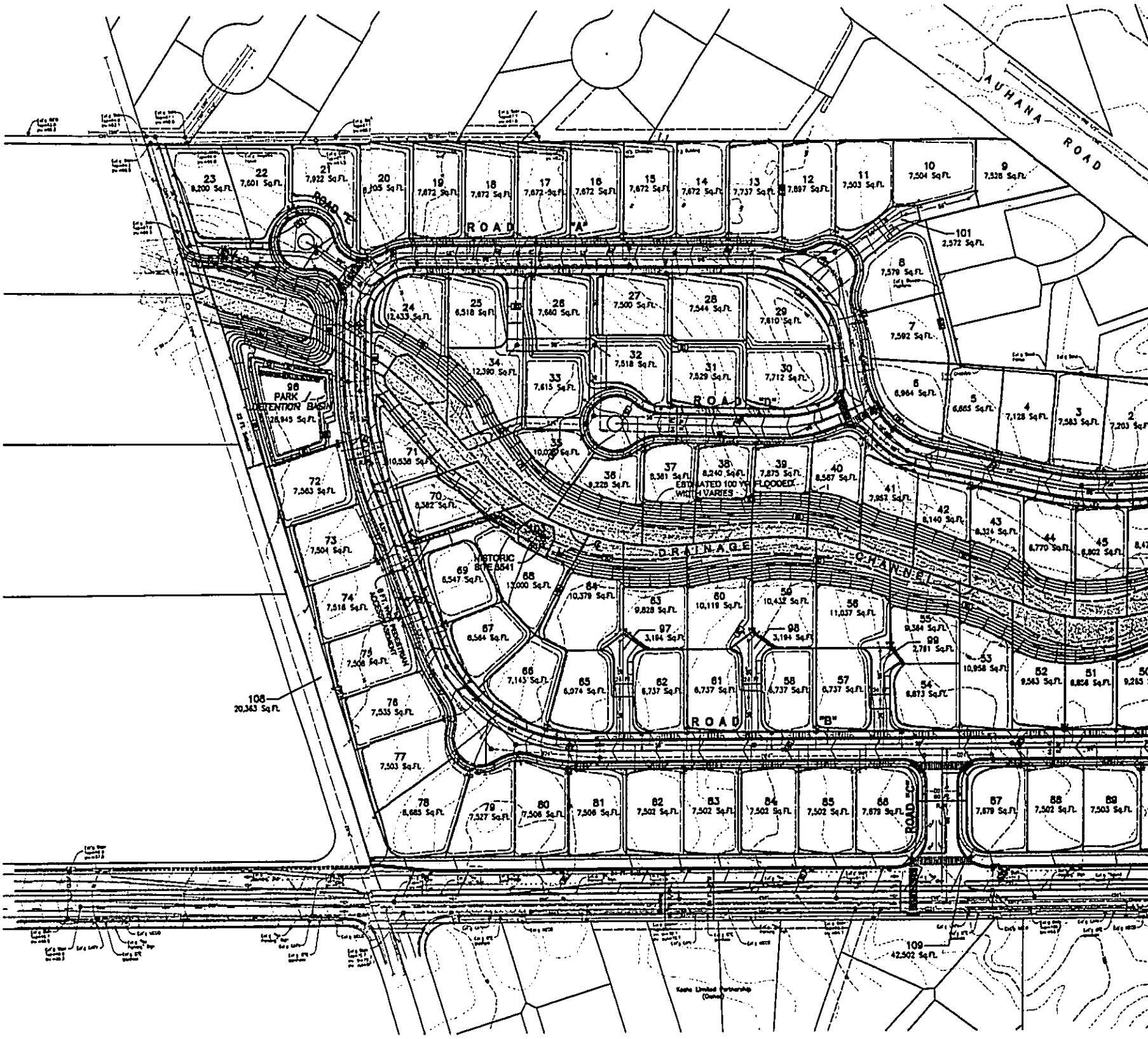


FIGURE 1
LOCATION MAP



MISC. INFORMATION

GROSS LAND AREA – 24.09 ACS.
ZONING – R-2 RESIDENTIAL
MIN. LOT SIZE – 7,500 Sq.Ft.
MIN. LOT WIDTH – 65 FT.
NO. OF HOUSELOTS – 95

PRELIMINARY SUBDIVISION M
(INCLUDING DEVELOPMENT AND DRAINAG

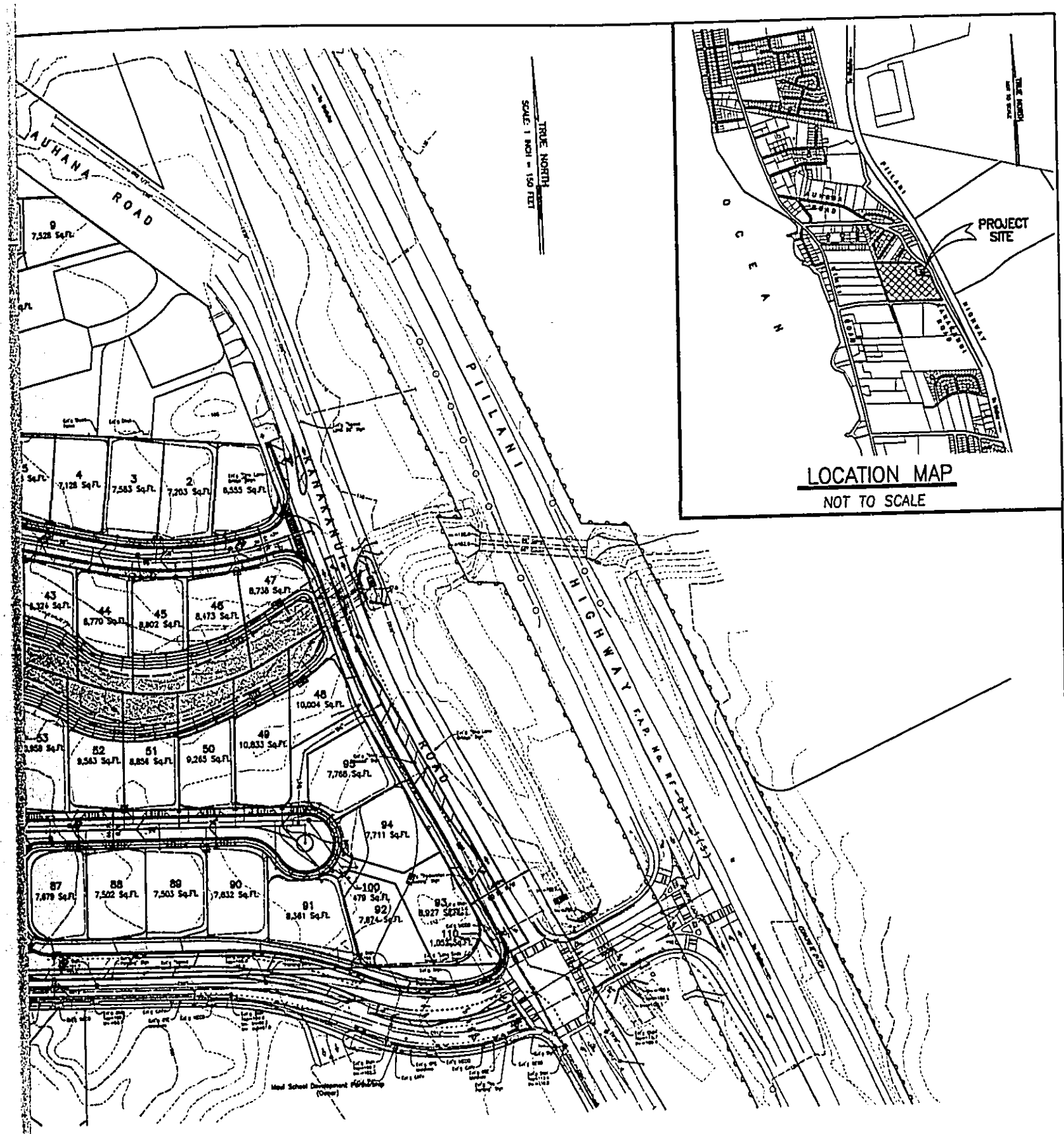
KE-ALII SUBDIVISION

KIHEI, MAUI, HAWAII

0 150 300 450 6

SCALE: 1 IN. = 150 FT.

T.M.K.: 3-9-18 : 01



BDIVISION MAP
AND DRAINAGE PLANS)

IVISION

HAWAII

450 600

150 FT.

FIGURE 2

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

October 8, 1999
Revised: June 19, 2000

NOTE:

ALL LANDSCAPE AREAS TO BE WATERED BY AN AUTOMATIC IRRIGATION SYSTEM.

ADD ROOTBARRIER TO ALL STREET TREES – AGAINST PAVEMENT SIDE ONLY.

PRELIMINARY LANDSCAPING PLANT

KE-ALII SUBDIVISION

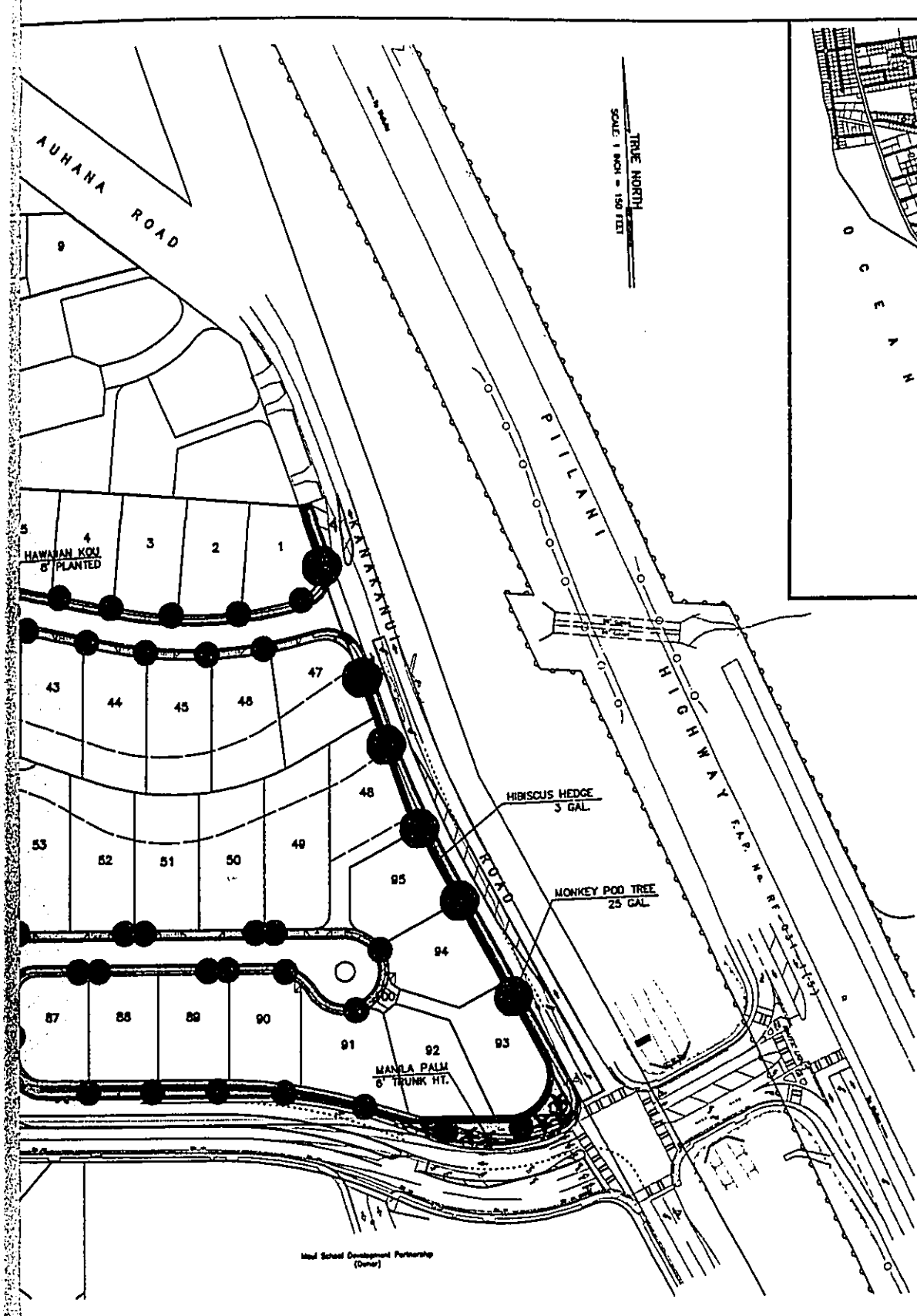
KIHEI, MAUI, HAWAII

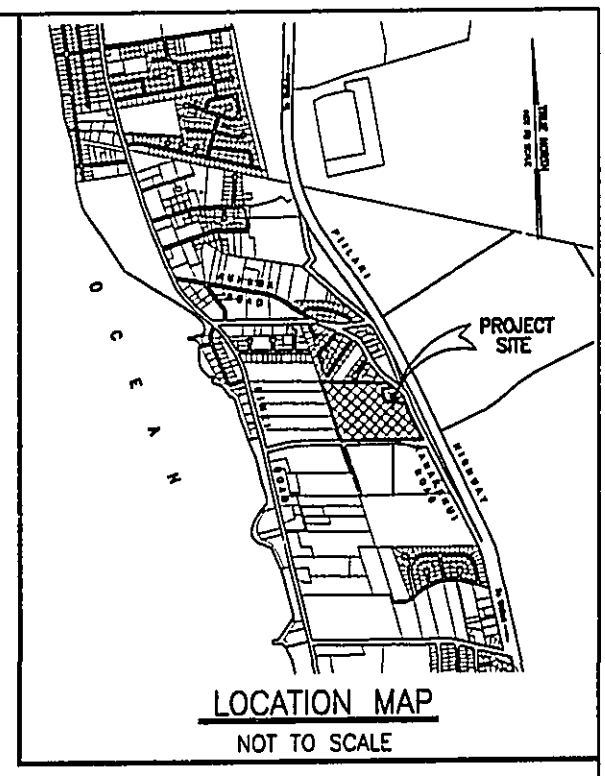
0 150 300 450

SCALE: 1 IN. = 150 FT.

T.M.K.: 3-9-18 : 01

j:\gg exhit ndsc .dwg





LOCATION MAP

NOT TO SCALE

LEGEND:

- MONKEY POD TREE
- HAWAIIAN KOU
- HIBISCUS HEDGE
- MANILA PALM
- GRASS LAWN

NG PLANTING PLAN

IVISION

HAWAII

450 600

150 FT.

FIGURE 3

CHRIS HART & PARTNERS

LANDSCAPE ARCHITECTURE AND PLANNING

1955 MAIN STREET, SUITE 200
WAILUKU, MAUI, HI 96793-1706
TELEPHONE: 808-242-1955
FACSIMILE: 808-242-1956
E-MAIL: ____@CHPMAUI.COM

October 8, 1999
Revised: June 19, 2000

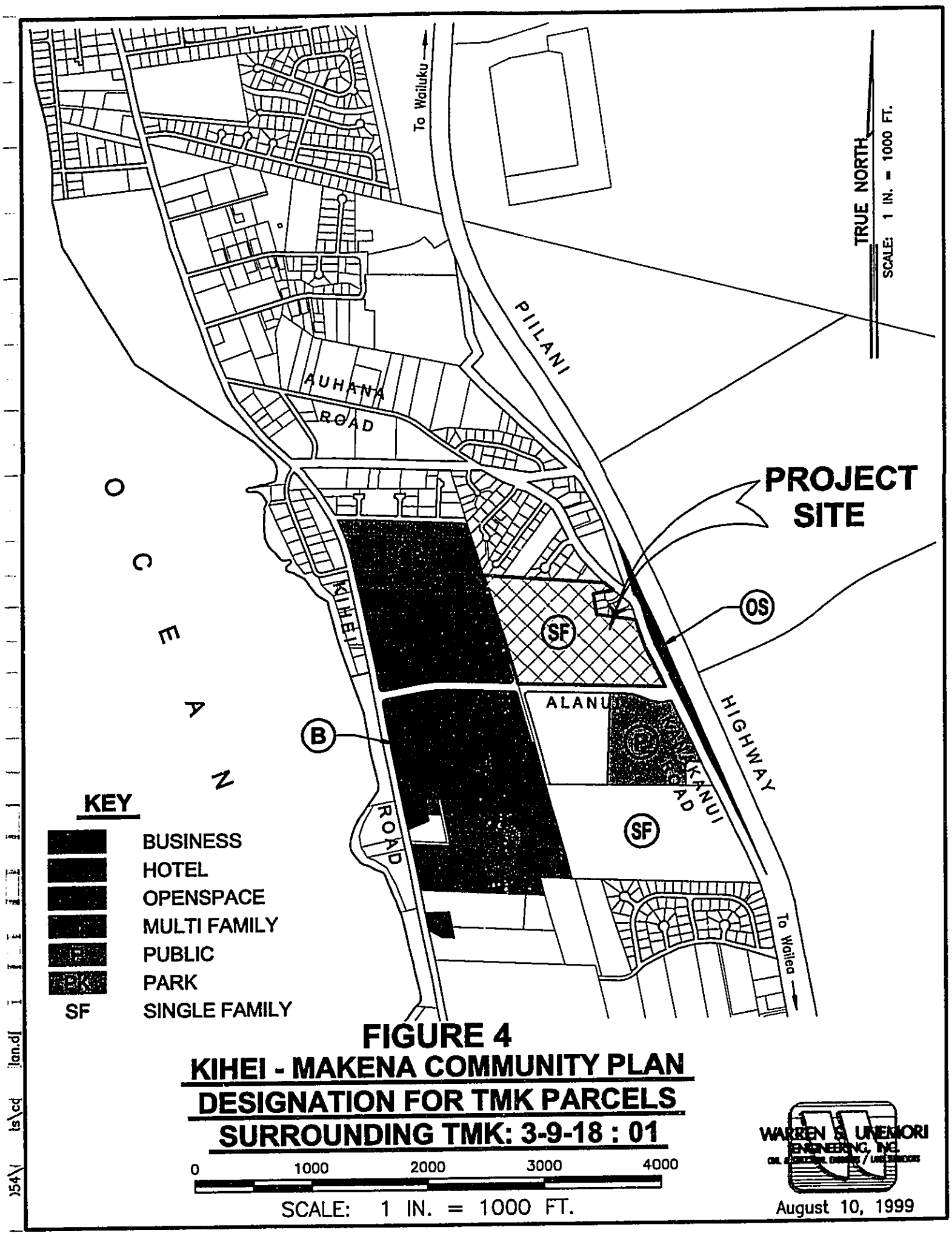


FIGURE 4
KIHEI - MAKENA COMMUNITY PLAN DESIGNATION FOR TMK PARCELS SURROUNDING TMK: 3-9-18 : 01

0 1000 2000 3000 4000

SCALE: 1 IN. = 1000 FT.

WARREN S. UNEMORI ENGINEERING, INC.

August 10, 1999

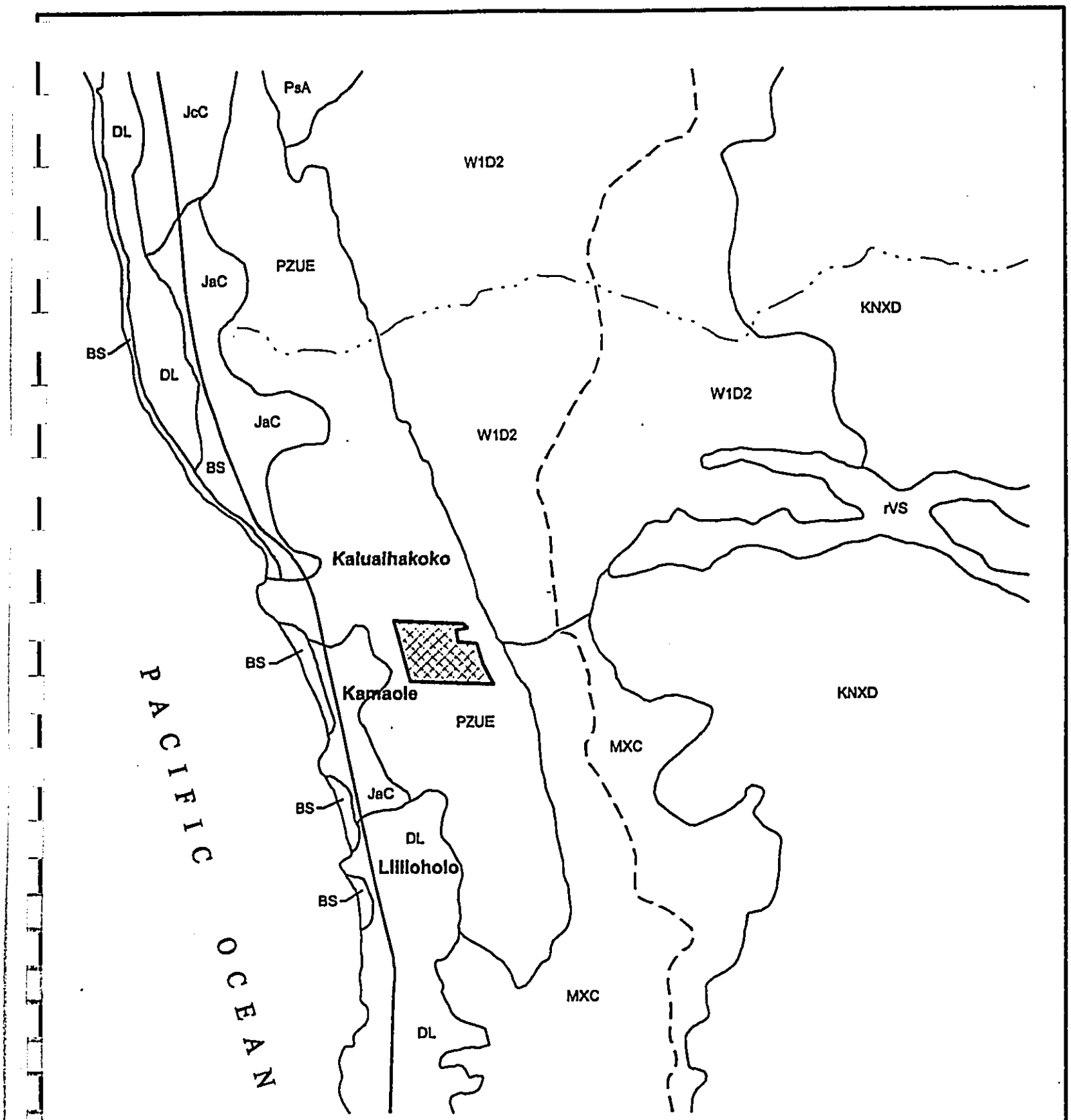
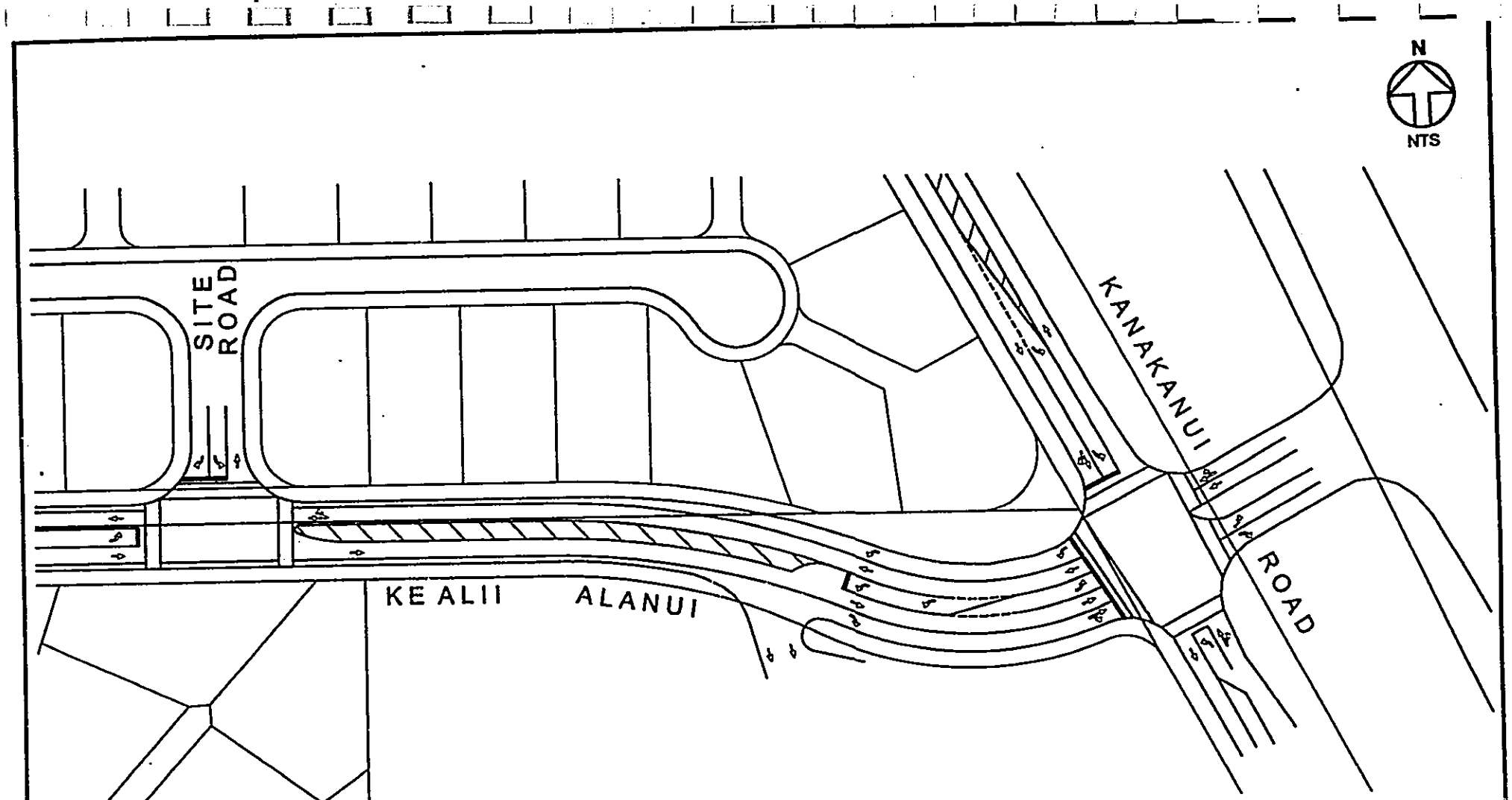


FIGURE 5

SITE SPECIFIC SOIL
CLASSIFICATION MAP

WARREN S. UNEMORI
ENGINEERING, INC.

August 11, 1999



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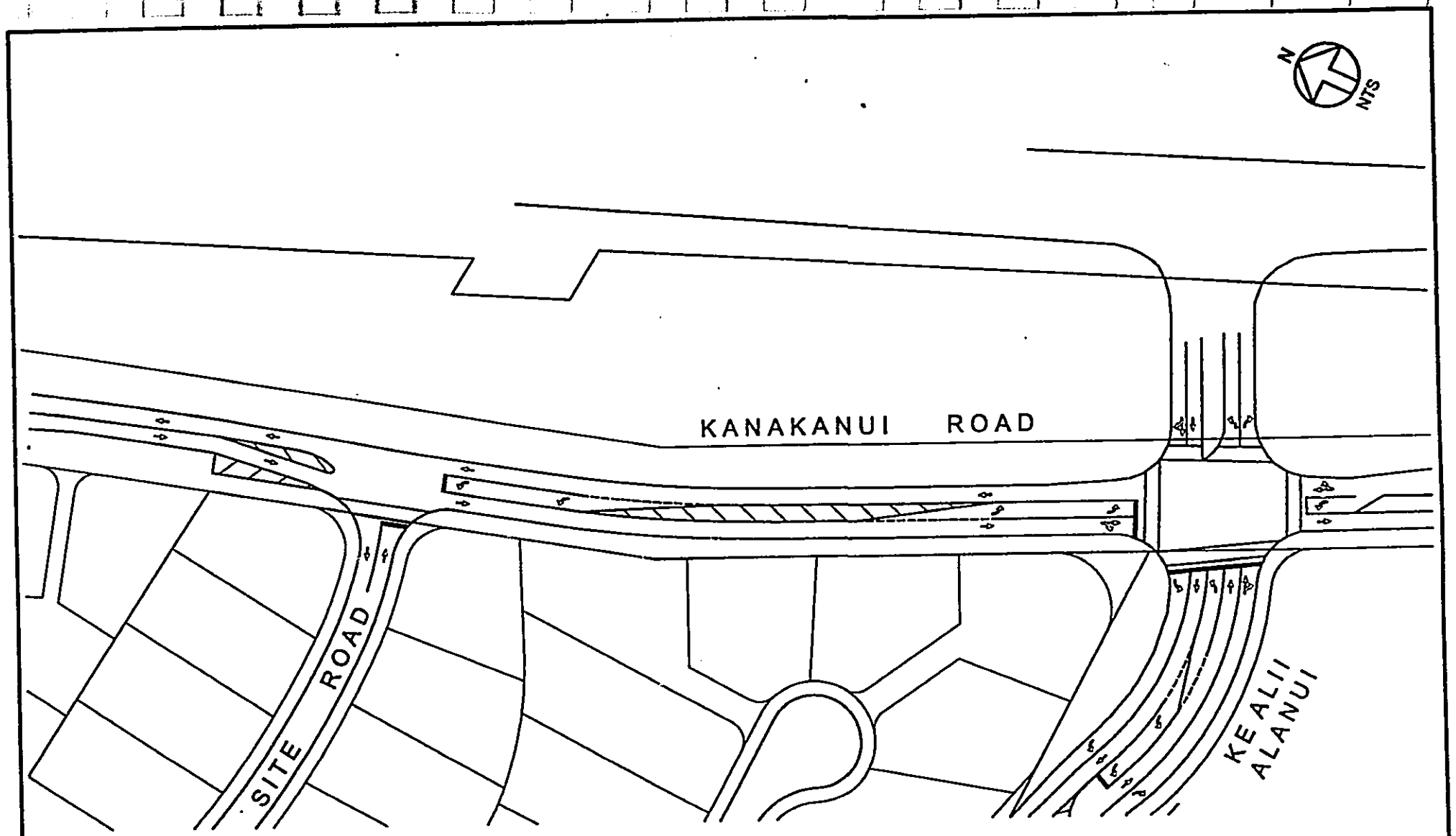
WARREN S. UNEMORI ENGINEERING, INC.

RECOMMENDED LANE CONFIGURATION ON KE ALII ALANUI

Figure **6**



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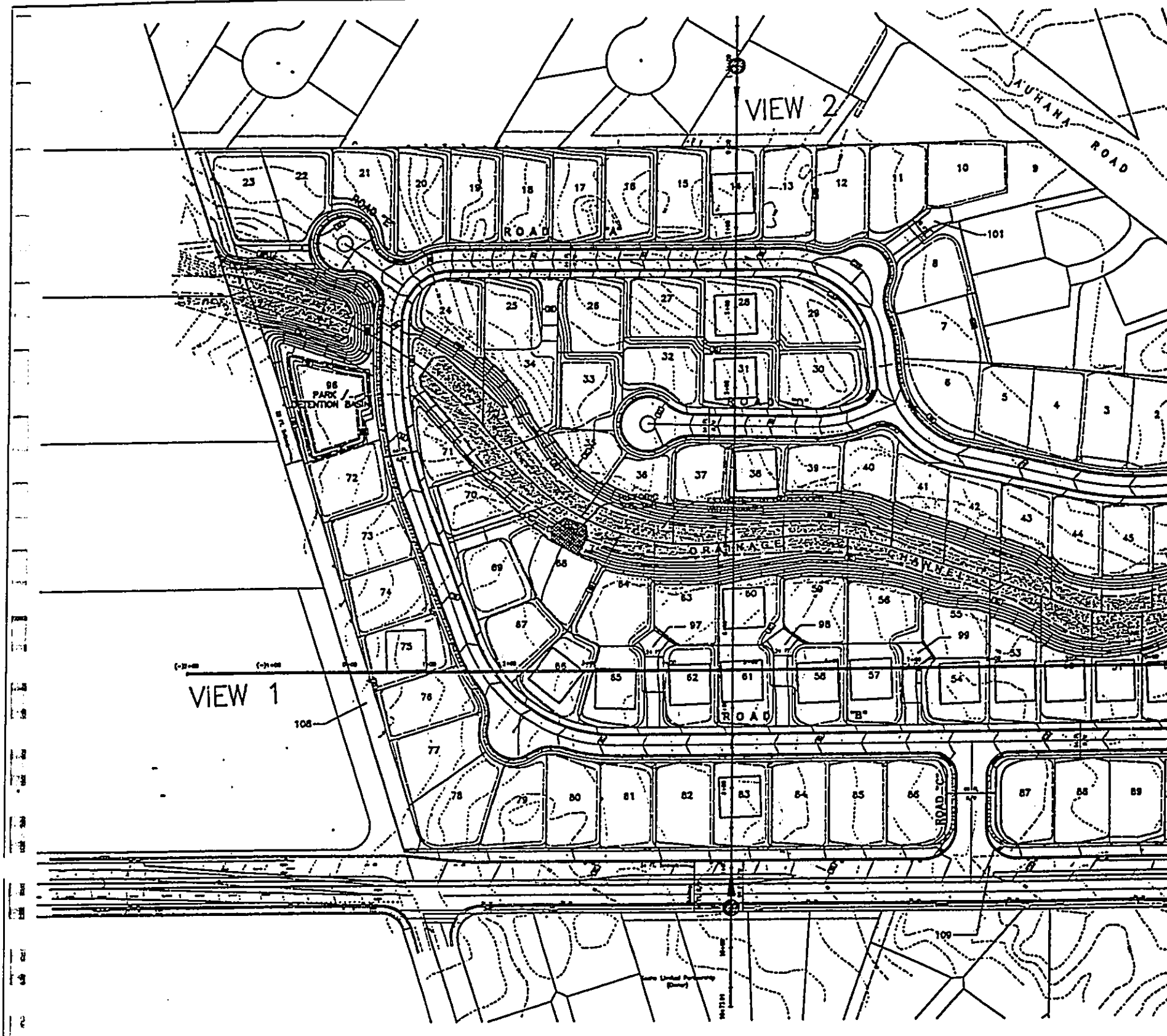
WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & TRAFFIC ENGINEERS / LAND SURVEYORS

RECOMMENDED SITE ACCESS TO KANAKANUI ROAD

Figure **7**



VIEW PLANE EXHIBIT

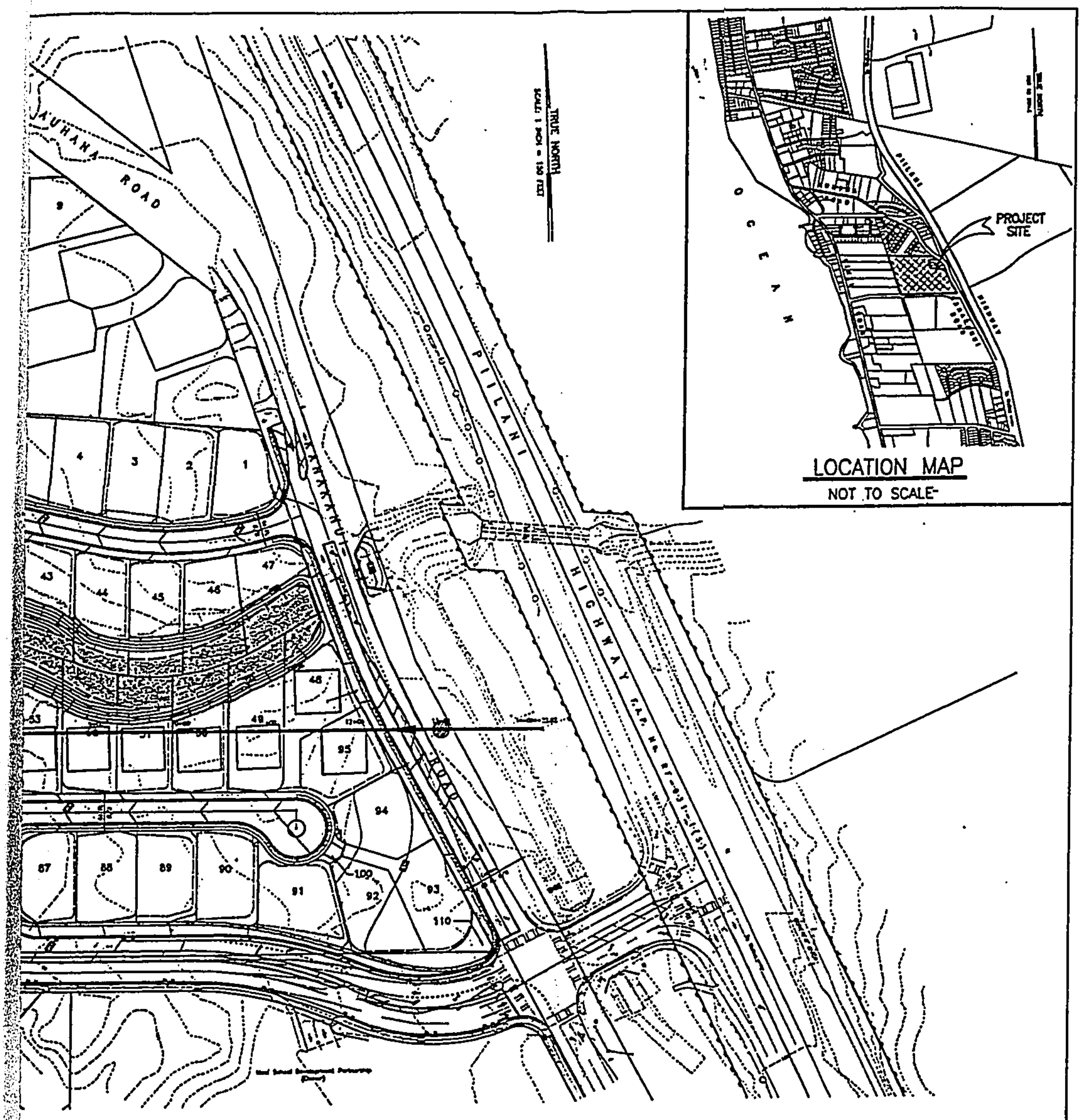
KE-ALII SUBDIVISION

KIHEI, MAUI, HAWAII

0 150 300 450

SCALE: 1 IN. = 150 FT.

T.M.K.: 3-9-18 : 01



EXHIBIT

VISION

HAWAII

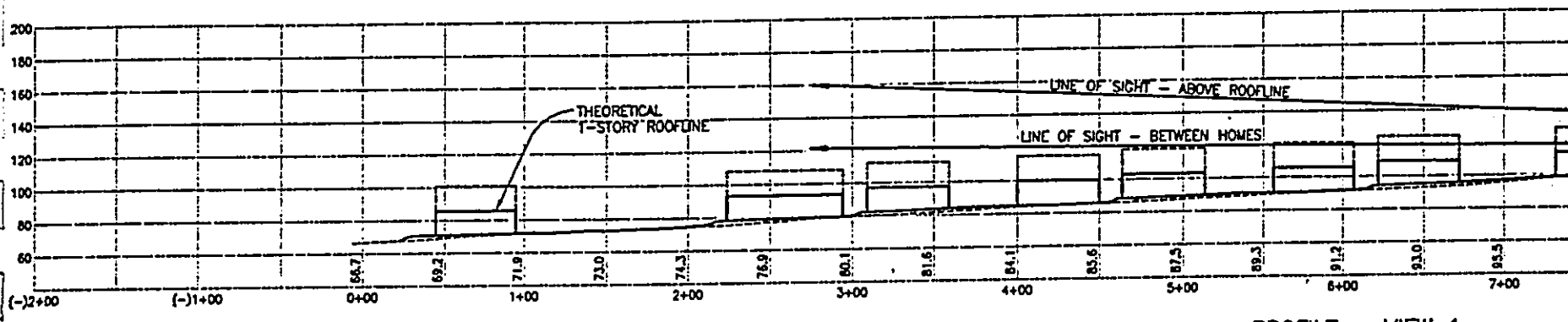
450 600

150 FT.

FIGURE 8

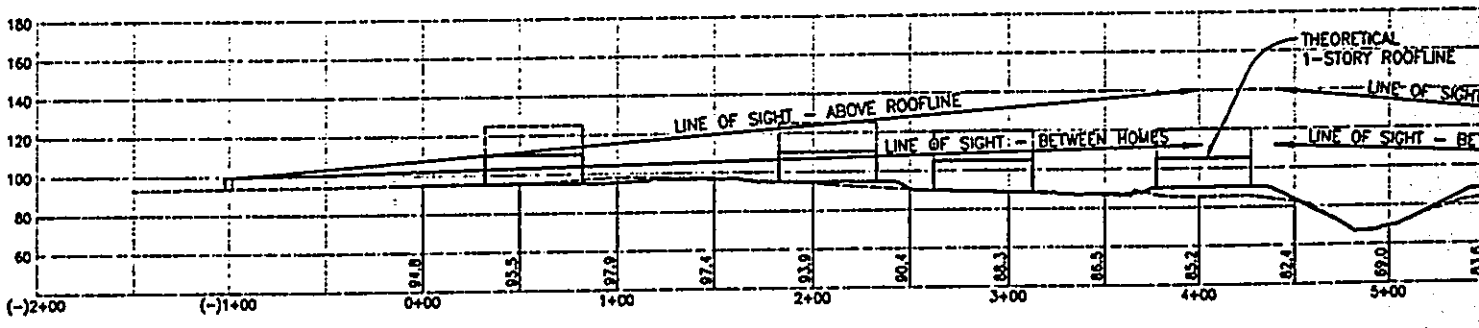
WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

June 20, 2000



PROFILE – VIEW 1

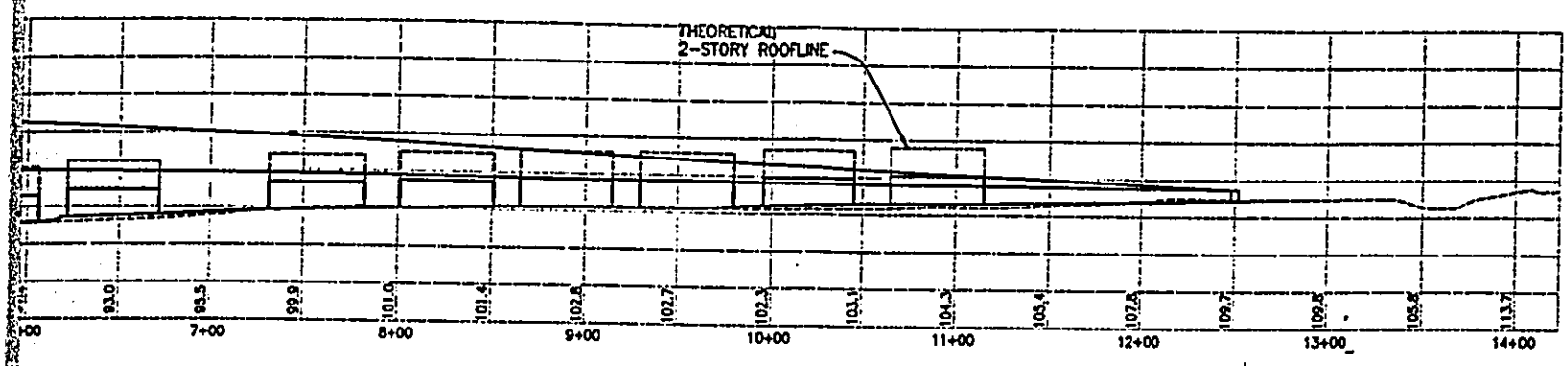
Scale: 1" = 100'



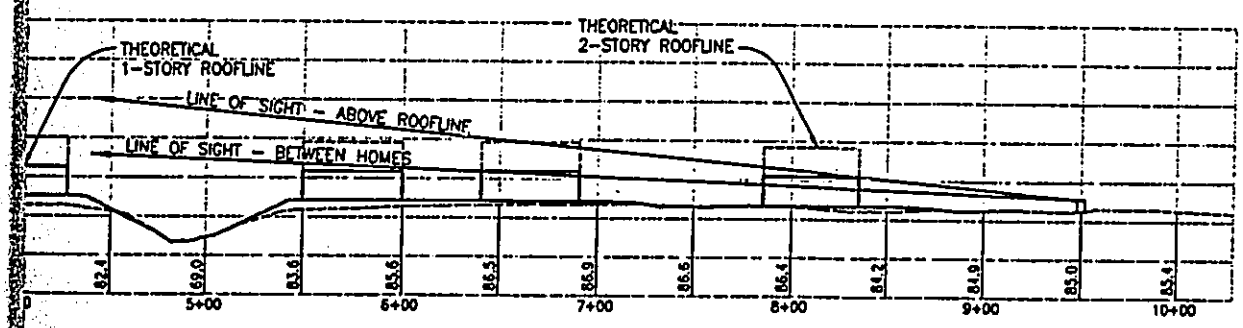
PROFILE – VIEW 2

Scale: 1" = 100'

VIEW PLANE EXHIBIT



– VIEW 1
1" = 100'



– VIEW 2
1" = 100'

E EXHIBIT

WARREN S. UNEMORI
ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

FIGURE 9

June 20, 2000

EXHIBITS

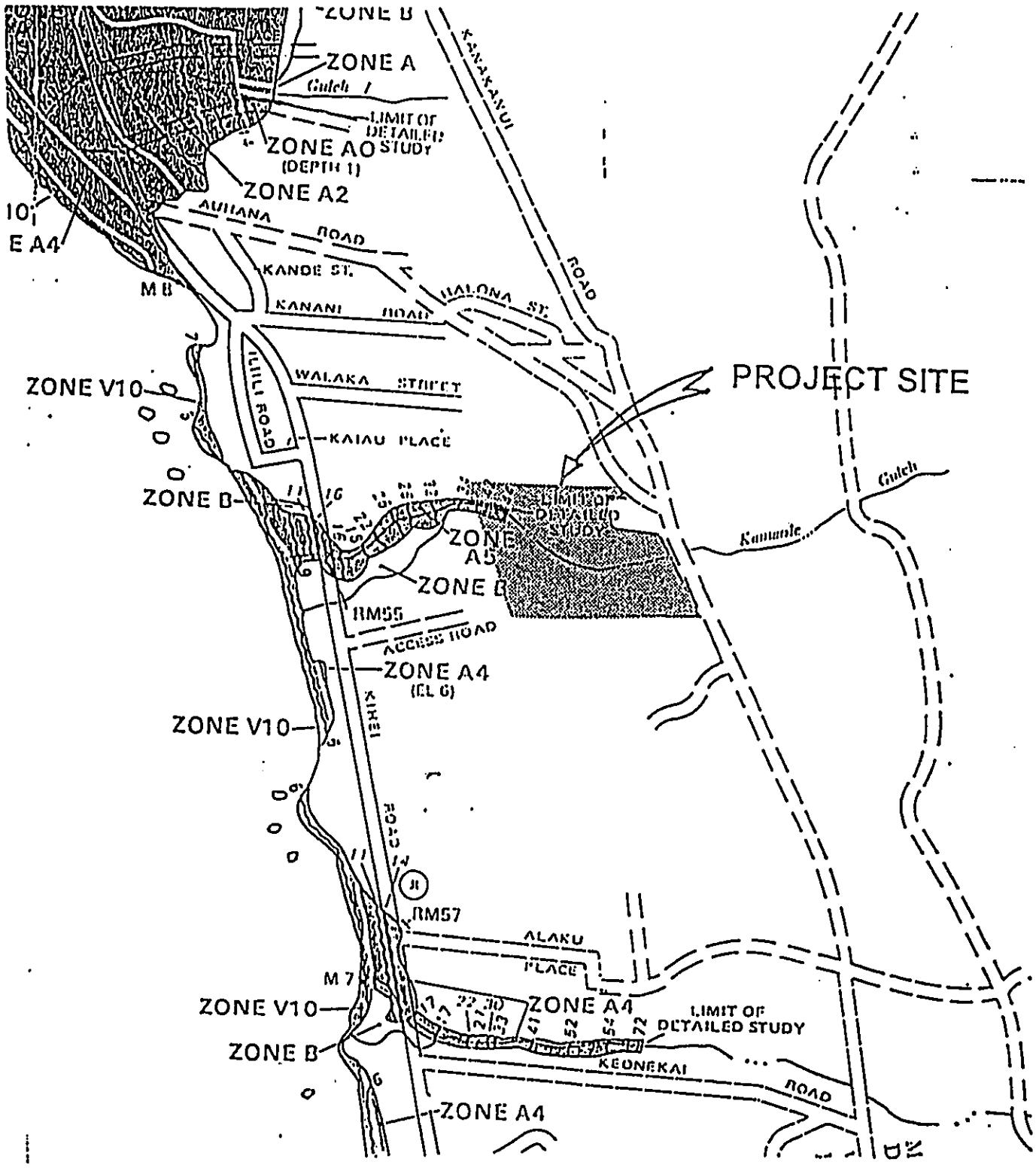


EXHIBIT "A"

FLOOD INSURANCE RATE MAP

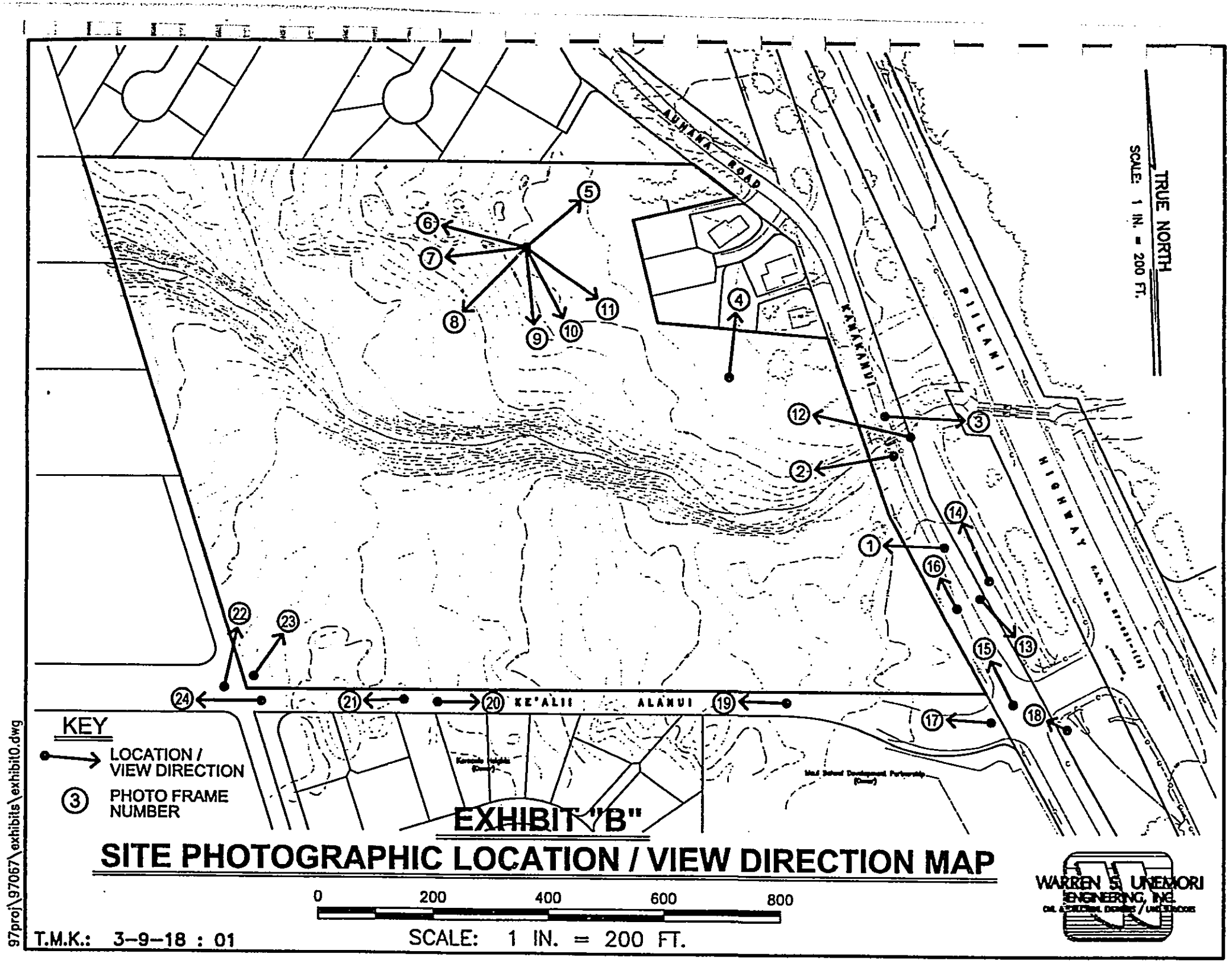


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EXHIBIT "B"

SITE PHOTOGRAPHIC LOCATION / VIEW DIRECTION MAP

T.M.K.: 3-9-18 : 01

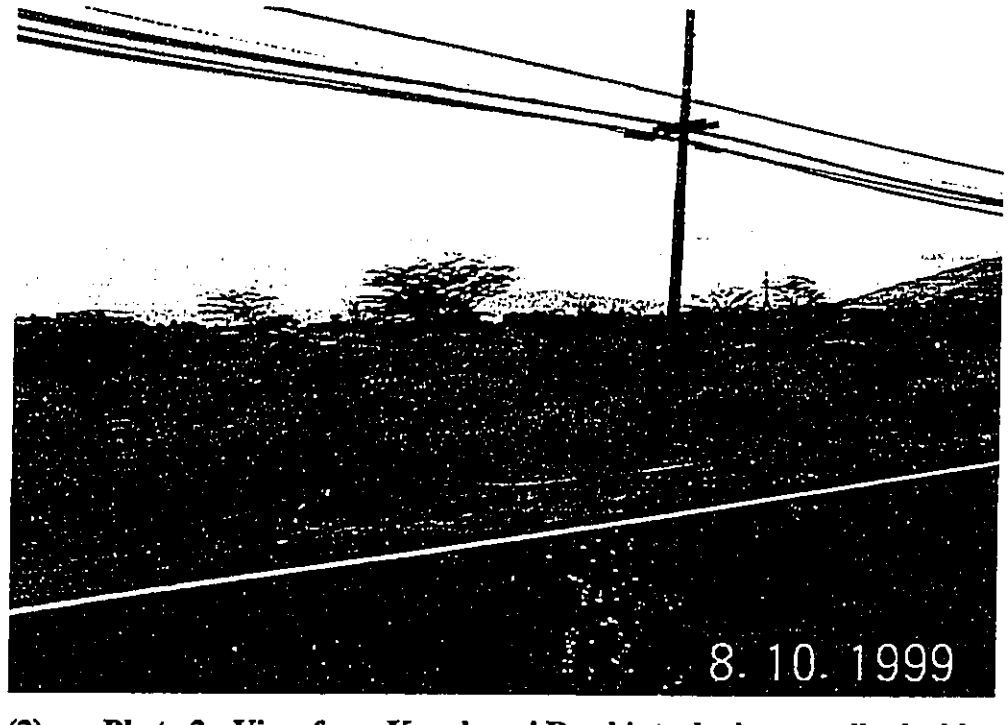
SCALE: 1 IN. = 200 FT.

WARREN S. UNEMORI ENGINEERING, INC.

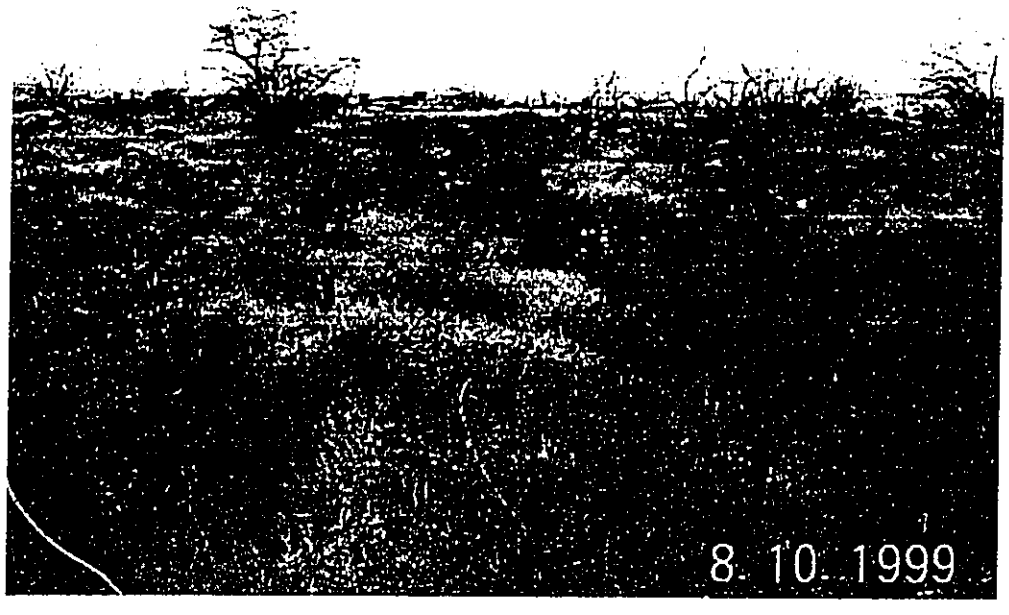
August 12, 1999

Exhibit "C" - Site Photos of Existing Property

(1) Photo 1 - View from Kanakanui Road near Intersection, looking northwest



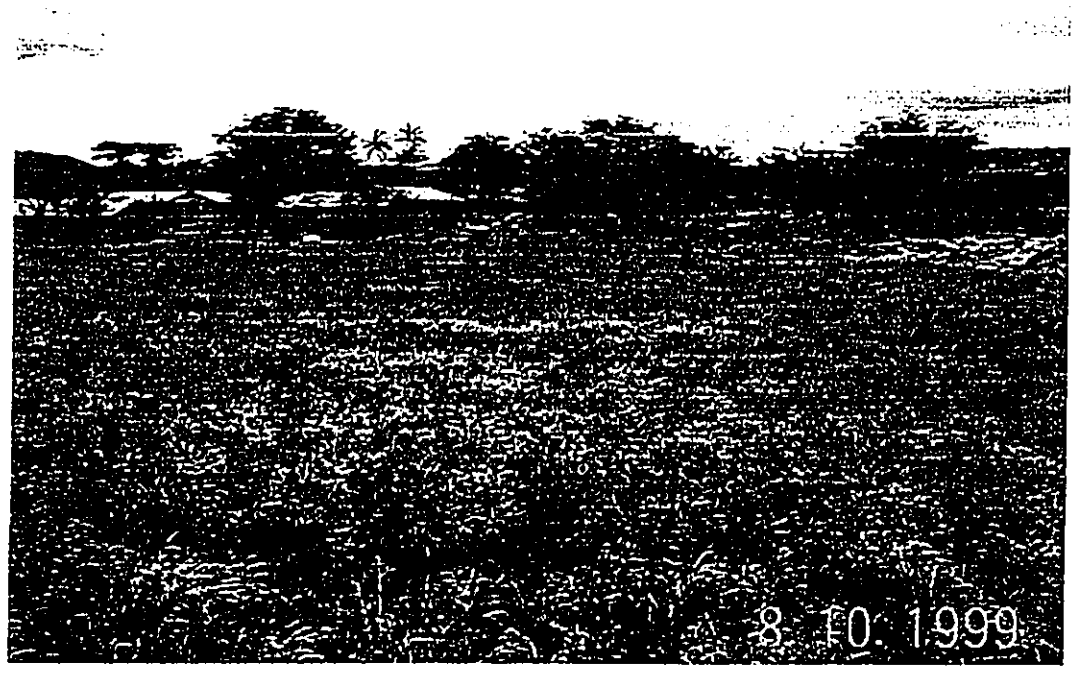
(2) Photo 2 - View from Kanakanui Road into drainage gully, looking westward



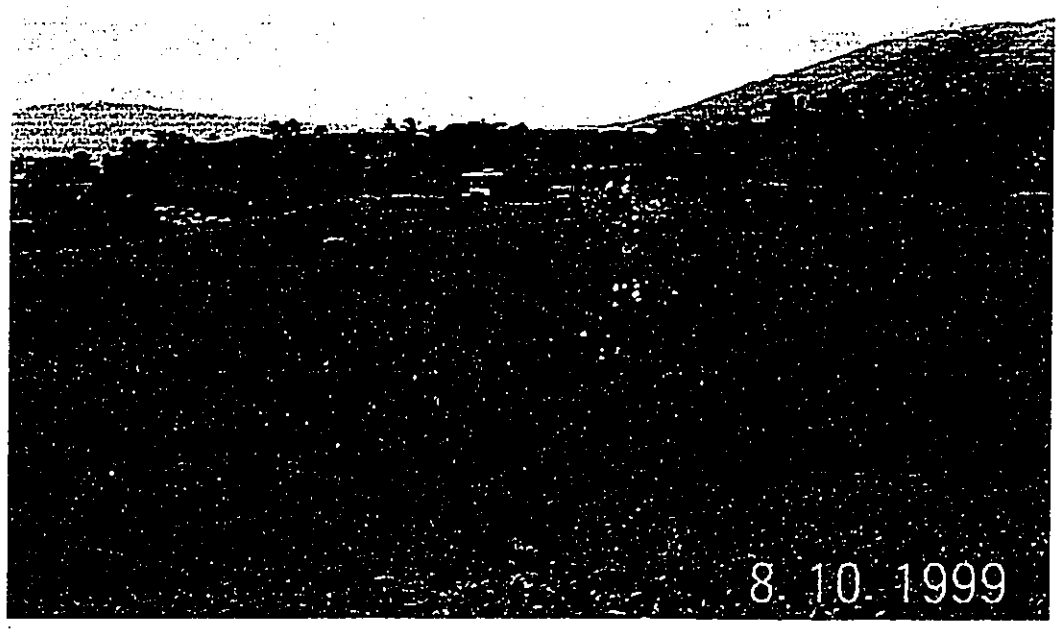
(3) **Photo 3 - Twin 96" Culverts Upstream from Kanakanui Road, looking east**

(4) **Photo 4 - View of existing residential subdivision, looking north**

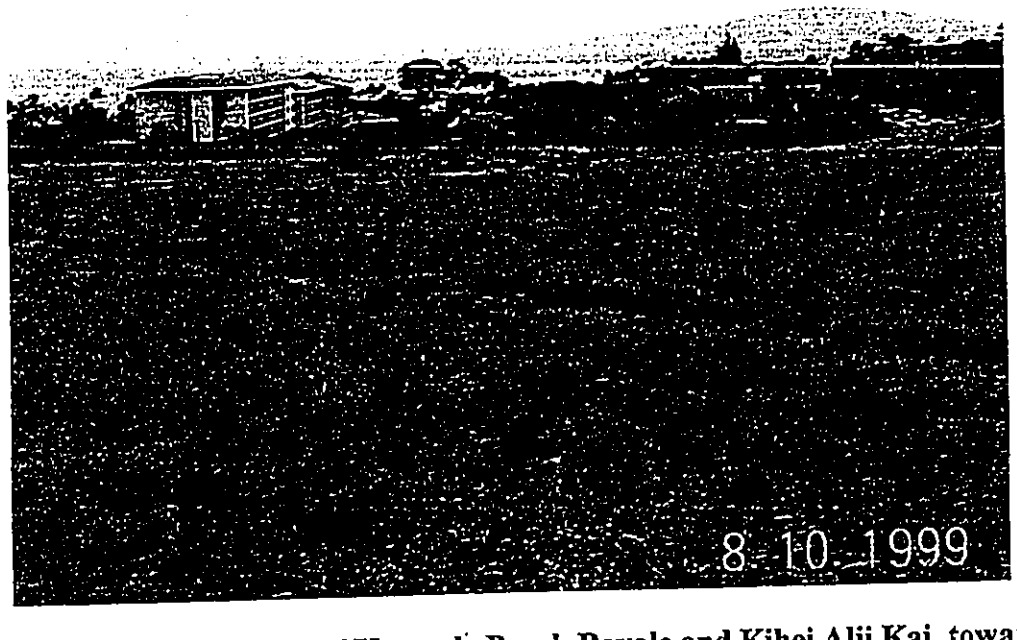
(5) **Photo 5 - View from top of knoll, looking toward northeast corner**



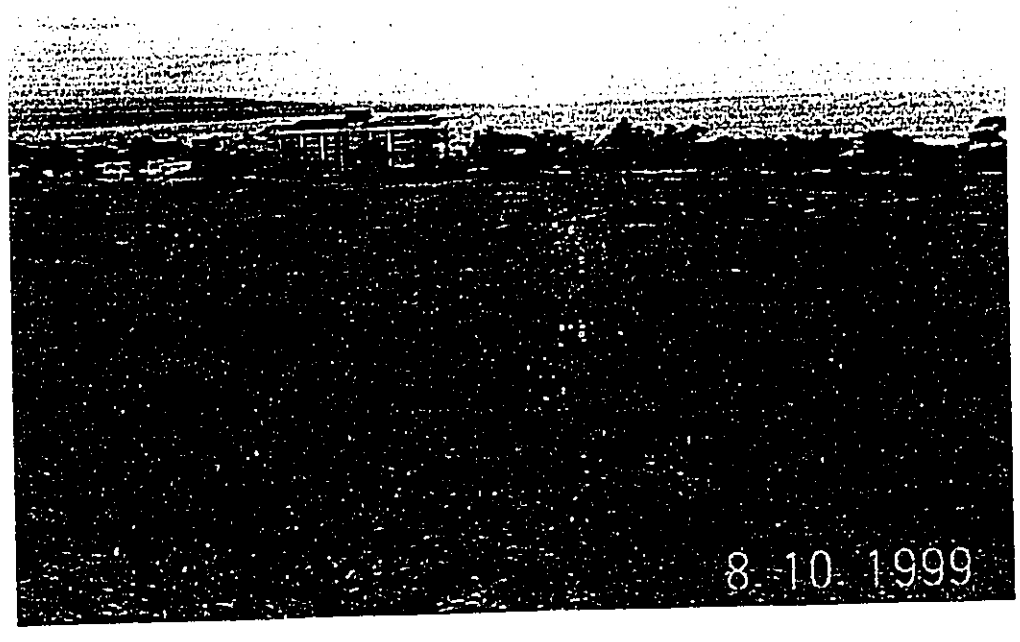
(6) **Photo 6 - View of Maui Vista Condo, looking to northwest corner**



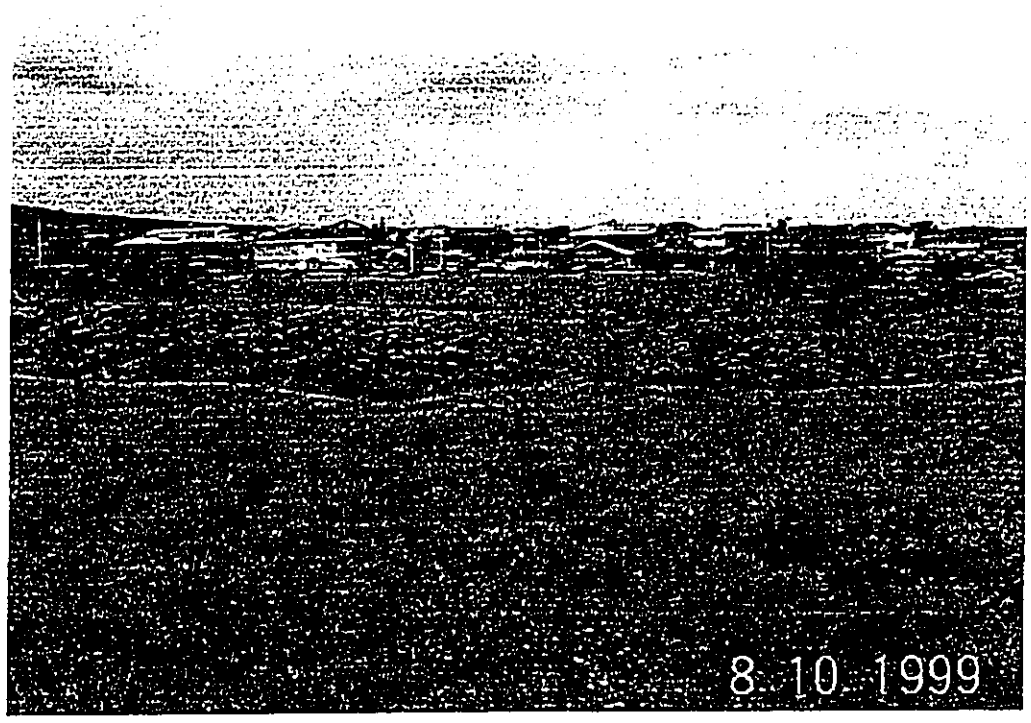
(7) **Photo 7 - View of Maui Coast Hotel and Pacific Shores Condo, looking west**



(8) **Photo 8 - View of Kamaole Beach Royale and Kihei Alii Kai, toward southwest**

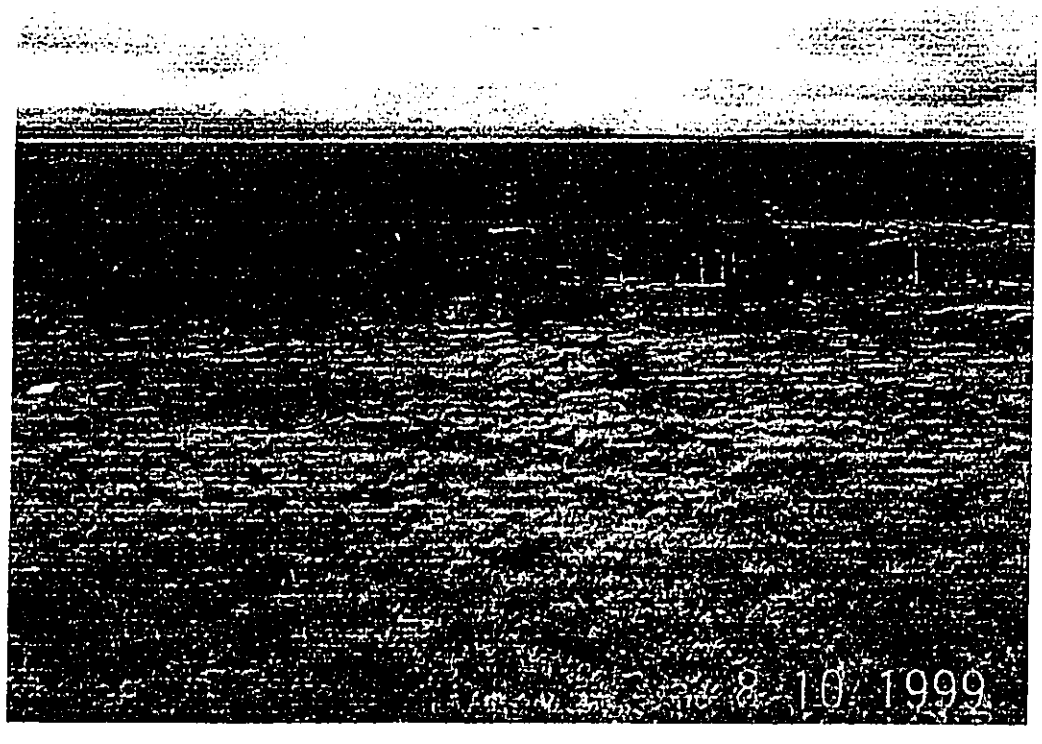


(9) **Photo 9 - View of Kamaole Heights SF Residential Subdivision, looking south**



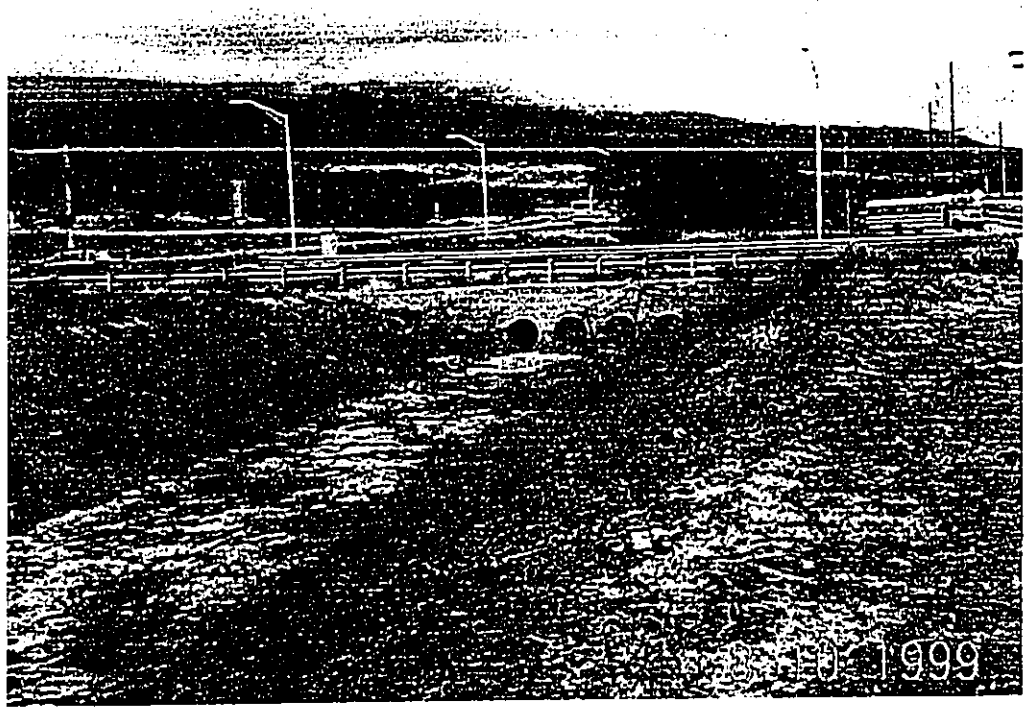
(10) **Photo 10 - View of Kamalii Elementary School, looking southeast**

(11) **Photo 11 - View of Kamaole Water Tank, looking toward southeast corner**



(12) **Photo 12 - View of 48" Culvert on east side of Kanakanui Road, looking west**

(13) **Photo 13 - View of Four 36" culverts upstream, looking south**

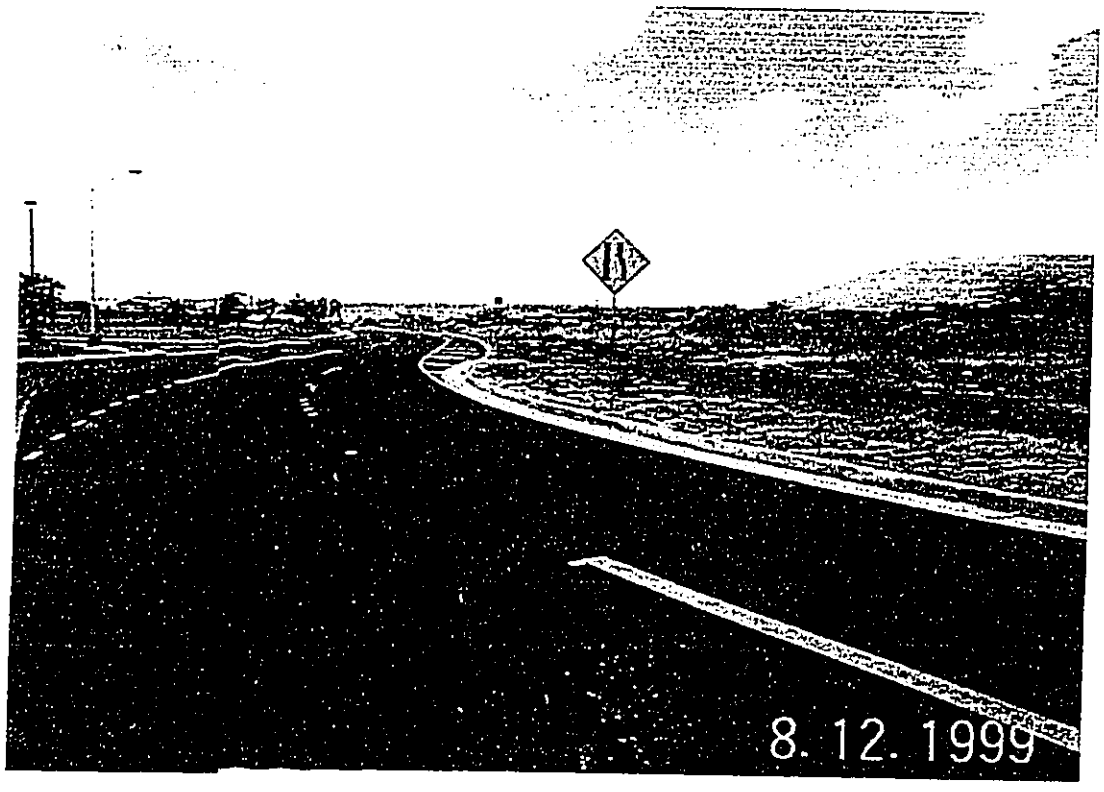


(14) **Photo 14 - View of Drainage Channel, looking north (downstream)**

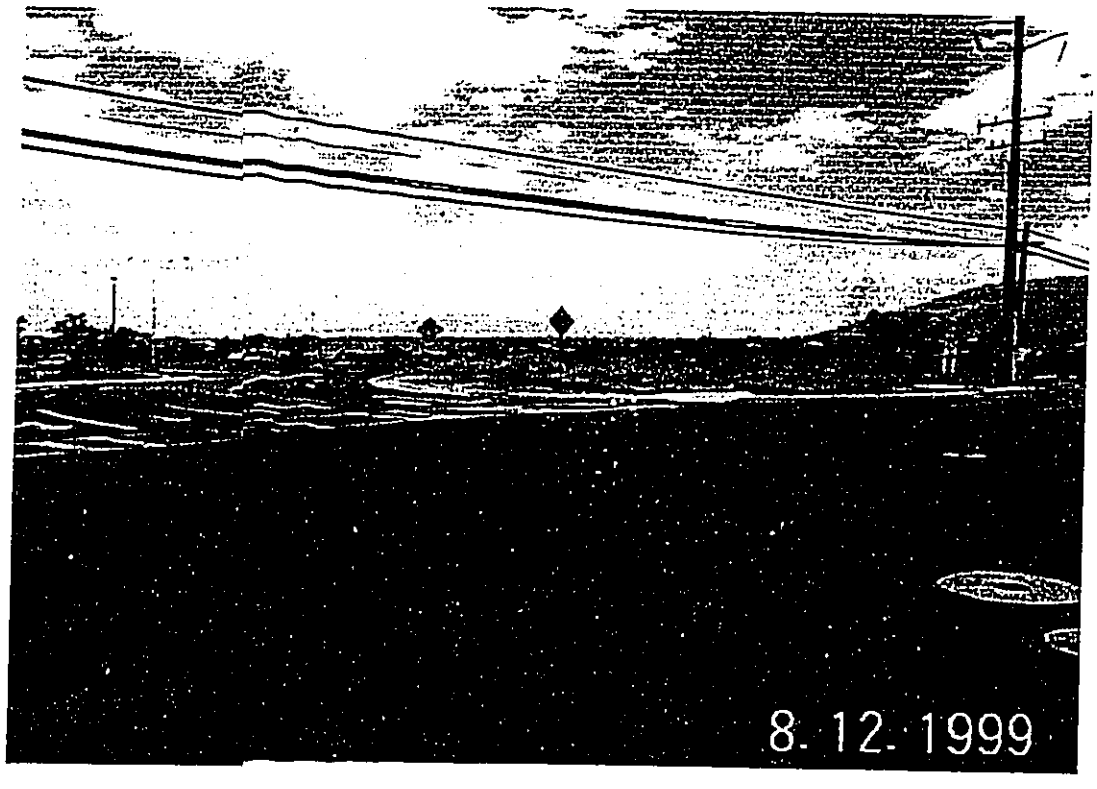
(15) **Photo 15 - View of Kanakanui Road from Ke Alii Alanui, looking north**

(16) **Photo 16 - View of Kanakanui Road as it narrows, looking north**

(17) **Photo 17 - View of Ke Alii Alanui at Intersection, looking west**

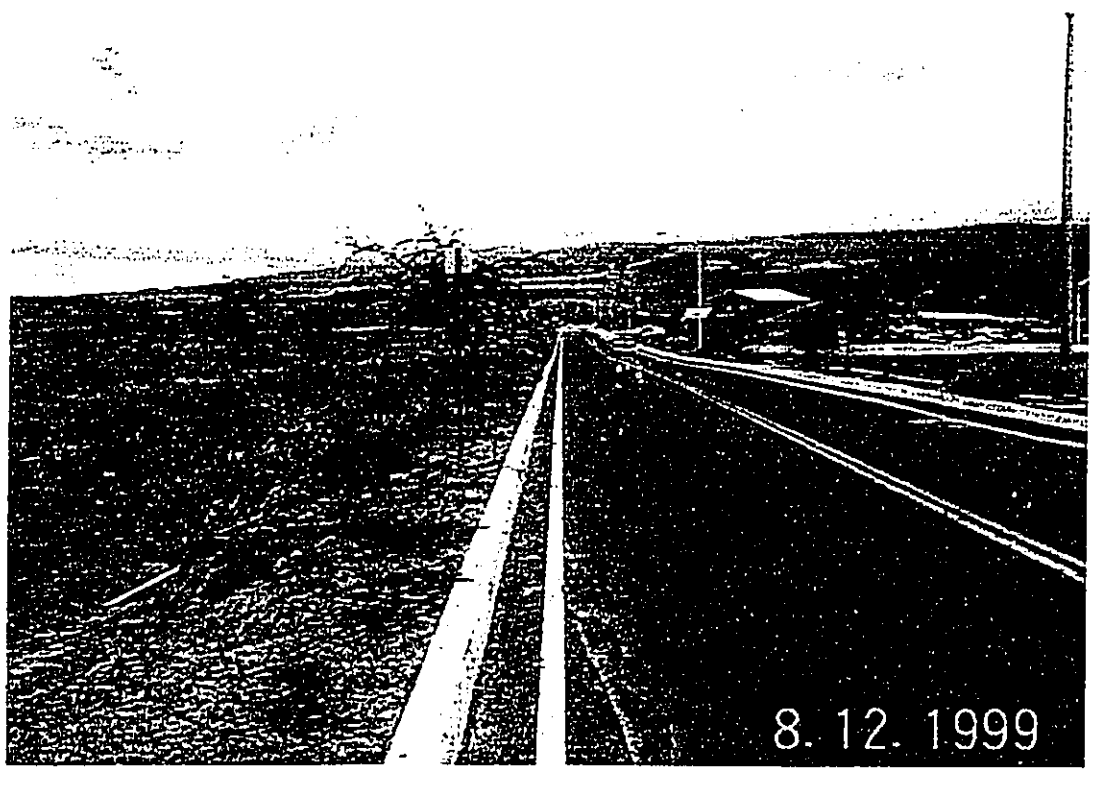


(18) **Photo 18 - View of southeast corner, looking northwest**



(19) **Photo 19 - View of Ke Alii Alanui, looking west**

(20) **Photo 20 - View of Ke Alii Alanui, looking eastward**



(21) **Photo 21 - View of Ke Alii Alanui from further downhill, looking west**

(22) **Photo 22 - View along western property line, looking north**

(23) **Photo 23 - View from southwest corner of lot, looking northeast**

(24) **Photo 24 - View from southwest corner, looking downhill (west)**

Established 1969

2000-07-23-MA-FEA

JUL 23 2000

FINAL ENVIRONMENTAL ASSESSMENT

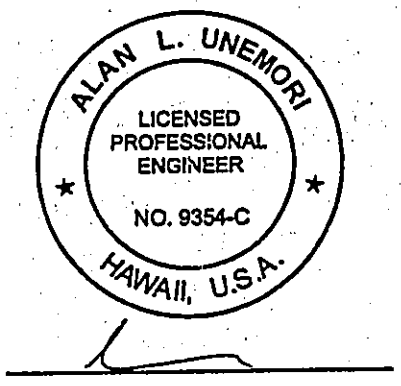
FILE COPY

KE ALI'I SUBDIVISION

Kihei, Maui, Hawaii
TMK: (2) 3-9-18:01

Prepared For:

Spencer Homes
4372 W. Waiola Street
Kihei, Maui, Hawaii 96753



Warren S. Unemori Engineering, Inc.
Civil and Structural Engineers - Land Surveyors
2145 Wells Street, Suite 403
Wailuku, Hawaii 96793

July, 2000

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XI. COMMENTS RECEIVED ON THE DRAFT EA

REFERENCES

APPENDICES:

A Letter from State Historic Preservation Division, DLNR, approving Archaeological Inventory Survey Report, and Archaeological Mitigation Plans

B. Preliminary Engineering Report and Drainage Report

C. Traffic Impact Assessment Report

FIGURES:

1. Project Location Map
2. *Preliminary Subdivision Map (including Development and Drainage Plans)*
3. Preliminary Landscape Planting Plan
4. Kihei-Makena Community Plan Map
5. Site Specific Soil Classification Map
6. Recommended Lane Configuration on Ke Alii Alanui
7. Recommended Site Access to Kanakanui Road
8. View Plane Exhibit, Plan View
9. View 1 and View 2 Profiles

EXHIBITS:

1. Exhibit A - Flood Rate Insurance Map
2. Exhibit B - Site Photographic Location/View Direction Map
3. Exhibit C - Site Photos of Existing Property

PREFACE

Spencer Homes, Inc., proposes to construct a 95-lot single family residential subdivision on 24 acres of undeveloped and vacant land at the northwest corner of the intersection of Kanakanui Road and Ke Alii Alanui in Kihei, Maui.

Pursuant to Chapter 343, Hawaii Revised Statutes; and, Chapter 200 of Title 11, Hawaii Administrative Rules; this Environmental Assessment documents the project's technical characteristics, environmental impacts and alternatives, and advances findings and conclusions relative to the project.

SPENCER HOMES, INC. PROPOSED KE ALI'I SUBDIVISION

AGENCY: Spencer Homes, Inc.

PROJECT DESCRIPTION: Spencer Homes, Inc., proposes to develop a 95-lot single family residential subdivision at the northwest corner of Kanakanui Road and Ke Alii Alanui (see Figure 1) on a 24 acre property.

The project does not involve any County, State or Federal funds or lands, with the exception of replacing a substandard, and extremely undersized 48" culvert beneath Kanakanui Road (a County roadway right-of-way) with a larger drainage structure designed for a 100-year recurrence storm.

Spencer Homes, Inc., has prepared the present Final Environmental Assessment (EA) pursuant to Chapter 343, Hawaii Revised Statutes. In the Final EA, three (3) alternatives were considered: (1) Alternative "1": the Proposed Action; (2) Alternative "2": the "No-Build" alternative; and Alternative "3" the "Delayed Action" alternative.

PROJECT SUMMARY:

An undeveloped and vacant 24 acre lot at the northwest corner of Kanakanui Road and Ke Alii Alanui will be subdivided into 95 single family residential lots consistent with the State Land Use Commission designation "Urban", County Zoning "R-2 Residential" and Kihei-Makena Community Plan Designation "Single-Family (SF)". An Application for Special Management Area Permit has been filed with the County of Maui Planning Department.

Based on the EA and supporting analyses, Spencer Homes, Inc., is satisfied that potential improvement and long-term impacts have been identified and addressed.

FOR FURTHER INFORMATION, CONTACT: Mr. Jesse Spencer, Spencer Homes, Inc., 4372 W. Waiola Street, Kihei, Maui, HI 96753: (808) 891-8770

7-10-2000
Date

Jesse E Spencer
Jesse Spencer, President
SPENCER HOMES, INC.

I. PROJECT OVERVIEW

I. PROJECT OVERVIEW:

A. APPLICANT:

The applicant is Spencer Homes, Inc.

B. LOCATION:

The subject property is located at the northwest corner of the intersection of Kanakanui Road and Ke Alii Alanui (see Figure 1). The site is bordered by Kanakanui Road to the east, a single-family residential subdivision to the north, the recently-opened Kamalii Elementary School to the southeast, the Kamaole Heights single-family residential subdivision to the southwest, and the Maui Coast Hotel, Maui Vista Condominium, Pacific Shores Condominium and Worldmark, The Club, currently under construction to the west.

The project site is approximately 200 feet west (makai) of the State of Hawaii's Piilani Highway. Riilani Highway is the main north/south arterial highway linking Kihei to other urban areas of Maui.

Ke Alii Alanui was recently constructed by the County and abuts the south boundary of the project site. It serves as a major east-west collector road that connects Piilani Highway and South Kihei Road.

C. LAND OWNERSHIP:

This parcel is currently wholly and privately owned by Spencer Homes, Inc. (TMK 3-9-18:01).

D. EXISTING LAND USE:

The 24 acre project site is currently undeveloped and vacant. The project site generally slopes downward from an elevation of 112 feet at the southeast corner to about 56 feet at the makai boundary. This yields an overall cross slope of roughly 5%. A natural drainage gully bisects the property in a mauka-makai direction, beginning with an existing 48-inch diameter culvert crossing beneath Kanakanui Road on the mauka side and exiting the western property line roughly 200 feet south of the northwest corner.

E. PROJECT NEED:

The project's design objectives are to create an attractive single family residential subdivision with attractive landscape planting and site planning that will ensure a quality project that complements the existing urban design character of the Kihei area.

The project is consistent with the March 6, 1998, Update of the Kihei-Makena Community Plan's recommended goals, objectives and policies:

> *"**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 Maalaea, Kihei, Wailea and Makena as well as the region's natural environment, marine resources and traditional shoreline uses.*
>
> ***Objectives and Policies***
>
> *b. Identify priority growth areas to focus public and private efforts on the provision of infrastructure and amenities to serve existing residents and to accommodate new growth.*
>
> *f. Establish a distribution of land uses which provides housing, jobs, shopping, open space and recreation areas in close proximity to each other in order to enhance Kihei's neighborhoods and to minimize dependence on automobiles.*
>
> *g. Encourage the establishment of single-family and multi-family land use designations which provide affordable housing opportunities for areas which are in close proximity to infrastructure systems and other urban services."*

The proposed project will implement the objectives of the Kihei-Makena Community Plan.

F. PROPOSED ACTION:

The proposed action will involve the following subdivision improvements:

(1) Clearing, grubbing and grading of the overall Project Site.

(2) Widening of the existing 40 feet right-of-way for Ke Alii Alanui by 40 feet to 80 feet to provide three (3) 12-foot lanes (plus a turn lane) and 6-foot bike lanes (including gutter) in both directions and 8-foot shoulders. Curb, gutter and a 4-feet wide sidewalk will be added on the north side of Ke Alii Alanui (see Exhibit "C", Photos 17 through 21)

(3) Kanakanui Road, which is currently a narrow substandard County road, will be widened along the project frontage. Curb and gutter and a 4-feet wide sidewalk will also be added along the project frontage (see Exhibit "C", Photos 15 and 16)

(4) Dedication of a 22-feet wide strip of land along the makai or westerly boundary for a future two lane road with bike lanes, with none of the subdivision streets connected to this future road (see Exhibit "C", Photo 22)

(5) The existing single 48-inch culvert on Kanakanui Road will be replaced with a much larger culvert to handle the total estimated offsite runoff for a 100-year recurrence storm (see Exhibit "C", Photos 3 and 12), and the existing drainage channel bisecting the project site will be designed to accommodate a 100-year recurrence storm. Side slopes and channel invert sections that currently consist of erodible material will be shaped above the 100-year inundation limits utilizing rocky material from the rock excavation on site.

(6) Construction of a grassed Park/Detention basin above a subsurface detention system designed to keep the post-development flow equal to or less than the current runoff from the project site. The park area itself will be fully grassed and provided with a sprinkler system to keep it usable as a neighborhood passive mini-park (except during periods of heavy and prolonged rainstorms).

(7) Construction of new waterlines, fire hydrants, sewer and underground electricity/telephone/CATV facilities and street lights.

(8) Construction of two subdivision streets interconnected near the northwest corner of the project forming a continuous loop with a 44-feet right-of-way with a curb-to-curb travelway of 28 feet (including gutter) and 8-feet shoulders on both sides plus a 4-feet wide sidewalk on one side.

Exhibits "B" and "C" show other photos of the existing property. Figure 2 displays the Preliminary Subdivision Map (including Development and Drainage Plans) including the location of Lot 103, a 1,435 square foot area created for a historic site (Site 3541) and an easement providing public access to that site. Figure 3 displays the Preliminary Landscape Planting Plan for this subject property.

The proposed subdivision will provide a highly desirable location for single family residential housing accommodations to prospective home buyers near an elementary school and in the heart of the quickly expanding residential core of the Kihei-Makena Community.

II. ALTERNATIVES ANALYSIS

II. ALTERNATIVES ANALYSIS:

A. ALTERNATIVE "1":

Alternative "1" represents the proposed action. The project site is designated as "Urban" by the State Land Use Commission, the Kihei-Makena Community Plan as "Single Family (SF), and the Maui County Zoning as "R-2 Residential". The proposed development is consistent with all zoning regulations currently in place, and is consistent with the recommended goals, objectives and policies of the latest Kihei-Makena Community Plan.

The layout itself is largely dictated by the large natural drainage way that bisects the parcel from east to west, and by accessibility to both Kanakanui Road to the east and Ke Alii Alanui to the south. The single crossing of the drainage way in the northwest corner of the property allows for better traffic circulation and access to both entryways into and out of the proposed subdivision. The "R-2 Residential" zoning designation provides for a minimum lot size of 7,500 square feet, and a minimum lot width of 65 feet, but also permits a mixture of lot sizes provided that minimum lot size will not be less than six thousand square feet and that the overall project density is not exceeded (subject to approval of the Planning Commission).

In addition, the existing single 48" culvert beneath Kanakanui Road is completely inadequate for directing the expected volume of discharge from the two 96" culverts immediately upstream beneath Piilani Highway, and the four 36" culverts beneath Ke Alii Alanui into the natural drainage channel. This poses a serious threat of flooding to adjacent properties below Kanakanui Road. Development of the subject property will reduce the existing flooding potential by substantially improving the flow capacity across Kanakanui Road into the natural drainage channel.

The layout and improvements for the proposed subdivision is presented in Figure 2, while the landscape planting plan is shown in Figure 3. Details of the proposed action are given in Section "I(F)" above.

B. ALTERNATIVE "2"

Alternative "2" represents the "No-Build" alternative. This Alternative leaves the undeveloped and vacant parcel with no improvements, and the existing undersized and substandard 48" culvert below Kanakanui Road with an extremely high potential for flooding of adjacent properties should the design-level storm occur. This alternative is also in contradiction with the Project Needs and the stated "Goals, Objectives and Policies" of the latest "Kihei-Makena Community Plan.

For these reasons, Alternative "2" was eliminated in favor of Alternative "1".

C. ALTERNATIVE "3"

Alternative "3" represents the "Delayed Action" Alternative. This Alternative is one in which the construction of the proposed improvements is delayed. Delay of the project will serve no purpose other than to defer the expense of improvements which are currently needed. Delayed action will also maintain the high potential for flooding of adjacent properties, contrary to the best interests of adjacent property owners.

For these reasons, Alternative "3" was also eliminated in favor of Alternative "1".

III. DESCRIPTION OF EXISTING ENVIRONMENT

III. DESCRIPTION OF THE EXISTING ENVIRONMENT:

A. PHYSICAL ENVIRONMENT:

1. Surrounding Environment

The subject property is located in the community of Kihei, on the south coast of the Island of Maui. Kihei is one of the major communities of Maui and provides resort and residential condominiums, along with single family housing units and commercial shopping centers with resort and retail businesses. The Kihei area has grown substantially over the past twenty years

Specific uses and land designations surrounding the subject site include the following (see Figure 4)

- ***North:*** Abutting the property's entire northern boundary are several independent single family residential subdivisions. Present Kihei-Makena Community Plan designation is "Single Family (SF)"

- ***South:*** Abutting the subject property's southeastern boundary is Ke Alii Alanui and the recently opened Kamalii Elementary School. Present Kihei-Makena Community Plan designation is "Public". Abutting the subject property's's southwestern boundary is Ke Alii Alanui and the Kamaole Heights single-family residential subdivision. Present Kihei-Makena Community Plan designation is "Single Family (SF)".

- ***East:*** The property abuts Kanakanui Road, across from which is a long narrow strip of vacant, undeveloped land between Kanakanui Road and Piilani Highway. The Kihei-Makena Community Plan designation is "Open Space (OS)".

- ***West:*** The northwest corner of the western property line abuts the southeast corner of the 280-unit Maui Vista Condominiums and the eastern property line of the 136-unit Pacific Shores condominium. The Maui Coast Hotel abuts the center of the western property line of the subject property. The two other adjacent parcels are currently under construction for Worldmark, The Club, development. The Kihei-Makena Community Plan designation is "Multi-Family (MF)" or "Hotel" for these parcels.

2. Climate

The climate in the South Maui region is influenced by the persistent north-northeasterly trade winds. Average annual temperature in South Maui is 80° F. In Kihei Town, the annual high temperature averages in the high 80's with the low temperature averaging in the high 60's (Atlas of Hawaii, 1983). June through August are historically the warmer months of the year, while the cooler months are January through March.

Average rainfall distribution in the Kihei-Makena region varies from under 10 inches per year to 30-inches per year in the higher elevations. Rainfall in the Kihei-Makena region is highly seasonal, with most of the precipitation occurring in the winter months.

Northeast trade winds prevail approximately 80 to 85 percent of the time. Winds average 10 to 15 miles per hour during afternoons with slightly lighter winds during mornings and nights. Between October and April, the southerly winds of Kona storms may be felt.

In the absence of trade winds and of nearby storms, winds may become light and variable. The diurnal heating and cooling of the land mass gives rise to onshore sea breezes during the day and offshore land breezes at night.

3. Topography and Soils

The project site generally slopes downward from an elevation of 112 feet at the southeast corner to about 56 feet at the makai boundary at a slope of approximately 5%. A natural drainage gully bisects the property in a mauka-makai direction, beginning with an existing 48-inch diameter culvert crossing beneath Kanakanui Road on the mauka side and exiting the western property line roughly 200 feet south of the northwest corner.

Figure 5 shows the Site-Specific Soil Classification Map for the subject property and the adjacent landmarks. The U. S. Department of Agriculture, Soil Conservation Service designates soils within and surrounding the project site as part of the Puuone Series (PZUE). Puuone soils are developed in material derived from coral and seashells. They are typically located on the low uplands on the island of Maui in elevations ranging from 50 to 350 feet. These soils are used for pasture and home sites. The natural vegetation consists of bermuda grass, kiawe and lantana (see Exhibits "B" and "C" for photos of the existing site).

4. Flood and Tsunami Hazard

According to FEMA's Flood Insurance Map (Panel 150003 0265C), with the exception of a short segment of the natural drainage channel on the northwest corner of the property, the Ke Alii project site is located above the flood boundaries investigated by the National Flood Insurance program (Exhibit "A" shows the upper limits of the flood plain study in the Kamaole area of Kihei).

5. Flora and Fauna

Vegetation within the project area is dominated by buffelgrass (see Exhibits"B" and "C" for photos of the existing site).

Avifauna and mammals common to the project site and surrounding areas are also typical of species found in the urbanized Kihei area. Feral mammals typically found in the area include cats, rats, mice and mongoose. Exotic species of birds commonly found in this area include the Northern Cardinal, Common Mynah, Golden Plover, Spotted Dove, House Finch and Gray and Black Francolin.

6. Wetlands

The nearest "Wetlands" sites are located north of Welakahao Street, including the Azeka/Long's 3.5 acre wetland mitigation ponds, which are approximately 2 miles north of the project site.

7. Archaeological Resources

An Archaeological Inventory Survey of the project site was conducted by Xamanek and sent to the State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources (DLNR). This Report was subsequently reviewed and a letter from the SHPD to Xamanek was issued on September 7, 1999. This letter (see Appendix A) states the following:

> ***"The survey has adequately covered the project area, finding a total of 11 historic sites. The background review is good, indicating that this area might have a few temporary habitations and small agricultural sites. Site descriptions are very good, and interpretations are acceptable. Several late 1800s - 1900s ranch walls are present, but only one clearly pre-contact (a temporary***

> ***habitation site: a small rock shelter, 3541, in Kama'ole Gulch). Several of the sites may actually be less than 50 years in age, and may not technically be historic sites."***

The Archaeological Report suggested two mitigating measures, which were acknowledged by the SHPD in the letter as follows:

> ***"We also agree with your proposed mitigation actions. You recommend that site 3541 (the rock shelter of precontact age) be preserved. You indicate that the other 10 sites have had reasonable and adequate amounts of their significant information recorded/collected in the survey and need no further work or protection. We agree, since these are walls, small features with very shallow surface shell scatters of possibly recent age, or structures with deposits of very recent age.***
>
> ***You further suggest that the northwest part of the parcel with deeper sand deposits be archaeologically monitored when any land alteration occurs, just in case burials might be found. Test trenching in this area found no burials or archaeological deposits, but we agree that there is the possibility that a few burials might be found and that monitoring is reasonable."***

In conclusion, the letter states the following:

> ***"In sum, the report is acceptable. With the commitment to preserve site 3541 and to monitor any land alteration in the deeper sands in the northwest part of the parcel, we believe that any development of this parcel will have "no adverse effect" on significant historic sites."***

The Archaeological Mitigation Plans are shown in Appendix A. Figure 2 displays the Preliminary Subdivision Map (including Development and Drainage Plans) including the location of Lot 103, a 1,435 square foot area created for a historic site (Site 3541) and an easement providing public access to that site.

8. Air Quality

Air quality in the Kihei region is considered relatively good. There are no point source in the immediate vicinity and non-point sources (e.g.,

automobiles) of emissions are not significant to generate high concentration of pollutants. The relatively high quality of air can also be attributed to the region's constant exposure to the wind, which quickly disperses concentrations of emissions. Maui is currently in attainment of all criteria pollutants established by the Clean Air Act, as well as the State of Hawaii Air Quality Standards.

The State of Hawaii Air Quality Standards meet or exceed the Federal Air Quality Standards. Air pollutant levels in Hawaii are monitored by a network of sampling stations under the supervision of the State Department of Health (SDOH). On Maui, there are only two stations that are strategically located in Kihei and Paia to be downwind of several sugarcane fields, primarily to monitor sugarcane burning activities. In December, 1995, an air quality study was completed by B. D. Neal & Associates and published in a report entitled, ***"Air Quality Study for the Proposed Kahului Airport Improvements".*** This study concluded that the monitored levels of pollutants in the Maalaea/Kihei area were ***well below the applicable State and Federal standards.***

The northeast trade winds, which prevail approximately 80 to 85 percent of the time, with winds averaging 10 to 15 miles per hour during afternoons helps to disperse any airborne pollutants. The diurnal heating and cooling of the land mass also aids in the dispersal of any airborne pollutants in the area.

9. Noise Characteristics

Traffic noise from Piilani Highway is the predominant source of noise in the locality of the project. Other background noise levels are attributed to natural (e.g., wind) conditions. The following describes the surrounding neighborhood from which other ambient noise sources exist.

- North: Abutting the property's entire northern boundary are several independent single-family residential subdivisions

- South: Abutting the property's southeastern boundary is Ke Alii Alanui and the recently open Kamalii Elementary School, while the Kamaole Heights single-family residential subdivision sits across Ke Alii Alanui at the southwestern corner of the property..

- East: The property abuts Kanakanui Road, across from which is Piilani Highway

- West: The northwest corner of the western property line abuts the southeast corner of the 280-unit Maui Vista Condominiums and the eastern property line of the 136-unit Pacific Shores condominium. The Maui Coast Hotel abuts the center of the western property line of the proposed project, while Worldmark, The Club, abuts the southwestern corner of the proposed project.

The subject property is completely surrounded by developed single-family residential, multi-family condominiums, an elementary school and hotels.

10. Scenic and Open Space Resources

The subject property is situated makai (west) and downhill of the Piilani Highway and Kanakanui Road. Public views include those from Kanakanui Road looking makai (west) toward the ocean (see Exhibit "C", Photos 1 and 2), and from Ke Alii Alanui looking north (see Exhibit "C", Photo 22 and 23). Private views include those from the single family residential subdivisions immediately north of the property, looking south and west (Exhibit "C", Photos 7, 8 and 9, are taken from the top of a small knoll at the highest point inside the property boundary, not from the private subdivision immediately north).

The existing natural drainage channel which bisects the property in the mauka-makai direction provides a natural open space corridor which will be retained. Also, the natural slope of the property, rising at a slope of approximately 5% from an elevation of approximately 56 feet at the makai (west) end up to an elevation of approximately 112 feet at the southeast corner provides view planes typical of the surrounding area.

The 280-unit Maui Vista Condominium, the 136-unit Pacific Shores Condominium and the Maui Coast Hotel exist makai (west) and downhill from and between the Pacific Ocean and the subject property. Construction of Worldmark, The Club, which is immediately below the southwestern corner of the subject property, had not commenced at the time that the photos were taken in August, 1999. Views to the ocean, which is a minimum of 1300 feet from the shoreline, are for the most part obscured by the existing hotel and

condominiums (see Exhibit "C", Photos 6, 7 and 8), and may be further obscured upon completion of Worldmark, The Club.

B. COMMUNITY SETTING:

1. Community Character

The Kihei-Makena Community Plan region includes a diverse range of physical and socio-economic environments. With its dry and mild climate and proximity to recreation-oriented shoreline resources, the visitor-based economy has grown steadily over the past few years. The town of Kihei serves as the commercial and residential center of the region with the master-planned communities of Wailea and Makena serving as the focal point for visitor activities.

2. Population

The population of the County of Maui has exhibited relatively strong growth over the past decade with a 1996 population of 117,013, a 16.6% increase of the 1990 population of 100,374 (U.S. Bureau of Census, 3/20/97). The 1990 population of Maui Island was 91,361. Growth in the County is expected to continue, with resident population projected to the Years 2000 and 2010 estimated to be 124,562 and 145,872, respectively (Community Resources, Inc., January, 1994).

The 1990 population of the South Maui District was 15,365, which is 16.8% of Maui Island's population. South Maui's de facto population for 1990 was 31, 444 (Community Resources, Inc., March, 1994). The projection of the resident population for the Years 2000 and 2010 are 20,092 and 24,846, respectively (Community Resources, Inc., January, 1994)

3. Economy

The South Maui economy is based primarily upon the visitor industry. Visitor accommodations are located near the shoreline along with necessary support facilities and residential communities. Wailea has developed into an important visitor destination anchor while Kihei has developed into the region's visitor, service, commercial and residential center.

Support for the visitor industry is found in Kihei, where numerous retail commercial centers are found. New commercial centers in Kihei, such as the

Piilani Commercial Center and The Shops at Wailea in Wailea, both of which are now under construction, lend further support to the regional economy and the need for more residential housing.

4. Police and Fire Protection

The Maui Police Department (MPD) consists of five (5) patrol divisions and includes 410 employees. These divisions provide police services through its Hana, Lahaina, Lanai, Molokai and Wailuku districts. On Maui, the MPD includes 373 administrative, patrol and support personnel.

Police services for the Kihei-Makena subdistrict are currently provided by patrol officers on assignment from the Wailuku Patrol Division. Each eight (8) hour watch is staffed by a minimum of four (4) patrol officers.

Fire prevention, protection and suppression services are provided by the Maui Fire Department's (MFD) Kihei, Station. Situated approximately one mile north of the project site, the Kihei Fire Station is equipped with a 1,500 gallon pumper, and is staffed by one (1) captain and five (5) firefighters per twenty-four (24) hour shift. There are future plans to build a second South Maui Fire Station at the intersection of Kilohana Drive and Piilani Highway.

5. Medical Facilities

Maui Memorial Hospital, the only major medical facility on the island, services the Kihei-Makena region. Acute, general and emergency care services are provided by the 185-bed facility, which is located in Wailuku. Several Kihei clinics, and dental and medical offices provide local health care services for Kihei-Makena residents and visitors.

6. Recreational Facilities

The South Maui area has a wide reputation as a recreational destination, particularly for ocean-related activities. Ocean sports and recreation available in the South Maui District include swimming, fishing, surfing, scuba diving, snorkeling, sailing and para-sailing. State and County beach parks in the South Maui District include the Maipoina oe lau Beach Park, Kalama Beach Park, Kamaole Beach Park, Ulua Beach, Wailea Beach, Polo Beach, Makena Beach Park and Ahihi-Kinau Marine Reserve, including the northern portion of La Perouse Bay.

Wailea Resort offers numerous recreational amenities including three (3) golf courses, a tennis center, and two (2) public beach parks and an approximately 1.75 mile long coastal beach. Makena offers an additional golf course and tennis center.

Less than 2 miles north on Piilani Highway is the Silversword Golf Course and the recently-completed Kihei Community and Aquatic Center which also offers a 50-meter swimming pool.

The Kihei Small Boat Landing Ramp near Kamaole Beach Park is also available to the general public for off-shore boating activities.

7. Schools

The Kihei District is served by both private and public schools, which provide education for preschool through intermediate school age children. High schools are located in Wailuku and Kahului. There are various private schools in the Kihei District for grades kindergarten through eight along with several preschools.

The Kamalii Elementary School is located immediately across Ke Alii Alanui from the proposed subdivision. The Department of Education was contacted on February 24, 2000. Mr. Alan Honma of the DOE [Phone No.: (808) 733-4862] stated that the current enrollment in Kamalii Elementary School is 872 students in the 1999-2000 academic year. He further stated that since Kamalii Elementary School was designed as a "Year-Round" facility, it can accommodate 1051 students per year. Therefore, there s adequate room to accommodate the projected 20 additional students estimated by the DOE for a 95-lot subdivision. As the subdivision will allow up to half (50%) of the lots to permit "ohana" dwellings, 30 additional students could be projected to attend Kamalii Elementary School. (Refer to Sections "L(1)", "L(2)" and "L(16)" for more detailed comments on school capacity by the Planning Department, State Land Use Commission and Department of Education).

The nearest public Intermediate School to the proposed subdivision is Lokelani Intermediate School at the corner of Lipoa Avenue and Piilani Highway. Future residents of the proposed subdivision are in the public school district leading to attendance at Maui High School in Kahului.

The projected enrollment for academic year 200-2001 for Lokelani Intermediate School and Maui High School are as follows:

Lokelani Intermediate School:	679 student
Maui High School:	1751 students

8. Solid Waste

Only two landfills are currently operating on Maui, the Central Maui Landfill in Pulehu, and the Hana landfill. Single-family residential waste collection service is provided by the County of Maui on a once-a-week basis. Residential solid waste collected by County crews are disposed at the County's 55-acre Central Maui Landfill located four miles southeast of the Kahului airport. In addition to County-collected refuse, the Central Maui Landfill accepts commercial waste from private collection companies.

C. INFRASTRUCTURE

1. Roadway System

Piilani Highway is the main north/south arterial highway linking Kihei to other urban areas of Maui. Piilani Highway is a two-lane undivided highway owned and maintained by the State. It contains 12-foot wide travel lanes in each direction with 10-feet wide paved shoulders. Kihei Road is a two-lane collector that parallels Piilani Highway along a more coastal route.

Ke Alii Alanui was recently constructed by the County and abuts the south boundary of the project site (see Exhibit "C", Photos 17 through 21). It serves as a major east-west collector road that connects Piilani Highway and South Kihei Rod. Ke Alii Alanui along the project frontage presently consists of a 40-feet right-of-way, two 12-feet lanes, curb and gutter on both sides, and a four feet wide sidewalk on the south side. The intersection of Piilani Highway and Ke Alii Alanui is presently signalized with appropriate turn lanes and approaches.

Kanakanui Road is a narrow substandard County road that parallels Piilani Highway along the easterly boundary of the Project site (see Exhibit "C", Photos 15 and 16). The intersection of Kanakanui Road and Ke Alii Alanui is stop-controlled and is not signalized.

2. Water

The project site, which is located in the northwest corner of the intersection of Kanakanui Road and Ke Alii Alanui, is situated in the Kihei mid-level

service area. Storage for this area in upper Kamaole is provided by the recently-installed 2.0 MG Kamaole reservoir at elevation 311 feet.

The sources of water for this mid-level service area (MLS) are wells located in Upper Waiehu and North Waihee. The North Waihee wells were recently developed by the Department of Water Supply to augment the Upper Waiehu wells. These wells draw water from the heretofore undeveloped Waihee aquifer. Each well has a pumping capacity of 1.0 to 1.5 MGD. Two more wells in North Waihee, referred to as Kapuaa Well 1 and Kanoa Well 1, have also been drilled, tested, and are scheduled to be operational later this year pending acquisition of appropriate easements from the land owner.

A 24-inch transmission line, 1.0 MG storage tank, and a pair of booster pumps have been installed to interconnect this new source to the Upper Waiehu well source and transmission system. Water from the Upper Waiehu and North Waihee well sources is transported by gravity to the Kamaole area via a series of 42", 36" and 30" transmission lines. The 2.0 MG Kamaole tank (see Exhibit "C", Photo 11) is fed by the 30-inch transmission line on Kanakanui Road and conveyed back to the vicinity of Ke Alii Alanui and project site by means of a 12-inch distribution system.

3. Drainage

The project site generally slopes downward from an elevation of 112 feet at the southeast corner to about 56 at the makai boundary. This translates to an approximate cross slope of around 5%. A drainage gully bisects the property in a mauka-makai direction. According to the "Hydrology Report for Piilani Highway" prepared by Trans-Meridian Engineers and Surveyors, Inc., there are three tributary areas 21, 22 and 22a located above Piilani Highway that drain into the existing gully.

The 50-year recurrence interval storm runoffs from areas 21, 22 and 22a were computed to be 399 cfs, 363 cfs, and 91 cfs, respectively, for a total of 853 cfs. The 50-year storm runoff was adopted by the State to design their drainage structures across Piilani Highway. Using the NRCS (SCS) Method, our calculations indicate that for a 50-year recurrence interval storm, runoff from the same three basins is approximately 769 cfs. The existing 48-inch diameter culvert on Kanakanui Road is obviously too small to handle this flow (see Exhibit "C", Photos 3, 13 and 14, which display the twin 96" and four 36" culverts and drainage channel upstream of the existing property, and Photo 12, which displays the 48-inch culvert into which the runoff is

currently directed). Based on the NRCS (SCS) TR 20 Hydrograph method, total runoff from contributory basins above the project site for a 100-year/24-hour recurrent interval rainfall is estimated to total 1082 cfs.

Peak runoff from the 24 acre project site under its present undeveloped condition for a 50 year storm totals approximately 21 cfs.

According to FEMA's Flood Insurance Map, with the exception of a short segment of the natural drainage channel on the northwest corner of the property, the Ke Alii project site is located above the flood boundaries investigated by the National Flood Insurance program (Exhibit "A" shows the upper limits of the flood plain study in the Kamaole area of Kihei).

4. Wastewater System

There is an 8-inch sewer line on Ke Alii Alanui. This line was installed when Ke Alii Alanui and Kamalii Elementary Intermediate School were constructed a few years ago. There is also an 8-inch sewer line at the northwest corner of the project site. This line is located within a sewer easement that runs along the south boundary of the Maui Vista Condominium property and connects to the 10-inch gravity interceptor on South Kihei Road.

A series of gravity collectors, pump stations and force mains then transport wastewater collected on South Kihei Road to the Kihei Wastewater Reclamation Facility (KWRF) located above Piilani Highway south of Silversword Golf Course for processing and disposal.

5. Electrical and Telephone System

There are overhead electrical and telephone distribution systems along Kanakanui Road. The distribution system along Ke Alii Alanui were installed underground when this road was constructed. It presently serves the subdivision on the south side of Ke Alii Alanui.

IV. POTENTIAL IMPACTS AND MITIGATION MEASURES

IV. POTENTIAL IMPACTS AND MITIGATION MEASURES:

A. IMPACTS TO THE PHYSICAL ENVIRONMENT:

1. Surrounding Uses

As mentioned in Section III(A)1 above, specific uses and land designations surrounding the subject site include the following (see Figure 4)

- ***North:*** Abutting the property's entire northern boundary are several independent single family residential subdivisions. Present Kihei-Makena Community Plan designation is "Single Family (SF)"

- ***South:***Abutting the subject property's southeastern boundary is Ke Alii Alanui and the recently opened Kamalii Elementary School. Present Kihei-Makena Community Plan designation is "Public". Abutting the subject property's's southwestern boundary is Ke Alii Alanui and the Kamaole Heights single-family residential subdivision. Present Kihei-Makena Community Plan designation is "Single Family (SF)".

- ***East:*** The property abuts Kanakanui Road, across from which is a long narrow strip of vacant, undeveloped land between Kanakanui Road and Piilani Highway. The Kihei-Makena Community Plan designation is "Open Space (OS)".

- ***West:*** The northwest corner of the western property line abuts the southeast corner of the 280-unit Maui Vista Condominiums and the eastern property line of the 136-unit Pacific Shores condominium. The Maui Coast Hotel abuts the center of the western property line of the subject property. The two other adjacent parcels are currently under construction for Worldmark, The Club, development. The Kihei-Makena Community Plan designation is "Multi-Family (MF)" or "Hotel" for these parcels.

Given the land use designations above, the proposed project should have no significant negative impact with regards to land use patterns in the area, as the proposed project and the surrounding parcels have similar and compatible uses.

2. Flora, Fauna and Wetland Considerations

Vegetation types found on this site consist primarily of introduced species and does not include any rare, threatened or endangered native plants. There are no known endangered or threatened wildlife species in this region. (Refer to Photos 1 through 24 in Exhibit "C" to get an idea of the existing flora and fauna).

The nearest "wetlands" sites are located north of Welakahao Street, including the Azeka/Long's 3.5 acre wetland mitigation ponds, which are approximately 2 miles north of the project site. ***There are no wetlands on the proposed Project Site.***

3. Archaeological Resources

As mentioned in Section III(A)7 above, an Archaeological Inventory Study was performed by Xamanek and sent to the State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources. The Report was subsequently reviewed and a letter from the SHPD to Xamanek was issued on September 7, 1999 (see Appendix A) That SHPD letter states ***"With the commitment to preserve site 3541 and to monitor any land alteration in the deeper sands in the northwest part of the parcel, we believe that any development of this parcel will have 'no adverse effect' on significant historic sites"***

The Archaeological Mitigation Plan is attached in Appendix A. This Plan was developed by Xamanek in March, 2000, and recommends the following for the preservation of the Site 3541 Rock Shelter:

Short-Term Preservation

(1) An interim buffer be established around the rock shelter prior to construction.

(2) Orange construction fencing be placed along the southern top of the gulch in the vicinity of the shelter to ensure damage from bulldozer push from above.

(3) A 75-foot long fence along the southern side of the gulch be constructed

(4) A 30 foot diameter buffer area around the site itself marked by construction fencing be erected

Long-Term Preservation

(1) Signage to identify the site in compliance with the size (1.5 ft x 1.0 ft), heading and text recommended by Xamanek

(2) Use of only hand-held equipment for any maintenance in the vicinity of the site

Figure 2 displays the Preliminary Subdivision Map (including Development and Drainage Plans) including the location of Lot 103, a 1,435 square foot area created for historic Site 3541, and an easement providing public access to that site. This lot will be maintained by the Homeowners Association as a common area.

Monitoring of the land in the deeper sands in the northwest part of the project site will be done as recommended and outlined in the Archaeological Monitoring Plan, which was also prepared by Xamanek and is included in Appendix A of this Final EA Report.

4. Air Quality

Air quality impacts attributed to the proposed project could include dust generated by the *short-term* construction-related activities. Site work such as grading, for example, could generate airborne particulate. Clearing and grubbing will be limited to 15 acres at a time, consistent with provisions of the County Grading Ordinances. Dust control measures such as regular watering, sprinkling and the installation of dust screens will be implemented to minimize the potential impact from wind-blown emissions. (Refer to Section "L(11)" for details of a Best Management Practice program for dust and erosion control, together with Construction Plan Sheets "37" and "38", which give details on silt fences, filter berms, cleaning pads, dust fence and their location, which were formulated in response to comments from the Department of Health)

In the *long-term*, the increase in the number of residents will result in a slight increase in the volume of traffic in the project's vicinity, which in turn could affect the air quality. However, this increase is not considered significant when compared to the overall amount of vehicles in this area and current

ambient air quality (refer to Section III.A.8 for a detailed discussion of the current air quality)

Assuming a minimum of one vehicle per household, there will be an increase of 150+ cars in the area when fully built out. However, as the northeast trade winds prevail approximately 80 to 85 percent of the time, with winds averaging 10 to 15 miles per hour during afternoons and slightly lighter winds during mornings and nights, any airborne pollutants should readily disperse. In the absence of trade winds during periods of "Kona" storms, there may be some build-up of airborne pollutants. However, these storms are typically of relatively short durations (2-3 days). Further, the diurnal heating and cooling of the land mass should help to disperse any pollutants in the mornings and evenings after peak traffic periods. As such, the proposed project is not anticipated to be detrimental to local air quality.

5. Noise

In the *short-term*, the proposed project could generate some adverse impacts during construction. Noise from heavy construction equipment, such as bulldozers, front-end loaders and material-carrying trucks and trailers, would be the dominant source of noise during the construction period.

To minimize construction-related impact to the surrounding property owners, the developer proposes to limit construction activities to normal daylight working hours, and to adhere to the State Department of Health's noise regulations for construction equipment. In addition, the proposed site plan has been designed to follow existing topography to the greatest extent practical. This lessens the need for extensive cut and fill operations, which in turn lessens the potential for negative noise impacts.

In the *long-term*, the project, once completed, is not expected to have any adverse impact upon the existing noise conditions in the Kihei area. The Landscaping Plan (see Figure 3) calls for a dense, 6-ft high Hibiscus hedge surrounding the eastern and southern property boundaries between Kanakanui Road and Ke Alii Alanui, respectively. This hedge, as well as the numerous plantings of Hawaiian Kou, Monkeypod trees, and the expected grass lawns on the homeowners property will certainly contribute to quieting typical "backyard noises" in single-family residential subdivisions.

The following describes the surrounding neighborhood from which other ambient noise sources currently exist.

- ***North:*** Abutting the property's entire northern boundary are several independent single-family residential subdivisions

- ***South:*** Abutting the property's southeastern boundary is Ke Alii Alanui and the recently open Kamalii Elementary School, while the Kamaole Heights single-family residential subdivision sits across Ke Alii Alanui at the southwestern corner of the property..

- ***East:*** The property abuts Kanakanui Road, across from which is Piilani Highway

- ***West:*** The northwest corner of the western property line abuts the southeast corner of the 280-unit Maui Vista Condominiums and the eastern property line of the 136-unit Pacific Shores condominium. The Maui Coast Hotel abuts the center of the western property line of the proposed project, while Worldmark, The Club, abuts the southwestern corner of the proposed project.

The proposed subdivision will add another 95 (up to 142, including maximum Ohana) single-family units to this area which now consists of a mixture of single-family residential units, multi-unit condominiums, elementary schools and hotels. Noise levels emanating from the proposed subdivision are not expected to be at levels which are any higher than those that currently exist in the immediate surrounding area.
(Refer to Section "L(11)" for comments made by the Department of Health regarding "Noise Concerns" during construction; the Contractor will comply with the listed Administrative Rules for both "Community Noise Control" and "Vehicular Noise Control for Oahu" as referred to in that letter)

6. Scenic and Open Space Resources

Impacts to views from Piilani Highway and Kanakanui Road will be minimal and consistent with the Maui County Code, Chapter 19.08 "Residential Districts", Section 19.08.050, "Height Regulations",

"No building shall exceed two stories nor thirty-feet in height."

The project's design objectives are to create an attractive single family residential subdivision with attractive landscape planting and site planning that will ensure a quality project that complements the existing urban design character of the Kihei area. Thus, in terms of urban design and scenic

resources, the project is considered to have a positive effect upon the visual character of the site and its immediate surroundings.

As mentioned in Section III.A.10 above, public views include those from Kanakanui Road looking makai (west) toward the ocean, and from Ke Alii Alanui looking north. Private views include those from the single family residential subdivisions immediately north of the property, looking south and west.

In order to get some idea of the scenic public and private view planes, two Figures were prepared as follows. Figure 8 shows the location of two typical view planes. View 1 includes views from a person standing on Kanakanui Road, looking mauka (west) toward the ocean, with hypothetical "building pads" placed on the lots crossing this view plane. Similarly, View 2 includes views from a person standing on Ke Alii Alanui looking north, as well as a person standing in the single-family subdivision immediately to the north of the project, looking south, with hypothetical "building pads" placed on the lots crossing this view plane.

Figure 9 shows the corresponding profiles for both View 1 and View 2, showing the "lines of sight" both "above the roof for single-story buildings" and "between buildings for single story buildings". The profile for possible two-story buildings is also superimposed

The visual impact should therefore be typical of single-family residential subdivisions, and is aided by the 5% cross-slope across the project site.

B. IMPACTS TO COMMUNITY SETTING

1. Land Use and Community Character

As discussed in detail in Section I(E) and I(F), and in Sections III(A)1 and III(B)1, the proposed project is consistent with the designated Land Uses at the State, County and Kihei-Makena Community Plan levels, as well as consistent with the overall Community Character of the Kihei-Makena area.

2. Population

The proposed project will add a much needed 95 single family homes to the residential core of the Kihei area. According to the Atlas of Hawaii, Third Edition, 1998, ***"Hawaii's average household size is steadily shrinking:***

in 1990 it was 3.01 persons, compared with 3.15 in 1980, 3.87 in 1960 and 4.46 in 1940". Based on this estimate of average household size, accounting for a maximum number of "ohana" housing for half (50%) of the lots, the project can accommodate 429 residents (1.5 households including ohanas x 3.01 persons per household x 95 lots = 429 residents).

This is *less than 1.4%* (429/31,444 = 0.0136 => 1.36%) of the de facto population in South Maui ten years ago. Given the reported 16.6% growth increase in the County of Maui's population over a 6-year span, this is *not a significant impact* on the local population levels, and should be considered a welcome addition to the Kihei Community.

3. Police, Fire and Medical Services

The proposed project will not extend the existing service area limits for emergency services. Comments were received on an intra-departmental memorandum from Maui Police Officer Bradney Hickle to Maui Police Chief Tom Phillips (refer to Section "L(9)" for a full copy of the memorandum). The concerns raised were primarily related to traffic congestion, signage and roadway design. These are discussed in more detail in "Section C, Impacts to Infrastructure, 1. Roadways", which follows. While the memorandum describes Officer Hickle's observations of the existing situation, it does not state or imply that any additional Police manpower would be required (e.g., for issuing parking or speeding tickets - approximately 1 moving violation per day per Officer Hickle's memo).

Comments were also received from the Department of Fire Control regarding two design requirements as follows:

(1) Fire access roads must be provided when any building is located more than 150 feet from fire department vehicle access

(2) Fire hydrants (or standpipes) capable of supplying required fire flow must be located no farther than 150 feet from the nearest part of the building pad

Based on these requirements, the fire hydrant locations were modified to comply with the requirements, and a Fire Hydrant Layout Plan and close-up map showing locations of fire hydrants near private access roads in the

proposed project were sent to the Department of Fire Control. (Refer to Section "L(10)" for copies of this correspondence.)

4. Recreation

The proposed residential subdivision is not anticipated to have any significant impact upon existing recreation facilities and services in the region. The South Maui area has a wide reputation as a recreational destination, particularly for ocean-related activities. Ocean sports and recreation available in the South Maui District include swimming, fishing, surfing, scuba diving, snorkeling, sailing and para-sailing. State and County beach parks in the South Maui District include the Maipoina Oe lau Beach Park, Kalama Beach Park, Kamaole Beach Park, Ulua Beach, Wailea Beach, Polo Beach, Makena Beach Park and Ahihi-Kinau Marine Reserve, including the northern portion of La Perouse Bay.

Wailea Resort offers numerous recreational amenities including three (3) golf courses, a tennis center, and two (2) public beach parks and an approximately 1.75 mile long coastal path. Makena offers an additional golf course, and tennis center.

Less than 2 miles north on Piilani Highway is the Silversword Golf Course and the recently-completed Kihei Community and Aquatic Center which also offers a 50-meter swimming pool. The Kihei Small Boat Landing Ramp near Kamaole Beach Park is also available to the general public for off-shore boating activities.

Also, a 15 acre regional park site, hereinafter referred to as the "Kihei Regional Park" is planned and will be located across Piilani Highway and immediately northeast of the Ke Alii Subdivision. This will add yet another large recreational facility in the Kihei area.

In short, given the myriad of parks and recreational facilities in the South Maui region alone, the additional impact of the future residents of the proposed single-family residential subdivision should be insignificant on the existing recreational facilities and services.

An onsite park/detention basin will also be constructed near the northwest corner of the lot for use by Homeowners. A plan view drawing and profile for a corresponding section on the plan are shown in Section "L(1)". The park/detention basin will be approximately trapezoidal in shape, 119± feet

long and 59± feet wide at its narrowest point. A 10-foot wide access road (with 15% slope) will provide ramp access into the park, while a concrete stairway off the street will provide conventional access.

The park will be a passive park, which will be privately owned and maintained by the Homeowners Association. The general public will be able to use the park except when individual homeowners reserve the park through the Homeowners Association for private activities. The general public will not be able to reserve the park for their private events through the Homeowners Association. Rules for use and reservation of the park by Homeowners will be included in the Bylaws and CC&Rs. (Refer to correspondence in Sections "L(1)" and "L(8)" for more details on the park site in response to comments from the Planning Department and Parks and Recreation)

5. Solid Waste

The proposed project will not extend the existing service area limits for County-collected refuse. Based on a typical estimated solid waste generation of 55 lbs per week per residence (phone call to the Public Works and Waste Management Department, Solid Waste Division on 8/13/1999), the Ke Alii Subdivision will generate approximately 55 x 95 = 5225 lbs of solid waste per week. Solid waste disposal fees are paid for by each participating household.

A Solid Waste Management Plan has been prepared and issued to the Department of Health. To summarize, the developer's Solid Waste Management Plan includes the following actions:

- *"o The dry brush will be grubbed and hauled to a property permitted recycling facility such as Campaign Recycle Maui.*
- *o The kiawes will be offered to various individuals for use as firewood. Any remaining kiawe waste will be composted on site for future landscape use or will be deposited to a proper recycling facility.*
- *o Any discarded vehicles or miscellaneous items will be taken to Maui Scrap Metal or any properly permitted recycling facility*

- ***We will at all times try to recycle any materials found during site construction. There will be no exporting of soil as the sitework requires importing fill materials."***

(Refer to Section "L(11)" for a copy of this correspondence).

6. Schools

The proposed 95-lot single-family residential subdivision is not anticipated to significantly affect school enrollment. Based on a phone conversation on 8/16/1999 with a Business and Facility Specialist, Mr. Sanford Beppu, of the DOE, the following statistics are expected for student enrollment per 100 single-family homes (prorated to 95 lots):

Elementary School:	21 students x 95/100 =	20 students
Intermediate School:	9 students x 95/100 =	9 students
High School:	10 students x 95/100 =	10 students

As the subdivision will allow up to half (50%) of the lots to permit "ohana" dwellings, the above numbers would correspondingly increase by 50% (e.g., 30 Elementary School students, 14 Intermediate School students, and 15 High School Students).

The Department of Education was contacted on February 24, 2000. Mr. Alan Honma of the DOE [Phone No.: (808) 733-4862] stated that the current enrollment in Kamalii Elementary School is 872 students in the 1999-2000 academic year. He further stated that since Kamalii Elementary School was designed as a "Year-Round" facility, it can accommodate 1051 students per year.

Therefore, there is adequate room to accommodate the projected 30 additional Elementary School students. (Refer to Section "L(2)" for more details on the capacity of schools in response to comments from the State Land Use Commission).

Based on a phone call on June 19, 2000, to Ms. Helen Fukugawa, Deputy District Superintendent, Maui [Phone No.: 984-8011], the projected attendance for academic year 2000-2001 for Lokelani Intermediate School and Maui High School are as follows:

Lokelani Intermediate School:	679 students

Maui High School	1751 students

Based on a phone conversation on June 20, 2000, with Ms. Marion Muller, Principal of Lokelani Intermediate School [Phone No.: 875-6800], when all planned school buildings are completed, Lokelani Intermediate School will have a capacity of 900 students. It should therefore be able to accommodate the estimated 14 additional Intermediate School students.

Based on a phone conversation on June 19, 2000, with Mr. Eugene Kennedy, Registrar at Maui High School [Phone No.: 873-3000], in past years Maui High has accommodated up to 1850 students. It should therefore be able to accommodate the estimated 15 additional high school students.

C. IMPACTS TO INFRASTRUCTURE

1. Roadways

Preliminary Project Plans call for the present 40-foot right-of-way to be widened by 40 feet to 80 feet (see Exhibit "C", Photos 17 through 21). The pavement along the project frontage will also be widened by 30 feet in the makai-bound direction to provide one (1) 12-feet lane (plus a turn lane) and one 6-foot bike lane (including gutter) with shoulders. Curb, gutter and a 4-feet sidewalk will also be added on the north side shoulder of Ke Alii Alanui.

Kanakanui Road will also be widened along the project frontage (see Exhibit "C", Photos 15 and 16). Curb and gutter and a four-feet wide sidewalk will also be added along the project frontage.

In addition to the above, the developer will be dedicating a 22-feet wide strip of land for the North-South Collector Road along the makai or westerly boundary of the project site to accommodate a future two-lane road with bike lanes. None of the subdivision streets will be connected to this future road.

Access to the project site will be provided form Kanakanui Road and Ke Alii Alanui. These two subdivision streets will be interconnected near the northwest corner of the project, forming a continuous loop. Subdivision streets will have a right-of-way of 44 feet with a curb-to-curb travelway of 28 feet (including gutter) and 8-feet shoulders on both sides. A 4-feet wide sidewalk will be installed on one side.

A Traffic Impact Assessment Study was recently completed for the Ke Alii Alanui Subdivision by Parsons Brinckerhoff Quade & Douglas, Inc. In this Study, estimates of the Level of Service (LOS) of traffic were prepared for the Year 2001 (the expected date of project build-out) for each of the unsignalized and signalized intersections in the immediate vicinity of the proposed project site considering expected traffic patterns both with and without the proposed project.

This Study concluded:

> ***"The results of the traffic analysis show that the proposed development will not change any intersection levels of service within the study area. The Kanakanui Road approach to Piilani Highway is projected to experience some delay with or without the proposed developments. The proposed development is not projected to increase intersection approach delay significantly on Kanakanui Road.***
>
> ***The intersection of Ke Alii Alanui and Piilani Highway is projected to operate well with and without the proposed development. The additional traffic volume is not projected to change future intersection levels of service. The queue on Ke Alii Alanui at Piilani Highway is not projected to increase the expected queue beyond the existing queue length.***
>
> ***It is, therefore, concluded that the single-family parcel can be accommodated by the roadway system anticipated to be in place at its build out."***

It is important to recognize that this September, 1999, Study recognized that the Kamaole Heights Subdivision was then currently under construction, and Worldmark, The Club had been recently approved. Traffic volumes generated by both developments were added to the background traffic volumes. Traffic volumes for Kamaole Heights were generated and distributed in a similar procedure to the proposed development. The traffic volumes for Worldmark, The Club were taken from the 1997 Traffic Impact Assessment Report (TIAR) prepared for Worldmark, The Club. Also, the new traffic signal at the intersection of South Kihei Road and Ke Alii Alanui was also recognized in the TIAR for the proposed project.

This Report also provided recommendations that identified specific roadway improvements that help to enhance traffic operations and to protect existing development in the vicinity of the proposed single-family parcel which are consistent with the construction plans of the proposed development, as follows:

Site Access to Ke Alii Alanui (see Figure 6)

> ***"The driveway to Ke Alii Alanui is proposed to be located 425 feet west of Kamalii Elementary School entrance ... It will be a full-movement intersection with STOP-sign control at the single-family parcel driveway. This intersection spacing exceeds minimum spacing usually required by the Maui County Department of Public Works and Waste Management.***
>
> ***As part of the single-family development, Ke Alii Alanui will be widened and improved on its north side along the frontage of the single-family parcel. Curb and gutter will be installed along this frontage. The improved roadway will be 30-feet wide in the makai-bound direction along the frontage of the proposed single-family parcel. This will provide enough roadway width to allow the installation of a median left turn lane, a 12-foot wide through lane, along with a 6-foot bike lane in the westward direction."***

Site Access to Kanakanui Road (see Figure 7)

> ***"The second access to the single-family parcel is located on Kanakanui Road and is proposed approximately 600 feet north of the Ke Alii Alanui. It will be a full-movement intersection with STOP-sign control at the single-family parcel driveway.***
>
> ***As part of the single-family development, Kanakanui Road will be widened and improved on its west side along the frontage of the single-family parcel. Curb and gutter will be installed along this frontage. The improved roadway will be 36-feet wide measured from face of curb to edge of pavement along the frontage of the proposed single-family parcel. This will provide enough roadway width to allow the installation of a median left-turn lane for traffic turning into the single family [parcel]."***

Appendix C provides a copy of the Traffic Impact Assessment Study Report in its entirety.

Comments were received on an intra-departmental memorandum from Maui Police Officer Bradney Hickle to Maui Police Chief Tom Phillips (refer to Section "L(9)" for a full copy of the memorandum), primarily stating that he believes that "adding 40 to 180 new vehicles to the area of Ke Alii Alanui Road/Kanakanui Road will greatly increase the traffic problems and the hazards to motorists and pedestrians". His comments were forwarded to Parsons Brinckerhoff (PB), the consultant who prepared the "Traffic Impact Analysis Update for the Ke Alii Single-Family Units", September, 1999. After reviewing these concerns, Mr. Wayne Yoshioka, Manager of Transportation Planning/Traffic Engineering, addressed each of these concerns. His letter summarizes as follows:

> ***"We believe this letter addresses the issues that Officer Hickle raised in his memorandum.***
>
> ***First, Ke Alii Single-Family Units development will generate very little traffic impact. Intersection analysis show that traffic from the development would not change the level of service at the intersections of Alanui Ke Alii. It contributes about 10 percent of the traffic projected for Alanui Ke Alii and a very small percentage on the traffic on South Kihei Road and Piilani Highway.***
>
> ***Second, many of the issues are related to existing traffic issues connected with the operation of Kamalii Elementary School. It is appropriate and desirable for Kamalii Elementary School to conduct the recommended internal traffic circulation study, the school crossing study, and the school speed zone study to enhance the safety for students attending the school."***

(Refer to Section "L(9)" for this correspondence).

In addition, Officer Hickle's concern regarding traffic congestion will be addressed as noted below.

Comments related to Traffic Study were also received from the Environmental Center at the University of Hawaii at Manoa. In response to these comments, roadway improvements were described as follows:

"The improvements to Ke Alii Alanui on the south side of the property include each of two 6-foot wide bicycle lanes adjacent to each of the mauka-bound and makai-bound traffic lanes. In addition, the Kihei-Makena Community Master Plan includes a North-South Collector Road which will eventually support two 6-foot wide bicycle lanes and two traffic lanes. The North-South Collector Road will eventually provide bicycle lanes going from Uwapo Road in North Kihei to Kilohana Drive at the Wailea border - a distance of approximately 6 miles. The 22-foot wide strip at the western border of the Ke Alii Subdivision will be donated by Spencer Homes to the County of Maui for this purpose.

In addition, two significant improvements to the traffic flow entering and existing Kamalii Elementary School are proposed as part of this project. First, the existing makai-bound left-hand turn lane into Kamalii Elementary School will be lengthened to accommodate more cars turning into Kamalii Elementary School. Second, in the mauka-bound direction, a second lane will be provided on Ke Alii Parkway for school-bound traffic. This will eliminate the bottleneck that currently exists at the start and end of classes as parents queue to take a right-hand turn into the Kamalii Elementary School parking lot from the one available lane on Ke Alii Parkway. Both of these proposed improvements are shown in the attached figure entitled, "Ke Alii Subdivision Proposed Improvements to Ke Alii Parkway/Kanakanui Road Intersection".

(Refer to Section "XI.A" for this correspondence including the "attached figure" referred to immediately above).

2. Water and Wastewater

The 95-lot subdivision project is expected to generate 33,600 to 38,000 gpd of wastewater when fully built out. The existing collection, transmission and treatment facilities have ample capacity to handle this flow. Since these facilities were recently upgraded, the developer will be fulfilling his obligation for this upgrade by paying a one-time assessment of approximately $4.65 per gallon of additional wastewater generated by the project and $0.80 per gallon for off-site transmission improvements.

Comments were received from the Department of Water Supply encouraging consideration of water conservation measures. Those recommendations will be included as part of the Homeowner's CC&Rs. (Refer to Section "L(15)" for this correspondence).

Comments were also received from the Department of Public Works and Waste Management relating to availability of wastewater system capacity and assessment fees for treatment plant expansion costs and off-site improvements. The developer agrees to pay the one-time assessment fees for treatment plant expansion as well as off-site improvements. (Refer to Section "L(7)" for this correspondence).

3. Drainage

After development, peak runoff from the project site is expected to total 44 cfs for a net increase of 23 cfs over current flow. This additional runoff will be intercepted by an offsite storm drain system and directed into a subsurface detention facility located at the northwest corner of the project site. This subsurface system, in combination with storage in the proposed park site, will be designed to keep the post-development flow equal to or less than the current runoff from the project site.

The park site will be bermed at the perimeter to serve as a detention basin. A plan view drawing and profile for a corresponding section on the plan are shown in Section "L(1)". The park/detention basin is approximately trapezoidal in shape, 119+ feet long and 59+ feet wide at its narrowest point. The bottom of the basin will be 5 feet below the top of the berm. Total storage capacity is approximately 267,800 gallons.

A 10-foot wide access road (with 15% slope) will provide ramp access into the park, while a concrete stairway off the street will provide conventional access. A subsurface 72-inch perforated pipe will provide additional initial storage.

The release line from the subsurface facility will be sized to limit the release into the channel to volumes which are equal to or less than current runoff volumes from the entire project site. The park area itself will be fully grassed, provided with an irrigation system to keep it usable as a mini-park, except during periods of heavy and prolonged rainstorm. (Refer to correspondence in Sections "L(1)" and "L(8)" for more details on the park site

in response to comments from the Planning Department and Parks and Recreation)

The existing drainage channel bisecting the entire project site will be preserved as a drainage way and designed to accommodate runoff from a 100 year-24 hour storm. Selected areas of side slopes beyond the 100-year inundation limits will be reshaped utilizing rocky material from rock excavation on site. The existing 48-inch culvert on Kanakanui Road will be replaced with a larger culvert to handle the total offsite runoff for a 100-year recurrence storm.

Comments were received from the State Land Use Commission requesting an explanation of the relationship between the Haleakala Ranch/Maui Research and Technology Park drainage and its effect, if any, on the proposed single-family residential subdivision. In response, a figure was prepared showing that the drainage watershed area for the Haleakala Ranch/Maui Research and Technology Park are completely isolated from the drainage watershed area for the project site. (Refer to Section "L(2)" for this correspondence and the figure referred to)

Comments were received from the Department of Land and Natural Resources, Engineering Branch, pointing out that there is a discrepancy between FEMA's 100-year design discharge (3,200 cfs) and those used for the Preliminary Drainage Report (1,209 cfs). The discrepancy in the volumes was identified in a meeting with individuals from Spencer Homes, the Planning Department, Department of Public Works and WSUE. Specifically, the FEMA design discharge comes from FEMA's "Flood Insurance Study for Maui County, Hawaii", hereinafter referred to as the "FEMA Report", while those in the Drainage Report are based primarily on the "Hydrology Report for Piilani Highway, Island of Maui", hereinafter referred to as the "Trans-meridian/SDOT Report", which served as the basis of design for the culverts beneath Piilani Highway. Although both studies identify a comparable combined drainage area draining into Kamaole Gulch and the adjacent Charley Young gulch to the north, the distribution of that flow into each gulch are substantially different, as follows:

(1) The FEMA Report assigns roughly 80% of the total flow to Kamaole Gulch, and the balance of 20% into Charley Young Gulch.

(2) The Trans-meridian Report, on the other hand, indicates roughly 35% of the total flow into Kamaole Gulch, and the balance of 65% into Charley Young Gulch.

As a result of this finding, a compromise was first proposed to the Planning Department whereby that portion of the drainage channel within the project area falling within the FEMA study limits would be designed for the FEMA design discharge, while the portion of the drainage channel between the FEMA study limits and Piilani Highway would be designed for the Trans-meridian/SDOT flow estimates, consistent with the design of the existing drainage structures beneath Piilani Highway.

The proposed compromise was apparently deliberated at length within the Planning Department with no resolution after 6 weeks. At this point, a letter was sent to the Department of Public Works and Waste Management (copy to the Planning Department) by WSUE on behalf of Spencer Homes, stating the following

> ***"Rather than further delay this project over this inconsistency, we will design the natural drainage channel (within the project site) and drainage structure beneath the roadway crossing at the northwest corner of the property to handle the FEMA 100-year design discharge level of 3200 cfs, as requested by the County."***

This was acknowledged by the Planning Department by phone on June 19, 2000, and in writing on July 3, 2000 (see Section "XI.B" for a copy of this letter from the Planning Department).

The Preliminary Drainage Report (see Appendix B) was updated for the FEMA flow. Two Figures in that Report, entitled, "Profile - Existing Drainage way", show that the computed water surface for the FEMA flow is well below the lower of the two banks surrounding the drainage channel.

(Refer to Section "L(4)" for this correspondence)

Comments were also received from the U. S. Department of Agriculture, Soil Conservation Service, requesting a plan defining the responsibilities for operation and maintenance of the natural drainage channel. A Policy Statement was provided defining those responsibilities. Subsequent to this response, the Planning Department, on behalf of the USDA, requested details on the different options for design of the outer curves of the drainage

channel to mitigate erosion. Two options were proposed and detailed in Construction Sheets "37" and "39", including (1) G.P. Slope Protection, and (2) Guaiacol Slope Protection.

(Refer to Section "L(6)" for this correspondence and Construction Plan sheets)

The Department of Public Works and Waste Management commented that the drainage channel and retention basin should be kept under private ownership and maintenance exclusive of the sections within the roadway rights-of-way. The developer responded that the drainage channel and retention basin would be privately owned. Further, a drainage easement would be created based on the estimated inundation limits for a 100-year storm, and the drainage channel maintained in its natural state by the individual homeowners whose lot includes part of the drainage way. Enforcement of proper maintenance would be the responsibility of the Homeowners Association. Similarly, the park/retention basin will be kept as a passive park, owned and maintained by the Homeowners Association.

(Refer to Section "L(7)" for this correspondence).

Comments were received from the Department of Health with respect to storm water discharges during construction. A Best Management Practices Plan was prepared and sent to the Department of Health, including an Erosion Control Plan and Details showing Silt Fences and Filter Beams designed to mitigate this potential problem.

(Refer to Section "L(11)" for this correspondence)

Comments were also received from the Environmental Center, University of Hawaii at Manoa stating that the changes to the drainage design should be ***"made in the document itself, not merely in the Correspondence section"***. This discussion of all Drainage issues has now been inserted into this section.

(Refer to Section "XI.A" for this correspondence)

V. RELATIONSHIPS TO GOVERNMENTAL PLANS, POLICIES, AND CONTROLS

V. RELATIONSHIPS TO GOVERNMENTAL PLANS, POLICIES AND CONTROLS:

A. STATE LAND USE DISTRICTS:

Chapter 205, Hawaii Revised Statutes, relating to the Land Use Commission, establishes the four major land use districts in which all lands in the State are placed. These districts are designated "Urban", "Rural", "Agricultural" and "Conservation". The subject property is within the "Urban" Districts. The proposed improvements are considered permissible uses within the "Urban" District, and therefore, are consistent with the State Land Use Law.

B. MAUI COUNTY GENERAL PLAN

The General Plan of the County of Maui (1990), updated in 1991, provides long term goals, objectives and policies directed toward the betterment of living conditions in the County. Addressed are social, environmental, and economic issues that influence future growth in Maui County. The subject property's use is consistent with the following General Plan objectives and policies:

"Objectives:

To see that all developments are well designed and are in harmony with their surroundings

Policies:

- ***Require that appropriate principles of urban design be observed in the planning of all new developments***

Objectives:

To encourage development which reflects the character and culture of Maui County's people."

C. KIHEI-MAKENA COMMUNITY PLAN

Nine (9) community plan regions have been established in Maui County. Each region's growth and development is guided by a Community Plan, which contains objectives and policies in accordance with the County General Plan. The purpose

of the Community Plan is to outline a relatively detailed agenda for carrying out the General Plan's objectives.

The most recent Kihei-Makena Community Plan was adopted on March 6, 1998. The subject property is designated as "Single Family (SF)" in the Plan's land use map (see Figure 4). Thus, the proposed project is consistent with the 1998 Kihei-Makena Community Plan Land Use Map.

The project is also consistent with the March 6, 1998, Update of the Kihei-Makena Community Plan's recommended goals, objectives and policies:

> ***Goal:*** *a well-planned community with land use and development patterns designed to achieve the efficient and timely provision of infra structural and community needs while preserving and enhancing the unique character of Maalaea, Kihei, Wailea and Makena as well as the region's natural environment, marine resources and traditional shoreline uses.*
>
> ***Objectives and Policies:***
>
> *b. Identify priority growth areas to focus public and private efforts on the provision of infrastructure and amenities to serve existing residents and to accommodate new growth.*
>
> *f. Establish a distribution of land uses which provides housing, jobs, shopping, open space and recreation areas in close proximity to each other in order to enhance Kihei's neighborhoods and to minimize dependence on automobiles.*
>
> *g. Encourage the establishment of single-family and multi-family land use designations which provide affordable housing opportunities for areas which are in close proximity to infrastructure systems and other urban services.*

D. ZONING

The Maui County Zoning designation for the subject property is "R-2 Residential", which provides for a minimum lot size of 7,500 square feet, and minimum lot width of 65 feet. Section 19.08.040.B of the Maui County Code also stipulates that:

> ***"Subject to approval of the commission, mixture of lot sizes may be permitted within any residential district: provided, however that the minimum lot size shall not be less than six thousand square feet, and that the overall project density shall not exceed that permitted within the district."***

The subdivision plot plan will be consistent with these and all other applicable provisions prescribed for the "R-2 Residential" zoning.

E. COUNTY OF MAUI SPECIAL MANAGEMENT AREA

The subject property is located within the County of Maui's Special Management Area. Pursuant to Chapter 205A, Hawaii Revised Statutes, and the Rules and Regulations of the Maui Planning Commission, projects located within the SMA are evaluated with respect to SMA objectives, policies and guidelines. This section addresses the project's relationship to applicable coastal zone management considerations, as set forth in Chapter 205A and the Rules and Regulations of the Maui Planning Commission.

1. Recreational Resources

Objective:

Provide coastal recreational resources accessible to the public.

Policies:

a. *Improve coordination and funding of coastal recreational planning and management; and*

b. *Provide adequate, accessible and diverse recreational opportunities in the coastal zone management area by:*

   (in) *Protecting coastal resources uniquely suited for recreation activities that cannot be provided in other areas;*

   (ii) *Requiring replacement of coastal resources having 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 recreation when replacement is not feasible or desirable;

(iii) Providing and managing adequate public access, consistent with conservation of natural resources, to and along shorelines with recreational value;

(iv) Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;

(v) Ensuring public recreational use of county, state and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;

(vi) Adopting water quality standards and regulating point and non-point sources of pollution to protect and where feasible, restore the recreational value of coastal waters;

(vii) Developing new shoreline recreational opportunities where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and

(viii) Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the Land Use Commission, Board of Land and Natural Resources, County Planning Commission; and crediting such dedication against the requirements of Section 46-6 of the Hawaii Revised Statutes.

Response:

The subject property is located across South Kihei Road and is a minimum of 1300 feet inland from the shoreline. It is further separated from shoreline by the 280-unit Maui Vista Condominium, the 136-unit Pacific Shores Condominium, and the Maui Coast Hotel (see Exhibit "C", Photos 6, 7 and 8). The proposed project will have no impact on the public's access to existing coastal amenities and resources. The project's distance from the ocean as well as installing the subsurface detention facilities for on-site runoff will minimize the possibility of non-point source pollution from entering the marine environment.

2. *Historical/Cultural Resources*

Objective:

Protect, preserve and where desirable, restore those natural and man-made historic and prehistoric resources in the coastal zone management area that are in Hawaiian and American history and culture.

Policies:

a. *Identify and analyze 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*

Response:

As reported earlier in this Project Assessment Report, an Archaeological Inventory Survey of the project site was recently conducted by Xamanek and sent to the State Historic Preservation Division (SHPD) of the Department of Land and Natural Resources (DLNR). This letter concluded the following:

> ***"In sum, the report is acceptable. With the commitment to preserve site 3541 and to monitor any land alteration in the deeper sands in the northwest part of the parcel, we believe that any development of this parcel will have 'no adverse effect' on significant historic sites."***

The Archaeological Mitigation Plan is attached in Appendix A.

3. Scenic and Open Space Resources

Objective:

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

Policies:

a. *Identify valued scenic resources in the coastal zone management area;*

b. *Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural land forms and existing public views to and along the shoreline;*

c. *Preserve, maintain and, where desirable, improve and restore shoreline open space and scenic resources; and*

d. *Encourage those developments which are not coastal dependent to locate in inland areas.*

Response:

The proposed project will not impact coastal scenic and open space resources. Furthermore, the project will not affect public views to and along the shoreline.

4. Coastal Ecosystems

Objective:

Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

a. *Improve the technical basis for natural resource management;*

b. *Preserve valuable coastal ecosystems, including reefs of biological economic importance;*

c. *Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and*

d. Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate State water quality standards

Response:

As noted earlier, the subject property is located a minimum of 1300 feet inland from the shoreline and is further separated by two large condominium complexes and one hotel. The project distance from the ocean as well as the addition of subsurface detention facilities will not increase the possibility of non-point source pollution from entering the marine environment above existing levels. The onsite subsurface system will be designed to intercept and induce settlement of waterborne particles before leaving the site. Erosion control measures will be implemented during construction to ensure that coastal ecosystems are not impacted.

5. *Economic Uses*

Objective:

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

Policies:

a. Concentrate coastal dependent development in appropriate areas;

b. Ensure that coastal dependent 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 and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

(in) Use of presently designated locations is not feasible;

(ii) Adverse environmental effects are minimized; and

(iii) The development is important to the State's economy.

Response:

The project would have a beneficial short term impact on the local economy during construction. In the long term, the addition of permanent residents in the residential core of the Kihei area will expand the consumer base and thereby support local commercial centers and businesses.

6. *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, subsidence, and point and non-point source pollution hazards;*

c. *Ensure that developments comply with requirements of the Federal Flood Insurance Program; and*

d. *Develop a coastal point and non-point source pollution control program.*

Response:

According to Panel Number 150003 0265C of the Flood Insurance Rate Map, revised September 6, 1989, prepared by the U. S. Federal Emergency Management Agency, Federal Insurance Administration, the project site is entirely within Flood Zone C (see Exhibit "A"), outside the tsunami inundation limits and subject to minimal flooding.

Erosion control measures such as silt and dust fences and crushed aggregate berms will be incorporated during the construction period to minimize soil loss and erosion hazards. Again, the addition of the subsurface detention facilities will minimize any adverse drainage impacts to downstream properties.

7. *Managing Development*

Objective:

Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

Policies:

a. *Use, implement and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development;*

b. *Facilitate timely processing of applications for development permits and resolve overlapping of conflicting permit requirements; and*

c. *Communicate the potential and short and long-term impacts of proposed coastal developments early in their life-cycle and in terms understandable to the general public to facilitate public participation in the planning and review process*

Response:

The development of the subject property is being conducted in accordance with applicable State and County requirements. Opportunity for review of the proposed action is provided through the County's Special Management Area (SMA) permitting process, for which this Project Assessment Report has been prepared.

8. *Public Participation*

Objective:

Stimulate public awareness, education and participation in coastal management.

Policies:

a. *Maintain a public advisory body to identify coastal management problems and to provide policy advice and assistance to the coastal zone management program;*

b. *Disseminate information on coastal management issues by means of educational materials, published reports, staff contact and public workshops for persons and organizations concerned with coastal related issues, development, and government activities; and*

c. *Organize workshops, policy dialogues, and site specific mediations to respond to coastal issues and conflict.*

Response:

The public will have ample opportunity to review and comment on the proposed project. Spencer Homes, Inc., has met with the adjoining neighbors and the Kihei Community Association. A "Notice of Application Special Management Area Use Permit" was published in the Maui News on January 9, 2000. A "Notice of Public Hearing" will be sent to the surrounding land owners and lessees within 500 feet of the subject property at least 30 days prior to the SMA permit's public hearing. Public hearing dates along with location maps will be published in the Maui News once that date is scheduled by the Planning Department. The public will be allowed to participate in the public hearing portion of the Maui Planning Commission review process.

9. *Beach Protection*

Objectives:

Protect Beaches for public use and recreation.

Policies:

a. *Locate new structures inland from the shoreline setback to conserve open space and to 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 interference with existing recreational and waterline activities; and

d. *Minimize the construction of public erosion-protection structures seaward of the shoreline.*

Response:

As noted earlier, the subject property is located a minimum of 1300 feet inland from the shoreline. Accordingly, the subject property has no involvement with the construction of any structures within the shoreline area. The subject property will not have any impact on any beaches.

10. Marine Resources

Objective:

Implement the State's ocean resource management plan.

Policies:

a. *Exercise an overall conservation ethic, and practice stewardship in the protection, use and development of marine and coastal resources;*

b. *Assure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;*

c. *Coordinate the management of marine and coastal resources and activities management to improve effectiveness and efficiency;*

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

e. *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 the ocean and coastal resources; and*

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

Response:

As noted earlier, the subject property is located across South Kihei Road and a minimum of 1300 feet inland from the shoreline. The project will have no direct impact on the region's coastal or marine resources, and with the incorporation of mitigation measures during construction as well as the permanent subsurface sediment control facilities, there will be no adverse impact to near shore waters from point and non-point sources of pollution. Therefore, the subject property will not have a significant negative impact upon any coastal or marine resources.

VI. SUMMARY OF ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

VI. SUMMARY OF ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED:

The proposed development will result in some unavoidable construction-related impacts as described in Chapter III, Potential Impacts and Mitigation Measures.

Potential effects include noise generated impacts occurring from site preparation and construction activities. In addition, there may be temporary air quality impacts associated with dust generated from construction activities, and exhaust emissions discharged by construction equipment. However, mitigation measures such as silt and dust fences and crushed aggregate berms will be used to control dust and erosion. All construction will occur during normal daylight hours.

The proposed project is not anticipated to create any significant, long-term adverse environmental effects.

VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

VII. IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES:

The proposed project will result in the "loss" of approximately 24.0 acres of undeveloped and vacant land to be replaced by a new single-family residential subdivision with substantial improvements to the infrastructure, landscaping, drainage and community character in the residential core of the Kihei area.

No other irreversible and irretrievable commitments of resources have been identified in connection with the proposed action.

VIII. FINDINGS AND CONCLUSIONS

VIII. FINDINGS AND CONCLUSIONS:

The proposed Project involves the construction of a 95-lot single-family residential subdivision in the residential core of the Kihei area on a 24 acre parcel which is current vacant and undeveloped.

Every phase of the proposed action, expected consequences, both primary and secondary, and the cumulative as well as the short-term and long-term effects of the action have been evaluated herein in accordance with the "Significance Criteria" of Section 11-200-12 of the Administrative Rules. Based on the analysis, the proposed project will not result in any adverse impacts. Discussion of project conformance to the criteria is given below:

1. ***No Irrevocable Commitment to Loss or Destruction of any Natural or Cultural Resource Would Occur as a result of the Proposed Project.***

   There are no known habitats of rare, endangered or threatened species of flora and fauna within the project limits. An Archaeological Inventory Study has been performed and mitigating measures agreed to by the State Historic Preservation Division of the Department of Land and Natural Resources.

2. ***The Proposed Action Would Not Curtail the Range of Beneficial Uses of the Environment.***

   The project site is currently undeveloped and vacant, and could pose a potential fire hazard if left undeveloped. On the contrary, the proposed improvements would add a much needed 95 single family homes to the residential core of the Kihei area at a time when Maui Island's population, particularly in the Kihei area, is significantly growing. The subject project will provide locations for single family residences within reasonable, if not convenient, travel distances/times for those residents who support the visitor industry within the Kihei-Makena Community area.

   The project will also extend the fire protection system into the parcel along roadways which are more accessible to fire fighting vehicles and equipment.

3. ***The Proposed Action Does not Conflict with the State's Long-Term Environmental Policies or Goals or Guidelines as Expressed in Chapter 344, Hawaii Revised Statutes.***

The State Environmental Policy and Guidelines are set forth in Chapter 344, Hawaii Revised Statutes. The proposed action is in conformance with the following policies and guidelines:

Environmental Policy:

Enhance the quality of life by:

> *"(c) Establishing communities which provide a sense of identity, wise use of land, efficient transportation, and aesthetic and social satisfaction in harmony with the natural environment which is uniquely Hawaiian."*

Guidelines:

Community life and housing

> *"(b) Develop communities which provide a sense of identify and social satisfaction in harmony with the environment...*
>
> *(d) Foster safe, sanitary, and decent homes*
>
> *(e) Recognize community appearances as major economic and aesthetic assets of the counties and the State; ... and preserve and promote mountain-to-ocean vistas."*

4. *The Economic or Social Welfare of the Community or State Would not be Substantially Affected*

The project would directly benefit the local economy during the construction phase. In the long term, the project should have an indirect beneficial effect of providing a larger residential population which local businesses in the area can provide typical consumer goods and services.

5. *The Proposed Action does not Affect Public Health*

No impacts to the public's health and welfare are anticipated.

6. ***No Substantial Secondary Impacts, such as Population Changes or Effects on Public Facilities are Anticipated.***

No major population changes are anticipated as a result of the proposed project. The project is not anticipated to have adverse impacts upon medical, police and fire protection services as well as other public service systems. In fact, the project will improve fire protection services within the Kihei area.

7. ***No Substantial Degradation of Environmental Quality is Anticipated***

No substantial degradation of environmental quality is anticipated as a result of the project. The project responds to a real need for improved single-family residential housing in the area.

8. ***The Proposed Action does not involve a Commitment to Larger Actions, nor would Cumulative Impacts Result in Considerable Effects on the Environment***

The proposed action does not involve a commitment to larger actions and should have no cumulative impacts on the environment.

9. ***No Rare, Threatened or Endangered Species or Their Habitats would be Adversely Affected by the Proposed Action***

There are no rare, threatened or endangered species of flora, fauna or avifauna or their habitats on the subject property. The nearest wetland is approximately 2 miles north of the subject property.

10. ***Air Quality, Water Quality or Ambient Noise Levels would not be Detrimentally Affected by the Proposed Project***

Construction activities will result in short term air quality and noise impacts. Dust control measures, such as regular watering and sprinkling, will be implemented to minimize wind-blown emissions. Noise impacts will occur primarily from construction equipment. All equipment will be provided with mufflers to suppress noise to allowable noise standards. Construction will be limited to daylight working hours.

In the long term, the project is not anticipated to have an impact on air quality or noise levels.

11. The Proposed Project would not affect Environmentally Sensitive Areas, such as Flood Plains, Tsunami Zones, Erosion-Prone Areas, Geologically Hazardous Lands, Estuaries, Fresh Waters or Coastal Waters.

The entire project area is located in Zone C, areas of minimal flooding. The project does not involve lands subject to tsunami inundation, erosion-prone areas, geologic hazards, estuaries, fresh waters or coastal waters. Hydrological calculations indicate that there will be no net increase of onsite surface runoff volume due to the proposed improvements. Drainage patterns in the area surrounding the project will not be altered.

12. The Proposed Project would not Substantially Affect Scenic Vistas and View planes Identified by County or State Plans or Studies

Scenic vistas and View planes from the subject property are not identified in any County or State plans or studies.

13. The Project would not Require Substantial Energy Consumption

The project will only require reasonable energy consumption due to the operation of construction equipment, which will be limited to the period of construction. Energy consumption at full build-out will be that for a typical single family residence.

Based on the foregoing findings, it is concluded that the proposed action will not result in any significant impacts.

IX. AGENCIES CONTACTED IN THE PREPARATION OF THE ENVIRONMENTAL ASSESSMENT

IX. AGENCIES CONTACTED IN THE PREPARATION OF THE ENVIRONMENTAL ASSESSMENT:

The following agencies and organizations were contacted during the Environmental Assessment review process:

1. U.S. Army Corps of Engineers
   U. S. Army Engineer District
   Fort Shafter, Hawaii 96858-5440

2. U. S. Fish and Wildlife Service
   Office of Environmental Services
   300 Ala Moana Blvd. Room 6307
   Honolulu, Hawaii 96813

3. U. S. Department of Agriculture
   Natural Resources Conservation Service
   210 Imi Kala Street, Suite 209
   Wailuku, Hawaii 96793

4. State of Hawaii
   Department of Transportation
   Highways Division
   650 Palapala Drive
   Kahului, Hawaii 96732

5. Department of Land and Natural Resources
   State Historic Preservation Division
   Kakuhihewa Building, Room 555
   601 Kamokila Boulevard
   Kapolei, Hawaii 96707

6. Department of Land and Natural Resources
   Land Division Planning Branch
   1151 Punchbowl Street
   Honolulu, Hawaii 96813

7. Department of Health
   Environmental Planning Office
   919 Ala Moana Blvd., Room 312
   Honolulu, Hawaii 96814

8. Department of Health
Maui District Health Office
54 High Street
Wailuku, Hawaii 96793

9. Department of Education
State of Hawaii
Maui District Office
54 High Street, 4th Floor
Wailuku, Hawaii 96793

10. Office of Hawaiian Affairs
State of Hawaii
711 Kapiolani Boulevard, Suite 500
Honolulu, Hawaii 96813

11. Department of Accounting and General Services
Survey Division
P. O. Box 119
Honolulu, Hawaii 96810

12. Land Use Commission
State of Hawaii
P. O. Box 2359
Honolulu, Hawaii 96804

13. Department of Planning
County of Maui
250 South High Street
Wailuku, Hawaii 96793

14. Department of Public Works and Waste Management
County of Maui
200 South High Street
Wailuku, Hawaii 96793

15. Department of Water Supply
County of Maui
200 South High Street
Wailuku, Hawaii 96793

16. Department of Fire Control
County of Maui
200 Dairy Road
Kahului, Hawaii 96732

17. Department of Parks and Recreation
County of Maui
1580-C Kaahumanu Avenue
Wailuku, Hawaii 96793

18. Police Department
County of Maui
55 Mahalani Street
Wailuku, Hawaii 96793

19. Maui Electric Company
210 West Kamehama Avenue
Kahului, Hawaii 96732

20. Kihei Community Association
P. O. Box 662
Kihei, Hawaii 96732

21. 400+ residents of condominium and home owners within 500 feet of the project site who were notified as required for the Application for Special Management Area Permit.

22. University of Hawaii at Manoa
Environmental Center
2550 Campus Road, Crawford 317
Honolulu, HI 96822

X. COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD AND APPLICABLE RESPONSES

X. COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD AND APPLICABLE RESPONSES:

An application for Special Management Area Permit was submitted to the County of Maui Planning Department in October, 1999. Individual comments received from all agencies through the close of the comment period, ending January 28, 2000, are attached at the end of this section (subsection L).

A request to respond to outstanding comments were summarized in a letter from the Department of Planning, dated February 22, 2000, which is also included at the end of this section. The following is an item-by-item response to the comments summarized in that letter:

A. Planning Department Requests

Request

"1. Please provide a detailed description of the park/detention area. What are the dimensions of the park/detention area? Will this be a passive park or active park? If an active park, what types of activities are proposed? Where will parking be provided for use of the park? How high is the berm? How will users of the park access the park? Will it be accessible from the street? Will the park be open to the public? Will this be a common area owned by the Homeowner's Association? Will it be in the CC&R's?"

Response

A plan view drawing and profile for a corresponding section on the plan are shown in Section "L(1)". The park/detention basin is approximately trapezoidal in shape, 119± feet long and 59± feet wide at its narrowest point. The bottom of the basin will be 5 feet below the top of the berm. Total storage capacity is approximately 267,800 gallons.

A 10-foot wide access road (with 15% slope) will provide ramp access into the park, while a concrete stairway off the street will provide conventional access. A subsurface 72-inch perforated pipe will provide additional initial storage.

The park will be a passive park, which will be privately owned and maintained by the Homeowners Association. The general public will be able

to use the park except when individual homeowners reserve the park through the Homeowners Association for private activities. The general public will not be able to reserve the park for their private events through the Homeowners Association. Rules for use and reservation of the park by Homeowners will be included in the Bylaws and CC&Rs.

Request

"2. *Each lot owner abutting the drainage channel owns a portion of the drainage area. How will the maintenance and operation of the drainage channel be controlled and who will oversee the maintenance and operation of the drainage channel? Will this be incorporated in the bylaw and CC&R's? How will the Homeowner's Association ensure compliance?"*

Response

The drainage channel will essentially be left intact within the calculated inundation limits for the 100-year design storm. Drainage easement will be established based on the calculated 100-year design storm inundation limits. The individual lot owners will be responsible for the maintenance of the drainage channel within the drainage easement, while the Homeowner's Association will be responsible for enforcement of this policy upon individual owners through warning, penalties and fines. The Homeowner's Association will receive the right to go in and maintain the easement if any of the lot owners fail to do so. The negligent lot owner will be required to bear the cost of maintenance by the Homeowner's Association.

Request

"3. *Please provide a revised subdivision plan based upon comments made by the Department of Public Works and Waste Management (DPWWM) now that an additional right-of-way is required on Alanui Ke Alii Road."*

Response

A revised subdivision plan is attached in Section "L(1)".

B. State Land Use Commission Requests

Request

"1. State Land Use Commission (SLUC) - The SLUC stated in their letter that based upon two major reclassifications of land from agricultural to urban, the Maui Planning Commission (Commission) had major concerns relating tot he drainage problems of the lower Kihei area, the need for additional school facilities, and transportation improvements, as well as project-specific issues unrelated to your proposed project. Although the project-specific issues are unrelated to your project, issues that are regional in scope, along with your project, may have a cumulative effect. The cumulative effect of your proposed development along with these two approved developments should be addressed.

Schools - The data provided in your assessment report states that the projected enrollment for the elementary school level is approximately 20 students. This is equivalent to approximately one classroom. Please provide information on the total enrollment of Kamalii Elementary School and its capacity. Please discuss what effect the 20 additional students will have on the enrollment and capacity of the school."

Response

The Department of Education was contacted on February 24, 2000. Mr. Alan Honma of the DOE [Phone No.: (808) 733-4862] stated that the current enrollment in Kamalii Elementary School is 872 students in the 1999-2000 academic year. He further stated that since Kamalii Elementary School was designed as a "Year-Round" facility, it can accommodate 1051 students per year. Therefore there is adequate room to accommodate the projected 20 additional students.

It is also worth mention that the Department of Education itself had no comments on the SMA Project Assessment Report. See section "L(16)" for their comments.

Request

"Drainage - Please discuss the relationship of the Haleakala Ranch/Maui Research and Technology Park drainage and effect of the drainage, if any, on your proposed development."

Response

The Figure shown in Section "L(2)" clearly shows that the drainage watershed area for Haleakala Ranch/Maui Research and Technology Park are completely isolated from the project site, and will therefore not affect the drainage of the Ke Alii Subdivision.

Request

"Traffic - By addressing the concerns raised by the Police Department, the concerns raised by the SLUC may also be addressed."

Response

Maui Police Officer Bradney Hickle raised concerns referred to by Mr. John Min. His comments were forwarded to Parsons Brinckerhoff (PB), the consultant who prepared the "Traffic Impact Analysis Update for the Ke Alii Single-Family Units", September, 1999. After review of these concerns, Mr. Wayne Yoshioka, Manager of Transportation Planning/Traffic Engineering, addressed each of the concerns. This letter summarizes as follows:

"We believe this letter addresses the issues that officer Hickle raised in his memorandum.

First, Ke Alii Single-Family Units development will generate very little traffic impact. Intersection analysis show that traffic from the development would not change the level of service at the intersections of Alanui Ke Alii. It contributes about 10 percent of the traffic projected for Alanui Ke Alii and a very small percentage on the traffic on South Kihei Road and Piilani Highway.

Second, many of the issues are related to existing traffic issues connected with the operation of Kamalii Elementary School. It

is appropriate and desirable for Kamalii Elementary School to conduct the recommended internal traffic circulation study, the school crossing study, and the school speed zone study to enhance the safety for students attending the school."

See subsection "L(9)" for a copy of this correspondence. The developer will cooperate and work with the Police Department and Department of Education on these matters of concern.

C. Department of Land and Natural Resources, State Historic Preservation Division (DLNR, SHPD) Requests

Request

"2. *Department of Land and Natural Resources, State Historic Preservation Division (DLNR, SHPD.) - The DLNR, SHPD recommended that a preservation plan for Site 3541 and a monitoring plan be submitted to their office for review and acceptance. To date, they have not received either of these documents. Please provide this Department with a status of these documents and a time frame in which you intend to complete them."*

Response

The developer has retained Xamanek to prepare both the Archaeological Preservation Plan for Site 3541 and a Monitoring Plan for the sand dunes in the northwest corner of the parcel. No grading will occur until both of these documents have been reviewed and approved by the DLNR Historic Preservation Division. See subsection "L(3)" for a copy of this correspondence. A copy of the Archaeological Mitigation Plan is included in Appendix A.

We will coordinate the location survey of Site 3541 in the field with Xamanek. This information will then be plotted on our survey map to ensure its preservation.

D. Department of Land and Natural Resources, Engineering Branch (DLNR) Requests

Request

"3. Department of Land and Natural Resources, Engineering Branch (DLNR) - The DLNR recommended using FEMA's 100-year design discharge for the stream cross-section design proposed in the drainage report. FEMA's design discharge from the stream mouth to the upper end of the study area is 3,200 cfs. In future drainage studies, address decreasing peak discharge to pre-development conditions through the use of the proposed subsurface and bermed park site detention facilities. Please provide this Department with the necessary revisions and address the effect these changes have."

Response

The apparent discrepancy in the predicted storm flows for Kamaole Gulch was discussed in a meeting with Mark Spencer of Spencer Homes, Francis Cerizo of the Planning Department, Charles Jencks of the DPWWM and Warren Unemori of WSUE on March 2, 2000. The result of this meeting is summarized in the letter from Warren S. Unemori to John E. Min, Department of Planning, dated March 9, 2000.

The salient portion of that letter states that the DPWWM will accept the following as a reasonable solution:

"o The portion of the drainage channel within the project area and falling within FEMA study limits will be required to have a 100-year flow capacity of at least 3200 cfs in accordance with the current FEMA 'Flood Insurance Study'.

o The portion of the drainage channel between the FEMA study area and Piilani Highway shall be required to provide a 100-year floor capacity of at least 1200 cfs in keeping with both the existing drainage structures on Piilani Highway and the SDOT 'Hydrology Report for Piilani Highway'."

See Section "L(4)" for a copy of this correspondence.

E. Department of the Army, Corps of Engineers Request

Request

"4. Department of the Army, Corps of Engineers - Will you be acquiring a DA permit as noted by the Corps of Engineers?"

Response

The Department of the Army, Corps of Engineers states the following in their letter, dated February 23, 2000:

> ***"This letter is written regarding the proposed project, Keali'i Subdivision Project, file number 200000071 located in Kihei, Maui, Hawaii. After a further review of the project plans, it has been determined that this project will not require a Department of Army permit."***

See subsection "L(5)" for a copy of this correspondence.

F. United States Department of Agriculture (USDA), Soil Conservation Service Request

Request

"5. United States Department of Agriculture (USDA), Soil Conservation Service response - Your stated that Spencer Homes provided you with "Policy Statements". As noted in previous comments above, how will these be implemented and enforced? The last item states that a low CRM wall may be constructed at the base of the fill slope before the geo-cell lining is installed. How high will this wall be? This wall should be shown as part of this permit application. IF it is not included in this application, it may have to be processed as a separate application."

Response

The drainage channel will be kept in its natural state up to the 100-year storm inundation limits. Beyond these limits two (2) different options have been designed for outer curves of the channel as follows:

(1) GRP Slope Protection
(2) Geocell Slope Protection

The Construction Plan Sheets "37" and "39" show the location and details of these optional slope protection measures. See subsection "L(6)" for a copy of this correspondence and reduced size Construction Plans.

G. Department of Public Works and Waste Management Request

Request

"6. Department of Public Works and Waste Management - Please provide this Department with your comments to their Advisory Comments. Please provide the justification in which a 60-foot wide right-of-way is no longer necessary for only this portion of the North-South Collector Road."

Response

In a letter dated February 10, 2000, the Department of Public Works and Waste Management amended their original letter, dated January 31, 2000, as follows:

> ***"We wish to amend our January 31, 2000, letter by amending Advisory Comment 5. The right-of-way for the North-South Collector Road shall be 52 feet, which will consist of 22 feet wide from the subject property and 30 feet wide from the Worldmark property located west of the subject property. This is consistent with a letter the department sent to the applicant in July of 1999."***

Other comments to their advisory comments are attached in subsection "L(7)".

H. Department of Parks and Recreation Request

Request

"7. Department of Parks and Recreation - Please provide this Department with your comments on the Department of Parks and Recreation Comments"

Response

The park/detention basin area will be maintained as a private passive park by the Homeowner's Association. The developer agrees to pay a Parks and Playgrounds Assessment Fee less the 50% credit for maintaining the park as a private park in lieu of dedicating the park site to the County, on approval by the Parks and Recreation Department. See subsection "L(8)" for a copy of this correspondence.

I. Police Department Request

Request

"8. Police Department - Please provide this Department with your response to the Police Department's comments and concerns regarding the traffic problems. For your information, copies of their comments were sent to the Department of Transportation, Department of Public Works and Waste Management, and the Department of Education."

Response

Maui Police Officer Bradney Hickle raised concerns referred to by Mr. John Min. His comments were forwarded to Parsons Brinckerhoff (PB), the consultant who prepared the "Traffic Impact Analysis Update for the Ke Alii Single-Family Units", September, 1999. After review of these concerns, Mr. Wayne Yoshioka, Manager of Transportation Planning/Traffic Engineering, addressed each of the concerns. This letter summarizes as follows:

"We believe this letter addresses the issues that officer Hickle raised in his memorandum.

First, Ke Alii Single-Family Units development will generate very little traffic impact. Intersection analysis show that traffic from the development would not change the level of service at the intersections of Alanui Ke Alii. It contributes about 10 percent of the traffic projected for Alanui Ke Alii and a very small percentage on the traffic on South Kihei Road and Piilani Highway.

Second, many of the issues are related to existing traffic issues connected with the operation of Kamalii Elementary School. It is appropriate and desirable for Kamalii Elementary School to conduct the recommended internal traffic circulation study, the school crossing study, and the school speed zone study to enhance the safety for students attending the school."

See subsection "L(9)" for a copy of this correspondence. The developer will cooperate and work with the Police Department and Department of Education on these matters of concern.

J. Department of Fire Control Request

Request

"9. Department of Fire Control - Please provide this Department with an explanation of the location of any fire apparatus access roads and where any buildings would be in excess of 150 feet from a water supply on a public street."

Response

Fire hydrant locations have been revised such that all parcels are no more than 150 feet from the nearest fire hydrant. See subsection "L(10)" for a copy of this correspondence.

K. Department of Health (DOH) Requests

Request

"10. Department of Health (DOH) - How will a solid waste management plan be implemented? What and how will polluted runoff, vector, water pollution, fugitive dust, and noises be controlled? The DOH also recommended holding a public information meeting in the surrounding community to describe the project and potential environmental impacts, and to respond to concerns relating to the project. Please provide this Department with your response to the Department of Health's concerns and issues."

Response

The Solid Waste Management Plan has been prepared and issued to the Department of Health. To summarize, the developer's Solid Waste Manage Plan includes the following actions:

> ***"o The dry brush will be grubbed and hauled to a properly permitted recycling facility such as Campaign Recycle Maui.***
>
> ***o The kiawes will be offered to various individuals for use as firewood. Any remaining kiawe waste will be composted on site for future landscape use or will be deposited to a properly recycling facility.***
>
> ***o Any discarded vehicles or miscellaneous items will be taken to Maui Scrap Metal or any properly permitted recycling facility.***
>
> ***o We will at all times try to recycle any materials found during site construction. There will be no exporting of soil as the sitework requires importing fill material."***

See subsection "L(11)" for a copy of this correspondence.

As shown in subsection "L(11)", the Construction Plan Sheets "37" and "38", a Best Management Practice program has been developed as follows:

> ***"Best Management Practices***
>
> ***1. Erosion and Sediment Control Practices***
>
> ***A. Construction Management***
>
> ***(1) Grading operations will be planned so as to minimize time of construction***
>
> ***(2) Grading operations will be planned so as to minimize the size of the disturbed area. The***

area grubbed shall not extend beyond what will actually be required for grading

B. Stabilization Techniques

(1) Existing ground cover shall not be destroyed, removed or disturbed more than 7 calendar days prior to the start of grading operations

(2) Areas that remain unfinished for more than 15 calendar days shall be hydromulched to provide temporary soil stabilization

(3) After achieving finished grades, all slopes and exposed areas shall be permanently stabilized by hydromulching with grass seed as soon as practicable.

C. Structural Controls

(1) Silting basins will be constructed upstream of discharge points to remove sediment from onsite runoff prior to discharge into existing storm drains

(2) Drainage swales will be constructed to intercept onsite runoff and direct it into silting basins.

(3) When needed, additional silt fences, berms, cutoff ditches will be constructed to supplement the erosion control measures depicted on the grading plan

D. Inspection and Maintenance Procedures

All control measures will be inspected and repaired as necessary. Inspections will be performed at least weekly in dry periods, and within 24 hours after any rainfall 0.5 inches or greater over a 24-

hour period. Control measures will be checked daily during periods of prolonged rainfall.

2. Other Pollution Control Practices

Maintenance and fueling of construction equipment will be performed only in designated areas enclosed by a containment berm constructed so as to contain spills and prevent storm water runoff from carrying pollutants into downstream properties."

Vector control will be performed by Bugman, Inc., who have been retained to provide this service by the developer. See subsection "L(11)" for a copy of this authorization correspondence.

Mark Spencer of Spencer Homes, Inc., has already met with the Kihei Community Association Planning Committee on March 6, 2000, to discuss the Ke Alii Subdivision as well as other future Spencer Home projects in the Kihei-Wailea area.

L. Correspondence with Review Agencies

The individual comments received from each review agency mentioned above together with the direct responses to each of them, as well as responses from other agencies (which had no significant comments) are attached in this subsection.

1. Planning Department

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 9, 2000

Mr. John E. Min
Director
Department of Planning
County of Maui
250 South High Street
Wailuku, HI 96793

Re: Ke Alii Subdivision - Response to Your Requests for Additional Information, Dated February 22, 2000

Dear Mr. Min:

The following is our item-by-item response to your requests for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01 (SM1 990022):

Request

"1. *Please provide a detailed description of the park/detention area. What are the dimensions of the park/detention area? Will this be a passive park or active park? If an active park, what types of activities are proposed? Where will parking be provided for use of the park? How high is the berm? How will users of the park access the park? Will it be accessible from the street? Will the park be open to the public? Will this be a common area owned by the Homeowner's Association? Will it be in the CC&R's?"*

Response

A plan view drawing and profile for a corresponding section on the plan are enclosed. The park/detention basin is approximately trapezoidal in shape, 119± feet long and 59± feet wide at its narrowest point. The bottom of the basin will be 5 feet below the top of the berm. Total storage capacity is approximately 267,800 gallons.

A 10-foot wide access road (with 15% slope) will provide ramp access into the park, while a concrete stairway off the street will provide conventional access. At subsurface 72-inch perforated pipe will provide additional initial storage.

The park will be a passive park, which will be privately owned and maintained by the Homeowners Association. The general public will be able to use the park except when individual homeowners reserve the park through the Homeowners Association for private

activities. The general public will not be able to reserve the park for their private events through the Homeowners Association. Rules for use and reservation of the park by Homeowners will be included in the Bylaws and CC&Rs.

Request

"2. *Each lot owner abutting the drainage channel owns a portion of the drainage area. How will the maintenance and operation of the drainage channel be controlled and who will oversee the maintenance and operation of the drainage channel? Will this be incorporated in the bylaw and CC&R's? How will the Homeowner's Association ensure compliance?"*

Response

The drainage channel will essentially be left intact within the calculated inundation limits for the 100-year design storm. Drainage easement will be established based on the calculated 100-year design storm inundation limits. The individual lot owners will be responsible for the maintenance of the drainage channel within the drainage easement, while the Homeowner's Association will be responsible for enforcement of this policy upon individual owners through warning, penalties and fines. The Homeowner's Association will receive the right to go in and maintain the easement if any of the lot owners fail to do so. The negligent lot owner will be required to bear the cost of maintenance by the Homeowner's Association.

Request

"3. *Please provide a revised subdivision plan based upon comments made by the Department of Public Works and Waste Management (DPWWM) now that an additional right-of-way is required on Alanui Ke Alii Road."*

Response

A full-size revised subdivision plan is also enclosed for your reference.

Please note that we will be also be sending you copies of our responses to the comments made by each of the other review agencies as outlined in your letter, dated February 22, 2000, as we send them out in the next day or two. The summary of the comments and responses to these reviewing agencies (with reduced scale attachments, if any) will be included in the Environmental Assessment (EA) Report in Chapter X, "Comments Received During Public Comment Period and Applicable Responses". Copies of the actual correspondence will be included in Section L, "Correspondence with Review Agencies" of the EA Report, of which you will receive two (2) full copies.

Please feel free to call me if you have any questions or comments on our planned submittal of the EA Report.

Very truly yours,

Alan L. Unemori
Vice-President

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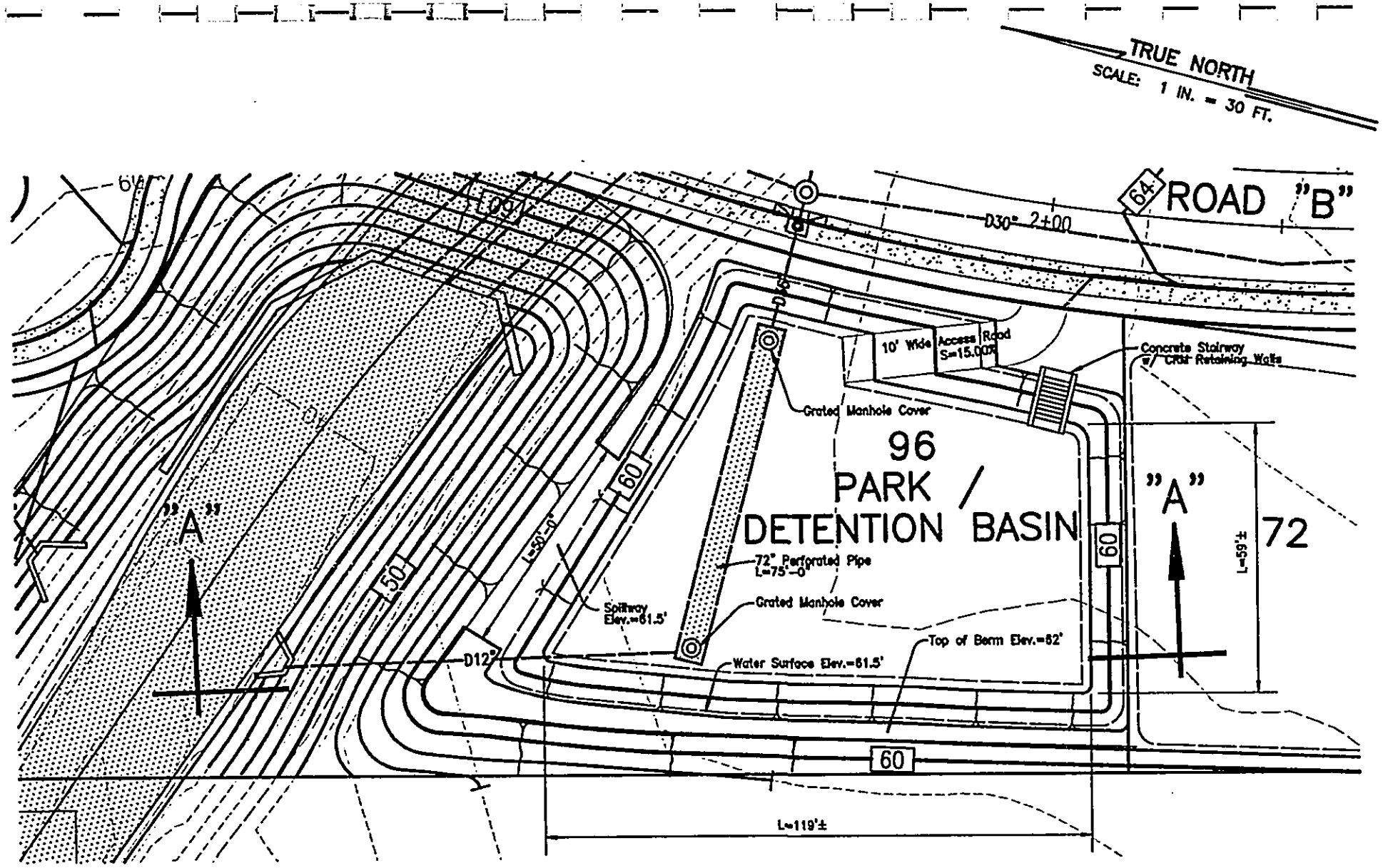
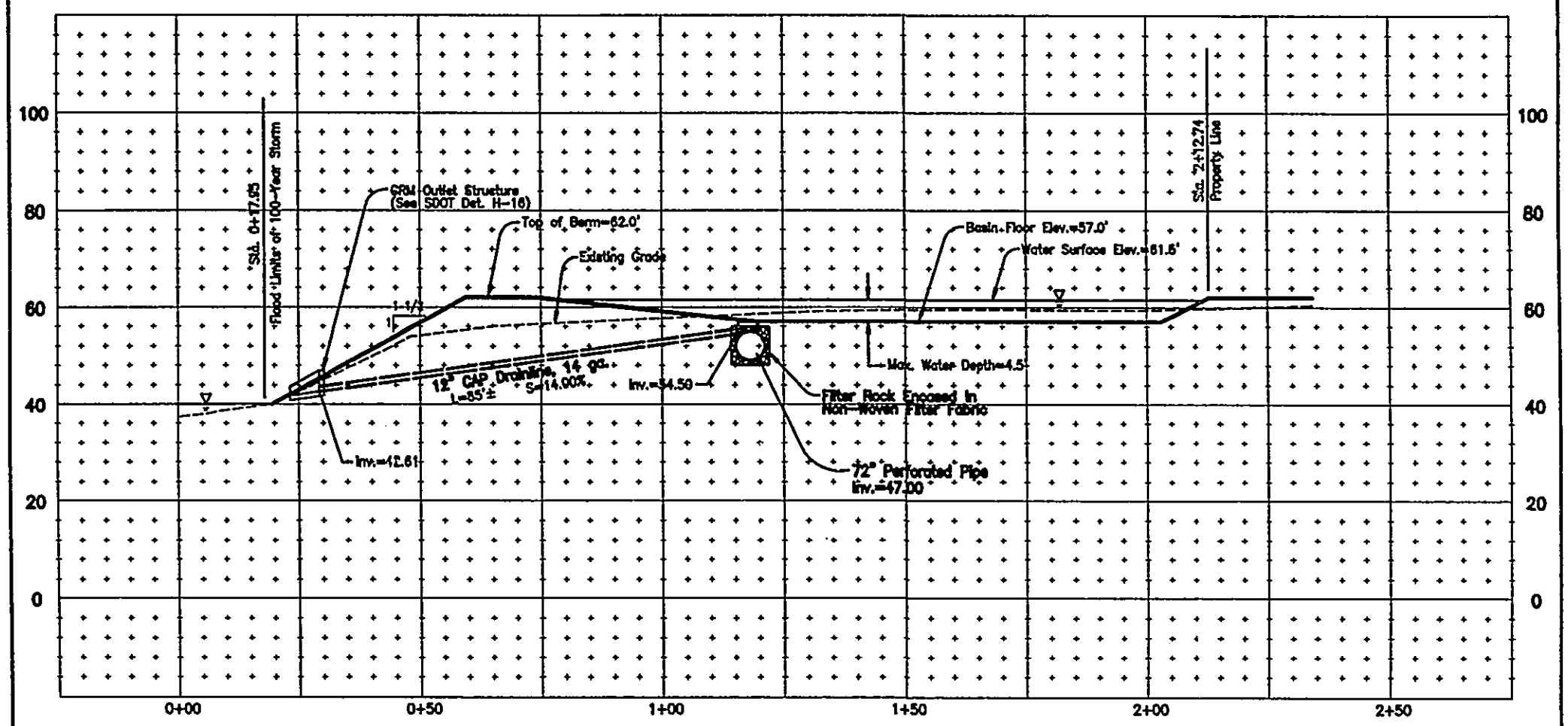


MAX. STORAGE CAPACITY=35,800 cf = 267,800 gallons

WARREN S. UNEMORI
ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

February 24, 2000

99054/dwg/exhibits/sec-basn.dwg



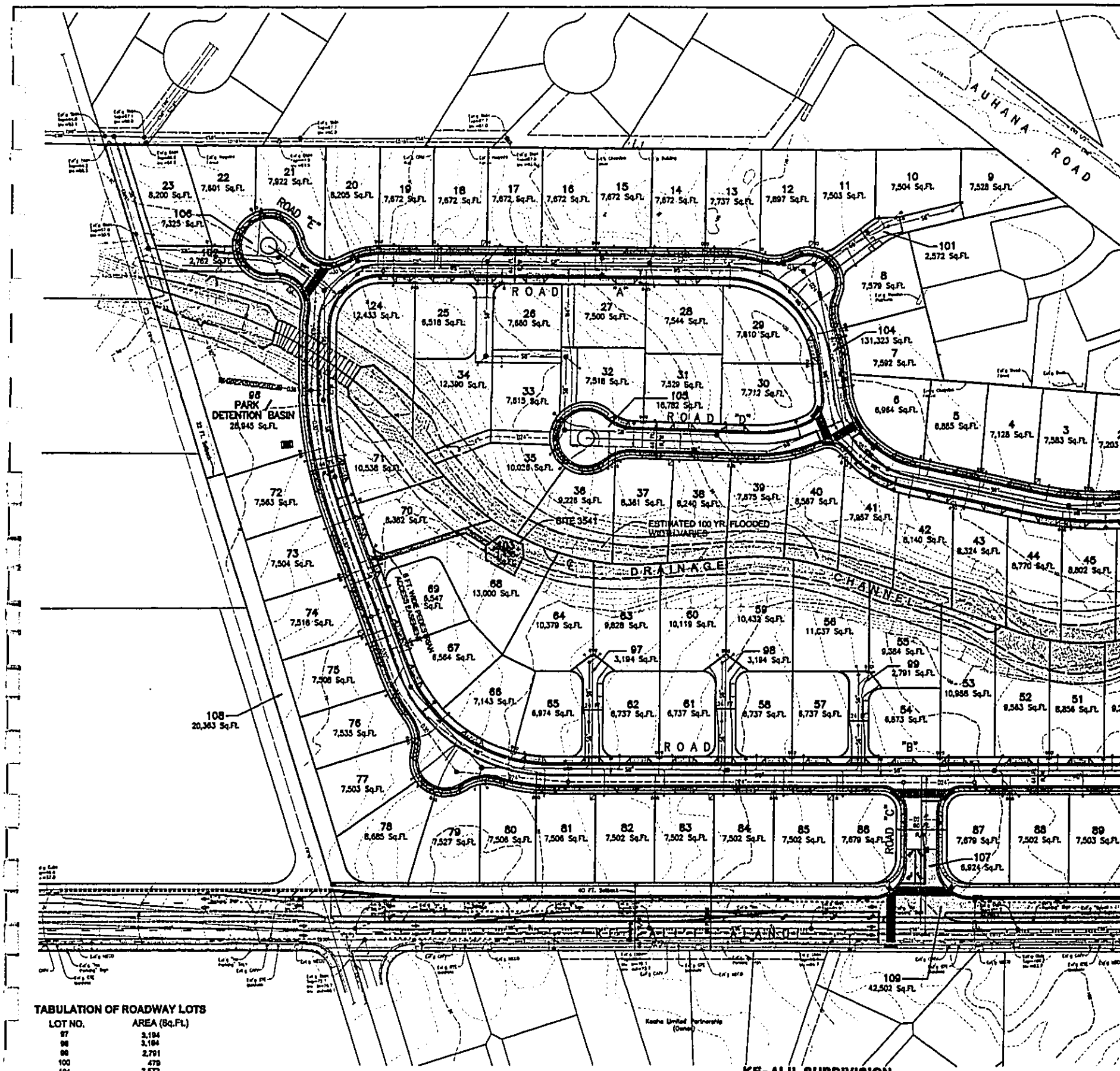
SECTION "A"–"A"

Scale: Horiz. 1" = 30'
Vert. 1" = 30'

WARREN S. UNEMORI
ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

February 24, 2000

99054/dwg/exhibits/sec-boat.dwg



TABULATION OF ROADWAY LOTS

LOT NO.	AREA (Sq.Ft.)
97	3,194
98	3,184
99	2,791
100	479
101	2,572
102	2,762
104	131,323
105	16,782
106	7,325
107	6,924
108	20,363
109	42,502
110	1,052
TOTAL:	341,263 Sq.Ft. = 5.84 Acs.

NET AREA: 24.09 - 5.84 = 18.66 ACS.
ALLOWABLE DENSITY: 18.66 x 5.81 = 107.77 LOTS
NO OF HOUSELOTS PROPOSED: 95 < 107

T.M.K.: 3-9-18 : 01

MISC. INFORMATION

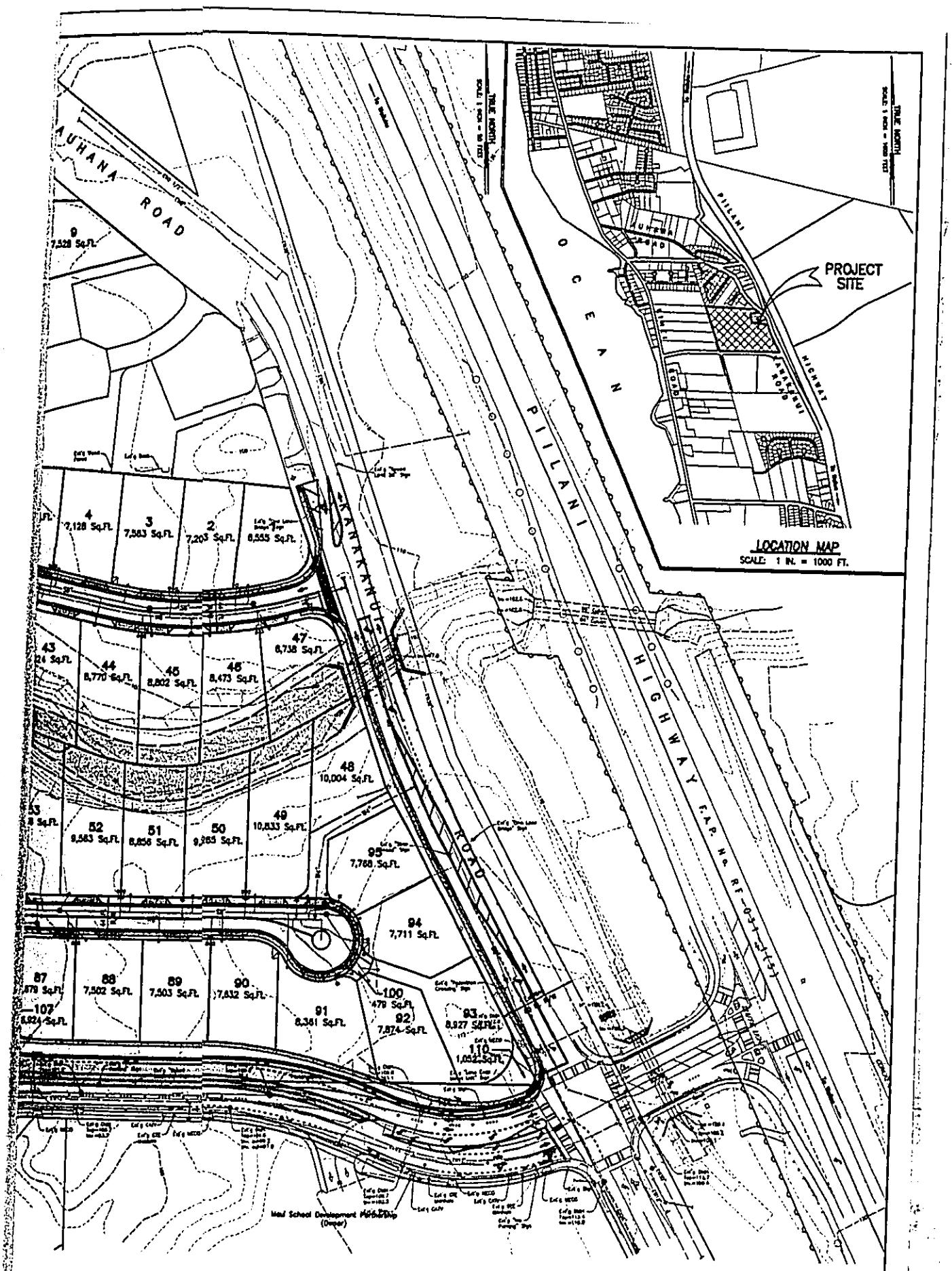
GROSS LAND AREA = 24.09 ACS.
ZONING = R-2 RESIDENTIAL
MIN. LOT SIZE = 6,500 Sq.Ft. (PROPOSED)
MIN. LOT WIDTH = 65 FT.
NO. OF HOUSELOTS = 95

KE-ALII SUBDIVISION

SUBDIVISION OF T.M.K.: 3-9-18 : 01,
INTO LOTS 1 TO 110, INCLUSIVE.
KIHEI, MAUI, HAWAII

DEVELOPER: SPENCER HOMES
ADDRESS: 4372 W. WAIOLA
KIHEI, MAUI, HI 96763
OWNER: KIHEI KAMAOLE ASSOCIATES
ADDRESS: 98-1608 HAPAHI STREET
AIEA, OAHU, HI 96701

0 50 100 150 200
SCALE: 1 IN. = 50 FT.



ADVANCED COPY
SUBJECT TO CHANGE

APPROXIMATE EARTHWORK QUANTITIES

EXCAVATION = 22,500 CU.YD.
EMBANKMENT = 35,600 CU YD.

WARREN S. UNEMORI ENGINEERING, INC.

July 29, 1997
Revised: October 9, 1998
Revised: January 18, 2000
Revised: March 17, 2000

W3UE #99054

JAMES "KIMO" APANA
Mayor

JOHN E. MIN
Director

CLAYTON I. YOSHIDA
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

February 22, 2000

Mr. Alan Unemori
2145 Wells Street
Wailuku, Hawaii 96793

Dear Mr. Unemori:

RE: Special Management Area Use Permit (SMA) Application for Ke Alii Subdivision - Spencer Homes, Single-Family Subdivision, Drainage and Related Improvements, Tax Map Key: 3-9-18:001, Kihei, Island of Maui, Hawaii (SM1 990022)

The Maui Planning Department (Department) requests that you provide additional information regarding the above subject application.

1. Please provide a detailed description of the park/detention area. What are the dimensions of the park/detention area? Will this be a passive park or active park? If an active park, what types of activities are proposed? Where will parking be provided for the use of the park? How high is the berm? How will users of the park access the park? Will it be accessible from the street? Will the park be open to the public? Will this be a common area owned by the Homeowner's Association? Will it be in the CC&R's?

2. Each lot owner abutting the drainage channel owns a portion of the drainage area. How will the maintenance and operation of the drainage channel be controlled and who will oversee the maintenance and operation of the drainage channel? Will this be incorporated in the bylaw and CC&R's? How will the Homeowner's Association ensure compliance?

3. Please provide a revised subdivision plan based upon comments made by the Department of Public Works and Waste Management (DPWWM) now that an additional right-of-way is required on Alanui Ke Alii Road.

The Department still has not received your responses addressing comments and concerns made by the following agencies:

1. State Land Use Commission (SLUC) - The SLUC stated in their letter that based upon two major reclassifications of land from agricultural to urban, the Maui Planning Commission (Commission) had major concerns relating to the drainage problems of the lower Kihei area, the need for additional school facilities, and transportation improvements, as well as project-specific issues unrelated to your proposed project. Although the project-specific issues are unrelated to your project, issues that are regional in scope, along with your project, may have a cumulative effect. The cumulative effect of your proposed development along with these two approved developments should be addressed.

   Schools - The data provided in your assessment report states that the projected enrollment for the elementary school level is approximately 20 students. This is equivalent to approximately one classroom. Please provide information on the total enrollment of Kamalii Elementary School and its capacity. Please discuss what effect the 20 additional students will have on the enrollment and capacity of the school.

   Drainage - Please discuss the relationship of the Haleakala Ranch/Maui Research and Technology Park drainage and effect of the drainage, if any, on your proposed development.

   Traffic - By addressing the concerns raised by the Police Department, the concerns raised by the SLUC may also be addressed.

2. Department of Land and Natural Resources, State Historic Preservation Division (DLNR, SHPD) - The DLNR, SHPD recommended that a preservation plan for Site 3541 and a monitoring plan be submitted to their office for review and acceptance. To date, they have not received either of these documents. Please provide this Department with a status of these documents and a time frame in which you intend to complete them.

3. Department of Land and Natural Resources, Engineering Branch (DLNR) - The DLNR recommended using FEMA's 100-year design discharge for the stream cross-section design proposed in the drainage report. FEMA's design discharge from the stream mouth to the upper end of the study area is 3,200 cfs. In future drainage studies, address decreasing peak discharge to pre-development conditions through the use of the proposed subsurface and bermed park site detention facilities. Please provide this Department with the necessary revisions and address the effect these changes have.

4. Department of the Army, Corps of Engineers - Will you be acquiring a DA permit as noted by the Corps of Engineers?

5. United States Department of Agriculture (USDA), Soil Conservation Service response - Your letter stated that Spencer Homes provided you with "Policy Statements." As noted in previous comments above, how will these be implemented and enforced? The last item states that a low CRM wall may be constructed at the base of the fill slope before the geo-cell lining is installed. How high will this wall be? This wall should be shown as part of this permit application. If it is not included in this application, it may have to be processed as a separate application.

6. Department of Public Works and Waste Management - Please provide this Department with your comments to their Advisory Comments. Please provide the justification in which a 60-foot wide right-of-way is no longer necessary for only this portion of the North-South Collector Road.

7. Department of Parks and Recreation - Please provide this Department with your comments on the Department of Parks and Recreation comments.

8. Police Department - Please provide this Department with your response to the Police Department's comments and concerns regarding the traffic problems. For your information, copies of their comments were sent to the Department of Transportation, Department of Public Works and Waste Management, and the Department of Education.

9. Department of Fire Control - Please provide this Department with an explanation of the location of any fire apparatus access roads and where any buildings would be in excess of 150 feet from a water supply on a public street.

10. Department of Health (DOH) - How will a solid waste management plan be implemented? What and how will polluted runoff, vector, water pollution, fugitive dust, and noises be controlled? The DOH also recommended holding a public information meeting in the surrounding community to describe the project and potential environmental impacts, and to respond to concerns relating to the project. Please provide this Department with your response to the Department of Health's concerns and issues.

In addition, this Department was informed by the Department of Public Works and Waste Management that you have been informed that an Environmental Assessment (EA) is required. The comments received from the agencies for the SMA application can be included in your draft EA. These concerns and comments should be addressed in your draft EA. The Department cannot proceed with the processing of your application until the EA has been filed and you have addressed the concerns and comments noted above. If during the 30-day comment period, there appears to be no significant comments made, the Department would be able to schedule the public hearing before the Maui Planning Commission, provided that you guarantee in writing that should there be a challenge during the Final EA period, whereby the public hearing has to be rescheduled, you will be responsible to pay for all costs associated with rescheduling and re-noticing of the public hearing.

Enclosed is a tentative schedule contingent upon you meeting all the requirements discussed above. A copy of the publication dates for the Office of Environmental Quality Control Bulletin is also enclosed for your information.

If you have any additional questions, please call Ms. Julie Higa, Staff Planner, of this office at 270-7814.

Very truly yours,

JOHN E. MIN
Planning Director

JEM:JH:cmb
Enclosures
c: Clayton Yoshida, AICP, Deputy Planning Director
Spencer Homes, Inc.
Charles Jencks, Director, Department of Public Works and Waste Management
Ralph Nagamine, Land Use and Codes Division
Julie Higa, Staff Planner
Project File
General File
S:\ALL\JULIE\KEALII.SM1\ADDINFO.LTR

2. State Land Use Commission

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 9, 2000

Ms. Esther Ueda
Executive Officer
Land Use Commission
State of Hawaii
P. O. Box 2359
Honolulu, HI 96804

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated January 25, 2000

Dear Ms. Ueda:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated January 25, 2000, he requested that we respond to you on several items. The following is our item-by-item response to his requests (on your behalf) for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"1. State Land Use Commission (SLUC) - The SLUC stated in their letter that based upon two major reclassifications of land from agricultural to urban, the Maui Planning Commission (Commission) had major concerns relating tot he drainage problems of the lower Kihei area, the need for additional school facilities, and transportation improvements, as well as project-specific issues unrelated to your proposed project. Although the project-specific issues are unrelated to your project, issues that are regional in scope, along with your project, may have a cumulative effect. The cumulative effect of your proposed development along with these two approved developments should be addressed.

Schools - The data provided in your assessment report states that the projected enrollment for the elementary school level is approximately 20 students. This is equivalent to approximately one classroom. Please provide information on the total enrollment of Kamalii Elementary School and its capacity. Please discuss what effect the 20 additional students will have on the enrollment and capacity of the school."

Response

The Department of Education was contacted on February 24, 2000. Mr. Alan Honma of the DOE [Phone No.: (808) 733-4862] stated that the current enrollment in Kamalii Elementary School is 872 students in the 1999-2000 academic year. He further stated that since Kamalii Elementary School was designed as a "Year-Round" facility, it can accommodate 1051 students per year. Therefore there is adequate room to accommodate the projected 20 additional students.

It is also worth mention that the Department of Education itself had no comments on the SMA Project Assessment Report (see attached letter from the DOE).

Request

"Drainage - Please discuss the relationship of the Haleakala Ranch/Maui Research and Technology Park drainage and effect of the drainage, if any, on your proposed development."

Response

Attached please find a Figure which clearly shows that the drainage watershed area for Haleakala Ranch/Maui Research and Technology Park are completely isolated from the project site, and will therefore not affect the drainage of the Ke Alii Subdivision.

Request

"Traffic - By addressing the concerns raised by the Police Department, the concerns raised by the SLUC may also be addressed."

Response

Maui Police Officer Bradney Hickle raised concerns referred to by Mr. John Min. His comments were forwarded to Parsons Brinckerhoff (PB), the consultant who prepared the "Traffic Impact Analysis Update for the Ke Alii Single-Family Units", September, 1999. After review of these concerns, Mr. Wayne Yoshioka, Manager of Transportation Planning/Traffic Engineering, addressed each of the concerns. This letter summarizes as follows:

> ***"We believe this letter addresses the issues that officer Hickle raised in his memorandum.***
>
> ***First, Ke Alii Single-Family Units development will generate very little traffic impact. Intersection analysis show that traffic from the development would not change the level of service at the intersections of Alanui Ke Alii. It contributes about 10 percent of the traffic projected for Alanui Ke Alii and a very small***

percentage on the traffic on South Kihei Road and Piilani Highway.

Second, many of the issues are related to existing traffic issues connected with the operation of Kamalii Elementary School. It is appropriate and desirable for Kamalii Elementary School to conduct the recommended internal traffic circulation study, the school crossing study, and the school speed zone study to enhance the safety for students attending the school."

Enclosed please find a copy of this correspondence. The developer will cooperate and work with the Police Department and Department of Education on these matters of concern.

Please feel free to call me at (808) 242-4403 if you have any questions or comments.

Very truly yours,

Alan L. Unemori
Vice-President

cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

D:\WP61DOCS\KEALII12.DOC

510

BENJAMIN J. CAYETANO
GOVERNOR

ESTHER UEDA
EXECUTIVE OFFICER

'00 JAN 26 P12:08

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
P.O. Box 2359
Honolulu, HI 96804-2359
Telephone: 808-587-3822
Fax: 808-587-3827

January 25, 2000

Mr. John E. Min
Planning Director
County of Maui
250 South High Street
Wailuku, Hawai'i 96793

Dear Mr. Min:

Subject: Notice of Application
Special Management Area Use Permit (SM1 990022)
Project Name: Ke Alii Subdivision – Spencer Homes
Owner: Spencer Homes, Inc.
Applicant: Warren Unemori Engineering, Inc.
TMK: 3-9-018: 001
Kihei, Maui, Hawaii

We have reviewed the subject application forwarded by your transmittal dated December 28, 1999, to subdivide a 24 acre lot into approximately 96 varied single family homesites in Kihei, Maui, Hawai'i. We confirm that the proposed project is designated within the State Land Use Urban District.

Based upon our review of the subject application, areas north of the project site were subject to two State Land District Boundary Amendments:

1. In 1983, the Commission approved the petition from Petitioner Halcakala Ranch Company (LUC Docket No. A82-536) to reclassify approximately 189.7 acres of land from the Agricultural District into the Urban District for residential development, and commercial and park uses, identified as TMK: 2-2-002: portion of 42. In the Commission's Decision and Order issued August 12, 1983, the Commission had indicated major issues, such as, the drainage problems of the lower Kihei area, the need for additional school facilities to accommodate growth, and transportation improvements. The Petitioner stated they were willing to work with the County and

State in mitigating these impacts. We do not know of the status of the improvements identified in the Decision and Order, since the Petitioner was not required to provide annual progress reports.

2. In another action, the Commission approved the petition from the Maui Economic Development Board, Inc. (LUC Docket No. A84-585) to reclassify approximately 300 acres of land from the Agricultural District into the Urban District to develop a research and technology park at Kihei, Maui, Hawaii, identified as TMK: 2-2-02: Portion of 42. Incremental districting was approved for two increments each of 150 acres. The first increment was reclassified from the Agricultural District into the Urban District with a five-year timeframe to complete urban development. The second increment was to remain in the Agricultural District subject to incremental districting into the Urban District with a ten to fifteen year timeframe to complete development upon reclassification. In LUC Docket No. A84-585 Finding of Fact, Conclusions of Law And Decision and Order issued July 15, 1985, and the amendment issued February 25, 1986, the Commission had specified that the Petitioner shall: conduct an archaeological reconnaissance survey prior to construction activities on the property; make roadway and traffic improvements to the Lipoa Street/Piilani Highway intersection as necessary; develop the property as an industrial park for high technology users; and, develop a secondary irrigation water source for irrigation.

The Decision and Orders for the dockets mentioned above are enclosed for your information. We have no further comments to offer at this time. We appreciate the opportunity to comment on the subject application.

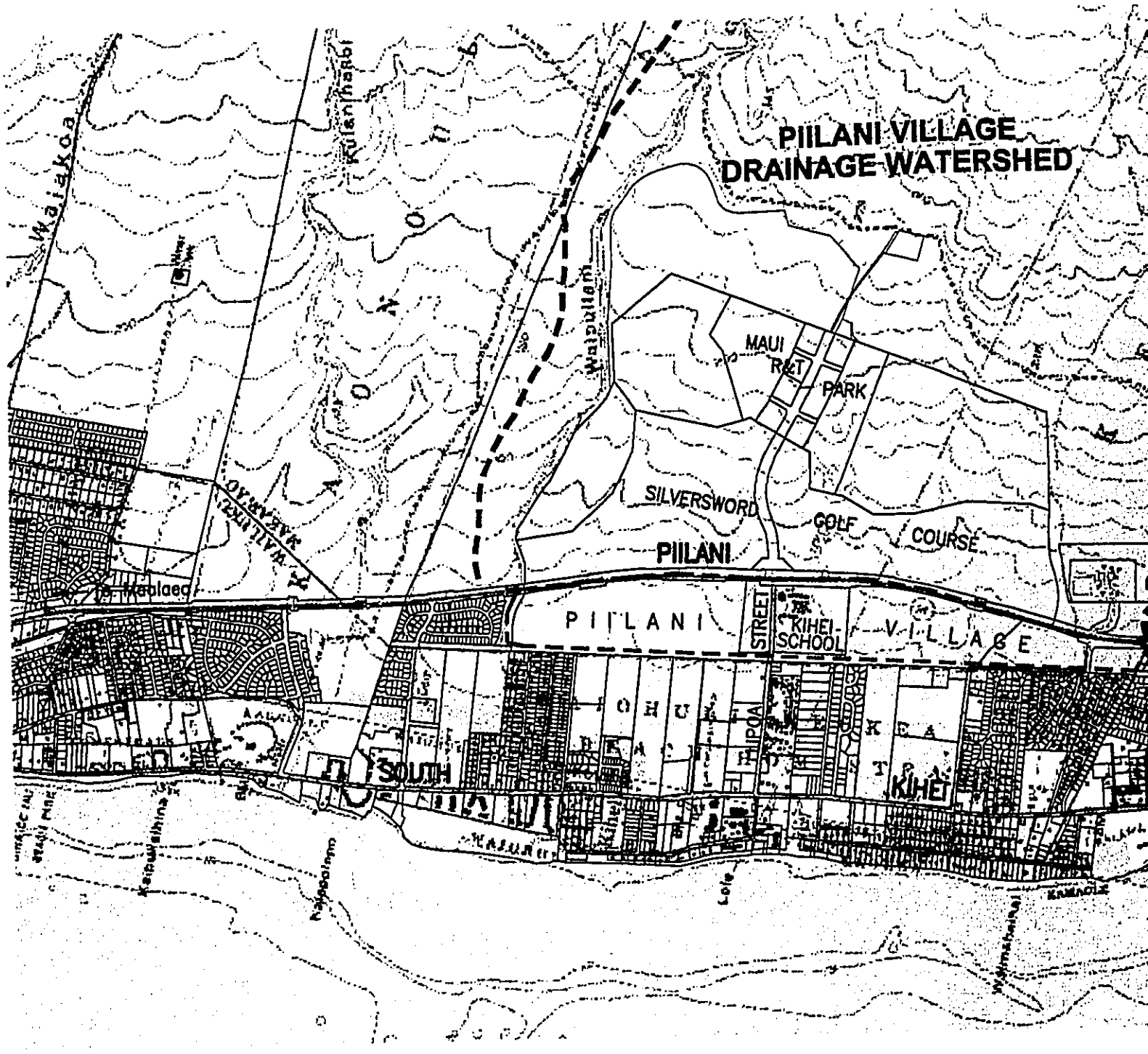
Should you have any questions, please feel free to call me or Russell Kumabe of our office at 587-3822.

Sincerely,

ESTHER UEDA
Executive Officer

EU:aa

Enclosures: Decision and Order for LUC Docket No. A82-536
Decision and Order for LUC Docket No. A84-585



OFFSITE DRAINAGE AREAS
PIILANI VILLAGE AND KE ALI'I

SCALE: 1 IN. = 2000 FT.

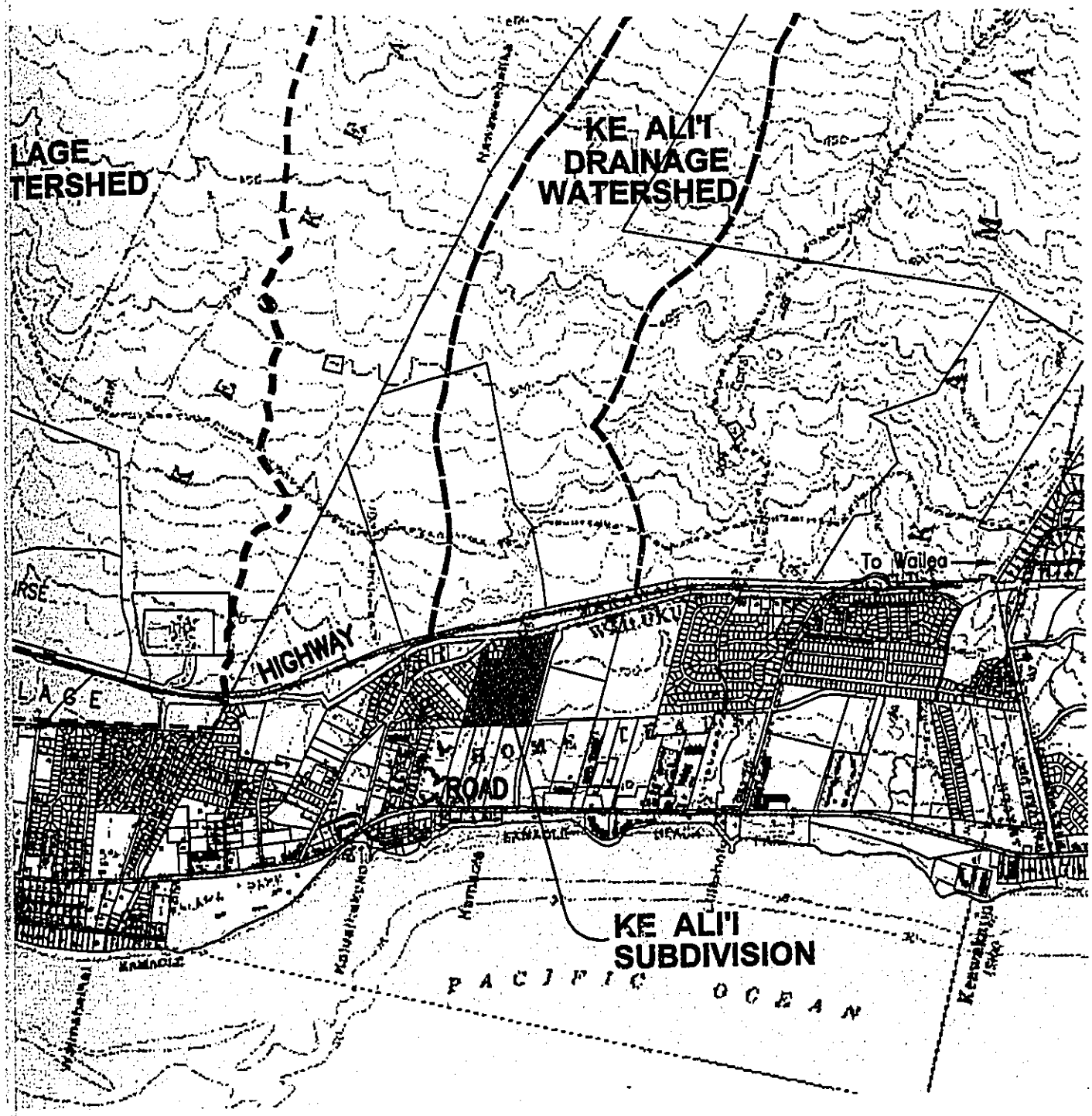
LEGEND:

- LIMITS OF PIILANI VILLAGE DRAINAGE WATERSHED
- LIMITS OF KE ALI'I SUBDIVISION DRAINAGE WATERSHED

99proj/99054/dwg/exhibits/drn-exbt.dwg

TRUE NORTH

SCALE: 1 IN. = 2000 FT.



E AREAS MAUKA OF KE ALI'I SUBDIVISION

2000 FT.

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

February 29, 2000

3. **Department of Land and Natural Resources, State Historic Preservation Division**

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 10, 2000

Mr. Don Hibbard
Administrator
Department of Land and Natural Resources
State Historic Preservation Division
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, HI 96707

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated January 21, 2000

Dear Mr. Hibbard:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated January 21, 2000, he requested that we respond to you for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"2. *Department of Land and Natural Resources, State Historic Preservation Division (DLNR, SHPD.) - The DLNR, SHPD recommended that a preservation plan for Site 3541 and a monitoring plan be submitted to their office for review and acceptance. To date, they have not received either of these documents. Please provide this Department with a status of these documents and a time frame in which you intend to complete them."*

Response

The developer has retained Xamanek to prepare both the Archaeological Preservation Plan for Site 3541 and a Monitoring Plan for the sand dunes in the northwest corner of the parcel. No grading will occur until both of these documents have been reviewed and approved by the DLNR Historic Preservation Division. Attached please find a copy of this correspondence and a copy of the Archaeological Mitigation Plan

We will coordinate the location survey of Site 3541 in the field with Xamanek. This information will then be plotted on our survey map to ensure its preservation.

Please feel free to call me at (808) 242-4403 if you have any questions or comments.

Very truly yours,

Alan L. Unemori
Vice-President

cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

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SPENCER HOMES, INC.
Building in Hawaii Since 1964

P.O. Box 97
Kihei , HI 96753
Telephone (808) 891-8770
Fax (808) 891-8771

AUTHORIZATION

March 6, 2000

To Whom It May Concern:

This letter authorizes Xamanek Researches to develop an Archaeological Preservation Plan for Site 3541 and Monitoring Plan for norwest corner sand dunes of the proposed Ke Alii Subdivision, located at Ke Alii Alanui Rd., in Kihei, Maui, with TMK No. 3-9-18:01.

Sincerely yours,

Mark Spencer
Project Manager

57

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

TIMOTHY E. JOHNS, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

DEPUTIES
JANET E. KAWELO
LINNEL NISHIOKA

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND
STATE PARKS
WATER RESOURCE MANAGEMENT

January 21, 2000

Mr. John E. Min, Director
Department of Planning - Maui County
250 South High Street
Wailuku, Hawaii 96793

LOG NO: 24735 ✓
DOC NO: 0001CD10

Dear Mr. Min,

SUBJECT: Chapter 6E-42 Historic Preservation Review of an Application for a Special Management Area Permit for the Proposed Ke Ali'i Subdivision (Subject I.D.: SM1 990022)
Kama'ole Ahupua'a, Wailuku District, Island of Maui TMK: 3-9-18:001

Thank you for the opportunity to comment on your letter of December 28, 1999.

From the submitted document, we understand the proposed undertaking to consists of the subdivision of 24-acres, the construction of 96 single family house lots, and the associated infrastructure.

A search of our records indicates Xamanek Researches conducted an archaeological inventory survey [Fredericksen et al. 1994] which has been reviewed and accepted by this office [SHPD DOC NO: 9909RC05]. During this investigation, a total of 11 historic sites were identified; one of which was significant.

We subsequently reviewed a preliminary plat review for the proposed Ke Ali'i Subdivision [SHPD DOC NO:9910CD25]. At this time we recommended a preservation plan for site 3541 and a monitoring plan be submitted to this office for review and acceptance. To date, we have not received either of these documents.

Therefore, to ensure that the mitigation commitments are fulfilled, we recommend that any approved application have the following conditions attached:

1. An acceptable preservation plan for historic site 3541 be submitted to the State Historic Preservation Division and that this plan be executed prior to any land alteration in the vicinity of the site. The State Historic Preservation Division shall verify in writing the successful execution of the plan.

2. An archaeological monitoring plan for activities in the sand areas in the northwest part of the parcel be submitted to the State Historic Preservation Division for approval.

Please call Cathleen Dagher at 692-8023 if you have any questions.

Aloha,

Don Hibbard, Administrator
State Historic Preservation Division

CD:jen

4. Department of Land and Natural Resources, Engineering Branch

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

May 31, 2000

Mr. Charles Jencks
Director
Department of Public Works and Waste Management
COUNTY OF MAUI
200 S. High Street
Wailuku, HI 96793

Re: Ke Alii Subdivision - Spencer Homes, TMK: 3-9-018:001, SMA Application, SM1 9900022, Summary of Meeting on Friday, May 26, 2000, Regarding Use of FEMA's 100-year Design Discharge

Dear Mr. Jencks:

I met with Mr. Francis Cerizo of the Planning Department last Friday, May 26, 2000, to discuss the 100-year design discharge to be used as the basis of design for the drainage system for Ke Alii Subdivision. As you know there is a discrepancy between the design discharge estimated by FEMA (3200 cfs) and the State Highways Divisions "Hydrology Report for Piilani Highway" (1200 cfs).

Rather than further delay this project over this inconsistency, we will design the natural drainage channel and drainage structure beneath the roadway crossing at the northwest corner of the property to handle the FEMA 100-year design discharge level of 3200 cfs, as requested by the County.

If you have any questions or concerns on our comments, please feel free to contact us to further discuss this matter.

Very truly yours,

Warren S. Unemori
President

cc Mark Spencer, Spencer Homes, Inc.
John Min, Planning Department
Francis Cerizo, Planning Department

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 10, 2000

Mr. Dean Y. Uchida
Administrator
Department of Land and Natural Resources
Land Division Planning Branch
1151 Punchbowl Street
Honolulu, HI 96813

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated February 14, 2000

Dear Mr. Uchida:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated February 14, 2000, he requested that we respond to you for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"3. Department of Land and Natural Resources, Engineering Branch (DLNR) - The DLNR recommended using FEMA's 100-year design discharge for the stream cross-section design proposed in the drainage report. FEMA's design discharge from the stream mouth to the upper end of the study area is 3,200 cfs. In future drainage studies, address decreasing peak discharge to pre-development conditions through the use of the proposed subsurface and bermed park site detention facilities. Please provide this Department with the necessary revisions and address the effect these changes have."

Response

The apparent discrepancy in the predicted storm flows for Kamaole Gulch was discussed in a meeting with Mark Spencer of Spencer Homes, Francis Cerizo of the Planning Department, Charles Jencks of the DPWWM and Warren Unemori of WSUE on March 2, 2000. The result of this meeting is summarized in the letter from Warren S. Unemori to John E. Min, Department of Planning, dated March 9, 2000.

The salient portion of that letter states that the DPWWM will accept the following as a reasonable solution:

"o The portion of the drainage channel within the project area and falling within FEMA study limits will be required to have a 100-year flow capacity of at least 3200 cfs in accordance with the current FEMA 'Flood Insurance Study'.

o The portion of the drainage channel between the FEMA study area and Piilani Highway shall be required to provide a 100-year floor capacity of at least 1200 cfs in keeping with both the existing drainage structures on Piilani Highway and the SDOT 'Hydrology Report for Piilani Highway'."

A copy of this correspondence is attached.

Please feel free to call me at (808) 242-4403 if you have any questions or comments.

Very truly yours,

Alan L. Unemori
Vice-President

cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

D:\WP61DOCS\KEALII14.DOC

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 9, 2000

Honorable John E. Min, Director
Department of Planning
County of Maui
250 S. High Street
Wailuku, Hawaii 96793

Dear Mr. Min,

Re: KE ALII SUBDIVISION DRAINAGE CHANNEL IMPROVEMENTS
Kihei, Maui, Hawaii
TMK: (2) 3-9-018: 001
LUCA File No. 3.1843; Planning Dept. ID # SM1 990022

I have received the copy of the letter from the DLNR Land Division that your department had forwarded to me which discusses the apparent discrepancy in storm flows for Kamaole Gulch, the existing natural drainageway that bisects the Ke Alii Subdivision project site. I met with Mr. Mark Spencer of Spencer Homes, Mr. Francis Cerizo of your department, and Mr. Charles Jencks, Director of the Dept. of Public Works, last week to discuss this issue in greater detail. Our discussion shed some light on the nature of the discrepancy noted by DLNR.

There are two regional drainage studies which have been widely used as the basis for determining the 100-year flows occurring in the natural drainageways within the Kihei area:

1) The Federal Emergency Management Agency's (FEMA) *Flood Insurance Study for Maui County, Hawaii*[1]. This study is the basis for the flood insurance maps for Maui County and the source of the 3200 cfs design flow for Kamaole Gulch cited by DLNR's Engineering Branch.

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[1]Federal Emergency Management Agency, *Flood Insurance Study for Maui County, Hawaii*, Community Number 150003, Revised March 16, 1995

2) State Highways Division's *Hydrology Report for Piilani Highway*[2]. This study was originally used to determine the design flows for the culverts and other drainage structures constructed by the Department of Transportation at the time Piilani Highway was built.

These two studies have generally agreed on the 100-year storm flows at Piilani Highway; however, Kamaole Gulch appears to be an exception. Both studies identify a comparable 5 to 5.5 square mile combined drainage area draining into Kamaole Gulch and the adjacent Charley Young gulch to the north; however, they disagree on the way the flow is divided into these two drainageways.

- The FEMA *Flood Insurance Study* assigns roughly 80% of the flow to Kamaole Gulch and 20% into Charley Young Gulch;

- The DOT *Hydrology Report for Piilani Highway* indicates roughly the reverse: only about 35% of the total flow is assigned to Kamaole Gulch, while 65% is assumed to flow into Charley Young Gulch.

As far as we can determine, both studies appear to have used USGS topographic data or the equivalent to determine the limits of the watersheds above Piilani Highway, and both appear to have made reasonable interpretations of the existing drainage areas that are difficult to either verify or refute without more detailed topographic information.

Prior to our meeting, we had discussed the matter with Mr. Sterling Yong, the State National Flood Insurance Program coordinator, who indicated that the County of Maui should establish a position on this matter to help resolve the apparent discrepancy in design flows being used for Kamaole Gulch in order for processing of the project's SMA application to continue in a timely manner.

---

2 *Hydrology Report for Piilani Highway, Island of Maui*, prepared for the State of Hawaii Department of Transportation, Highways Division, by Trans-meridian Engineers & Surveyors, Inc., January 1976.

After discussing this matter with Mr. Jencks, it was agreed that the Dept. of Public Works will accept the following as a reasonable solution to this apparent conflict of findings. The attached map, entitled "Offsite Drainage Studies Affecting Ke Alii Subdivision," places the limit of FEMA's detailed study area approximately 100 feet upstream of the westernmost boundary of the Ke Alii Subdivision project site. Therefore:

- The portion of the drainage channel within the project area and falling within the FEMA study limits will be required to have a 100-year flow capacity of at least 3200 cfs in accordance with the current FEMA *Flood Insurance Study*.

- The portion of the drainage channel between the FEMA study area and Piilani Highway shall be required to provide a 100-year flow capacity of at least 1200 cfs in keeping with both the existing drainage structures on Piilani Highway and the SDOT *Hydrology Report for Piilani Highway*.

I have based this recommendation on the following considerations:

- Without better topographic data for the region, we have no basis for determining which of the two studies is the more accurate of the two. It may take several months or longer to obtain current topographic data for this area for the level of detail we need. Waiting this long would impose an unfair burden on the developer, since this is really a regional drainage policy issue whose solution is beyond his control.

- The drainage improvements constructed with Piilani Highway, including the culvert crossings at Kamaole and Charley Young Gulches, were designed to conform to the flows reported in SDOT's *Hydrology Report for Piilani Highway*. Piilani Highway is a Federal-Aid- Highway; therefore, it is reasonable that the project developer be allowed to construct drainage improvements downstream of Piilani Highway in a manner consistent with the State Dept. of Transportation

on a highway project which carried the endorsement of the Federal Highway Administration. Furthermore, the County's 1994 Kihei *Drainage Master Plan*[3] adopts the SDOT *Hydrology Report for Piilani Highway* as the basis for runoff contributed by areas mauka of Piilani Highway, as do several other projects in the that have either been constructed or are now under construction.

- The County of Maui is a participant in the National Flood Insurance Program, and is, therefore, generally required to abide by the Federal requirements for flood plain management where applicable. Requiring drainage improvements to conform with FEMA's *Flood Insurance Study* within the detailed study area allows the County to meet its obligation.

- In addition, the County of Maui has already agreed to a 1200 cfs flow quantity for improvements downstream at South Kihei Road and for the Maui Coast Hotel project.

I feel that this solution offers as fair a compromise to both the public and the project developer as is possible at this time. Please contact me if you have any questions with regard to this recommendation.

Very truly yours,

Warren S. Unemori

enc.
cc: Charles Jencks, DPWWM w/ enc.
Mark Spencer, Spencer Homes w/ enc.

V:\PROJDATA\99proj\99054\Corrspdn\Mem\DLNR-response-draft-rev8.wpd

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[3]*Drainage Master Plan for Kihei, Maui, Hawaii*, prepared for the County of Maui Department of Public Works, Engineering Division, by Norman Saito Engineering Consultants, September 1994.

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
LAND DIVISION
P.O. BOX 621
HONOLULU, HAWAII 96809

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND DIVISION
STATE PARKS
WATER RESOURCE MANAGEMENT

00 FEB 15 P1:30

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

February 14, 2000

LD-NAV

Ref.: SM1990022.RCM

Honorable John E. Min
Planning Director
County of Maui
Planning Department
250 S. High Street
Wailuku, Hawaii 96793

Dear Mr. Min:

SUBJECT: Application for Special Management Area Permit
Spencer Homes Kealii Subdivision

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

Attached herewith is a copy of our Land Division Engineering Branch's comment(s) on the proposed project.

The Department has no other comment to offer on the subject matter. Should you have any questions, please feel free to contact Nicholas Vaccaro of the Land Division's Support Services Branch at 808-587-0438.

Very truly yours,

DEAN Y. UCHIDA
Administrator

C: Maui District Land Office

ENGINEERING BRANCH

COMMENTS

Project must comply with rules and regulations of the National Flood Insurance Program (NFIP) and all applicable County Flood Ordinances. If there are any questions regarding the NFIP, please contact the State NFIP Coordinator, Sterling Yong, of the Department of Land and Natural Resources at 587-0248. If there are questions regarding flood ordinances, please contact the applicable County representative.

We confirm that the project site, according to FEMA Community –Panel No. 150003 265 C is located in Zones A5 and C. Zone A5 is an area subject to the following conditions:

1. 100-year flooding.
2. Base flood elevations and flood hazard factors determined.

Zone C is an area of minimal flooding. The site is also located above the flood boundaries investigated by the National Flood Insurance program.

Use FEMA's 100-year design discharge for the stream cross section design proposed in the drainage report, instead of the 1,082 cfs from Warren S. Unemori Engineering, Inc. or 1,209 cfs from the Hydrology Report for Piilani Highway. FEMA's design discharge from the stream mouth to the upper end of the study area (1,600 feet from the stream mouth) is 3,200 cfs.

In future drainage studies; address decreasing the future peak discharge to pre-development conditions, through the use of the proposed subsurface and bermed park site detention facilities.

5. Department of the Army, Corps of Engineers

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

REPLY TO
ATTENTION OF

Regulatory Branch

February 23, 2000

RECEIVED
FEB 25 2000
WARREN S UNEMORI ENGINEERING, INC.

Mr. Alan Unemori
Warren S. Unemori Engineering, Inc.
2145 Wells Street
Wailuku, Hawaii 96793

Dear Mr. Unemori:

This letter is written regarding the proposed project, Keali'i Subdivision Project, file number 200000071 located in Kihei, Maui, Hawaii. After a further review of the project plans, it has been determined that this project will not require a Department of the Army permit.

Should you need additional information, you may contact Ms. Lolly Silva of my staff at 438-7023.

Sincerely,

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

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

REPLY TO ATTENTION OF

Civil Works Technical Branch

January 20, 2000

'00 JAN 24 P1:41

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

Ms. Julie Higa, Staff Planner
County of Maui
Department of Planning
250 South High Street
Wailuku, Maui, Hawaii 96793

Dear Ms. Higa:

Thank you for the opportunity to review and comment on the Special Management Area Application and Project Assessment Report for the Keali Subdivision Project, Kihei, Maui (TMK 3-9-18: 1). The following comments are provided in accordance with Corps of Engineers authorities to provide flood hazard information and to issue Department of the Army (DA) permits.

a. Enlargement of the existing 48-inch culvert may require a DA permit. For further information, please contact Ms. Lolly Silva at (808) 438-7023 and refer to file number 20000071.

b. The flood hazard information provided on page 4 of the Project Assessment Report is correct.

Sincerely,

James Pennaz

James Pennaz, P.E.
Chief, Civil Works
Technical Branch

6. United States Department of Agriculture, Soil Conservation Service

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 10, 2000

Mr. Neal S. Fujiwara
District Conservationist
U. S. Department of Agriculture
Natural Resources Conservation Service
210 Imi Kala Street, Suite 209
Wailuku, HI 96793

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated January 10, 2000

Dear Mr. Fujiwara:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated January 10, 2000, he requested that we respond to you for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"5. *United States Department of Agriculture (USDA), Soil Conservation Service response - Your stated that Spencer Homes provided you with "Policy Statements". As noted in previous comments above, how will these be implemented and enforced? The last item states that a low CRM wall may be constructed at the base of the fill slope before the geo-cell lining is installed. How high will this wall be? This wall should be shown as part of this permit application. IF it is not included in this application, it may have to be processed as a separate application."*

Response

The drainage channel will be kept in its natural state up to the 100-year storm inundation limits. Beyond these limits two (2) different options have been designed for outer curves of the channel as follows:

(1) GRP Slope Protection
(2) Geocell Slope Protection

The attached full-size Construction Plan Sheets "37" and "39" show the location and details of these optional slope protection measures.

Please feel free to call me at (808) 242-4403 if you have any questions or comments.

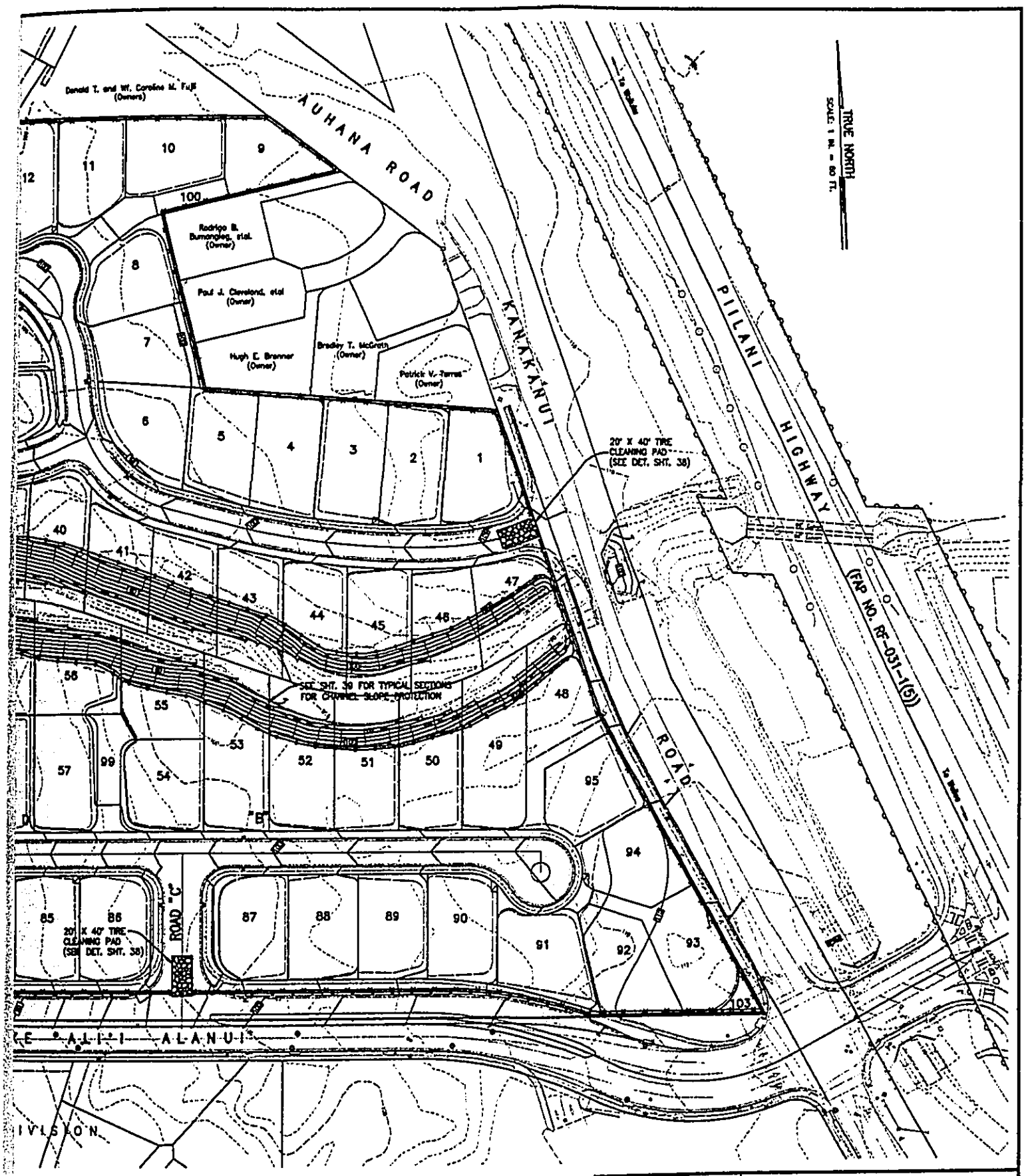
Very truly yours,

Alan L. Unemori
Vice-President

cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

D:\WP61DOCS\KEALII15.DOC


Kacor Realty Inc. (Owner)
Kihei Lutheran Church (Owner)
Lee E. Gardiner, Ltd. (Owner)
D.S. and W. Kathleen Robertson (Owners)
John A. Byrne, etal. (Owner)
Vincent J. Stiglone (Owner)
Wallace H. and W. Gladys H. Fujii (Owners)
Donald T. and W. Caroline M. Fujii (Owners)
Unicorn Live Lobster Co., Inc. (Owner)
FILTER BERM (SEE DET. SHT. 38)
United Realty Inc. (Owner)
WC Maui Coast LLC (Owner)
White Sands Maui Dev. Inc. (Owner)
Kachel Limited Partners (Owner)
98 PARK-DETENTION BASIN
ROAD "A"
ROAD "B"
ROAD "C"
ROAD "D"
ROAD "E"
20' X 40' TIRE CLEANING PAD (SEE DET. SHT. 38)
K E A L I I A L A N
K A M A O L E H E I G H T S S U B D I V I S I O N
LEGEND:
FINISH GRADE W/ ELEVATION
EXISTING GRADE W/ ELEVATION
TOP OF BANK
SILT FENCE OR FILTER BERM (SEE DET. SHT. 38)
DUST FENCE (SEE DET. SHT. 38)
CHANNEL SLOPE PROTECTION (SEE DET. SHT. 39 FOR OPTIONS)
TIRE CLEANING PAD (SEE DET. SHT. 38)
FILTER BERM (SEE DET. SHT. 38)
GEOCELL ON SLOPES GREATER THAN 2:1



DARREN T. UNEMORI
LICENSED PROFESSIONAL ENGINEER
NO. 7537-C
HAWAII, U.S.A.

Signature Date

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

NO.	DESCRIPTION	DATE

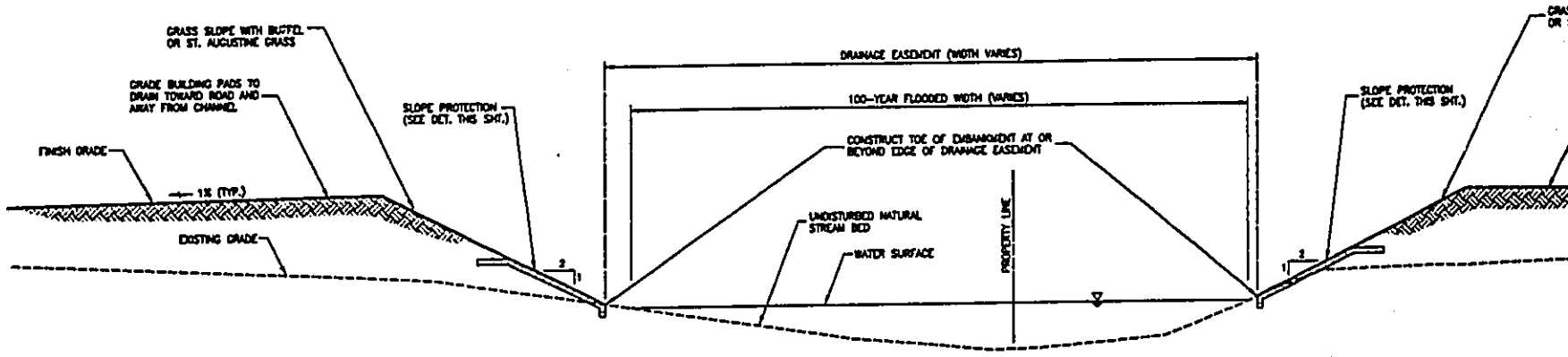
WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS/LAND SURVEYORS
WELLS STREET PROFESSIONAL CENTER, SUITE 403
2145 WELLS STREET, WAILUKU, MAUI, HAWAII 96793

KE ALI'I SUBDIVISION

KIHEI, MAUI, HAWAII

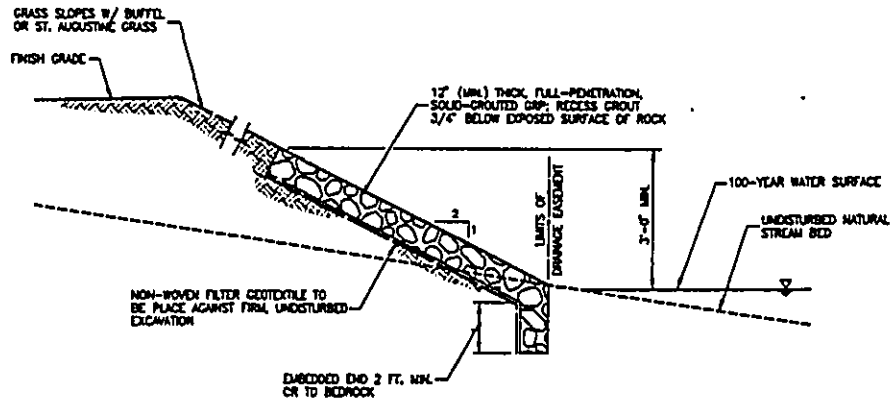
TITLE EROSION CONTROL PLAN

SRA DESIGNED BY	DTU CHECKED BY	99054 JOB NUMBER	37 SHEET
LCO DRAWN BY	WSU APPROVED BY	2-10-00 DATE	OF SHEETS
SCALE: 1 IN. = 60 FT.			



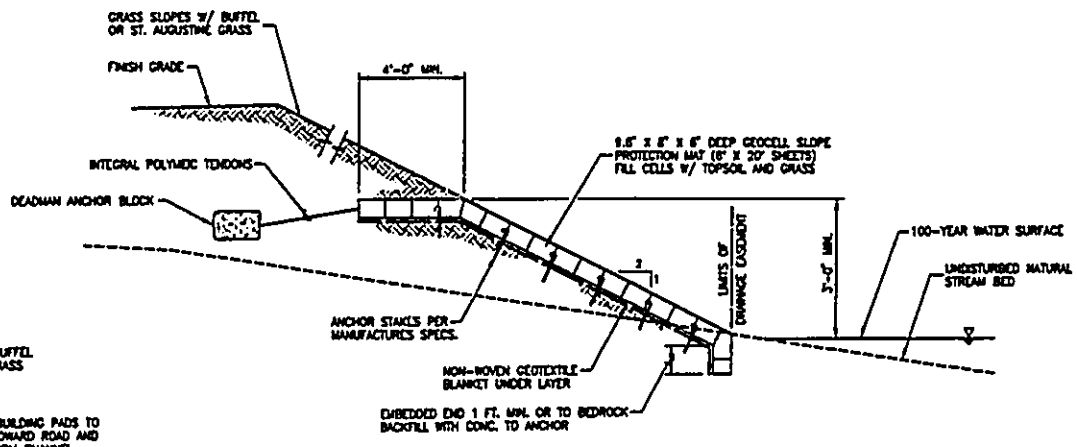
TYPICAL CHANNEL SECTION

SCALE: 1 IN. = 10 FT.



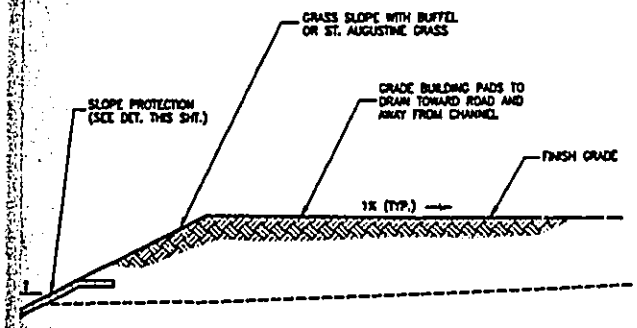
DETAIL – SLOPE PROTECTION (OPTION #1)

NOT TO SCALE



DETAIL – SLOPE PROTECTION (OPTION #2)

NOT TO SCALE



LETTER	DESCRIPTION	DATE

DARREN T. UNEMORI
LICENSED PROFESSIONAL ENGINEER
NO. 7937-C
HAWAII, U.S.A.

SIGNATURE DATE

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS/LAND SURVEYORS
WELLS STREET PROFESSIONAL CENTER, SUITE 403
2145 WELLS STREET, WAILUKU, MAUI, HAWAII 96793

KE ALI'I SUBDIVISION

KIHEI, MAUI, HAWAII

TYPICAL CHANNEL SECTION
TITLE AND SLOPE PROTECTION DETAILS

D.T.U. DESIGNED BY	D.T.U. CHECKED BY	99054 JOB NUMBER	39 SHEET
D.P.T. DRAWN BY	W.S.U. APPROVED BY	Jan. 24, 2000 DATE	OF SHEETS
AS NOTED SCALE			

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

January 19, 2000

Mr. Neal S. Fujiwara
District Conservationist
USDA
National Resources Conservation Service
210 Imi Kala Street, Suite 209
Wailuku, HI 96793

Re: Ke Alii Subdivision - Spencer Homes, TMK: 3-9-018:001, SMA Application, SM1 9900022

Dear Mr. Fujiwara:

Thank you for your comments on the Ke Alii Subdivision requesting an operation and maintenance plan of the existing drainage channel as outlined in your letter dated January 10, 2000, to Mr. John Min, Director, Planning Department (hereinafter referred to as Reference 1).

Your letter has been forwarded to Mr. Jesse Spencer of Spencer Homes, and he has provided the following Policy Statement regarding the existing drainage channel at Ke Alii Subdivision:

(1) The width of the drainage easment in the proposed subdivision was established according to the projected width of the inundation limits during a 100-year storm.

(2) The drainage channel easement will be in favor of the Ke Alii Homeowner's Association.

(3) Maintenance of the easement within each lot will be the responsibility of the respective land owner.

(4) The existing drainageway will be left as is. Only dead trees, branches and shrubs will be removed.

(5) No grading or planting within the existing drainageway will be permitted.

(6) Slopes along and outside of the drainage easement will be maintained by respective landowners.

(7) Slopes outside the drainage easements will be filled and lined with geoweb or geo-cell matting. Geo-cell linings will be backfilled with topsoil and grassed with St. Augustine or Buffel grass.

(8) Silt fences will be erected before any work is done on the slopes outside the drainage easement.

(9) In select locations along the outer curve of the channel, a low CRM wall may be constructed at the base of the fill slope before the geo-cell lining is installed.

If you have any questions on this Policy Statement, please contact us at (808) 242-4403. Thank you.

Very truly yours,

Warren S. Unemori
President

cc John Min, Planning Department
Jesse Spencer, Spencer Homes
Department of Public Works and Waste Management (w/ Reference 1)
Department of Health (w/ Reference 1)
Department of Land and Natural Resources (w/ Reference 1)
State Office of Planning (w/ Reference 1)
U. S. Army Corps of Engineers (w/ Reference 1)

United States
Department of
Agriculture

Natural
Resources
Conservation
Service

210 Imi Kala St.
Suite 209
Wailuku, HI 96793

Our People...Our Islands...In Harmony

'00 JAN 11 P1:01

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

DATE: January 10, 2000

Mr. John E. Min, Director
Department of Planning
County of Maui
250 S. High Street
Wailuku, Hawaii 96793

Dear Mr. Min,

SUBJECT: Ke Alii Subdivision; TMK: 3-9-018: 1
I.D. SM1 990022

It should be noted that operation and maintenance of the existing drainage channel is an integral part of the drainage system. An operation and maintenance plan defining responsibilities need to be developed.

Thank you for the opportunity to comment.

Sincerely,

Neal S. Fujiwara
District Conservationist

7. Department of Public Works and Waste Management

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

February 29, 2000

Mr. David Goode
Deputy Director
Department of Public Works and Waste Management
COUNTY OF MAUI
200 S. High Street
Wailuku, HI 96793

Re: Ke Alii Subdivision - Spencer Homes, TMK: 3-9-018:001, SMA Application, SM1 9900022, Response to the DPWWM's Advisory Comments, dated January 31, 2000, and Amended Comment 5, dated February 10, 2000 to John E. Min, Director of Planning,

Dear Mr. Goode:

The following is our item-by-item comments to the Advisory Comments in the DPWWM's letters to Mr. John Min, dated January 31, 2000, and amended February 10, 2000:

"1. *The Wastewater Reclamation Division cannot insure that wastewater system capacity will be available for the project."*

Your comment is noted.

"2. *The developer shall pay assessment fees for treatment plant expansion costs and fund any necessary off-site improvements to the collection system and wastewater pump stations."*

The developer understands from a phone conversation with Mr. Tracy Takamine of the Wastewater Reclamation Division on February 4, 2000, that there is a one-time assessment fee of $4.65 per gallon for treatment plant expansion costs, as well as a one-time assessment fee of $0.80 per gallon for offsite transmission improvements.

"3. *Provide a sewer impact study to substantiate that the existing water system is adequate to serve this project. Calculations are required before a building permit is issued."*

According to Mr. Takamine, this requirement is now obsolete and no longer required of the developer.

"4. *The drainage 'gully' and retention basin should be kept under private ownership and maintenance exclusive of the sections within the road rights-of-way."*

The developer intends to keep both the drainage "gully" and retention basin privately owned. The portion of the gully within the 100-year recurrence storm inundation limits will be designated as a drainage easement which is owned by the owner of each house lot immediately surrounding the drainage gully. This drainage "gully" will be maintained in its natural state with individual home owners responsible for the removal of loose branches or other natural debris which may accumulate thereon. Enforcement of reasonable maintenance in the drainage easement will be the responsibility of the Homeowners Association.

Similarly, the drainage retention basin will be kept as a passive park owned and maintained by the Homeowners Association.

"5. *(Modified February 20, 2000) The right-of-way for the North-South Collector Road shall be 52 feet, which will consist of 22 feet wide from the subject property and 30 feet wide from the Worldmark property located to the west of the subject property. This is consistent with a letter the department sent to the applicant in July of 1999."*

Agreed.

"6. *All structures, such as walls, trees, etc., shall be removed or relocated from the road widening strips. The rear boundaries of the road widening strips shall be clearly marked to determine if said structures have been properly removed and relocated."*

Agreed.

"7. *A 30-foot radii shall be provided at all the intersections of the proposed subdivision road and the adjoining Alanui Ke Alii and North-South Collector Road."*

Curves on the rights-of-ways at the intersections of both roads are, in fact, 30-feet in radius.

"8. *A site plan and a sight distance report to determine required sight distance and available sight distance at existing and proposed street intersections shall be provided for our review and approval."*

Agreed. The report will be submitted together with the Construction Plans and other reports will be sumitted during the design phase.

"9. *The subdivisions shall comply with the provisions of Title 18, "Subdivisions"*

Agreed.

"10. *Detailed and final drainage reports and site specific erosion control plans shall be submitted with the construction plans for review and approval prior to the issuance of grading permits. The drainage report shall include hydrologic and hydraulic*

calculations and the schemes for disposal of runoff waters. It must comply with the provisions of the 'Rules for Design of Storm Drainage Facilities in the County of Maui' and must provide verification that the grading and runoff water generated by the project will not have an adverse effect on adjacent and downstream properties. The site specific erosion control plan shall show the location and details of structural and non-structural Best Management measures."

Agreed. The drainage system will be designed in accordance with the provisions of the "Rules and Design of Storm Drainage Facilities in the County of Maui".

If you have any questions or concerns on our comments, please feel free to contact us to further discuss this matter.

Very truly yours,

Alan L. Unemori
Vice-President

cc Jesse Spencer, Spencer Homes, Inc.
John Min, Planning Department

D:\WP61DOCS\KEALII7.DOC

JAMES "KIMO" APANA
Mayor

CHARLES JENCKS
Director

DAVID C. GOODE
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
AND WASTE MANAGEMENT
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Land Use and Codes Administration

RON R. RISKA, P.E.
Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

ANDREW M. HIROSE
Solid Waste Division

February 10, 2000

MEMO TO: JOHN MIN, DIRECTOR OF PLANNING

F R O M: DAVID GOODE, DEPUTY DIRECTOR OF PUBLIC WORKS AND WASTE MANAGEMENT

SUBJECT: SPECIAL MANAGEMENT AREA PERMIT APPLICATION
KE ALII SUBDIVISION
TMK: (2) 3-9-018:001
SM 1 99/0022

We wish to amend our January 31, 2000 letter by amending Advisory Comment 5. The right-of-way for the North-South Collector Road shall be 52 feet, which will consist of 22 feet wide from the subject property and 30 feet wide from the Worldmark property located to the west of the subject property. This is consistent with a letter the department sent to the applicant in July of 1999.

If you have any further questions, please feel free to call me at ext. 7845.

DG:mt
cc: Land Use and Codes Administration
Charles Jencks

0500 & 74.

JAMES "KIMO" APANA
Mayor

CHARLES JENCKS
Director

DAVID C. GOODE
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS
AND WASTE MANAGEMENT
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Land Use and Codes Administration

RON R. RISKA, P.E.
Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

ANDREW M. HIROSE
Solid Waste Division

February 8, 2000

MEMO TO: JULIE HIGA, PLANNER

F R O M: CHARLES JENCKS, DIRECTOR OF PUBLIC WORKS AND WASTE MANAGEMENT

SUBJECT: KE ALA'I SUBDIVISION, EA REQUIREMENTS

This memo is being provided to you as notice that an environmental assessment for the subject project will not be required. Thank you.

CJ:mt

648

JAMES "KIMO" APANA
Mayor

CHARLES JENCKS
Director

DAVID C. GOODE
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS AND WASTE MANAGEMENT
200 SOUTH HIGH STREET
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Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

ANDREW M. HIROSE
Solid Waste Division

January 31, 2000

MEMO TO: JOHN E. MIN, DIRECTOR OF PLANNING

FROM: for CHARLES JENCKS, DIRECTOR OF PUBLIC WORKS AND WASTE MANAGEMENT

SUBJECT: SPECIAL MANAGEMENT AREA PERMIT APPLICATIONS
KE ALII SUBDIVISION
TMK: (2) 3-9-018:001
SM1 99/0022

We reviewed the subject application and have the following comments.

Advisory Comments

1. The Wastewater Reclamation Division cannot insure that wastewater system capacity will be available for the project.

2. The developer shall pay assessment fees for treatment plant expansion costs and fund any necessary off-site improvements to the collection system and wastewater pump stations.

3. Provide a sewer impact study to substantiate that the existing wastewater system is adequate to serve this project. Calculations are required before a building permit is issued.

4. The drainage "gully" and retention basin should be kept under private ownership and maintenance exclusive of the sections within the road rights-of-way.

5. Road widening lots shall be provided for the adjoining halves of Alanui Ke Alii and the North-South Collector Road to provide for future 80 and 60 foot wide rights-of-way and improved to County standards, to include, but not be limited to, pavement widening, construction of curb, gutter and sidewalk, street lights, and relocation of utilities

underground. Said lots shall be dedicated to the County upon completing of the improvements.

6. All structures, such as walls, trees, etc., shall be removed or relocated from the road widening strips. The rear boundaries of the road widening strips shall be clearly marked to determine if said structures have been properly removed and relocated.

7. A 30-foot radii shall be provided at all the intersections of the proposed subdivision road and the adjoining Alanui Ke Alii and North-South Collector Road.

8. A site plan and a sight distance report to determine required sight distance and available sight distance at existing and proposed street intersections shall be provided for our review and approval.

9. The subdivision shall comply with the provisions of Title 18, "Subdivisions."

10. Detailed final drainage reports and site specific erosion control plans shall be submitted with the construction plans for review and approval prior to the issuance of grading permits. The drainage report shall include hydrologic and hydraulic calculations and the schemes for disposal of runoff waters. It must comply with the provisions of the "Rules for Design of Storm Drainage Facilities in the County of Maui" and must provide verification that the grading and runoff water generated by the project will not have an adverse effect on adjacent and downstream properties. The site specific erosion control plan shall show the location and details of structural and non-structural Best Management measures.

If you have any questions, please call David Goode at 270-7845.

DG:msc/mt
S:\LUCA\CZM\kealii.wpd

JAMES "KIMO" APANA
Mayor

CHARLES JENCKS
Director

DAVID C. GOODE
Deputy Director

Telephone: (808) 270-7845
Fax: (808) 270-7955

COUNTY OF MAUI
DEPARTMENT OF PUBLIC WORKS AND WASTE MANAGEMENT
200 SOUTH HIGH STREET
WAILUKU, MAUI, HAWAII 96793

RALPH NAGAMINE, L.S., P.E.
Land Use and Codes Administration

RON R. RISKA, P.E.
Wastewater Reclamation Division

LLOYD P.C.W. LEE, P.E.
Engineering Division

BRIAN HASHIRO, P.E.
Highways Division

ANDREW M. HIROSE
Solid Waste Division

January 25, 2000

Mr. Warren Unemori
Warren S. Unemori Engineering
Wells Street Professional Center, Suite 403
2145 Wells Street
Wailuku, Hawaii 96793

Dear Mr. Unemori:

SUBJECT: KEALII SUBDIVISION AND IMPROVEMENTS TO ALANUI KEALII

Pursuant to the meeting of Thursday, January 20, 2000, in my office regarding the above referenced roadway improvements, I have considered the need to provide for the full master plan width of Alanui Kealii as well as the necessary roadway improvements which will be driven by your proposed subdivision.

After giving the matter relative to the amount of improvements and the amount of dedication for right-of-way purposes some thought, I have concluded that the 80-foot right-of-way is a reasonable requirement. However, the improvement requirements to Alanui Kealii adjacent to your subdivision will be restricted to development of the median strip, a travel lane, a bicycle lane, and any other reasonable modifications to the right-of-way to accommodate the impacts associated with development of your project. These improvements may require some additional striping and modification of existing striping within the existing right-of-way and those, of course, will also be your responsibility.

Should you have any questions with regard to this position, please feel free to contact me at 270-7845.

Sincerely,

for CHARLES JENCKS
Director of Public Works
and Waste Management

CJ:mt
cc: Engineering Division
Land Use and Codes Administration

8. Department of Parks and Recreation

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 10, 2000

Mr. Floyd S. Miyazono
Director
Department of Parks and Recreation
County of Maui
1580-C Kaahumanu Avenue
Wailuku, HI 96793

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated January 25, 2000

Dear Mr. Miyazono:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated January 25, 2000, he requested that we respond to you for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"7. *Department of Parks and Recreation - Please provide this Department with your comments on the Department of Parks and Recreation Comments"*

Response

The park/detention basin area will be maintained as a private passive park by the Homeowner's Association. The developer agrees to pay a Parks and Playgrounds Assessment Fee (PPAF) in lieu of dedicating the park site to the County, on approval by the Parks and Recreation Department.

It is our understanding that by the Maui County Code Section 18.16.320(E), the developer is given fifty percent credit for every 500 square feet of private park for each lot (in lieu of dedicating that amount of park to the County). Based on a total area of park site equal to 28,945 square feet, the calculation proceeds as follows:

PPAF = [(95 lots - 3 lots exempted) - 50%(park area/500 sq.ft. per lot)]
x ($2,040 per lot)

PPAF = [(92) - 0.5(28,945/500)] x ($2,040) = [92 - 28.945] x ($2,040)

PPAF = $128,632.20

Please feel free to call me at (808) 242-4403 if you have any questions or comments, or if our interpretation of the PPAF calculation procedure is incorrect..

Very truly yours,

Alan L. Unemori
Vice-President

cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

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DEPARTMENT
PARKS AND RECREATION
COUNTY OF MAUI

1580-C KAAHUMANU AVENUE WAILUKU, HAWAII 96793

JAMES "KIMO" APANA
Mayor

FLOYD S. MIYAZONO
Director

ELIZABETH D. MENOR
Deputy Director

(808) 270-7230
FAX (808) 270-7934

'00 JAN 25 P2:53

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

January 25, 2000

MEMO TO: John E. Min, Planning Director

FROM: FLOYD S. MIYAZONO, Director

SUBJECT: **Ke Ali'i Subdivision**
TMK: 3-9-018:01
SM1 990022

Thank you for the opportunity to review the subject application. We have the following comments:

1. The development would require a payment of $189,720.00 (96 lots - three lots x $2,040.00) to fulfill the parks and playgrounds assessment fee. We would prefer a cash contribution in lieu of land.

2. The proposed Park/Detention Basin site is part of the developer's drainage channel, and it is not an appropriate location and size for a park.

Should you have any questions please contact me at extension 7626 or Patrick Matsui at extension 7387.

FSM:PM:gu

c: Patrick Matsui, Chief-Planning and Development
SMA Files

south\jmin.18r

9. Police Department

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 10, 2000

Mr. Thomas M. Phillips
Chief of Police
Police Department
County of Maui
55 Mahalani Street
Wailuku, HI 96793

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated January 28, 2000

Dear Mr. Phillips:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated January 28, 2000, he requested that we respond to you for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"8. *Police Department - Please provide this Department with your response to the Police Department's comments and concerns regarding the traffic problems. For your information, copies of their comments were sent to the Department of Transportation, Department of Public Works and Waste Management, and the Department of Education."*

Response

Maui Police Officer Bradney Hickle raised concerns referred to by Mr. John Min. His comments were forwarded to Parsons Brinckerhoff (PB), the consultant who prepared the "Traffic Impact Analysis Update for the Ke Alii Single-Family Units", September, 1999. After review of these concerns, Mr. Wayne Yoshioka, Manager of Transportation Planning/Traffic Engineering, addressed each of the concerns. This letter summarizes as follows:

> ***"We believe this letter addresses the issues that officer Hickle raised in his memorandum.***

First, Ke Alii Single-Family Units development will generate very little traffic impact. Intersection analysis show that traffic from the development would not change the level of service at the intersections of Alanui Ke Alii. It contributes about 10 percent of the traffic projected for Alanui Ke Alii and a very small percentage on the traffic on South Kihei Road and Piilani Highway.

Second, many of the issues are related to existing traffic issues connected with the operation of Kamalii Elementary School. It is appropriate and desirable for Kamalii Elementary School to conduct the recommended internal traffic circulation study, the school crossing study, and the school speed zone study to enhance the safety for students attending the school."

Attached please find a copy of this letter. The developer will cooperate and work with the Police Department and Department of Education on these matters of concern.

Please feel free to call me at (808) 242-4403 if you have any questions or comments.

Very truly yours,

Alan L. Unemori
Vice-President

cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

D:\WP61DOCS\KEALII17.DOC

Parsons Brinckerhoff
Pacific Tower, Suite 3000
1001 Bishop Street
Honolulu, HI 96813
808-531-7094
Fax: 808-528-2368

March 7, 2000

Mr. Warren S. Unemori
Warren S. Unemori Engineering, Inc.
2145 Wells Street, Suite 403
Wailuku, Hawaii 96793

Re: Ke Alii Residential Subdivision
PBQD Reference: 16301A

Dear Mr. Unemori:

Per your request, we have reviewed the intra-departmental memorandum dated January 28, 2000 from Maui police officer Bradney Hickle to Maui police chief Tom Phillips. We applaud his caring and concern for the Kihei area.

In the memorandum, officer Hickle identified several concerns:

- Close spacing of Alanui Ke Alii/Piilani and Ke Alii Alanui/Kanakanui intersections;
- Traffic speeding on the Kanakanui Road approaches to Alanui Ke Alii;
- Lack of traffic control on Alanui Ke Alii between Piilani Highway and South Kihei Road;
- Lack of adequate parking for Kamalii Elementary School;
- Need for a change in speed limit on Alanui Ke Alii from 30 mph to 20 mph.

Officer Hickle also expresses an opinion that the addition of traffic from Kamaole Heights and Ke Alii residential subdivisions will greatly increase the traffic problems and the hazards to motorists and pedestrians. He also proposes a moratorium on new development within the Kihei area.

Traffic Impacts of Ke Alii Residential Development

The analyses documented in the Traffic Impact Analysis Update for the Ke Alii Single-Family Units, September 1999, found that the Ke Alii Single-Family Units development would generate an estimated 78 vehicles per hour (vph) during the AM peak hour and 104 vph during the PM peak hour. This amounts to about 10 percent of the total traffic projected for Alanui Ke Alii in Year 2001. The intersection analyses at the Alanui Ke Alii/Piilani Highway, the Alanui Ke Alii/Kanakanui Road, and the Alanui Ke Alii/South Kihei Road intersections show that the Ke Alii Single-Family Units development would not change their level of service (LOS) operations. In other words, the amount of traffic generated by Ke Alii Single-Family Units development does not affect the operation of these intersections.

If the Ke Alii Single-Family Units development only contributes about 10 percent of the total projected traffic on Alanui Ke Alii, then it contributes even a smaller proportion of the regional traffic on Piilani Highway and South Kihei Road. Ke Alii Single-Family Units development is targeted at the local residential market. Trips generated from this type of

development tend to be oriented more toward Piilani Highway, a benefit to South Kihei Road. Existing traffic conditions in Kihei are, at times, congested, especially on South Kihei Road, north of Lipoa Street. All the locations cited by officer Hickle are located in this area. The Ke Alii Single-Family Units development will have very little impact on this area of Kihei.

While frustrating to motorists, this sub-regional congestion is confined to relatively sharp peaks during selected time periods of the day. During other time periods, operations on South Kihei Road are acceptable. Piilani Highway operates well for most time periods and as access to Piilani Highway improves (Road C near Azeka Place), motorists will have an easier time utilizing it as an alternative to South Kihei Road. In the longer-range future, the North-South Collector Road between Lipoa and Uwapo will provide direct relief to South Kihei Road.

The key is to have the government and private sectors work together to implement these improvements.

Other Traffic-Related Concerns

Officer Hickle also expresses other traffic-related concerns. Existing traffic problems associated with the operation of the Kamalii Elementary School triggers many of these concerns.

Close spacing of Alanui Ke Alii/Piilani and Alanui Ke Alii/Kanakanui Intersections

The Piilani Highway and Kanakanui Road intersections on Alanui Ke Alii are closely spaced. To address this, the State of Hawaii Department of Transportation (SDOT) has treated the two intersections as a coordinated pair. Therefore, traffic turning into Alanui Ke Alii from Piilani Highway and proceeding makai-bound on Alanui Ke Alii, does not stop at Kanakanui Road, but have the right-of-way through the Kanakanui intersection. This minimizes the potentially hazardous situation of queuing traffic into Piilani Highway.

Traffic Speeding on Kanakanui Road Approaches to Alanui Ke Alii

The Kanakanui Road approaches to Alanui Ke Alii are STOP sign controlled. Therefore, to comply with the STOP sign, vehicles would have to slow down as they approach Alanui Ke Alii. Observations by our staff have not identified any instances of vehicles running the STOP sign, but if officer Hickle has observed this phenomenon, we agree that it is dangerous and needs to be stopped by Maui Police. As for vehicles speeding on Kanakanui Road, we agree that Maui Police is doing the right thing by issuing speeding citations.

Lack of Traffic Control on Alanui Ke Alii between Piilani Highway and South Kihei Road

As previously discussed, right-of-way for mauka-makai traffic flow on Alanui Ke Alii is maintained so that the Kanakanui and Piilani intersections can operate as a coordinated pair.

STOP-sign traffic control is provided on the Kanakanui Road approaches to Alanui Ke Alii. Traffic on Kanakanui Road must stop and wait for a safe gap in traffic on Alanui Ke Alii as they would at any other 2-way, STOP-controlled intersection.

Pedestrian crossing of Alanui Ke Alii is, likewise, handled in the same manner. It is acknowledged that children crossing Alanui Ke Alii as pedestrians should be protected in some way. It is suggested that Kamalii Elementary School conduct a school crossing study to determine the appropriate way to accomplish this goal.

Lack of Adequate Parking in Kamalii Elementary School

Currently, parents dropping off their children at Kamalii Elementary School queue onto Alanui Ke Alii. Part of the reason for this appears to be that the drop off site within Kamalii Elementary School is very near to the Alanui Ke Alii driveway entrance, leaving a relatively short distance for vehicles to stack before they protrude into Alanui Ke Alii.

Parents picking up their children in the afternoon often arrive early, and queue up on Alanui Ke Alii, waiting for school to end. The desire is to stage where they can see the children exit the school as opposed to a desire to park their car and leave it.

Given this situation, it may be more beneficial for Kamalii Elementary School to study ways to improve its internal traffic circulation and student drop-off and pick-up procedures.

Change Speed Limit Signs on Alanui Ke Alii

It is assumed that the designers of Alanui Ke Alii and the County of Maui followed the appropriate procedures in designating a Speed Limit of 30 mph on Alanui Ke Alii. Without having conducted an analysis, it is judged that 30 mph appears appropriate for a collector type roadway such as Alanui Ke Alii.

It may be prudent to establish a school speed zone on Alanui Ke Alii during the time periods immediately before and after school hours at Kamalii Elementary School. An engineering study should be conducted first. If the study finds that a school speed zone is appropriate, then one could be established in accordance with the appropriate Maui County ordinance. It is recommended that Kamalii Elementary School conduct such a study.

We believe this letter addresses the issues that officer Hickle raised in his memorandum.

First, Ke Alii Single-Family Units development will generate very little traffic impact. Intersection analyses show that traffic from the development would not change the level of service at the intersections on Alanui Ke Alii. It contributes about 10 percent of the traffic projected for Alanui Ke Alii and a very small percentage on the traffic on South Kihei Road and Piilani Highway.

Second, many of the issues are related to existing traffic issues connected with the operation of Kamalii Elementary School. It is appropriate and desirable for Kamalii Elementary School to conduct the recommended internal traffic circulation study, the school crossing study, and the school speed zone study to enhance the safety for students attending the school.

If you or the reviewing agencies have any further questions or comments, please call.

Very truly yours,

PARSONS BRINCKERHOFF QUADE & DOUGLAS, INC.

Wayne Y. Yoshioka
Manager of Transportation Planning/Traffic Engineering

POLICE DEPARTMENT
COUNTY OF MAUI

'00 FEB -2 A10:22

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

JAMES "KIMO" APANA
MAYOR

OUR REFERENCE

YOUR REFERENCE

55 MAHALANI STREET
WAILUKU, HAWAII 96793
(808) 244-6400
FAX (808) 244-6411

THOMAS M. PHILLIPS
CHIEF OF POLICE

DEPUTY CHIEF OF POLICE

January 28, 2000

MEMORANDUM

TO : DIRECTOR, PLANNING DEPARTMENT

FROM : THOMAS M. PHILLIPS, CHIEF OF POLICE

SUBJECT : I.D.: SM1 990022
TMK: 3-9-018:001
Project Name: Ke Alii Subdivision - Spencer Homes (96-lot single-family subdivision on 24 acres on Kanakanui Road and Ke Alii Alanuui)
Owner: Spencer Homes, Inc.
Applicant: Warren Unemori Engineering, Inc.

____ No recommendation or special condition is necessary or desired.

_✓_ Refer to attachment.

AC Ho

Assistant Chief Robert Tam Ho
For: THOMAS M. PHILLIPS
Chief of Police

TO : TOM PHILLIPS, CHIEF OF POLICE, COUNTY OF MAUI

VIA : CHANNELS

FROM : BRADNEY HICKLE, POLICE OFFICER III, KIHEI CPO

SUBJECT : KE ALII SUBDIVISION, ID # SM 1 990022

Sirs, on 01/07/00 I received a copy of the Ke Alii Subdivision plan, ID # SM 1 990022. In the past I have worked very closely with residents in the area and faculty at Kamalii Elementary School. I have discovered most of the problems with motorist and pedestrians in the area are associated with the Ke Alii Alanui rd./Kanakanui rd. intersection.

Currently the traffic problems are associated with the two intersections of Piilani Highway/ Ke Alii Alanui rd. and Kanakanui rd./Ke Alii Alanui rd. being so close together by Kamalii Elementary School. Other traffic problems include vehicles speeding on Kanakanui road and Auhana roads approaching the intersection of Ke Alii Alanui rd.. I issued 228 moving citations in 1999 and many were speeding violations for motorist in this area. The primary excuse of speeding motorist being the easy access to the traffic light at the Ke Alii Alanui rd. /Piilani Highway intersection. Another problem I have observed is the intersection at Ke Alii Alanui rd. and Kanakanui rd. has no traffic controls at all for east and west bound traffic on Ke Alii Alanui road from the traffic light on Piilani Highway intersection to stop sign on South Kihei rd. This makes pedestrian and vehicles crossing at the Ke Alii Alanui road/Kanakanui road intersection very dangerous. Stop signs or a stop light has to be placed at this intersection to allow for safe passage of motorist and pedestrians, especially the children.

To note another ongoing problem associated with this area is the lack of adequate parking for Kamalii Elementary School. There are "No Parking Signs" posted all along Ke Alii Alanui road and Kanakanui road surrounding Kamalii Elementary School but vehicles still park there and add to the traffic problems. Parents who pick up and drop off their children have no other place to park. In 1999 I issued 83 parking citations, many were issued in this area. A parking lot has to be provided by the County or the State to eliminate this problem and this should to be added to the design of this plan. I have also noticed a 30 MPH sign posted on Ke Alii Alanui road directly across from the school. In all my years as a Police Officer I have never seen a 30 MPH sign posted within a school zone within a residential area. All other surrounding county roads/streets are posted as 20 MPH zones from Piilani highway to South Kihei Road. This should be also changed to a 20 MPH zone.

There has been a lot of newly developed housing areas in Kihei. Over the past year the developments have included Kamaole Heights Subdivision, which is located in the area just west of Kamalii Elementary School on Ke Alii Alanui rd.

When completed 40 new single family homes will be constructed and possibly adding 40 to 60 new vehicles to the area. This will surely add to the current traffic problems. The proposed Ke Alii Subdivision will add 96 single family homes to this area. To me this means adding at least 96 to120 vehicles to the area.

In Kihei we experience daily traffic jams on South Kihei Rd.. In the afternoons north bound traffic backs up from the Lipoa street/ South Kihei Rd. intersection to Kamaole I park, which is to the Ke Alii Alanui rd intersection. In the south bound direction I have observed traffic backed up from Lipoa street to Mokulele highway at peak hours of traffic and Piilani highway is not yet designed to handle the overflow.

In my opinion adding 40 to180 new vehicles to the area of Ke Alii Alanui rd./Kanakanui rd. will greatly increase the traffic problems and the hazards to motorist and pedestrians. I believe this is not in the best interest of the persons currently living in this area and using the surrounding roadways specifically the Ke Alii Alanui road/Kanakanui road intersection. It is also my opinion and recommendation that the State Highways Division and the County Roadway Division take a realistic look at the current problems and future problems involving these intersections and address those problems before any new development is allowed to occur in this area.

Respectfully Submitted,

Brad Hickle **E-9966**
01/24/2000 **1000 hours**

HICKLE EXPRESSES VALID CONCERNS AS WELL AS SOLUTIONS. IT IS HIGHLY RECOMMENDED THAT PLANNERS WORK WITH HICKLE/MPO TO POSSIBLY PREVENT PROBLEMS.

1/25/2000 0823HRS

1/26/00 concur.

10. Department of Fire Control

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 10, 2000

Mr. Scott English
Lieutenant, Fire Prevention Bureau
Department of Fire Control
County of Maui
200 Dairy Road
Kahului, HI 96732

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated January 12, 2000

Dear Mr. English:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated January 12, 2000, he requested that we respond to you for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"9. Department of Fire Control - Please provide this Department with an explanation of the location of any fire apparatus access roads and where any buildings would be in excess of 150 feet from a water supply on a public street."

Response

Attached please find the Fire Hydrant Layout Plan for the Ke Alii Subdivision with the fire hydrant locations highlighted. A close-up of the fire hydrant locations near the private access roads on Road "B" is also provided to show compliance with the 150 feet criteria referred to in your letter.

Please feel free to call me at (808) 242-4403 if you have any questions or comments.

Very truly yours,

Alan L. Unemori
Vice-President

cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

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2 2

JAMES "KIMO" APANA
MAYOR

CLAYTON T ISHIKAWA
CHIEF

FRANK E. FERNANDEZ, JR.
DEPUTY CHIEF

'00 JAN 13 P2:55

DEPT OF PLANNING,
COUNTY OF MAUI
RECEIVED

COUNTY OF MAUI
DEPARTMENT OF FIRE CONTROL

200 DAIRY ROAD
KAHULUI, MAUI, HAWAII 96732
(808) 243-7561
FAX (808) 243-7919

January 12, 2000

Mr. Clayton Yoshida
Department of Planning
County of Maui

RE: Ke Alii Subdivision, I.D. # SM1 990022, TMK: (2) 3-9-018:001

Dear Mr. Yoshida

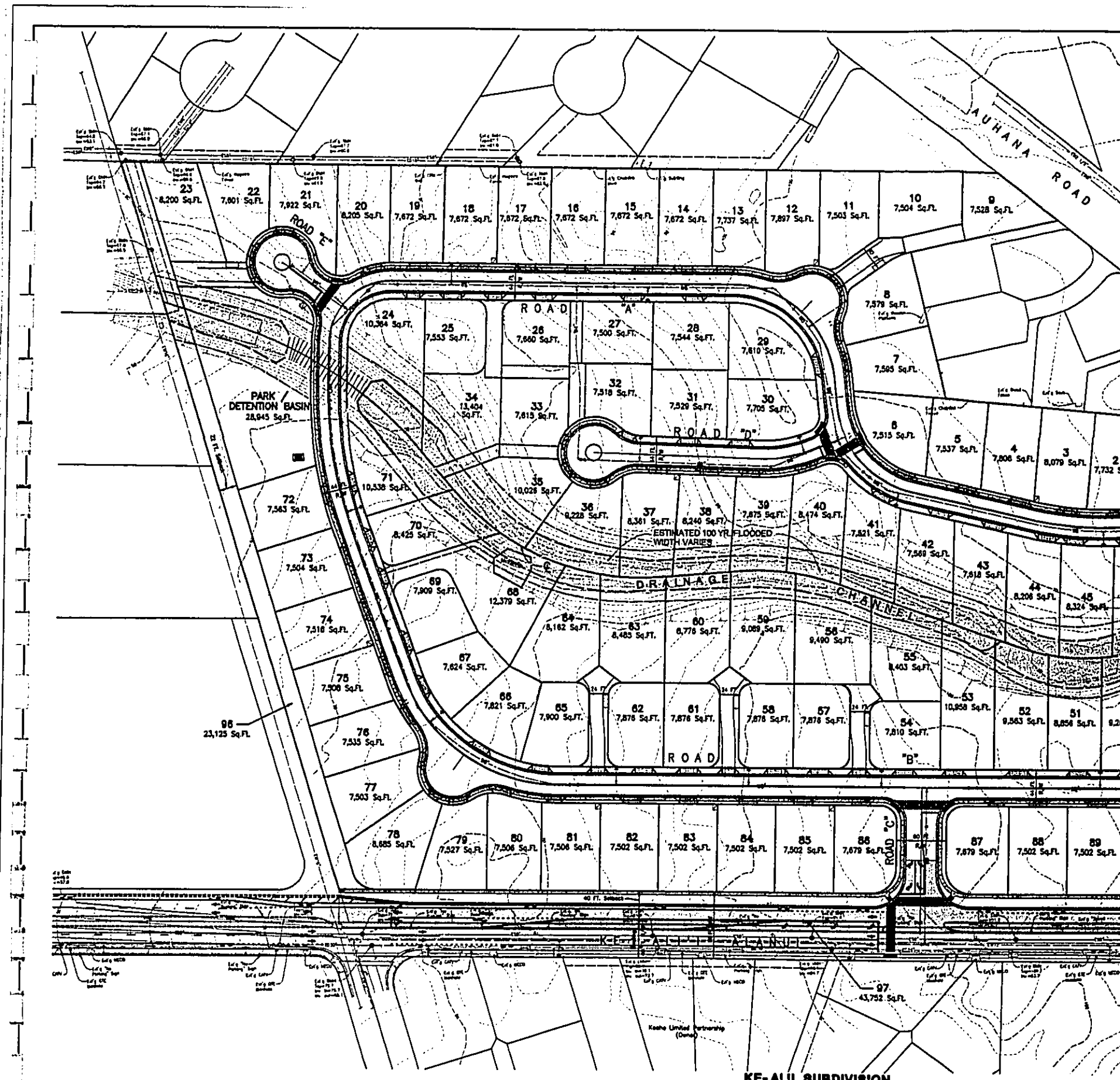
Thank you for the opportunity to comment of the proposed Ke Alii Subdivision, Fire Department Requirements are:

Fire Apparatus Access Road:
Fire apparatus access roads shall be required for every building hereafter constructed when any portion of an exterior wall of the first story is located more than 150 feet from fire department vehicle access. (Sec. 10.207.a UFC 1988)

Water Supply:
An approved water supply capable of supplying the required fire flow for fire protection shall be provided to all premises upon which buildings or portions of buildings are hereafter constructed. When any portion of the building protected is in excess of 150 feet from a water supply on a public street. (Sec. 10.301.c UFC 1988)

Sincerely,

Scott English
Lieutenant, Fire Prevention Bureau



KE-ALII SUBDIVISION

SUBDIVISION OF T.M.K.: 3-9-18 : 01,
INTO LOTS 1 TO 98, INCLUSIVE.
KIHEI, MAUI, HAWAII

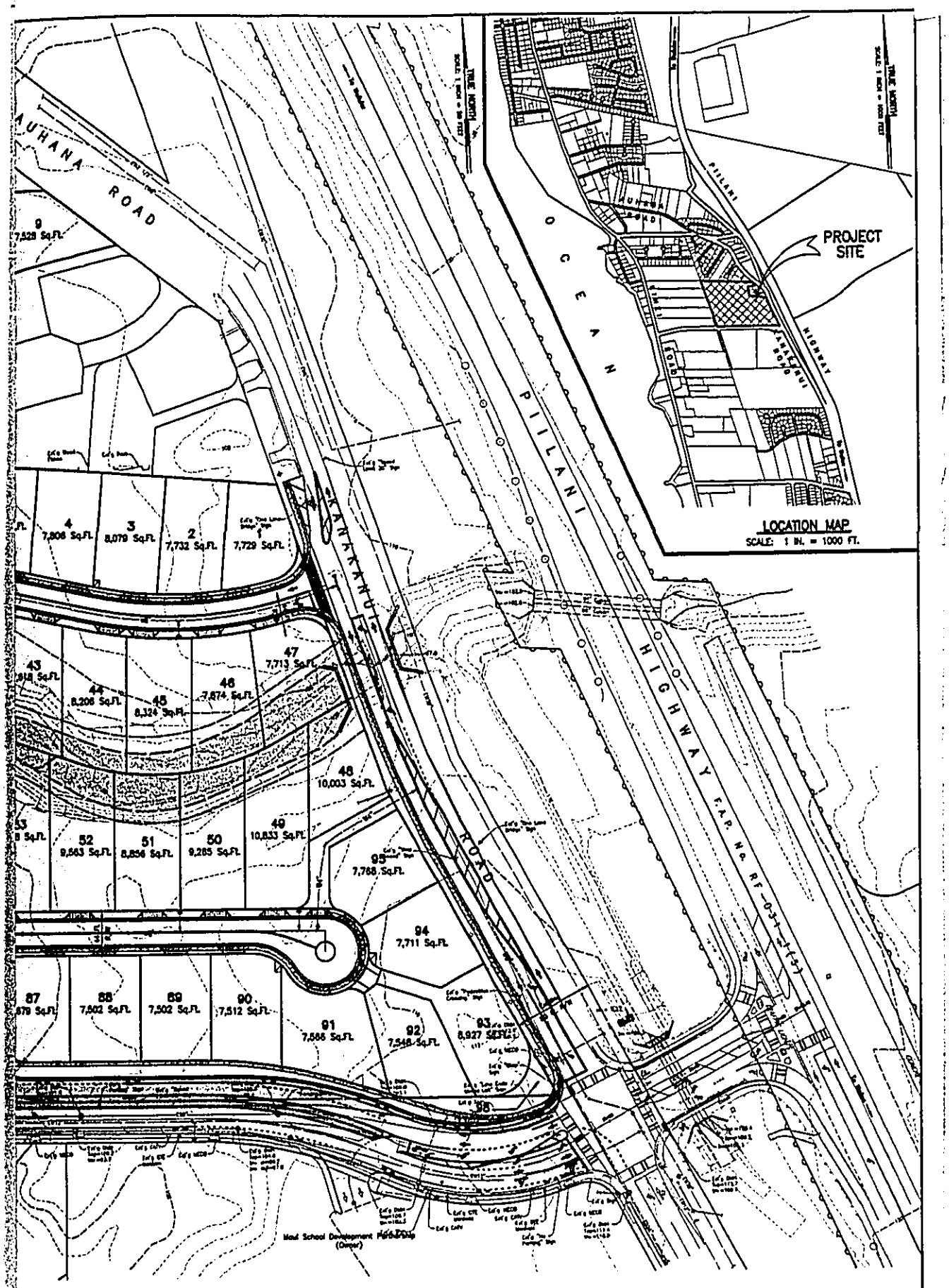
DEVELOPER: SPENCER HOMES
ADDRESS: 4372 W. WAIOLA
KIHEI, MAUI, HI 96763
OWNER: KIHEI KAMAOLE ASSOCIATES
ADDRESS: 98-1608 HAPAHI STREET
AIEA, OAHU, HI 96701

SCALE: 1 IN. = 50 FT.

MISC. INFORMATION

GROSS LAND AREA - 24.09 ACS.
ZONING - R-2 RESIDENTIAL
MIN. LOT SIZE - 7,500 SQ.FT.
MIN. LOT WIDTH - 65 FT.
NO. OF HOUSELOTS - 85

T.M.K.: 3-9-18 : 01



"FIRE HYDRANT LAYOUT PLAN"

ADVANCED COPY
SUBJECT TO CHANGE

APPROXIMATE EARTHWORK QUANTITIES

EXCAVATION = 22,500 CU.YD.
EMBANKMENT = 35,600 CU YD.

WARREN S. UNEMORI ENGINEERING, INC.

July 29, 1997
Revised: October 5, 1999
Revised: January 18, 2000

WSUE #99054

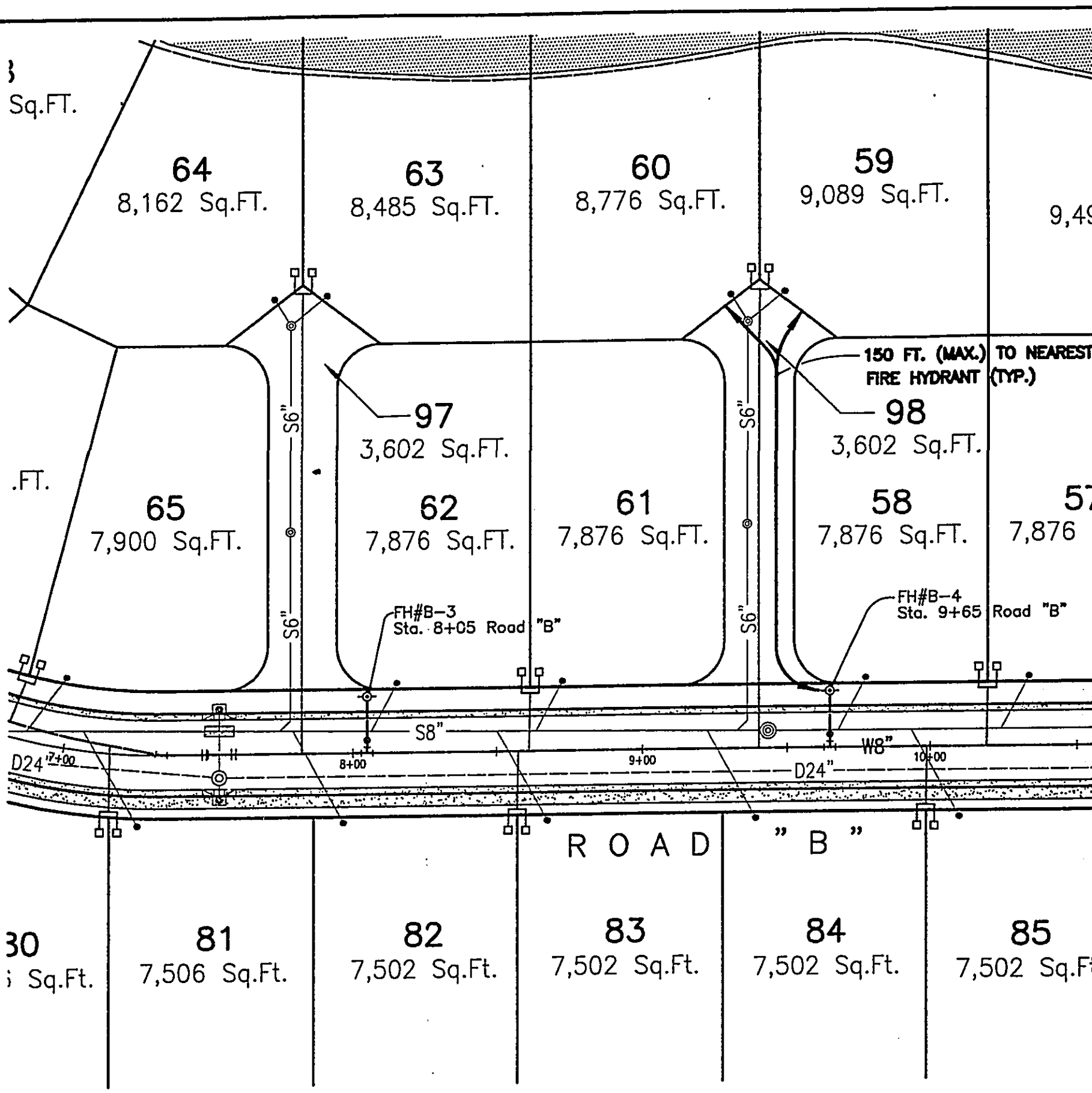
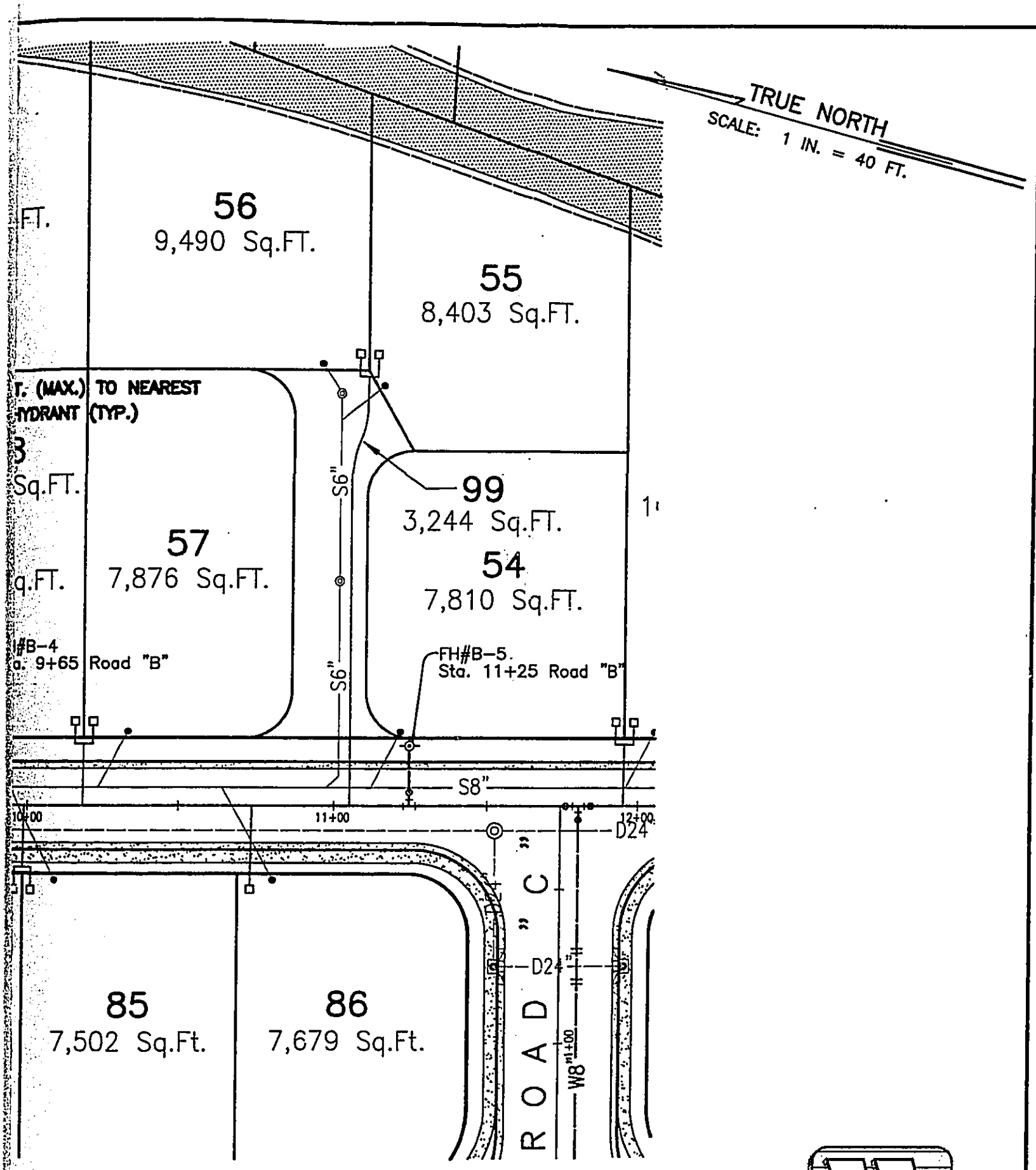


EXHIBIT – ROAD "B" FIRE HYDRANT LOCATIONS

SCALE: 1 IN. = 40 FT.



LOCATIONS

WARREN S. UNEMORI
ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

March 3, 2000

11. Department of Health

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

March 10, 2000

Mr. Gary Gill
Deputy Director
Department of Health
Environmental Planning Office
919 Ala Moana Blvd., Room 312
Honolulu, HI 96814

Re: Ke Alii Subdivision - Response to Requests for Additional Information by the Maui County Planning Department, Dated February 22, 2000, Following Your Letter, Dated February 3, 2000

Dear Mr. Gill:

In the attached letter from John E. Min, Director of Planning, Dated February 22, 2000, based on your comments in your letter, dated February 3, 2000, he requested that we respond to you for additional information regarding the Ke Alii Subdivision in Kihei, Maui, Hawaii, TMK: (2) 3-9-18:01:

Request

"10. Department of Health (DOH) - How will a solid waste management plan be implemented? What and how will polluted runoff, vector, water pollution, fugitive dust, and noises be controlled? The DOH also recommended holding a public information meeting in the surrounding community to describe the project and potential environmental impacts, and to respond to concerns relating to the project. Please provide this Department with your response to the Department of Health's concerns and issues."

Response

The Solid Waste Management Plan has been prepared and is hereby issued to the Department of Health. To summarize, the developer's Solid Waste Manage Plan includes the following actions:

- *"o The dry brush will be grubbed and hauled to a properly permitted recycling facility such as Campaign Recycle Maui.*
- *o The kiawes will be offered to various individuals for use as firewood. Any remaining kiawe waste will be composted on site for future*

landscape use or will be deposited to a properly recycling facility.

- *Any discarded vehicles or miscellaneous items will be taken to Maui Scrap Metal or any properly permitted recycling facility.*

- *We will at all times try to recycle any materials found during site construction. There will be no exporting of soil as the sitework requires importing fill material."*

As shown in the attached full-size Construction Plan Sheets "37" and "38", a Best Management Practice program (for dust and erosion control) has been developed as follows:

"Best Management Practices

1. Erosion and Sediment Control Practices

A. Construction Management

(1) Grading operations will be planned so as to minimize time of construction

(2) Grading operations will be planned so as to minimize the size of the disturbed area. The area grubbed shall not extend beyond what will actually be required for grading

B. Stabilization Techniques

(1) Existing ground cover shall not be destroyed, removed or disturbed more than 7 calendar days prior to the start of grading operations

(2) Areas that remain unfinished for more than 15 calendar days shall be hydromulched to provide temporary soil stabilization

(3) After achieving finished grades, all slopes and exposed areas shall be permanently stabilized by hydromulching with grass seed as soon as practicable.

C. Structural Controls

(1) Silting basins will be constructed upstream of discharge points to remove sediment from onsite runoff prior to discharge into existing storm drains

(2) Drainage swales will be constructed to intercept onsite runoff and direct it into silting basins.

(3) When needed, additional silt fences, berms, cutoff ditches will be constructed to supplement the erosion control measures depicted on the grading plan

D. Inspection and Maintenance Procedures

All control measures will be inspected and repaired as necessary. Inspections will be performed at least weekly in dry periods, and within 24 hours after any rainfall 0.5 inches or greater over a 24-hour period. Control measures will be checked daily during periods of prolonged rainfall.

2. Other Pollution Control Practices

Maintenance and fueling of construction equipment will be performed only in designated areas enclosed by a containment berm constructed so as to contain spills and prevent storm water runoff from carrying pollutants into downstream properties."

Vector control will be performed by Bugman, Inc., who have been retained to provide this service by the developer. See the attached copy of this authorization correspondence.

Mark Spencer of Spencer Homes, Inc., has already met with the Kihei Community Association Planning Committee on March 6, 2000, to discuss the Ke Alii Subdivision as well as other future Spencer Home projects in the Kihei-Wailea area.

Please feel free to call me at (808) 242-4403 if you have any questions or comments.

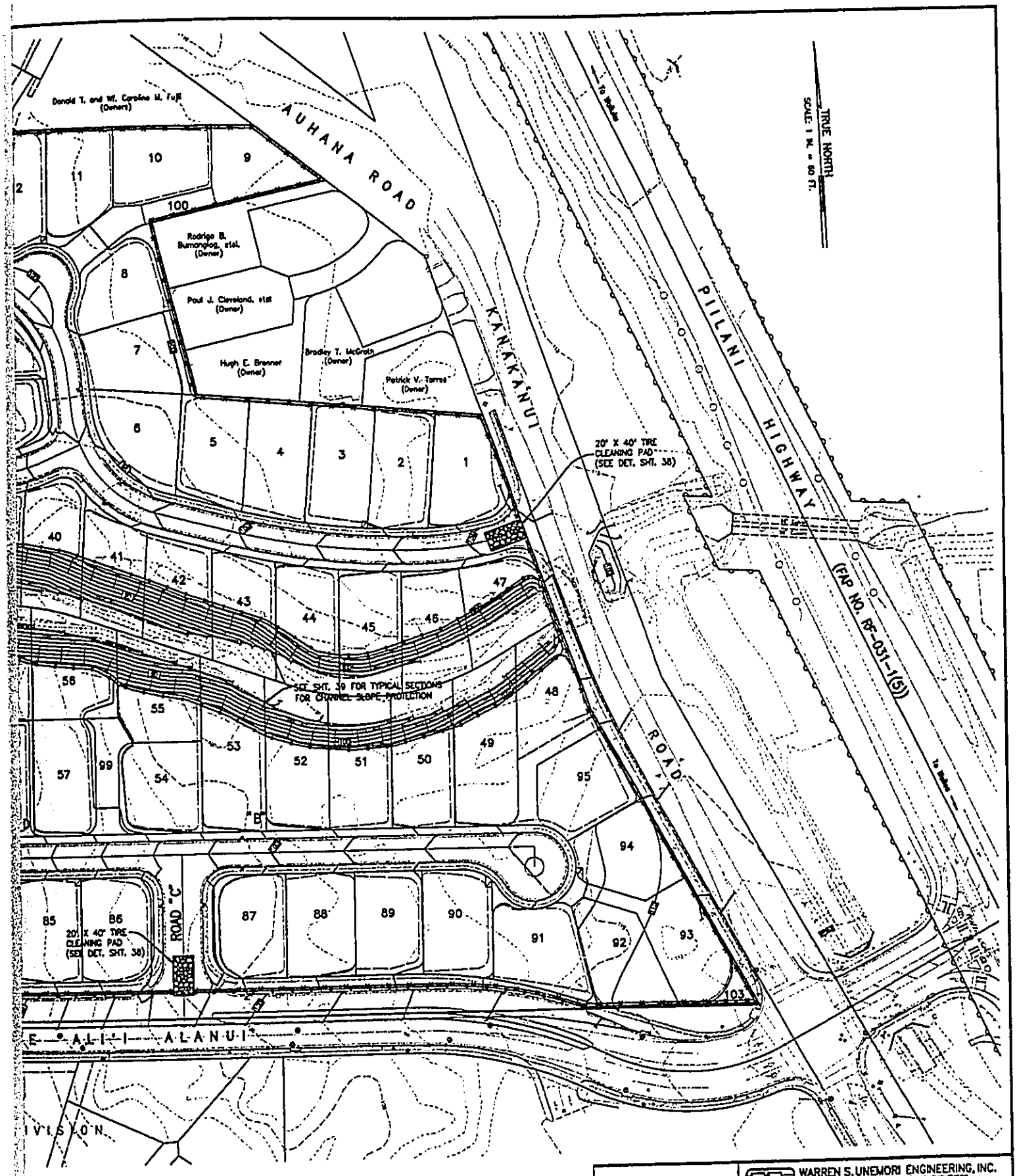
Very truly yours,

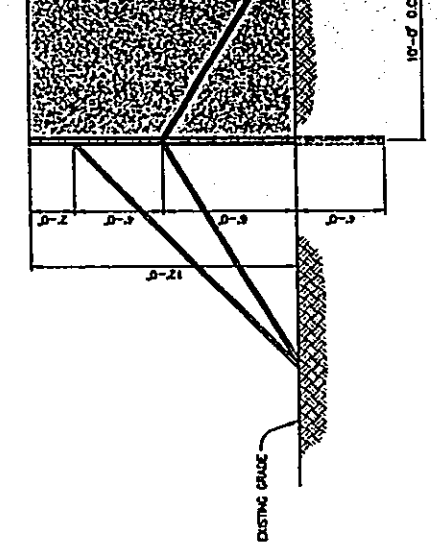
Alan L. Unemori
Vice-President

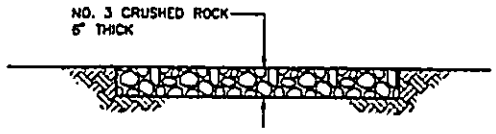
cc John Min, Planning Department, w/o attachments
Mark Spencer, Spencer Homes, w/o attachments

D:\WP61DOCS\KEALII19.DOC


Kacor Realty Inc. (Owner)
Khai Lutheran Church (Owner)
Lee E. Conner, etal. (Owner)
D.S. and Wf. Kathleen Robertson (Owners)
John A. Byrne, etal. (Owner)
Vincent J. Stigliano (Owner)
Wallace H. and Wf. Gladys H. Fujii (Owners)
Donald T. and Wf. Caroline M. Fujii (Owners)
Unicorn Live Lobster Co., Inc. (Owner)
United Realty Inc. (Owner)
WC Maui Coast LLC (Owner)
White Sands Maui Dev. Inc. (Owner)
Kaole Limited Partners (Owner)
FILTER BERM (SEE DET. SHT. 38)
96 PARK-/ DETENTION BASIN
ROAD "A"
ROAD "B"
ROAD "C"
ROAD "D"
ROAD "E"
20' X 40' TIRE CLEANING PAD (SEE DET. SHT. 38)
K E A L I I A L A
K A M A O L E H E I G H T S S U B D I V I S I O N
LEGEND:
FINISH GRADE W/ ELEVATION
EXISTING GRADE W/ ELEVATION
TOP OF BANK
SILT FENCE OR FILTER BERM (SEE DET. SHT. 38)
DUST FENCE (SEE DET. SHT. 38)
CHANNEL SLOPE PROTECTION (SEE DET. SHT. 39 FOR OPTIONS)
TIRE CLEANING PAD (SEE DET. SHT. 38)
FILTER BERM (SEE DET. SHT. 38)
GEOCELL ON SLOPES GREATER THAN 2:1


AUHANA ROAD
KANAKANUI
PILILANI HIGHWAY
(FAP NO. RF-031-1(5))
TRUE NORTH
SCALE: 1 IN. = 60 FT.
To Kihei
To Makena
Donald T. and Wf. Caroline M. Fujii (Owner)
Rodrigo B. Bumanglag, etal (Owner)
Paul J. Cleveland, etal (Owner)
Hugh E. Brenner (Owner)
Bradley T. McGrath (Owner)
Patrick V. Torres (Owner)
20' X 40' TIRE CLEANING PAD (SEE DET. SHT. 38)
SEE SHT. 39 FOR TYPICAL SECTIONS FOR CHANNEL SLOPE PROTECTION
ROAD "B"
ROAD "C"
E A L I ' I A L A N U I
VISION
DARREN T. UNEMORI
LICENSED PROFESSIONAL ENGINEER
NO. 7937-C
HAWAII, U.S.A.
SIGNATURE
DATE
THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION
NO.
DESCRIPTION
DATE
WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS/LAND SURVEYORS
WELLS STREET PROFESSIONAL CENTER, SUITE 403
2145 WELLS STREET, WAILUKU, MAUI, HAWAII 96793
KE ALI'I SUBDIVISION
KIHEI, MAUI, HAWAII
TITLE EROSION CONTROL PLAN
DESIGNED BY SRA
DRAWN BY LCO
CHECKED BY DTU
APPROVED BY WSU
SCALE 1 IN. = 60 FT.
JOB NUMBER 99054
DATE 2-10-00
SHEET 37
OF SHEETS


10'-0" O.C.
FILTER FABRIC (DUST SCREEN)
2" x 4" NAILED FLAT TO SCREEN FABRIC MATERIAL TO POSTS
2'-0"
3'-0"
6'-0"
3'-0"
12'-0"
EXISTING GRADE

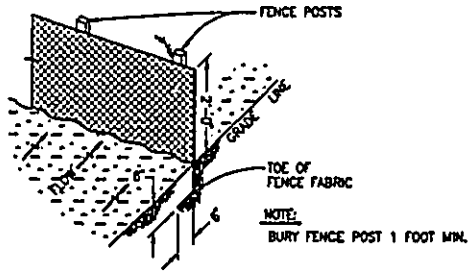


DETAIL -- TIRE CLEANING PAD

NOT TO SCALE

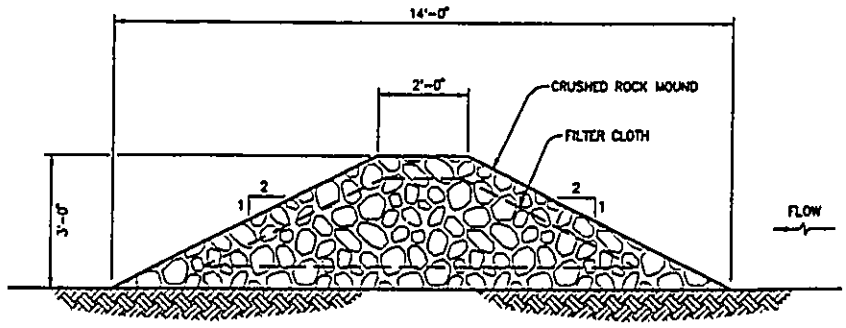
NOTE:

1. CONTRACTOR HAS RIGHT TO INTERCHANGE FILTER BERM FOR SILT FENCE WHERE SPECIFIED ON PLAN.
2. CONTRACTOR TO SURROUND PERIMETER OF BASEYARD WITH FILTER BERM ONCE LOCATION IS SPECIFIED.
3. CONTRACTOR TO MAINTAIN ALL EROSION CONTROL MEASURES IN GOOD WORKING CONDITION AT ALL TIMES.



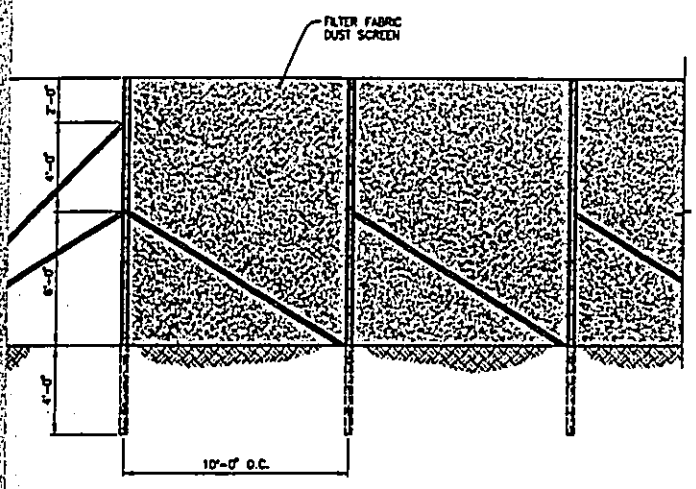
DETAIL -- SILT FENCE

NOT TO SCALE

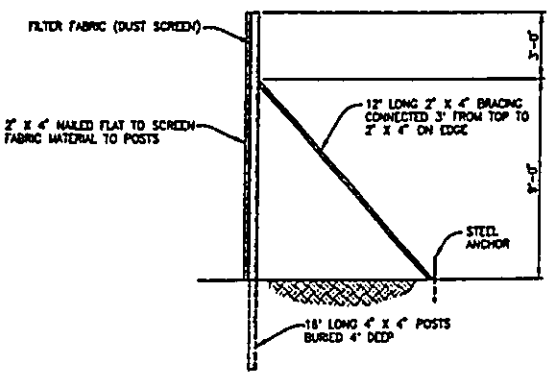


DETAIL -- FILTER BERM

SCALE: 1/2" = 1'-0"



FRONT ELEVATION



SIDE ELEVATION

DETAIL -- DUST FENCE

SCALE: 1/4 IN. = 1 FT.

BEST MANAGEMENT PRACTICES

1. EROSION AND SEDIMENT CONTROL PRACTICES

   A. CONSTRUCTION MANAGEMENT
      1) GRADING OPERATIONS WILL BE PLANNED SO AS TO MINIMIZE TIME OF CONSTRUCTION.
      2) GRADING OPERATIONS WILL BE PLANNED SO AS TO MINIMIZE SIZE OF THE DISTURBED AREA. THE AREA GRUBBED SHALL NOT EXTEND BEYOND WHAT WILL ACTUALLY REQUIRED FOR GRADING.

   B. STABILIZATION TECHNIQUES
      1) EXISTING GROUND COVER SHALL NOT BE DESTROYED, REMOVED OR DISTURBED MORE THAN 7 CALENDAR DAYS PRIOR TO THE START OF GRADING OPERATIONS.
      2) AREAS THAT REMAIN UNFINISHED FOR MORE THAN 15 CALENDAR DAYS SHALL BE HYDROMULCHED TO PROVIDE TEMPORARY SOIL STABILIZATION.
      3) AFTER ACHIEVING FINISHED GRADES, ALL SLOPES AND EXPOSED AREAS SHALL BE PERMANENTLY STABILIZED BY HYDROMULCHING WITH GRASS SEED AS SOON AS PRACTICABLE.

   C. STRUCTURAL CONTROLS
      1) SILTING BASINS WILL BE CONSTRUCTED UPSTREAM OF DISCHARGE POINTS TO REMOVE SEDIMENT FROM ONSITE RUNOFF PRIOR TO DISCHARGE INTO EXISTING STORM DRAINS.
      2) DRAINAGE SWALES WILL BE CONSTRUCTED TO INTERCEPT ONSITE RUNOFF AND DIRECT IT INTO SILTING BASINS.
      3) WHEN NEEDED, ADDITIONAL SILT FENCES, BERMS, CUTOFF DITCHES WILL BE CONSTRUCTED TO SUPPLEMENT THE EROSION CONTROL MEASURES DEPICTED ON THE GRADING PLAN.

   D. INSPECTION AND MAINTENANCE PROCEDURES

      ALL CONTROL MEASURES WILL BE INSPECTED AND REPAIRED AS NECESSARY. INSPECTIONS WILL BE PERFORMED AT LEAST WEEKLY IN DRY PERIODS, AND WITHIN 24 HOURS AFTER ANY RAINFALL 0.5 INCHES OR GREATER OVER A 24-HOUR PERIOD. CONTROL MEASURES WILL BE CHECKED DAILY DURING PERIODS OF PROLONGED RAINFALL.

2. OTHER POLLUTION CONTROL PRACTICES

   MAINTENANCE AND FUELING OF CONSTRUCTION EQUIPMENT WILL BE PERFORMED ONLY IN DESIGNATED AREAS ENCLOSED BY A CONTAINMENT BERM CONSTRUCTED SO AS TO CONTAIN SPILLS AND PREVENT STORM WATER RUNOFF FROM CARRYING POLLUTANTS INTO DOWNSTREAM PROPERTIES.

DARREN T. UNEMORI
LICENSED PROFESSIONAL ENGINEER
NO. 7937-C
HAWAII, U.S.A.

SIGNATURE DATE

THIS WORK WAS PREPARED BY ME OR UNDER MY SUPERVISION

LETTER	DESCRIPTION	DATE

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS/LAND SURVEYORS
WELLS STREET PROFESSIONAL CENTER, SUITE 403
2145 WELLS STREET, WAILUKU, MAUI, HAWAII 96793

KE ALI'I SUBDIVISION

KIHEI, MAUI, HAWAII

TITLE EROSION CONTROL NOTES AND DETAILS

DESIGNED BY: CRR	CHECKED BY: DTU	JOB NUMBER: 99054.00	SHEET: 38
DRAWN BY: DPT	APPROVED BY: WSU	DATE: 2-29-00	OF SHEETS
SCALE: 1 IN. = 40 FT.			

SPENCER HOMES, INC.
Building in Hawaii Since 1964

P.O. Box 97
Kihei , HI 96753
Telephone (808) 891-8770
Fax (808) 891-8771

Solid Waste Management Plan
Spencer Homes, Inc.
Project : Ke Alii Subdivision
T.M.K. : 3-9-18:01

Description of Site: The site is mostly barren with the exception of some low dry brush, a few scattered small kiawe trees and a few discarded vehicles/miscellaneous.

Plan of Action:

- The dry brush will be grubbed and hauled to a properly permitted recycling facility such as Campaign Recycle Maui.
- The kiawes will be offered to various individuals for use as firewood. Any remaining kiawe waste will be composite on site for future landscape use or will be deposited to a properly recycling facility.
- Any discarded vehicles or miscellaneous items will be taken to Maui Scrap Metal or any properly permitted recycling facility.
- We will at all times try to recycle any materials found during site construction. There will be no exporting of soil as the sitework requires importing fill material.

cc: Warren Unemori Engineering, Inc.
file

Printed: 03/06/00 at 12:32 PM
Solid Waste Management

SPENCER HOMES, INC.

Building in Hawaii Since 1964

P.O. Box 97
Kihei , HI 96753
Telephone (808) 891-8770
Fax (808) 891-8771

March 6, 2000

To Whom It May Concern:

This letter confirms that we are contracting Bugman, Inc. for the vector control of the proposed Ke Alii Subdivision, located at Ke Alii Alanui Rd., in Kihei, Maui, with TMK No. 3-9-18:01.

Sincerely yours,

Mark Spencer
Project Manager

BENJAMIN J. CAYETANO
GOVERNOR OF HAWAII

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

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

'00 FEB -9 P1:04

In reply, please refer to:
File:

February 3, 2000

99-262/epo

Mr. John E. Min, Director
Planning Department
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Dear Mr. Min:

Subject: Special Management Area Permit Application
(SM1-990022)
Ke Ali`I Subdivision (Spencer Homes)
Kihei, Maui
TMK: 3-9-18: 1

Thank you for allowing us to review and comment on the subject permit application. We have the following comments to offer:

Wastewater

All buildings generating wastewater shall connect to the municipal sewer system serving the area.

Solid Waste

The Department of Health suggests that the applicant/developer create a solid waste management plan prior to construction. A solid waste management plan should address opportunities for waste reduction and recycling during construction and use of the facility. Essential elements of such a plan are, at a minimum:

1) A Waste Audit - to determine what types of waste may be generated;

2) A Community Recycling Service Assessment - to investigate what materials are recoverable in the community surrounding that facility; what recycling programs are

mandatory; and how recycling companies in the area prefer to collect the recyclable materials.

3) A Feasibility Study - to examine what recycling and waste minimization programs could be put in place to minimize waste generation and maximize recycling at the project, and to accommodate the necessary recycling and waste minimization infrastructure in the design and planning stage. Some waste minimization suggestions are attached for your review and consideration.

4) A Recycled Content Building Materials Assessment - to determine which recycled content materials could be used in the construction of the project or during its use to support recycled material markets and to "close the loop." Plastic lumber, compost for landscaping, glasphalt for paving, etc., could all be specified for use in the project.

Should you have any questions on these comments, please contact Ms. Carrie McCabe or Mr. Lane Otsu of the Office of Solid Waste Management at 586-4240.

Polluted Runoff Control

We recommend that nonpoint source pollution control concerns be addressed and that there be no increase in polluted runoff from the project. The construction of the subject project will greatly increase the acreage of impervious area, thereby increasing storm water runoff volumes. The State has developed *Hawaii's Coastal Nonpoint Pollution Control Program Management Plan*. This management plan addresses proper planning, design, and use of Best Management Practices to substantially reduce polluted runoff (nonpoint source pollution) generated by different activities. Please refer to the management plan (pages III-101 to III-162) for urban management measures. The management plan can be obtained from the Coastal Zone Management Program (587-2877) in the Office of Planning, Department of Business and Economic Development and Tourism.

The following are suggested management measures to consider:

1. For New Development

Please refer to *Hawaii's Coastal Nonpoint Pollution Control Program Management Plan* (pages III-104 to III-108). The New Development Management Measure should

be achieved by reducing total suspended solid loadings by 80% once the site is permanently stabilized.

2. For Site Development

   a) Please refer to the management plan, pages III-112 to III-117;

   b) Within the conceptual landscape plan, include open "green areas" that will slow down and retain stormwater runoff. For example, the lands set aside for parks could be constructed as sediment basins which would retain and prevent polluted runoff from entering coastal waters; and

   c) Limit disturbance of natural drainage features and vegetation.

3. For Construction Site Erosion and Sediment Control

   a) Please refer to the management plan, pages III-117 to III-123;

   b) Conduct grubbing and grading activities during the low rainfall months (April-October);

   c) Grub areas sequentially so that only a small portion of the site is bare at any time;

   d) Use vegetation, mulch, gravel, and porous pavement wherever feasible to maximize the acreage of pervious areas; and

   e) Replant or cover bare areas as soon as grading or construction is completed. New plantings will require soil amendments, fertilizers and temporary irrigation to become established. Use high planting and/or seeding rates to ensure rapid stand establishment.

4. Pollution Prevention

   a) We encourage the implementation of pollution prevention and education programs to reduce nonpoint source pollution. The City and State can be assisted in their efforts in environmental education by providing new homeowners educational packets that contain information on reducing nonpoint source pollution; proper storage, use, and disposal of

household chemicals; and proper disposal of pet excrement; and

b) We encourage large developments to imprint the message "Dump No Waste, Goes to Ocean" over storm drains to remind homeowners not to illegally dump materials in the storm drain system.

Any questions concerning these polluted runoff control comments should be directed to the Clean Water Branch, Polluted Runoff Control Program at 586-4309.

Vector Control

The property may be harboring rodents which will be dispersed to the surrounding areas when any buildings are demolished or the site is cleared. The applicant is required by Hawaii Administrative Rules, Chapter 11-26, "Vector Control" to eradicate any rodents prior to demolition or site clearing activities and to notify the Department of Health by submitting Form VC-12 to the local Vector Control Branch when such action is taken. Rodent traps and/or rodenticides should be set out on the project site for at least a week or until the rodent activity ceases.

The Vector Control Branch phone numbers are as follows:

Oahu: 831-6767
Kauai: 241-3306
Hawaii--Hilo: 974-4238, Kona: 322-7011
Maui (includes Molokai and Lanai): 873-3560

Water Pollution

1. The applicant should contact the Army Corps of Engineers to identify whether a federal permit (including a Department of Army permit) is required for this project. If a federal permit is required, then a Section 401 Water Quality Certification is required from the State Department of Health, Clean Water Branch.

2. A National Pollutant Discharge Elimination System (NPDES) general permit is required for the following discharges to waters of the State:

   a. Storm water discharges relating to construction activities, such as clearing, grading, and excavation, for projects equal to or greater than five acres;

b. Storm water discharges from industrial activities;

c. Construction dewatering activities;

d. Noncontact cooling water discharges less than one million gallons per day;

e. Treated groundwater from underground storage tank remedial activities;

f. Hydrotesting water;

g. Treated effluent from petroleum bulk stations and terminals; and

h. Treated effluent from well drilling activities.

Any person requesting to be covered by a NPDES general permit for any of the above activities should file a Notice of Intent with the Department's Clean Water Branch at least 30 days prior to commencement of any discharge to waters of the State.

Any questions regarding these comments should be directed to Mr. Denis Lau, Branch Chief, Clean Water Branch at 586-4309.

Control of Fugitive Dust

There is a significant potential for fugitive dust emissions during the construction activities. Implementation of adequate dust control measures during all phases of construction is warranted.

Construction activities must comply with provisions of Hawaii Administrative Rules, Chapter 11-60.1, "Air Pollution Control," Section 11-60.1-33, Fugitive Dust.

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

a. Planning the different phases of construction, focusing on minimizing the amount of dust generating materials and activities, centralizing on-site vehicular traffic routes, and locating potentially dusty equipment in areas of the least impact;

b. Providing an adequate water source at the site prior to start up of construction activities;

c. Landscaping and rapid covering of bare areas, including slopes, starting from the initial grading phase;

d. Controlling of dust from shoulders and access roads;

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

f. Controlling of dust from debris being hauled away from project site.

If you have any questions regarding these issues on fugitive dust, please contact the Clean Air Branch at 586-4200.

Noise Concerns

1. Activities associated with the construction phase of the project must comply with the Department of Health's Administrative Rules, Chapter 11-46, "Community Noise Control."

   a. The contractor must obtain a noise permit if the noise levels from the construction activities are expected to exceed the allowable levels of the rules as stated in Section 11-46-6(a).

   b. Construction equipment and on-site vehicles requiring an exhaust of gas or air must be equipped with mufflers as stated in Section 11-46-6(b)(1)(A).

   c. The contractor must comply with the requirements pertaining to construction activities as specified in the rules and the conditions issued with the permit as stated in Section 11-46-7(d)(4).

2. Heavy vehicles travelling to and from the project site must comply with the provisions of the Administrative Rules, Chapter 11-42, "Vehicular Noise Control for Oahu."

Should there be any questions on this matter, please call Mr. Jerry Haruno, Environmental Health Program Manager of the Noise, Radiation and Indoor Air Quality Branch at 586-4701.

General Comments

The Department of Health recommends that the developer and/or contractor be required to hold a public informational meeting in the surrounding community to describe the project and

potential environmental impacts and to respond to concerns relating to the project.

Sincerely,

GARY GILL
Deputy Director for
Environmental Health

Attachment

c: WWB
OSWM
CWB
VCB
CAB
NR&IAQB
MDHO

ATTACHMENT

1) WASTE REDUCTION OPPORTUNITIES DURING CONSTRUCTION/DEMOLITION

GREENWASTE COMPOSTING
CONCRETE OR ASPHALT RECYCLING--ROCK & BOULDER SEPARATION
SALVAGE OF DIMENSIONAL LUMBER
METALS RECOVERY
SALVAGE BY LOCAL NON-PROFIT
HAZWASTE MINIMIZATION--ESPECIALLY FOR SUB-CONTRACTORS

2) WASTE REDUCTION DURING USE OF FACILITY

Include in the design and layout of the facility

DESIGN AND OPERATIONAL REQUIREMENTS

CONSIDER SPACIAL REQUIREMENTS FOR RECYCLING AT INTERNAL COLLECTION AND EXTERNAL STORAGE AREAS

REVIEW OPERATIONAL REQUIREMENTS WITH MAINTENANCE AND CUSTODIAL STAFF

PROVIDE COLLECTION, MULCHING AND/OR COMPOSTING CAPABILITIES FOR SEPARATED GREENWASTE

DISCUSS EQUIPMENT AND CONTAINER REQUIREMENTS WITH HAULERS AND VENDORS

CONSIDER MULTI-MATERIAL CHUTES IN HIGH RISES

GREENWASTE COMPOSTING - allocate space for baler, or extra bin, or recycling containers, composting area, etc.

ENJAMIN J. CAYETANO
GOVERNOR

BRUCE S. ANDERSON, Ph.D., M.P.H.
DIRECTOR OF HEALTH

ALFRED M. ARENSDORF, M.D.
DISTRICT HEALTH OFFICER

STATE OF HAWAII
DEPARTMENT OF HEALTH
MAUI DISTRICT HEALTH OFFICE
54 HIGH STREET
WAILUKU, MAUI, HAWAII 96793

'00 JAN 26 P2:59

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

January 24, 2000

Mr. John E. Min
Director of Planning
Planning Department
County of Maui
250 South High Street
Wailuku, Hawai'i 96793

Dear Mr. Min:

Subject: Ke Alii Subdivision – Spencer Homes
TMK: (2) 3-9-018:001
SM1 990022

Thank you for the opportunity to comment on the special management area permit.

Comments from this office were transmitted to our Honolulu Office. A coordinated response is forthcoming.

Should you have any questions, please call me at 984-8230.

Sincerely,

HERBERT S. MATSUBAYASHI
District Environmental Health Program Chief

cc: Art Bauckham, Env Planning Office

12. Department of Accounting and General Services

BENJAMIN J. CAYETANO
GOVERNOR

2000 JAN 14 P12:49

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

RAYMOND H. SATO
COMPTROLLER

RESPONSE REFER TO:

FILE NO. _____

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

January 13, 2000

MEMORANDUM

TO: Mr. John E. Min, Planning Director
Maui County Planning Department

ATTN.: Mr. Clayton Yoshida, Staff Planner

FROM: Randall M. Hashimoto, State Land Surveyor

SUBJECT: I.D.: SM1 990022
TMK: 3-9-018:001
Project Name: Ke Alii Subdivision - Spencer Homes
Applicant: Warren Unemori Engineering, Inc.

The subject proposal has been reviewed and confirmed that no Government Survey Triangulation Stations and Benchmarks are affected. The Survey Division has no objections to the proposed project.

Should you have any questions, please call me at 586-0390.

Randall M. Hashimoto

RANDALL M. HASHIMOTO
State Land Surveyor

13. Maui Electric Company, Ltd.

Maui Electric Company, Ltd. • 210 West Kamehameha Avenue • PO Box 398 • Kahului, Maui, ...

'00 JAN -4 P4:12

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

January 3, 2000

Mr. John E. Min
County of Maui
Department of Planning
250 South High Street
Wailuku, Maui, Hawaii 96793

Subject: Application for State Special Management Area Permit for Ke Ali'i Subdivision
Kihei, Maui, Hawaii
TMK: 3-9-018: 001

Dear Mr. Min,

Thank you for the opportunity to review and comment on the subject project.

Maui Electric Company's distribution facilities are located in the vicinity of the proposed project area. As stated in Chapter 5 Section IV Item 7, the electrical infrastructure must be installed to meet the power requirements of this proposed project as confirmed per Chapter 5 Section V Subsection D Item 5.

We have no further comments at this time. However, we suspect that our review of the subject project's power requirements must be obtained to complete this project. We would like to take this opportunity to mention that a design submittal and project timeframe from the project's consultant would be greatly appreciated to provide our electrical requirements.

Should you have any further questions, please contact me at (808) 871-2366.

Sincerely,

Gregorysenn Kauhi
Distribution Engineering Supervisor

GK:gk

14. Office of Hawaiian Affairs

PHONE (808) 594-1888

FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPI'OLANI BOULEVARD, SUITE 500
HONOLULU, HAWAI'I 96813

'00 JAN -7 P1:01

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

January 3, 2000

Mr. John E. Min, Director
Dept. of Planning
County of Maui
250 South High Street
Wailuku, Maui, Hawai'i 96793

PA# 349

Subject: Application for Special Management Area Permit for Ke Ali'i Subdivision – Spencer Homes (96-Lot Single Family Subdivision on 24 acres on Kanakanui Road and Ke Ali'i Alanui)
TMK: 3-9-018: 001

Dear Mr. Min,

Thank you for the opportunity to review the above-referenced application. At this time the Office of Hawaiian Affairs has no comment on this project. We acknowledge the findings of the State Historic Preservation Division of the Department of Land and Natural Resources in preserving site 3541 and monitoring any land alterations in the northwest part of the parcel.

If you have any questions, please contact Ken R. Salva Cruz, Policy Analyst, at 594-1847.

Sincerely,

Colin C. Kippen, Jr.
Deputy Administrator

cc: Board of Trustees
Maui CAC

15. Department of Water Supply

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

January 14, 2000

Mr. David Craddick
Director
Department of Water Supply
COUNTY OF MAUI
P. O. Box 1109
Wailuku, HI 96793

Re: Ke Alii Subdivision - Spencer Homes, TMK: 3-9-018:001, SMA Application, SM1 9900022

Dear Mr. Craddick:

Thank you for your comments on the Ke Alii Subdivision encouraging consideration of water conservation measures as outlined in your letter dated January 6, 2000, to Mr. John Min, Director, Planning Department.

Your letter has been forwarded to Mr. Jesse Spencer of Spencer Homes, and he has informed us that your recommendations will be included as part of the Homeowners' CC&Rs. Thank you.

Very truly yours,

Warren S. Unemori
President

cc John Min, Planning Department
Jesse Spencer, Spencer Homes

134

'00 JAN 10 P3:10

DEPT OF PLANNING
COUNTY OF MAUI
RECEIVED

DEPARTMENT OF WATER SUPPLY
COUNTY OF MAUI
P.O. BOX 1109
WAILUKU, MAUI, HAWAII 96793-6109
Telephone (808) 270-7816 • Fax (808) 270-7833

1949 - 1999 Celebrating 50 Years of Service

January 6, 2000

Mr. John Min, Director
County of Maui
Planning Department
250 South High Street
Wailuku, Maui, Hawaii 96793

Re: I.D.: SM1 9900022
TMK: 3-9-018:001
Project Name: Ke Alii Subdivision - Spencer Homes

Dear Mr. Min,

Thank you for the opportunity to comment on this project. The Department of Water Supply has the following comments:

The project will encompass 96 single-family residential units. Using State per unit standards, total consumption would be approximately 57,600 gpd. However, consumption in Kihei tends to be higher than State standards. Based on empirical data for Kihei area total consumption would be approximately 80,700 gpd. Domestic, fire, and irrigation calculations will be reviewed in detail during the development process.

The applicant is required to provide fire and domestic service according to standards. Actual fire demand for structures is determined by fire flow calculations performed by a certified engineer. DWS-approved fire flow calculation methods include:"Fire Flow" - Hawaii Insurance Bureau, 1991. The applicant is encouraged to contact our engineering division as soon as possible at 270-7835 with respect to required system improvements.

This project is served by the Central Maui System. The major source of water for this system is the Iao Aquifer. Rolling annual average groundwater withdrawals from the Iao Aquifer as of December 1, 1999 were 18.655 MGD. The regulatory sustainable yield of this aquifer is 20 mgd. On August 13, 1997, the State Commission on Water Resource Management (CWRM) elected not to designate Iao Aquifer as a State Groundwater Management Area. However, if rolling annual average withdrawals exceed 20 mgd, CWRM will designate Iao Aquifer. Two wells in North Waihee, pumping at a combined rate of 1.5 mgd, were brought on-line in July 1997. We anticipate completion of another well to produce about 1 MGD by the first quarter of

2000. The Department is continuing to implement a plan to bring new sources on-line and to mitigate withdrawals. No guarantee of water is granted or implied as a result of these comments. Water availability will be reviewed at the time of application for meter or meter reservation.

The applicant is encouraged to consider utilizing brackish and/or reclaimed water for irrigation of landscaping purposes. This measure would significantly reduce demand on the potable water system. To further conserve water resources, the applicant should refer to the attached documents and consider these measures:
Eliminate Single-Pass Cooling: Single-pass, water-cooled systems should be eliminated per Maui County Code Subsection 14.21.20. Although prohibited by code, single-pass water cooling is still manufactured into some models of air conditioners, freezers, and commercial refrigerators.
Utilize Low-Flow Fixtures and Devices: Maui County Code Subsection 16.20A.680 requires the use of low flow water fixtures and devices in faucets, showerheads, urinals, water closets and hose bibs. Water conserving washing machines, ice-makers and other units are also available.
Maintain Fixtures to Prevent Leaks: A simple, regular program of repair and maintenance can prevent the loss of hundreds or even thousands of gallons a day. Refer to the attached handout, "The Costly Drip". The applicant should establish a regular maintenance program.
Use Climate-adapted Plants: The project site is located in "Maui County Planting Plan" - Plant Zones 3 and 5. Please refer to the "Maui County Planting Plan", and to the attached documents. We encourage the applicants to consider using climate-adapted and salt-tolerant native plants. Native plants adapted to the area, conserve water and further protect the watershed from degradation due to invasive alien species.
Prevent Over-Watering By Automated Systems: For all common areas, provide rain-sensors on all automated irrigation controllers. Check and reset controllers at least once a month to reflect the monthly changes in evapotranspiration rates at the site. As an alternative, provide the more automated, soil-moisture sensors on controllers.

Should you have any questions, please call our Water Resources and Planning Division at 270-7199.

Sincerely,

David Craddick
Director

cmb

C:\WPdocs\Permcomm\KeAlii.wpd

cc: engineering division
applicant, with attachments:

1) "The Costly Drip"
2) "Maui County Planting Plan."
3) Ordinance 2108 - "An ordinance amending Chapter 16.20 of the Maui County Code, pertaining to the plumbing code"

By Water All Things Find Life

16. Department of Education

BENJAMIN J. CAYETANO
GOVERNOR

PAUL G. LeMAHIEU, Ph.D.
SUPERINTENDENT

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF THE SUPERINTENDENT

January 13, 2000

Mr. John E. Min
Planning Director
County of Maui
250 South High Street
Wailuku, Hawaii 96793

Dear Mr. Min:

Subject: Ke Alii Subdivision – SMi 990022

The Department of Education has no comment on the subject Special Management Area permit application.

Thank you for the opportunity to respond.

Very truly yours,

Paul G. LeMahieu, Ph.D.
Superintendent of Education

PLeM:hy

cc: C. Ito, OBS
P. Brown, MDO

XI. COMMENTS RECEIVED ON THE DRAFT EA

XI. COMMENTS RECEIVED ON THE DRAFT EA

A. ENVIRONMENTAL CENTER, UNIVERSITY of HAWAII (at Manoa)

A letter from the Environmental Center, University of Hawaii at Manoa was received by fax on May 8, 2000, and responded to on May 9, 2000. Copies of both letters follow.

University of Hawai'i at Mānoa

Environmental Center
A Unit of Water Resources Research Center
2550 Campus Road • Crawford 317 • Honolulu, Hawai'i 96822
Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

May 2, 2000
EA: 00208

Mark Spencer
Spencer Homes, Inc.
4372 W. Waiola Street
Kihei, Hawaii 96753

Dear Mr. Spencer:

Ke Ali'i Subdivision
Draft Environmental Assessment
Kihei, Hawaii

Spencer Homes, Inc. proposes to subdivide an undeveloped and vacant 24 acre lot at the northwest corner of Kanakanui Road and Ke Ali'i Alanui into 95 single family residential lots. Included in the development plans is the widening of the existing Ke Ali'i Alanui right of way to provide bike lanes and shoulders, and the widening of Kanaknui Road along the property. In addition, A 22-foot wide strip of land along the makai boundary will be set aside for a future road. The existing culvert on Kanakanui Road will be expanded to handle runoff for a 100-year recurrence, and a park/detention basin will be constructed to maintain runoff at current levels. New infrastructure is also planned. Within the subdivision, a street loop will be constructed.

This review was prepared with the assistance of Paul Eckern, Agron. and Soil Science, Emeritus, Karl Kim, DURP, and Jolie Wanger, Environmental Center.

Specific Major Comments

Alternatives

The alternatives section, which includes only two alternatives (Action and No-Build), is inadequate. HAR section 11-200-10(6) requires the identification and discussion of alternatives in the EA. We believe that other, reasonable uses for this property or alternative options for design could be considered. For this reason, we believe that this EA should not be accepted, until a more thorough discussion of alternatives is included.

Impacts to Infrastructure (Drainage)

In general, we would like to see a more thorough discussion on the impacts of the drainage channel to neighboring (downstream) properties.

Concerns over the discrepancy between design discharge capacity between FEMA (3,200 cfs) and Warren S. Unemori Engineering, Inc. (1,209 cfs) from the Engineering Branch (in their correspondence) seem to have been adequately addressed in the correspondence section with the compromise requiring that "the portion of the drainage channel within the FEMA study limits" has a 100-year flow capacity of at least 3,200 cfs, and "the portion of the drainage channel between the FEMA study area and Piilani Highway shall be required to provide a 100-year flow capacity of at least 1,200 cfs..." (Letter to John Min from Warren Unemori.) This change needs to be made in the document itself, not merely in the correspondence section. Our reviewers believe it is important to use FEMA numbers, as these are the legally recognized figures. Our reviewers were unable to make determinations based on the topographic information, and suggested that one possibility would be to consider reshaping the topography to assure for the lower flow levels. Regardless how it is accomplished, we feel it is necessary to disclose in the document exactly how the applicant plans to maintain the required flow capacities.

Adverse Environmental Effects Which Cannot Be Avoided

This is quite a large project involving county road improvements and the development of 24 acres of undeveloped land. It seems reasonable to include as one of the long-term unavoidable impacts, the loss of land for other purposes. Additionally, there will surely be impacts on schools, and other public facilities by an increase of residents in the area.

Specific Minor Comments

Project Overview

This section should include specific mention of how many lots will be developed (95) and their average size.

Impacts and Mitigation Measures (Air Quality)

There is no information to back up the prediction that impacts to air quality will be Insignificant; how much more air pollution will be generated by automobile and other sources? If some projected numbers are included, we can then determine what is significant or not.

Impacts to Community Setting

There is no information on the cost of lots and who will likely buy them. Additionally, there is no discussion about the impact on schools. How many new students can the current schools accommodate?

Traffic Study

Our reviewers feel that the EA provides adequate information on traffic generated by the project site and contains what appears to be a competent analysis of some of the site-specific impacts. The document, however, is deficient in terms of identifying overall regional effects and cumulative impacts on the transportation system. More attention to safety and capacity issues as well as broader discussion of trip generators and attractors in Kihei as well as other parts of Maui should be included. Additional detail on non-motorized forms of transportation (especially pedestrian and bicycle transport) in terms of access and safety should be provided. Neighborhood generators as well as travel routes and crossing areas for pedestrians and bicyclists should also be analyzed. Opportunities for traffic calming, speed control, and enhanced intersection control should also be reviewed. In particular, travel routes to the

CORRECTION

THE PRECEDING DOCUMENT(S) HAS BEEN REPHOTOGRAPHED TO ASSURE LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

Concerns over the discrepancy between design discharge capacity between FEMA (3,200 cfs) and Warren S. Unemori Engineering, Inc. (1,209 cfs) from the Engineering Branch (in their correspondence) seem to have been adequately addressed in the correspondence section with the compromise requiring that "the portion of the drainage channel within the FEMA study limits" has a 100-year flow capacity of at least 3,200 cfs, and "the portion of the drainage channel between the FEMA study area and Piilani Highway shall be required to provide a 100-year flow capacity of at least 1,200 cfs..." (Letter to John Min from Warren Unemori.) This change needs to be made in the document itself, not merely in the correspondence section. Our reviewers believe it is important to use FEMA numbers, as these are the legally recognized figures. Our reviewers were unable to make determinations based on the topographic information, and suggested that one possibility would be to consider reshaping the topography to assure for the lower flow levels. Regardless how it is accomplished, we feel it is necessary to disclose in the document exactly how the applicant plans to maintain the required flow capacities.

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Elementary School and other neighborhood destinations should be analyzed. Lastly, more careful attention should be directed to issues related to speeding and safety.

Conclusion

We believe this EA to be incomplete because it fails to discuss reasonable alternatives. The Maui Planning Department should not accept this document until a more robust discussion of alternatives is presented. We believe that the EA is underestimating the long-term impacts of the project at best or ignoring them at worst. If the subdivision generates 380 additional people in the area, how many will be school aged children, and how will this impact the schools, recreational facilities etc.? What is the capacity of the local schools to handle additional students?

We commend the consultants for their thorough reports on archeology and traffic, and on the clear maps, but wish the other sections could have been as complete.

Thank you for the opportunity to review the Environmental Assessment.

Sincerely,

Peter Rappa
Environmental Review Coordinator

CC. OEQC
James Moncur, WRRC
Paul Eckern
Karl Kim, DURP
Julie Higa, County of Maui Planning Dept.
Alan Unemori, Warren S. Unemori Engineering, Inc.
Jolie Wanger, EC

WARREN S. UNEMORI ENGINEERING, INC. Civil & Structural Engineers • Land Surveyors
Wells Street Professional Center • 2145 Wells Street, Suite 403 • Wailuku, Maui, HI 96793 TEL: (808) 242-4403 FAX: (808) 244-4856

May 9, 2000

Mr. Peter Rappa
Environmental Review Coordinator
Environmental Center
UNIVERSITY OF HAWAII AT MANOA
2550 Campus Road, Crawford 317
Honolulu, HI 96822
Fax: (808) 958-3980

Re: Response to Your Letter to Mark Spencer, SPENCER HOMES, Inc., Dated May 2, 2000

Dear Mr. Rappa:

I received a copy of your letter to Mark Spencer on Tuesday, May 2, 2000. I am writing this letter to respond to your reviewers' comments on behalf of Mark Spencer as I am the author of the Draft EA Report. The following are my item-by-item responses to your reviewers "**Specific Major Comments**":

Comment

"Alternatives:

> *The alternatives section, which includes only two alternatives (Action and No-Build), is inadequate. HAR section 11-200-10(6) requires the identification and discussion of alternatives in the EA. We believe that other, reasonable uses for this property or alternative options for design could be considered. For this reason, we believe that this EA should not be accepted until a more thorough discussion of alternatives is included."*

Response

It is quite obvious that your reviewers are unfamiliar with Maui County Zoning and the Kihei-Makena Community Plan Designation Laws. The subject property is classified by the State Land Use Commission as "Urban", by the Kihei-Makena Community Plan Designation as "Single Family (SF)", and the Maui County Zoning (General Plan) as "R-2 Residential". It is therefore, in fact, not possible to build anything other than an R-2 Single-Family Residential Subdivision on this property. Cognizant of these zoning restrictions, Spencer Homes, Inc., purchased the property with the sole objective of developing the proposed Single Family R-2 Residential Subdivision. There are no other "reasonable uses" for this property that the State, Maui County, or the Kihei-Makena

Community Association will allow.

Comment

"Impacts to Infrastructure (Drainage)

In general, we would like to see a more thorough discussion on the impacts of the drainage channel to neighboring (downstream) properties.

Concerns over the discrepancy between design discharge capacity between FEMA (3,200 cfs) and Warren S. Unemori Engineering, Inc., (1,209 cfs) from the Engineering Branch (in their correspondence) seem to have been adequately addressed in the correspondence section with the compromise requiring that "the portion of the drainage channel within the FEMA study limits" has a 100-year flow capacity of at least 3,200 cfs, and the "portion of the drainage channel between the FEMA study area and Piilani Highway shall be required to provide a 100-year flow capacity of at least 1,200 cfs.." (Letter to John Min from Warren Unemori). This change needs to be made in the document itself, not merely in the correspondence section. Our reviewers believe it is important to use FEMA numbers, as these are the legally recognized figures. Our reviewers were unable to make determinations based on the topographic information, and suggested that one possibility would be to consider reshaping the topography to assure for the lower flow levels. Regardless of how it is accomplished, we feel it necessary to disclose in the document exactly how the applicant plants to maintain the required flow capacities."

Response

The FEMA numbers come from an outdated source which was superseded by a study for the Department of Transportation by an independent party, Transmeridian Engineers & Surveyors, Inc., in January, 1978. Transmeridian published its findings in"Hydrology Report for Piilani Highway, Island of Maui, Prepared for the State of Hawaii Department of Transportation". On the basis of these findings, the culverts beneath Piilani Highway itself were sized and designed. On the other hand, FEMA changes it's zoning ***only after someone petitions it to do so*** when more accurate information (e.g., the Transmeridian study) becomes available. (Refer to FEMA "Amendments and Revisions to National Flood Insurance Program Maps", Application/Certification Forms for Conditional and Final Letters of Map Amendment and Letter of Map Revision Based on Fill" to details on this quite cumbersome and time-consuming process) In the case at hand, the Transmeridian estimates were accepted by the State DOT as being the more accurate. Perhaps at a future date someone will have the time and resources to update the FEMA data. In the meantime, as a compromise to the situation at hand, the letter you refer to above was submitted.

With respect to the impacts to downstream properties, it is the County of Maui's policy

that the developer *mitigate the additional flow created on-site* as the result of the development; after all, *the developer has no control over what enters his property from outside the boundaries of his property, and that off-site flow through the property will happen with or without the proposed development.*. In the project at hand, the additional estimated on-site flow due to the proposed development will be well contained in the subsurface drainage structures and park/detention basin, while great care is being taken to maintain the existing drainage system in its natural condition. A drainage easement will be created at the calculated inundation limits for the postulated 100-year design flood, within which no improvements will be made, and beyond which the channel will be strengthened at selected locations to mitigate erosion of the drainage channel banks usable to the homeowners whose lots border the channel.

With respect to your reviewers' comment that the document be changed to reflect the comments in the body of the report, as preparer of the EA Report, and consistent with the structure of the Final EA Report, I believe it is more effective to place all comments from reviewing agencies, and the responses to those comments together in the same chapter. It is a matter of opinion, and is not mandated in the structure of the Draft EA Report.

Comment

"Adverse Environmental Effects Which Cannot Be Avoided

This is quite a large project involving county road improvements and the development of 24 acres of undeveloped land. It seems reasonable to include as one of the long-term unavoidable impacts, the loss of land for other purposes. Additionally, there will surely be impacts on schools, and other public facilities by an increase of residents in the area."

Response

As I mention in my response to your "Alternatives" comments, the land cannot be used for any other purpose than what is being proposed. As to the impacts to schools and other public facilities, these have all been addressed in the Comments Section of the Draft EA Report.

The following are my item-by-item comments to your *"Specific Minor Comments"*:

Comment

"Project Overview

This section should include specific mention of how many lots will be developed (95) and their average size"

Response

As mentioned above, the project is in an "R2" Single Family Residential District. The "R2" designation requires that the lots be at least 7,500 square feet in size and a minimum of 65 feet in width. This is clearly shown in the lower left corner on Figure 2, "Preliminary Subdivision Map". Again, interpreting subdivision maps may be unfamiliar to your reviewers.

Comment

"Impacts and Mitigation Measures (Air Quality)

There is no information to back up the prediction that impacts to air quality will be insignificant; how much more air pollution will be generated by automobile and other sources? If some projected numbers are included, we can then determine what is significant or not."

Response

Given the number of households that will be added (95) to the de facto resident population in Kihei (31,444 in 1990), plus the daily visitors from other communities in Maui, the fact that the Kihei-Wailea-Makena is a world-class vacation destination, and that the air is current well above standards, I think it's a "no-brainer" to estimate that the additional residents will not have a significant adverse effect on Air Quality.

Comment

"Impacts to Community Setting

There is no information on the cost of lots and who will likely buy them. Additionally there is no discussion about the impact on schools. How many new students can the current schools accommodate?"

Response

The cost of lots had not been determined at the time that the Draft EA was prepared, and cannot be set until the subdivision is fully designed, cost of construction estimated and the final subdivision approval is granted by the County of Maui.

For your information, the Department of Education had no concerns over the proposed subdivision (see Section X(L)(16) of the Draft EA Report for letter from Paul LeMahieu, Superintendent of Education for the State of Hawaii). Also in the Draft EA Report, as stated in Sections X(L)(2) in the response to the Land Use Commission on this very issue, the following was written:

"The Department of Education was contacted on February 24, 2000. Mr. Alan Honma of the DOE stated that the current enrollment in Kamalii Elementary School is 872 students in the 1999-2000 academic year. He further stated that since Kamalii Elementary School was designed as a 'Year-Round' facility, it can accommodate 1051 students per year. Therefore there is adequate room to accommodate the projected 20 additional students".

Please have your reviewers read the Draft EA Report more thoroughly before commenting on information that is already contained in the Draft EA Report.

Comment

"Traffic Study

Our reviewers feel that the EA provides adequate information on traffic generated by the project site and contains what appears to be a competent analysis of some of the site-specific impacts. The document, however, is deficient in terms of identifying overall regional effects and cumulative impacts on the transportation system. More attention to safety and capacity issues as well as broader discussion of trip generators and attractors in Kihei as well as other parts of Maui should be included. Additional detail on non-motorized forms of transportation (especially pedestrian and bicycle transport) in terms of access and safety should be provided. Neighborhood generators as well as travel routes and crossing areas for pedestrians and bicyclists should also be analyzed. Opportunities for traffic calming, speed control, and enhanced intersection control should also be reviewed. In particular, travel routes to the Elementary School and other neighborhood destinations should be analyzed. Lastly, more careful attention should be directed to issues related to speed and safety."

Response

The improvements to Ke Alii Alanui on the south side of the property include each of two 6-foot wide bicycle lanes adjacent to each of the mauka-bound and makai-bound traffic lanes. In addition, the Kihei-Makena Community Master Plan includes a North-South Collector Road which will eventually support two 6-foot wide bicycle lanes and two traffic lanes. The North-South Collector Road will eventually provide bicycle lanes going from Uwapo Road in North Kihei to Kilohana Drive at the Wailea border - a distance of approximately 6 miles. The 22-foot wide strip at the western border of the Ke Alii Subdivision will be donated by Spencer Homes to the County of Maui for this purpose.

In addition, two significant improvements to the traffic flow entering and existing Kamalii Elementary School are proposed as part of this project. First, the existing makai-bound left-hand turn lane into Kamalii Elementary School will be lengthened to accommodate more cars turning into Kamalii Elementary School. Second, in the mauka-

bound direction, a second lane will be added on Ke Alii Parkway. This will eliminate the bottleneck that currently exists at the start and end of classes as parents queue to take a right-hand turn into the Kamalii Elementary School parking lot from the one available lane on Ke Alii Parkway. Both of these proposed improvements are shown in the attached figure entitled, "Ke Alii Subdivision Proposed Improvements to Ke Alii Parkway/Kanakanui Road Intersection".

I believe that your reviewers have missed a major point in the review of this Draft EA Report -- that point being that the Kihei-Makena Community Plan was designed to guide the anticipated development of the Kihei-Makena Community in a way that would be most beneficial to the current and future residents and visitors there. A primary objective of this Plan (backed by the Maui County General Plan and Zoning Designations) is to ensure that any new developments meet all standards and maintain the setting of the Community in order to maintain it's attraction as a world class resort destination.

For your information, the subdivision is located in a "Special Management Area". Standards for development in the Special Management Area are much more stringent than areas not designated as a Special Management Area, and a separate SMA Application must be submitted for review and approval before any subdivision within such an area can be built.
The proposed Ke Alii Subdivision will be built by a very conscientious, successful and respected developer who is himself a permanent resident in the Kihei area on Maui.

I would appreciate any effort on your part to make this point clearer to the reviewers of this Draft EA Report.

Please call me if you have any technical questions on the subdivision that I can help you or your reviewers with.

Very truly yours,

Alan L. Unemori
Vice-President

cc Mark Spencer, Spencer Homes
Julie Higa, Maui Planning Department.
Jeyan Thirugnanam, OEQC

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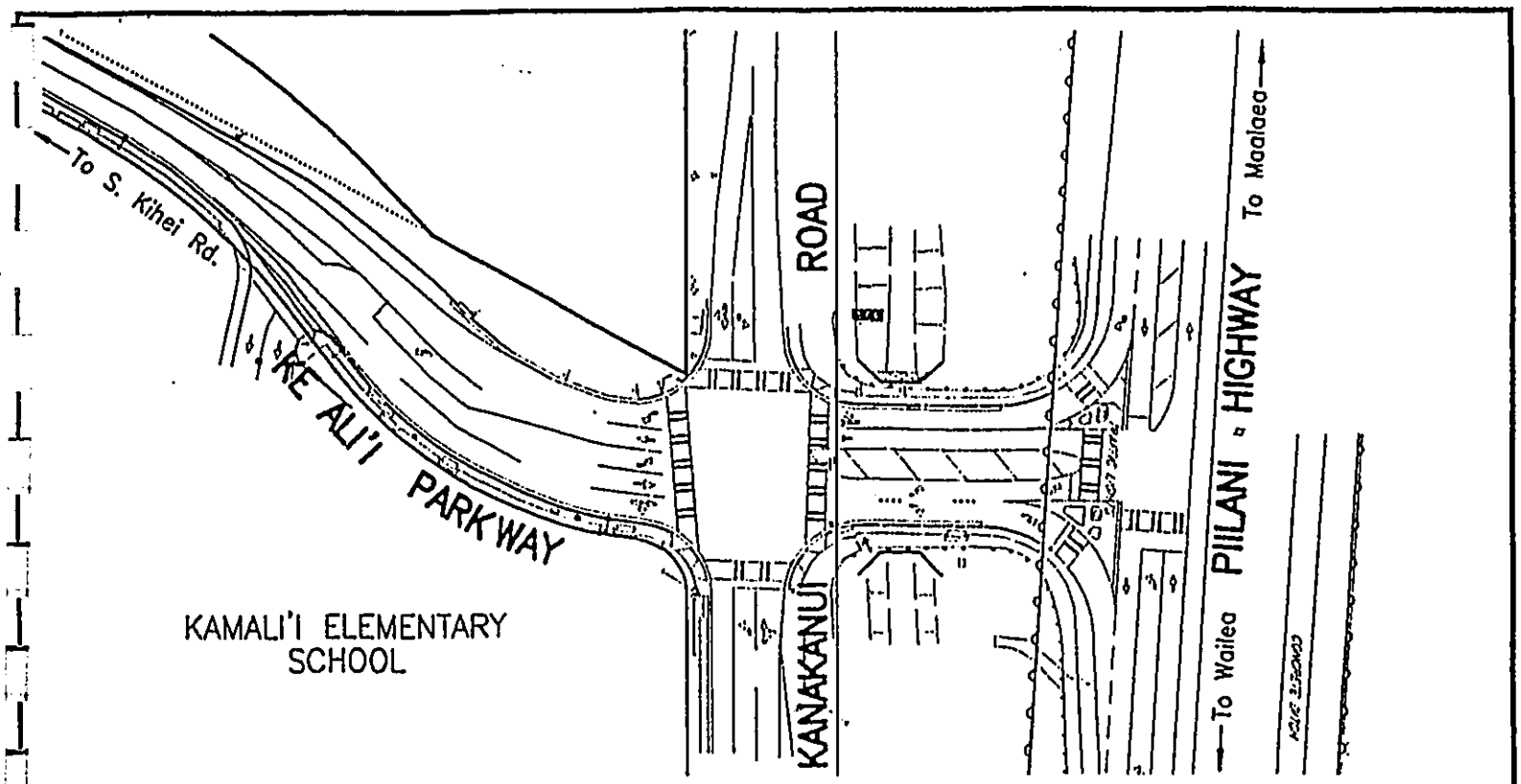

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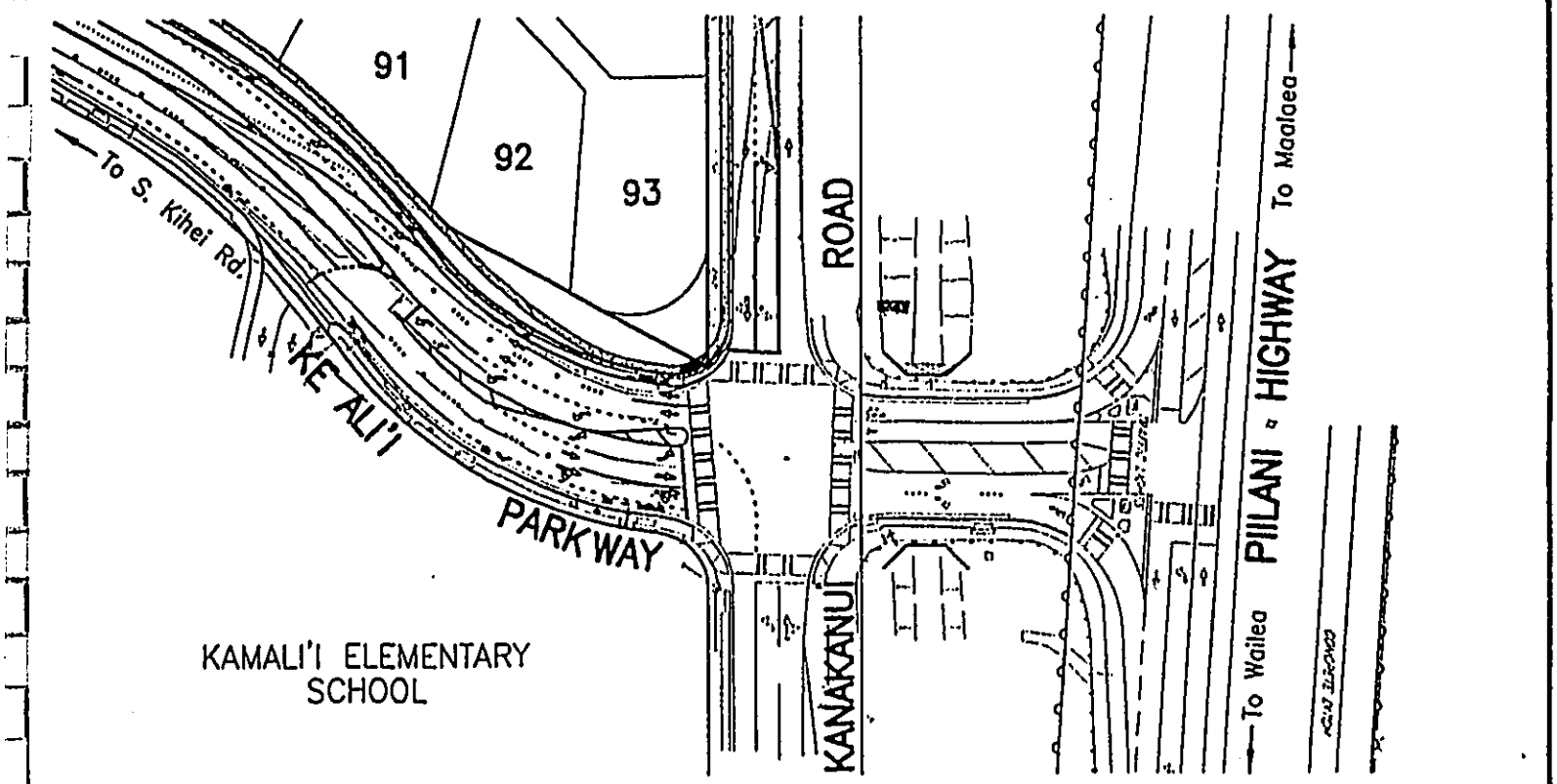

PROPOSED

KE ALI'I SUBDIVISION PROPOSED IMPROVEMENTS TO KE ALI'I PARKWAY / KANAKANUI ROAD INTERSECTION

SCALE: 1 IN. = 100 FT.

WARREN S. UNEMORI ENGINEERING, INC.
CIVIL & STRUCTURAL ENGINEERS / LAND SURVEYORS

May 8, 2000

99proj/99054/dwas/exhibits/exb-intr.dwg

B. PLANNING DEPARTMENT

The letter confirming the use of FEMA's 100-year design discharge, dated July 3, 2000, follows.

JAMES "KIMO" APANA
Mayor

JOHN E. MIN
Director

CLAYTON I. YOSHIDA
Deputy Director

COUNTY OF MAUI
DEPARTMENT OF PLANNING

July 3, 2000

Mr. Warren S. Unemori
Warren S. Unemori Engineering, Inc.
2145 Wells Street, Suite 403
Wailuku, Hawaii 96793

Dear Mr. Unemori:

SUBJECT: KE ALII SUBDIVISION SMA APPLICATION, USE OF FEMA'S 100-YEAR DESIGN DISCHARGE, TMK: 3-9-018:001; SM1 990022

Thank you for a copy of your May 31, 2000 letter to Mr. Charles Jencks.

Your letter stated that you will be designing "the natural drainage channel and drainage structure beneath the roadway crossing at the northwest corner of the property to handle the FEMA 100-year design discharge level of 3200 cfs, as requested by the County." Mr. Alan Unemori of your office has clarified that the "natural drainage channel" noted above includes the entire drainage channel (Kamaole Gulch) within your project limits. This satisfies the Planning Department's drainage concerns relative to the subject permit application.

If you have any questions regarding this letter, please call Francis Cerizo, Staff Planner, of this office at 270-7253.

Very truly yours,

JOHN E. MIN
Planning Director

FAC:nsg
xc: Clayton I. Yoshida, AICP, Deputy Planning Director
Aaron H. Shinmoto, Planning Program Administrator
Charles Jencks, Director, DPWWM
Julie Higa, Staff Planner
Project File
00/ZAED File
S:\ZONING\REPLY\00REPLY\KEALII.FAC

REFERENCES

REFERENCES

- Community Resources, Inc., "Maui County Community Plan Update Program Socio-Economic Forecast Report", January, 1994
- "Kihei-Makena Community Plan (1998)"
- Maui Economic Development Board, Inc., "Maui County Data Book", December, 1994
- Warren S. Unemori Engineering, Inc., "Preliminary Engineering Report for Ke Alii Subdivision", prepared for Spencer Homes, August, 1999
- State of Hawaii, Department of Business, Economic Development and Tourism, "Data Book", March, 1993
- U. S. Department of Agriculture, Soil Conservation Service, "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii", 1972
- University of Hawaii at Hilo, Department of Geography, "Atlas of Hawaii", Third Edition, 1998
- University of Hawaii, Land Study Bureau, "Detailed Land Classification-Island of Maui", May 1967
- Warren S. Unemori Engineering, Inc., "Application for Special Management Area Permit, Ke Ali'i Subdivision", October, 1999
- Warren S. Unemori Engineering, Inc., "Drainage Report, Ke Alii Subdivision", Revised June, 2000.

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APPENDICES

Appendix A

Letter from State Historic Preservation Division, DLNR, approving Archaeological Inventory Survey Report

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

HISTORIC PRESERVATION DIVISION
Kakuhihewa Building, Room 555
601 Kamokila Boulevard
Kapolei, Hawaii 96707

September 7, 1999

Demaris Fredorickson
Xamanek Researches
P.O. Box 131
Pukalani, Hawaii 96788

LOG NO: 24066
DOC NO: 9909RC05

Dear Ms. Fredorickson:

SUBJECT: Review of Archaeological Inventory Survey
Kama'ole, Wailuku (Kula Moku), Maui
TMK: 3-09-18: 1

This letter reviews the survey report which our staff received on August 24, 1999 (Erik Fredericksen et al. 1994. An Archaeological Inventory Survey of a 24-Acre Parcel, Kama'ole Ahupua'a ... Xamanek ms.).

The survey has adequately covered the project area, finding a total of 11 historic sites. The background review is good, indicating that this area might have a few temporary habitations and small agricultural sites. Site descriptions are very good, and interpretations are acceptable.. Several late 1800s-1900s ranch walls are present, but only one clearly pre-contact site (a temporary habitation site: a small rockshelter, 3541, in Kama'ole Gulch). Several of the sites may actually be less than 50 years in age, and may not technically be historic sites.

We agree with your significance evaluations -- all sites are significant for their information content.

We also agree with your proposed mitigation actions. You recommend that site 3541 (the rockshelter of precontact age) be preserved. You indicate that the other 10 sites have had reasonable and adequate amounts of their significant information recorded/collected in the survey and need no further work or protection. We agree, since these are walls, small features with very shallow, surface shell scatters of possibly recent age, or structures with deposits of very recent age.

You further suggest that the northwest part of the parcel with deeper sand deposits be archaeologically monitored when any land alteration occurs, just in case burials might be found. Test trenching in this area found no burials or archaeological deposits, but we agree that there is the possibility that a few burials might be found and that monitoring is reasonable.

In sum, the report is acceptable. With the commitment to preserve site 3541 and to monitor any land alteration in the deeper sands in the northwest part of the parcel, we believe that any development of this parcel will have "no adverse effect" on significant historic sites.

Prior to any land alteration, we will need to approve a preservation plan for site 3541 (or minimally the interim protection component of such a plan) and to approve the scope of work for monitoring (which can be very brief). We will recommend those two steps as conditions to any approved County of Maui permits

If there are any questions, please have your client call Dr. Ross Cordy, our Branch Chief for Archaeology (692-8025).

Aloha,

Don Hibbard, Administrator
State Historic Preservation Division

RC:jen

c: Jesse Spencer [fax 891-8771 & fax 875-1312]
County of Maui, Planning Department
County of Maui, Public Works Department

An Archaeological Mitigation Plan for a c. 24-acre Parcel of Land in Kama'ole *Ahupua'a*, Wailuku District, Kihei, Maui (TMK: 3-09-18: 1)

Prepared for:

Mr. Mark Spencer, Spencer Homes
Kihei, Maui

Prepared by:

Xamanek Researches
Pukalani, Maui

Erik Fredericksen

9 March 2000

INTRODUCTION

Xamanek Researches conducted an archaeological inventory survey on a c. 24-acre parcel of land in Kihei, Maui (TMK: 3-09-18: 1) in the spring of 1994. This property is located near the Kihei coastline in Kama'ole *ahupua'a* (Figure 1). During the course of our archaeological inventory survey, a total of 11 sites were found (Sites 50-50-10-3531 through 3541). Identified sites included 3 post-contact animal containment walls, 3 surface midden scatters, a remnant of an old foot trail, 2 post-contact rock enclosures with associated midden deposits, an oval rock feature of relatively recent origin, and a rock overhang shelter. In addition, relatively deep dune sand deposits were identified in the northwestern section of the project area.

A draft report of our findings was prepared in June 1994, but not sent to the State Historic Preservation Division (SHPD) for review. The report was not submitted at the time, because the former owner failed to pay for the survey and subsequently declared bankruptcy. At the request of Mr. Jesse Spencer of Spencer Homes, Inc., we submitted our draft inventory survey to SHPD for review in the late summer of 1999. The report was subsequently accepted in a 7 September 1999 letter (Doc. No: 9909RC05). Spencer Homes, Inc. purchased the subject parcel in the early part of 2000. Current plans call for the development of over 80 residential lots.

The following archaeological mitigation plan has been prepared to address State Historic Preservation Division requirements set forth in the above review letter. This plan consists of a preservation plan for the Site 3541 rock shelter and a monitoring plan for the northwestern portion of the parcel.

PRESERVATION PLAN FOR THE SITE 50-50-10-3541 ROCK SHELTER, KAMA'OLE *AHUPUA'A*, WAILUKU DISTRICT, ISLAND OF MAUI (TMK: 3-09-18: 1)

The plan outlined here follows suggestions in the SHPD rules (HAR Title 13, Subtitle 6, Chapter 148, pp. 2-5).

IDENTIFICATION OF SITE TO BE PRESERVED

Site 50-50-10-3541 is located in Kama'ole Gulch c. 400-m *mauka* (east) of the Kihei coast line (Figure 2). This site is interpreted as a precontact rock overhang shelter (Fredericksen et al., June 1994). The site lies on the southern portion of the gulch at about 56 – 58 ft. AMSL. This shelter represents one of the few surviving rock overhang shelters in the developed Kihei area.

SHORT-TERM PRESERVATION OF SITE 3541

It is recommended that an interim buffer be established around the rock shelter prior to project construction. Given the site's location in the gulch, we recommend that orange construction fencing be placed along the southern top of the gulch in the vicinity of the shelter. This placement will help to ensure that this site is not impacted by bulldozer push from above during the development of the overall residential project. A c. 25-m. (75-ft.) long length of fence is recommended for the southern side of the gulch. It is also recommended that a buffer area around the site itself be marked with construction fencing. This buffer zone should be c. 10 m. (30 ft.) in diameter.

LONG-TERM PRESERVATION OF SITE 3541

It is recommended that Site 3541 be preserved in the gulch. The location of this site should be shot in and placed on the topographic map of the proposed subdivision. The long-term preservation plan for Site 3541 consists of 3 components:

1) interpretive signage
2) maintenance
3) public access

Signage

The Site 3541 rock overhang shelter has limited interpretive value. However, the site should be clearly marked, in order to help ensure its long-term integrity. The proposed heading and text of the sign are as follows:

a. **Heading of sign:**

Site 50-50-10-3541
Kama'ole Gulch Rock Overhang Shelter
Kama'ole *Ahupua'a*, Wailuku District,
Island of Maui

b. **Text of sign** (A brown background with black lettering is recommended):

"This rock overhang shelter was likely used for temporary habitation by native Hawaiians in the late precontact period (i.e. 1500 to 1700's). The presence of this site further indicates the importance of the sea and its resources to the early inhabitants of the area.

Damage to this site is punishable under Chapter 6E-11, Hawaii Revised Statutes"

b. **Size of sign:**
The recommended size for the Site 3541 sign is 1.5-ft. (0.45 m.) by 1-ft. (0.3 m.).

Maintenance

The Site 3541 preservation area lies near the bottom of the southern side of the gulch. Given the arid nature of the area, no landscaping is planned for the gulch.

However, in the event that maintenance does need to occur in the vicinity of the site, it is recommended that only hand held equipment be utilized.

Public Access

Given the relative isolation of this site in the gulch, formal access may not be practical, due to safety considerations. Informal access would most likely occur from the bottom of the gulch itself.

ARCHAEOLOGICAL MONITORING PLAN

Scope of monitoring

The scope of this monitoring plan includes having an archaeological monitor present during all subsurface disturbances in the northwestern portion of the subject parcel (Figure 2). Actual on-site time and specific actions to be followed in the event of inadvertent discoveries will be discussed and agreed upon by the general contractor, Mark Spencer of Spencer Homes, and Erik Fredericksen of Xamanek Researches, during a pre-construction meeting held for this purpose. Additional meetings may be called, if either the archaeologist or contractor believes that other relevant information should be disseminated.

Monitoring methodology

There is a possibility that significant material culture remains may be discovered during earthmoving activities on the portion of the property that contains sand dune deposits. Human burials and/or skeletal materials have been found in this general coastal area, especially in sand dunes.

Close cooperation between the monitoring archaeologist and construction personnel is important to a successful monitoring program. Topics for discussion should include, but not necessarily be limited to the following:

1) The contractor will be responsible for ensuring that the monitor(s) is aware of construction schedules and that they are present at all earth-moving activities designated for monitoring.

2) Both Xamanek Researches and the contractor are responsible for ensuring that on-site work is halted in an area of significant findings and to protect the find from any further damage (i.e., fencing, protective covering, etc.). The State Historic Preservation Division (SHPD) will recommend appropriate mitigation actions. Both SHPD and the Maui/Lana'i Islands Burial Council (MLIBC) will be consulted in the event that human remains are found.

3) In the event of the discovery of human remains, work shall cease in the immediate find area. The monitoring archaeologist will be responsible for notifying the Historic Preservation Division Burials Program (UPDBP), which, in consultation with the Maui/Lana'i Islands Burial Council, will determine the appropriate mitigation measures. The notification will include accurate information regarding the context and composition of the find.

4) Xamanek Researches will work in compliance with Hawaii Revised Statutes Chapter 6E (procedures Relating to Inadvertent Discoveries).

5) The archaeologist will have the authority to closedown construction activities in areas where potentially significant discoveries have been made until they have been properly evaluated. Normally, construction activities may continue in unaffected project areas.

6) Field procedures to be followed for documentation of discovered cultural features or human skeletal remains: a) standard field methods including recording of profiles showing stratigraphy, cultural layers, etc.; b) mapping; photographing of finds other than human remains; d) and excavation of cultural materials and/or exposed features.

7) The SHPD Maui Archaeologist will be notified and consulted with regarding treatment of identified features such as cultural layers, artifact or midden concentrations, structural remains, etc., considered to be of significance under S13-279-2 (definitions)

8) The contractor should take into account the necessity for machine excavation at a speed slow enough to allow for reasonable visual inspection of the work. The monitoring archaeologist must make a "best effort" to search for significant material culture remains (i.e. artifacts, features, midden, skeletal materials, etc.).

9) Significant archaeological discoveries, if they occur, should be protected and identified by construction "caution" tape, fencing, or other reasonable means, until mitigation is decided upon by SHPD.

10) One monitor in most instances will carry out fieldwork. Tasks will include observation of grubbing and earth-moving activities.

11) The MLIBC requests that one archaeological monitor be assigned to each piece of major earth-moving equipment in the dune area.

Field methods utilized will include photographic recording (where appropriate), artifact excavation (recovery and recording), profile documentation of cultural layers and

stratigraphy, excavation and recording of exposed features, and mapping of all pertinent features on an appropriate site map. A daily log (field notes) of activities and findings will also be kept. Gathered information will be utilized in the preparation of the monitoring report to be submitted to the SHPD.

In the event human skeletal materials are inadvertently discovered, notification of SHPD (HPDBP) and/or Maui/Lana'i Islands Burial Council will be made, and appropriate mitigation determined (Note: photographs of human skeletal materials will not be taken).

A supervisory archaeologist will regularly visit the monitoring site, or as often as is necessitated by the nature of the construction activities and archaeological findings. If significant discoveries are made, appropriate mitigation measures will be negotiated with SHPD.

Any cultural materials, other than human remains recovered from the monitoring project, will be curated by the monitoring organization until analysis is completed and then turned over to the appropriate parties. Long-term curation arrangements of such materials shall be approved by the SHPD.

When fieldwork for the required archaeological monitoring project has been completed, preparation and publication of a draft monitoring report will be undertaken. The draft report will be submitted to the State Historic Preservation Division within 180 days of the completion of fieldwork, for comment and approval. Approved final changes and corrections will result in the final monitoring report for the project.

Reference

Fredericksen, Erik M., Fredericksen, Demaris L., and Fredericksen Walter M.
June 1994 An Archaeological Inventory Survey of a 24-Acre Parcel, Kama'ole *Ahupua'a*, Wailuku, Wailuku District, Island of Maui (TMK: 3-09-18: 1). Prepared for Grant Y. M. Chun, Esq., Wailuku, Maui. Prepared by Xamanek Researches, Pukalani, Maui.

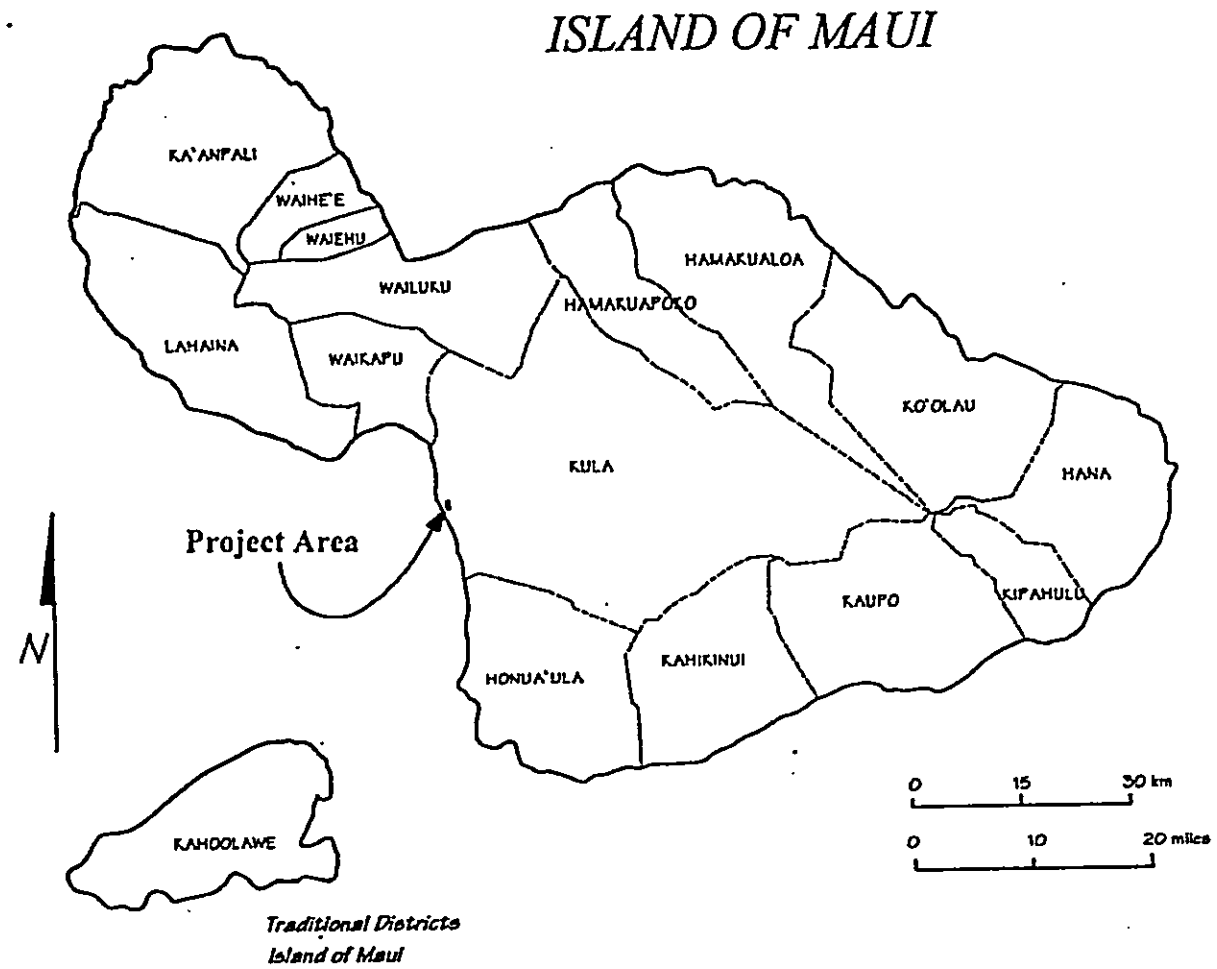

Figure 1: General location of the project area.

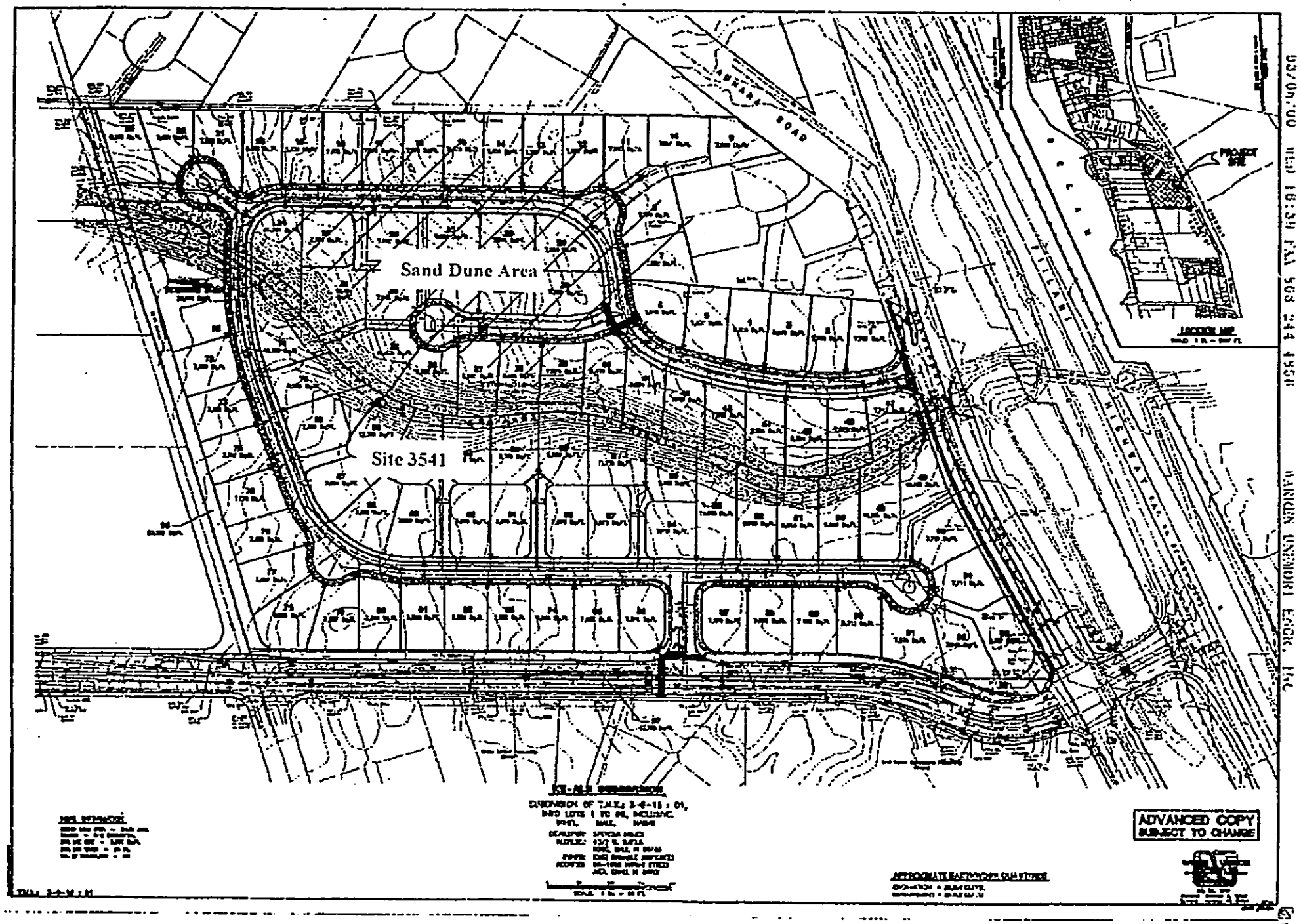

Figure 2: Project area, including locations of Site 3541 and the dune area.

Appendix B

Preliminary Engineering Report and Drainage Report

Established 1969

Preliminary Engineering Report for

KE ALI'I SUBDIVISION

Kihei, Maui, Hawaii
TMK: (2) 3-9-18: 01

Prepared For: Spencer Homes
4372 W. Waiola St.
Kihei, Maui, HI 96753

WARREN S. UNEMORI
LICENSED PROFESSIONAL ENGINEER
NO. 1569-C
HAWAII, U.S.A.

Date: August, 1999

WARREN S. UNEMORI ENGINEERING, INC.
Civil and Structural Engineers - Land Surveyors
Wells Street Professional Center - Suite 403
2145 Wells Street
Wailuku, Maui, Hawaii 96793

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PRELIMINARY ENGINEERING REPORT
FOR
KE ALII SUBDIVISION

1.0 INTRODUCTION

The 24 acre project site is being purchased by Spencer Homes Inc. from Kihei-Kamaole Associates. Spencer Homes Inc. (SHI) plan to subdivide the property into approximately 96 single family home sites ranging in size from 7,500 square feet to 11,000 square feet.

This report briefly describes and evaluates the existing infrastructure in the vicinity of the project site. It also provides a brief summary of probable infrastructural improvements needed to support the proposed project.

2.0 EXISTING INFRASTRUCTURE

2.1 Water System

The project site, which is located at the northwest corner of the intersection of Kanakanui Road and Ke Alii Alanui, is situated in the Kihei mid-level service area. Storage for this area in upper Kamaole is provided by the recently installed 2.0 MG Kamaole reservoir at elevation 311 feet.

The sources of water for this mid-level service area (MLS) are wells located in Upper Waiehu and North Waihee. The North Waihee wells were recently developed by the Department of Water Supply to augment the Upper Waiehu wells. These wells draw water from the heretofore undeveloped Waihee aquifer. Each well has a pumping capacity of 1.0 to 1.5 MGD. Two more wells in North Waihee referred to as Kupaa Wells 1 and 2 have also been drilled, tested, and are

scheduled to be operational later this year or early next year pending acquisition of appropriate easements from the land owner.

A 24-inch transmission line, 1.0 MG storage tank, and a pair of booster pumps have been installed to interconnect this new source to the Upper Waiehu well source and transmission system. Water from the Upper Waiehu and North Waihee well sources is transported by gravity to the Kamaole area via a series of 42", 36" and 30" transmission lines. The 2.0 MG Kamaole tank is fed by this 30-inch transmission line on Kanakanui Road and conveyed back to the vicinity of Ke Alii Alanui and project site by means of a 12-inch distribution system.

2.2 Sewer System

There is an 8-inch sewer line on Ke Alii Alanui. This line was installed when Ke Alii Alanui and Kamalii Intermediate School were constructed a few years ago. There also is an 8-inch sewer line at the northwest corner of the project site. This line is located within a sewer easement that runs along the south boundary of The Maui Vista's property and connects to the 10-inch gravity interceptor on Kihei Road.

A series of gravity collectors, pump stations and force mains then transport wastewater collected on Kihei Road to the Kihei Wastewater Reclamation Facility (KWRF) located above Piilani Highway south of Silversword Golf Course for processing and disposal.

2.3 Drainage

The project site generally slopes from an elevation of 56 feet at the makai boundary to about 112 feet at the southeast corner. This translates to an approximate cross slope of around 5%. A drainage gully bisects the property in an east to west direction. According to the "Hydrology Report for Piilani Highway" prepared by Trans-Meridian Engineers and Surveyors, Inc., there are three tributary areas 21, 22, and 22A, located above Piilani Highway that drain into the existing gully. The 50-year recurrence interval storm runoffs from areas 21, 22, and 22-A were computed to be 399 cfs, 363 cfs, and 91 cfs, respectively, for a total of 853 cfs. The 50-year storm runoff was adopted by the State to design their drainage structures across Piilani Highway. Using the NRCS (SCS) Method our calculation indicate that for a 50-year recurrence interval storm, runoff from the same three basins is approximately 769 cfs. The existing 48-inch diameter culvert on Kanakanui Road is obviously too small to handle this flow.

Peak runoff from the 24 acre project site under its present undeveloped condition for a 50 year storm totals approximately 21 cfs.

According to FEMA's Flood Insurance Map, the Ke Alii project site is located above the flood boundaries investigated by the National Flood Insurance program. Exhibit A shows the upper limits of the flood plain study in the Kamaole area of Kihei.

2.4 Roadway

Piilani Highway is the main north/south arterial highway linking Kihei to other urban areas of Maui. Piilani Highway is a two-lane undivided highway owned and maintained by the State. It contains

12-foot travel lanes in each direction with 10 feet wide paved shoulders. Kihei Road is a two-lane collector that parallels Piilani Highway along a more coastal route.

Ke Alii Alanui was recently constructed by the County and abuts the south boundary of the project site. It serves as a major east-west collector road that connects Piilani Highway and Kihei Road. Ke Alii Alanui along the project frontage consist of a 40-foot right-of-way, two 12-foot lanes, curb and gutter on both sides, and a four feet wide sidewalk on the south side. The intersection of Piilani Highway and Ke Alii Alanui is presently signalized with appropriate turn lanes and approaches.

Kanakanui Road is a narrow substandard County road that parallels Piilani Highway along the easterly boundary of the project site. The intersection of Kanakanui Road and Ke Alii Alanui is stop controlled and is not signalized.

2.5 Electricity and Telephone

There are overhead electrical and telephone distribution systems along Kanakanui Road. The distribution system along Ke Alii Alanui were installed underground when this road was constructed. It presently serves the subdivision on the south side of Ke Alii Alanui.

3.0 PROBABLE INFRASTRUCTURAL IMPROVEMENTS

3.1 Water System

Based on DWS's consumption rate per lot, the domestic water demand for the proposed 96 lot subdivision is expected to total

around 57,600 gpd. Fire flow rate required for this type of project is 1,000 gpm.

The distribution system for the project will be extended from the existing line on Ke Alii Alanui and looped to interconnect with the new line that will be extended along Kanakanui Road from its present terminus at the intersection of Ke Alii Alanui. Fire hydrants will be installed within the subdivision streets at intervals of 300 to 350 feet. Source development, storage and transmission line fees will be paid for as part of the comprehensive meter fee of $3,385 per lot.

The existing storage and transmission system to the project site is adequate to meet the project's domestic and fire flow demands.

3.2 Sewer System

The 96 lot subdivision project is expected to generate 33,600 to 38,000 gpd of wastewater when fully built out. The existing collection, transmission and treatment facilities have ample capacity to handle this flow. Since these facilities were recently upgraded, the developer will be fulfilling his obligation for this upgrade by paying a one-time assessment of approximately $7.80 per gallon of additional wastewater generated by the project.

3.3 Drainage

After development peak runoff from the project site is expected to total 44 cfs for a net increase of 23 cfs over current flow. This additional runoff will be intercepted by an onsite storm drain system and directed into a subsurface detention facility located at the northwest corner of the project site. This subsurface system, in combination with storage in the proposed park site, will be designed