APPENDIX P
Preliminary
Engineering Report

PRELIMINARY ENGINEERING REPORT

FOR

PUUNENE HEAVY INDUSTRIAL SUBDIVISION

Puunene, Maui, Hawaii

T.M.K.: (2) 3-8-008: 019

Prepared for:

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PRELIMINARY ENGINEERING REPORT
FOR
PUUNENE HEAVY INDUSTRIAL SUBDIVISION
T.M.K.: (2) 3-8-008: 019

1.0 INTRODUCTION

The purpose of this report is to provide information on the existing infrastructure which will be servicing the proposed project. It will also evaluate the adequacy of the existing infrastructure and anticipated improvements which may be required for the proposed project.

The subject parcel is identified as T.M.K.: (2) 3-8-008: 019, and encompasses an area of approximately 86.030 acres. It is also known as Lot 2 of the Puaa Subdivision. It is bordered by undeveloped land, an irrigation reservoir and sugar cane fields to the north; sugar cane fields and a quarry to the east, sugar cane fields to the south, and the old Puunene Airport to the west.

Access to the project site is from Kamaaina Road, South Firebreak Road, and Lower Kihei Road. There is an existing traffic signal at the Mokulele Highway - Kamaaina Road intersection with a left turn storage lane and a right turn deceleration lane.

The project plan is to seek a change in zoning to heavy industrial. The heavy industrial zoning district provides for a minimum lot size of 10,000 square feet. The sizes of the lots in the proposed heavy industrial subdivision shall be determined by the types of uses proposed in the subdivision and the market demand at the time the subdivision application is filed with the County of Maui. Currently, the plan is to provide ten (10) lots ranging in size from one-half to one acre; five (5) lots ranging in size from over one acre to two acres and the balance of the lots ranging in size from over two acres to twenty acres for a total of 28 lots. Proposed improvements include paved private roadways, private water system, and landscaping. Underground water, sewer, drainage, electrical, and telephone systems will also be constructed.

2.0 EXISTING INFRASTRUCTURE

2.1 ROADWAYS

All traffic will access and egress from the project site at the Mokulele Highway-Kamaaina Road-Mehameha Loop intersection. Mokulele Highway runs in the north-south direction with Kamaaina Road at the east approach and Mehameha Loop at the west approach. Kamaaina Road intersects with South Firebreak Road which provides access to the Hawaiian Cement Quarry and the project site. Mehameha Loop provides access to the Maui Humane Society to the west.

Mokulele Highway is a four-lane undivided State Highway which runs in the north-south direction which connects Kahului and Kihei. The speed limit is 45 miles per hour (mph) in the vicinity of Kamaaina Road. There is a separate bike path along the east side of Mokulele Highway.

The intersection of Mokulele Highway at Kamaaina Road is a four-legged , signalized intersection. The northbound and southbound approaches of Mokulele Highway have separate left turn and right turn deceleration and storage lanes. The eastbound (Mehameha Loop) and westbound (Kamaaina Road) approaches are one lane.

Kamaaina Road has a 24-feet wide concrete pavement for approximately 1,500 feet from Mokulele Highway and transitions to an asphalt pavement up to South Firebreak Road. South Firebreak Road has a 24-feet wide asphalt pavement up to the project site.

2.2 DRAINAGE

The parcel slopes down in the east to west direction ranging in elevation from approximately 140 feet to 120 feet above mean sea level, with an average slope of approximately 1.8%. It is estimated that the existing 50-year storm runoff from the project site is 75.2 cfs and 135,400 cf of runoff volume. Presently, onsite runoff sheet flows across the project site in a east to west direction into the downstream parcels and towards Mokulele Highway.

According to the "Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii (August, 1972)," prepared by the United States Department of Agriculture Soil Conservation Service, a majority of the soil within the project site is classified as Waiakoa extremely stony silty clay loam (WID2).

Waiakoa extremely stony silty clay loam is characterized as having medium runoff, and a severe erosion hazard. A portion of the soils within the southern end of the property is classified as Alae Sandy Loam Alae sandy loam (AaB). Alae Sandy Loam is characterized as having slow runoff with a slight erosion hazard (See Exhibit 3).

According to Panel Number 1500030580E of the Flood Insurance Rate Map, dated September 25, 2009, prepared by the United States Federal Emergency Management Agency, the project site is situated in Flood Zone X. Flood Zone X represents areas outside of the 0.2% annual chance flood plain (See Exhibit 4).

2.3 SEWER

There are no County sewer facilities within or adjacent to the project site. The nearest County sewerline is approximately 10,000 feet to the south of the project site in Kihei.

2.4 WATER

There is no County water system currently servicing the project site. However, there is an 8" water line from the County water system extending up Kamaaina Road to service some of the surrounding properties. The source for this water system is the Mokuhau wells located in Happy Valley. The 36-inch Central Maui transmission line runs along Mokulele Highway from Wailuku to service the Kihei area. This system is at or near capacity therefore may be inadequate to provide source and storage for this project.

2.5 ELECTRIC AND TELEPHONE

There is an existing electrical transmission system traversing along Kaimana Road and South Firebreak Road to the north end of the project site providing service to the surrounding area. This system is located within an easement granted to Maui Electric Company, Ltd.

3.0 ANTICIPATED INFRASTRUCTURE IMPROVEMENTS

3.1 ROADWAYS

Access to the proposed subdivision will be from Kamaaina Road, South Firebreak Road, and Lower Kihei Road. From Mokulele Highway, there will be access to Kihei to the south and Kahului to the north. Easements from Alexander & Baldwin and/or the State of Hawaii will provide for access to the project area from Mokulele Highway (see Exhibit 5).

The interior subdivision streets will have 56 foot right-of-ways and will be improved with two 18 foot wide travel lanes and 10 foot wide shoulders on each side. The larger traffic lanes are to accommodate the larger fire trucks in the Central and South Maui district. Flexible design standards will be utilized in the design of the subdivision's internal and external roadway system as provided for by Section 18.32.030 of the Maui County Code pertaining to General Criteria for Flexible Design Standards. Appropriate striping and signage will be installed in accordance with the Department of Public Works.

A Traffic Impact Analysis Report (TIAR), dated January 24, 2012 was prepared by Phillip Rowell and Associates, which provided the following summary for recommended mitigation for 2015 background conditions:

"Intersection of Mokulele Highway at Kamaaina Road and Mehameha Loop - No mitigation required."

The following summary was recommended to mitigate the background plus the project deficiencies:

"1. Modify westbound approach to provide a separate right turn lane.

2. Provide acceleration lane for westbound to northbound right turns.

3. Lengthen southbound left turn deceleration lane from 60 feet to 350 feet."

In addition, the TIAR recommended the following:

"1. The areas adjacent to Kamaaina Road, South Firebreak Road and Lower Kihei Road should be monitored often to insure that the sugar cane growth impedes sight distances and visibility of traffic control devices are maintained.

2. Because of the increased traffic volumes along Kamaaina Road, South Firebreak Road and Lower Kihei Road as a result of the project, these roadways should be striped and signed per County of Maui Standards. The high proportion of traffic that will be heavy vehicles should be considered in the design and installation of traffic control devices, especially the longer stopping sight distances required for the heavy vehicles."

3.2 DRAINAGE

The project's drainage system will be designed to accommodate the increase in runoff generated by the development of the entire project site. Subdivision improvements will include a master drainage system within the roadways, including catch basins, manholes, drainlines and a drain stubout to each lot. As each lot is developed, it will be required to install an onsite drainage system to collect runoff from the site and provide a drainline connection to the drain stubout to the master drainage system. The roadside runoff will be captured by the catch basins within the right-of-way, and conveyed to a series of retention basins constructed as part of the subdivision improvements. It is estimated that the post development runoff will be approximately 328.5 cfs and generate 413,900 cf of surface runoff volume. This would be an increase of approximately 253.3 cfs of runoff and 278,500 cf of runoff volume. The proposed retention basins to be constructed along the western portion of the property will have a capacity to accommodate at least the increase in surface runoff from a fully developed project site.

There will be no increase in runoff sheet flowing from the project site after completion of the development and the drainage design will also be to minimize any alterations to the natural pattern of the existing onsite surface runoff. This is in accordance with Chapter 4, Rules for the Design of Storm Drainage Facilities in the County of Maui.

3.3 SEWER

The nearest County sewer system is located approximately 10,000 feet from the project site, therefore a master private sewer system will be installed within the subdivision roadways and a sewer lateral will be provided to each lot. The master sewer system will outlet into a community leach field within the project site, which will require review and approval from the State Department of Health (SDOH).

Individual wastewater systems (IWS) will be installed by individual lot owners and used for the treatment of wastewater for each lot. Each lot will be required to connect the outlet line of the IWS to the sewer lateral provided. Wastewater will be conveyed from each lot into the community leach field which is required to be at least 1,000 feet away from the wells providing water to the subdivision. Each IWS will adhere strictly to the requirements set forth by the SDOH.

As the project progresses and building permits are applied for, the building permit applicant will be required to submit the design of an IWS. It is the responsibility of the SDOH to review and approve the IWS. Some of the restrictions of an IWS are that it has to be at least 5 feet away from the wall line of any structure, 9 feet from a property line, 50 feet from a stream, 10 feet from a large tree, and 1,000 feet from a potable drinking water well (if cesspools are used). The IWS to be used for the subdivision will be aerobic units which will allow installation in close proximity to the subdivision wells.

3.4 WATER

The development plan will involve the construction of a dual water system to provide the required potable and non-potable water, as well as adequate fire flow. Groundwater supplied by onsite wells will provide the source for non-potable water use and as well as reverse osmosis (RO) treatment for potable water use.

As determined by the Domestic Consumption Guidelines set forth by the Department of Water Supply and dual water system guidelines that recommend a 30/70, potable/non-potable split for industrial lands, the potable water demand for the proposed lots of the subdivision is calculated to be approximately 118,620 gallons per day. The non-potable requirement for the

proposed lots as well as the landscaped and irrigated common areas and roadways is calculated to be approximately 305,030 gallons per day. In accordance with Department of Water Supply standards, the fire flow demand for a heavy industrial development is 2,500 gallons per minute for a 2-hour duration. The maximum spacing for fire hydrants is 250 feet. The projects fire flow demand will be met by the proposed non-potable system.

A Groundwater Resource and Water System Assessment Report, prepared by Tom Nance Water Resource Engineering, provided the following summary of recommended improvements for the proposed dual water system:

1. Three 300 gpm wells, one providing standby capacity.
2. Three 75 gpm reverse osmosis (RO) treatment trains, one providing standby capacity.
3. A 0.25 million gallon (MG) storage reservoir for potable use
4. A 0.30 million gallon (MG) storage reservoir for non-potable use.
5. The potable and non-potable water system will each require a booster pump with a backup generator power for the non-potable pump station to ensure fire protection during a power outage.

3.5 ELECTRIC AND TELEPHONE

The proposed electrical and telephone distribution systems for the subject subdivision will be installed from the existing overhead facilities located along the north side of the project site. Within the project site, the electric and telephone systems will be installed underground in accordance with the utility companies rules and regulations. Street lights will be installed along the subdivision streets at intervals to be determined by the electrical engineer.

EXHIBITS

1 Location Map

2 Vicinity Map

3 Soil Survey Map

4 Flood Insurance Rate Map

5 Preliminary Site Plan

6 Preliminary Grading & Drainage Plan

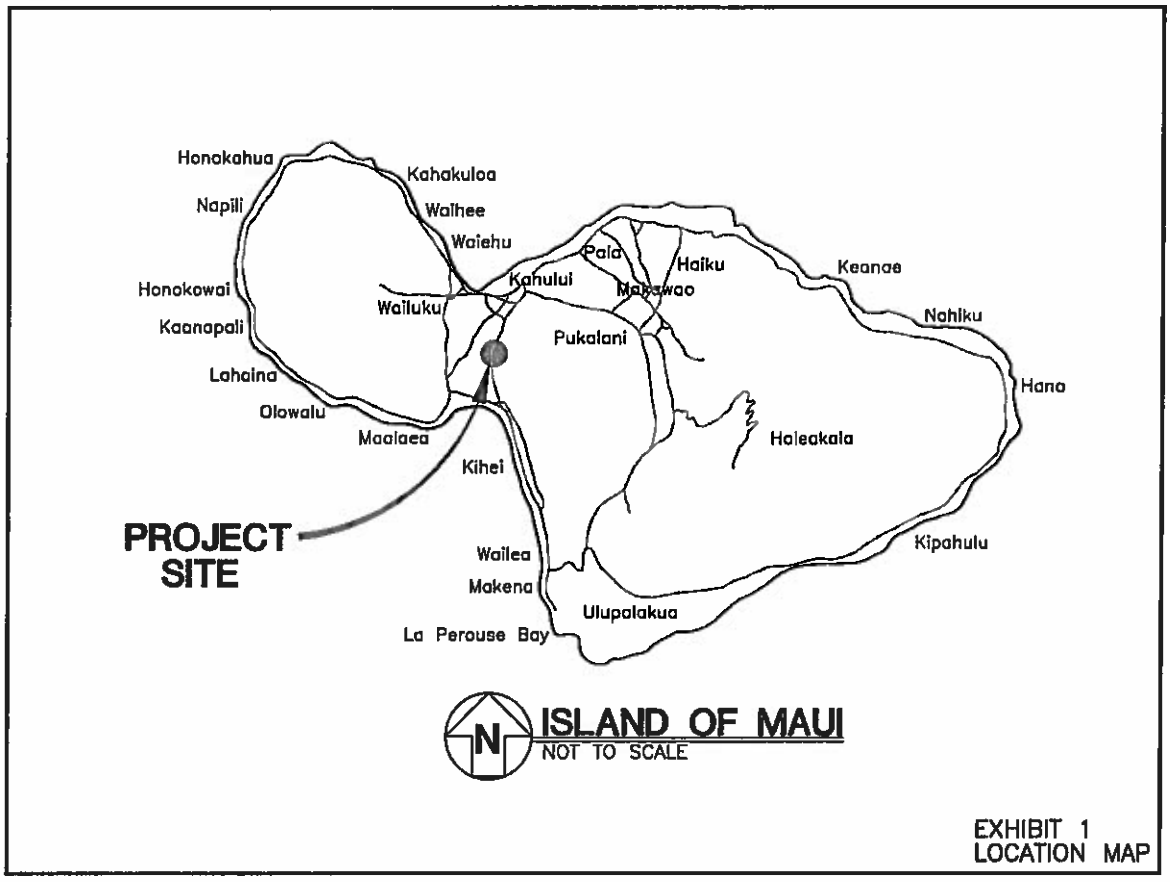


EXHIBIT 1
LOCATION MAP

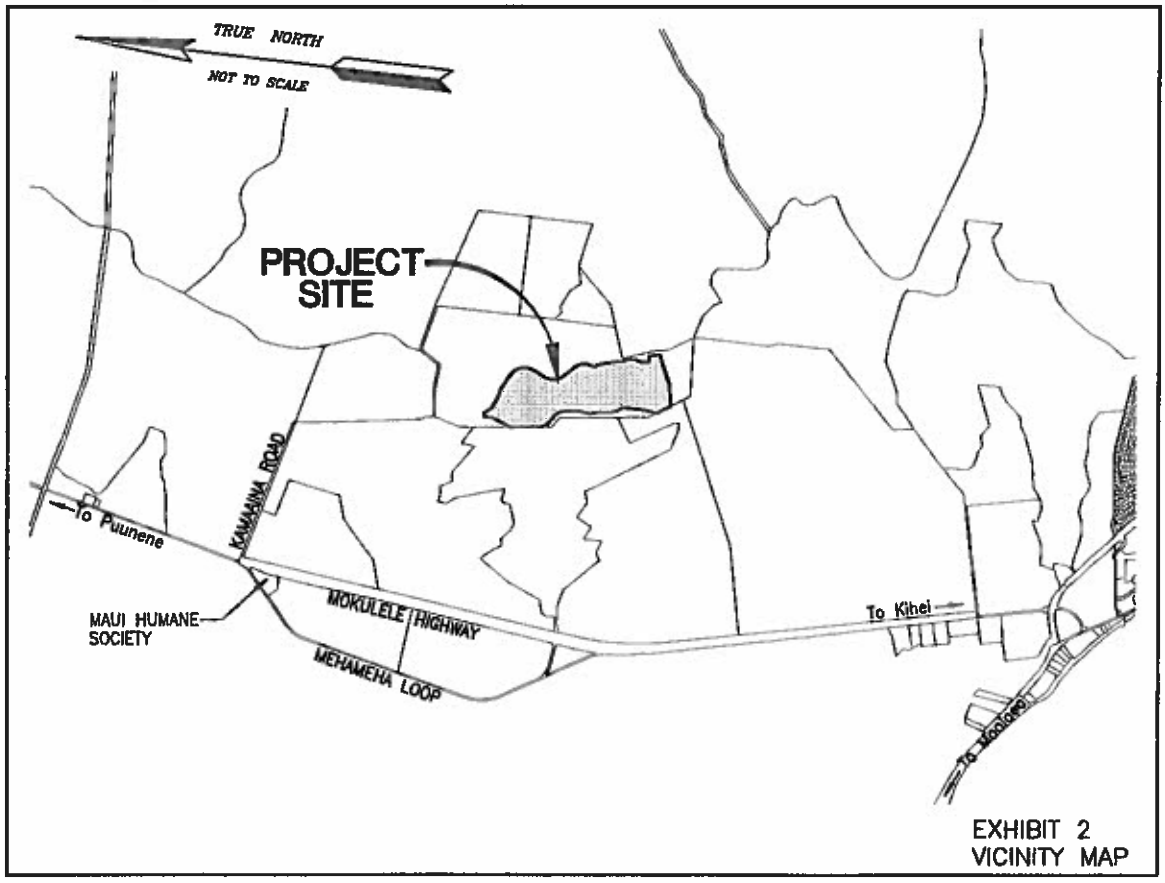
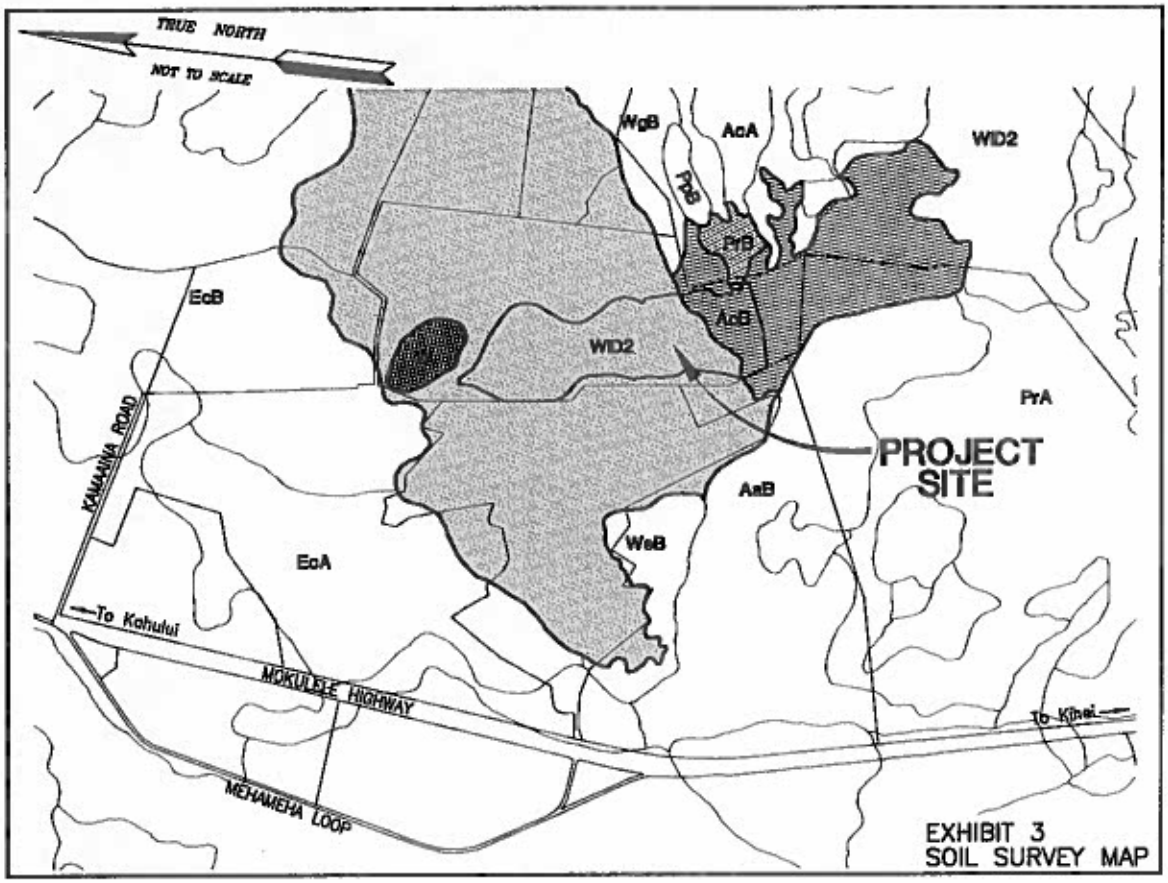


EXHIBIT 2
VICINITY MAP


TRUE NORTH
NOT TO SCALE
WgB
AcA
WID2
PrB
PrB
AcB
EcB
WID2
PrA
PROJECT SITE
KAMAHINA ROAD
AnB
WaB
EcA
To Kahului
MOKULELE HIGHWAY
To Kihei
MEHAMEHA LOOP
EXHIBIT 3
SOIL SURVEY MAP

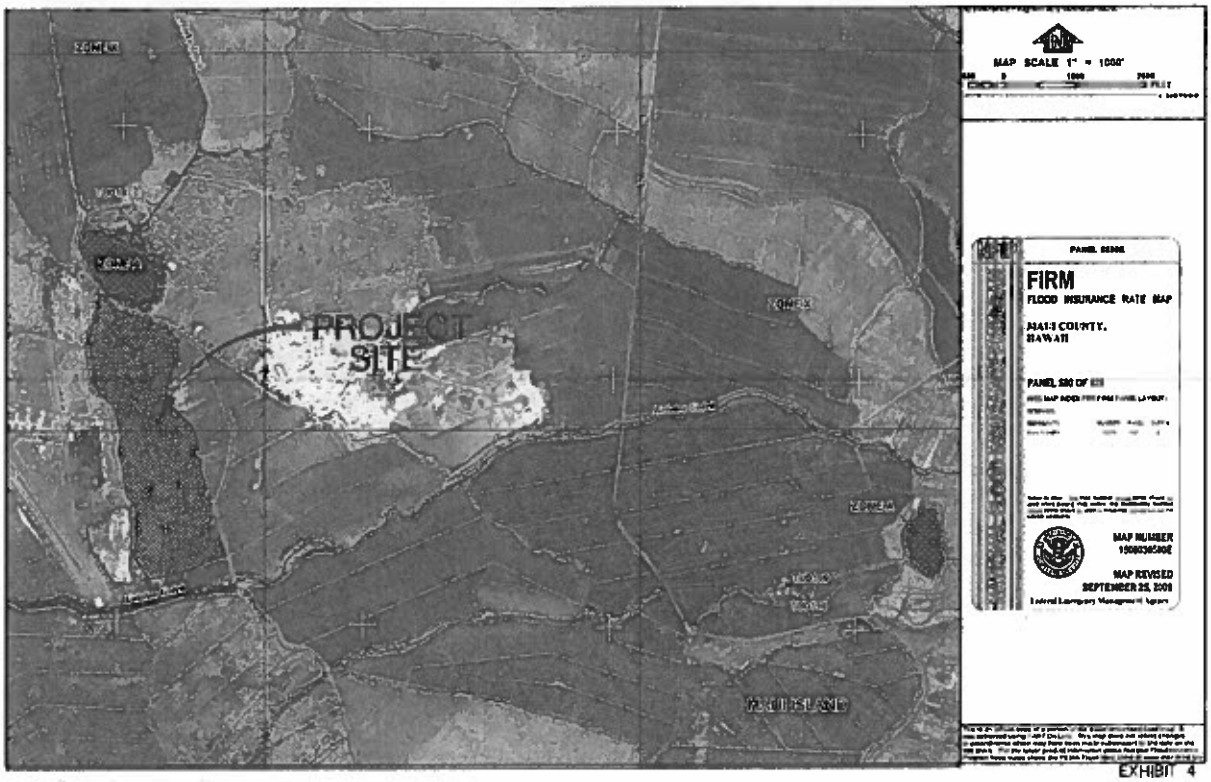

PROJECT SITE
MAP SCALE 1" = 1000'
FIRM
FLOOD INSURANCE RATE MAP
MAUI COUNTY, HAWAII
MAP NUMBER
MAP REVISED
SEPTEMBER 25, 2009

EXHIBIT 4

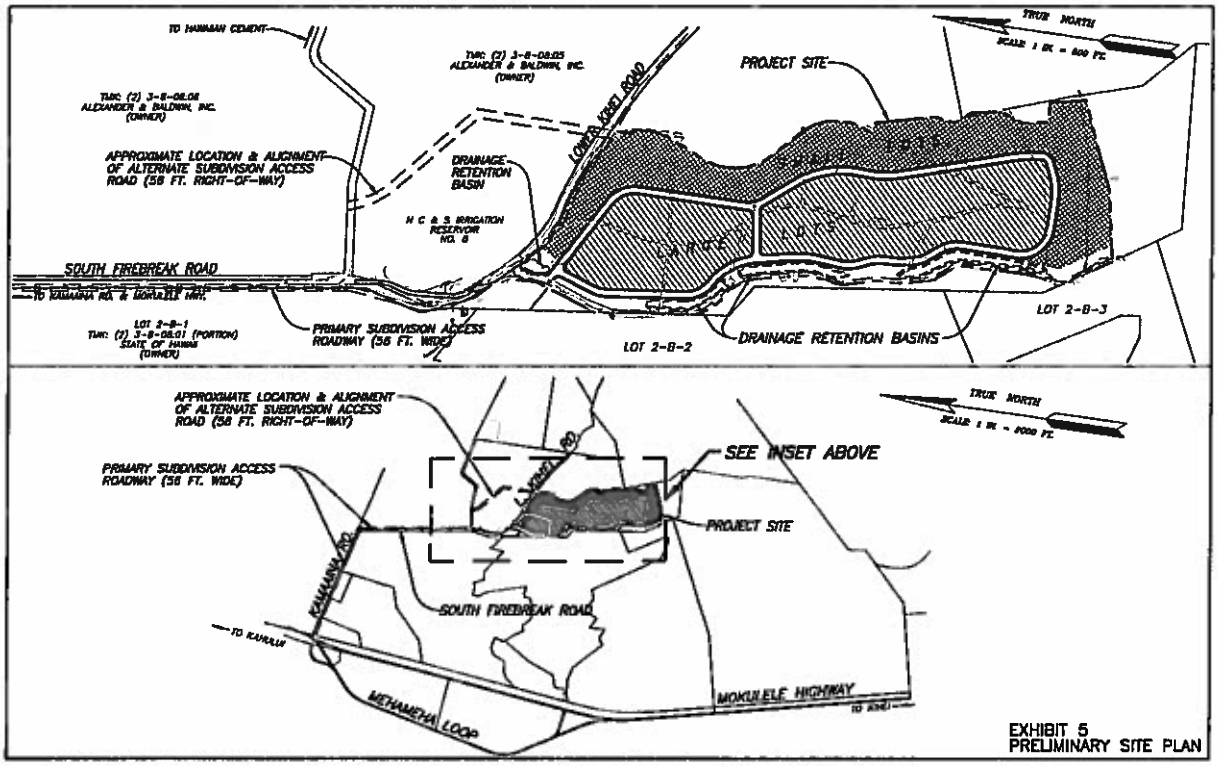


EXHIBIT 5
PRELIMINARY SITE PLAN

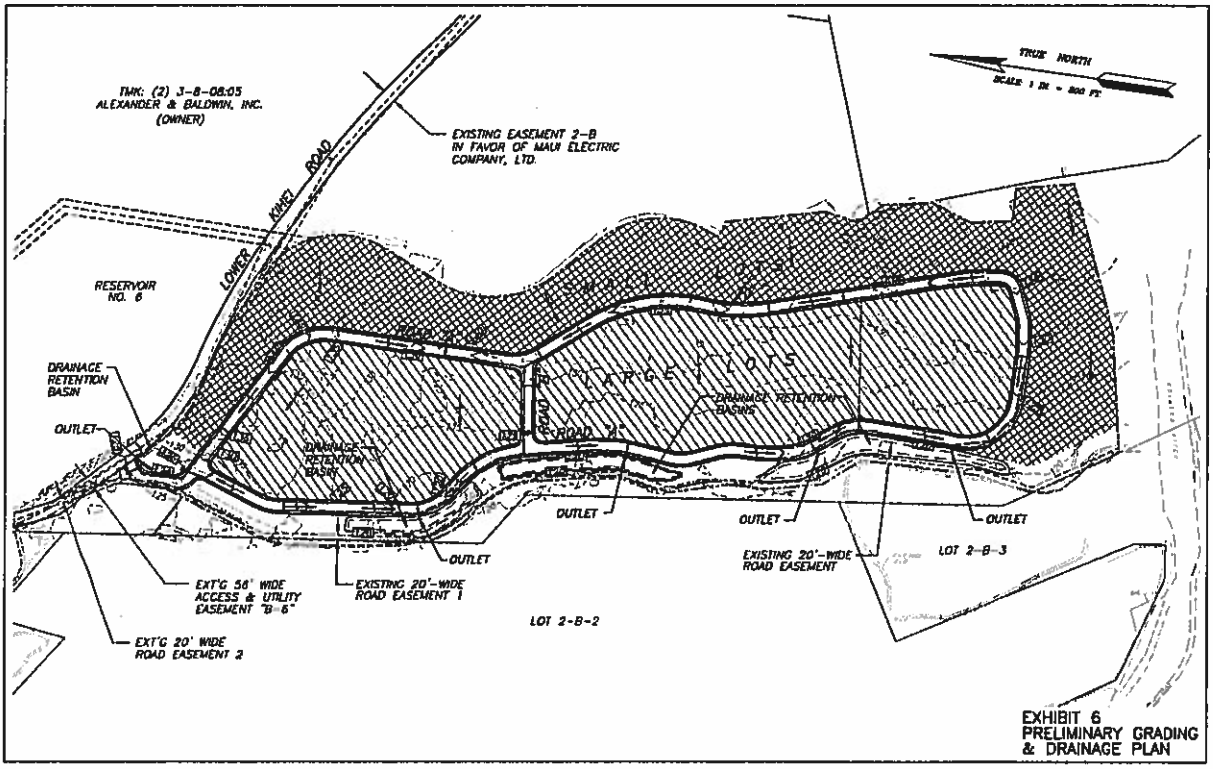


EXHIBIT 6
PRELIMINARY GRADING & DRAINAGE PLAN

APPENDIX A
HYDROLOGIC CALCULATIONS

Hydrologic Calculations

Purpose: Determine the increase in onsite surface runoff from the undeveloped portion of the project site based on a 50-year, 1-hour storm.

A. Determine the Runoff Coefficient (C):

EXISTING AREAS:

Infiltration (Medium)	= 0.07
Relief (Flat)	= 0.00
Vegetal Cover (Good)	= 0.03
Development Type (Open)	= 0.15
	C= 0.25

DEVELOPED AREAS:

Infiltration (Negligible)	= 0.20
Relief (Flat)	= 0.00
Vegetal Cover (Poor)	= 0.05
Development Type (Industrial)	= 0.55
	C= 0.80

B. Determine the 50-year 1-hour rainfall:

i_{50} = 2.5 inches

Adjust for time of concentration to compute Rainfall Intensity (I):

Existing Condition:

T_c = 30 minutes
I = 3.50 inches/hour

Developed Condition:

T_c = 14 minutes
I = 4.78 inches/hour

C. Drainage Area (A) = 86 acres

D. Compute the 50-year storm runoff volume (Q):

$Q = CIA$

Existing Condition:

$Q = (0.25)(3.50)(86)$

$= 75.2$ cfs

Developed Condition:

$Q = (0.80)(4.78)(86)$

$= 328.5$ cfs

The increase in runoff due to the proposed development is 328.5 - 75.2 = 253.3 cfs.

Hydrograph Plot

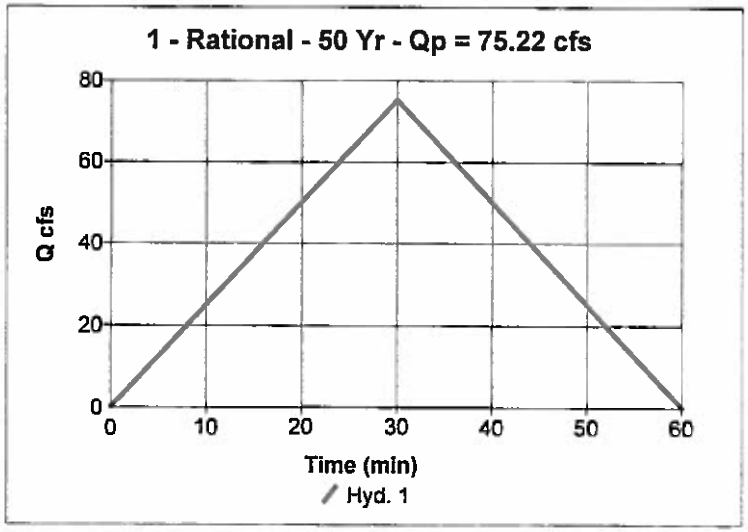
English

Hyd. No. 1

PRE

Hydrograph type	= Rational	Peak discharge	= 75.22 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 86.0 ac	Runoff coeff.	= 0.25
Intensity	= 3.50 in	Time of conc. (Tc)	= 30 min
I-D-F Curve	= 2-5.IDF	Reced. limb factor	= 1

Total Volume = 135,395 cuft



Hydrograph Plot

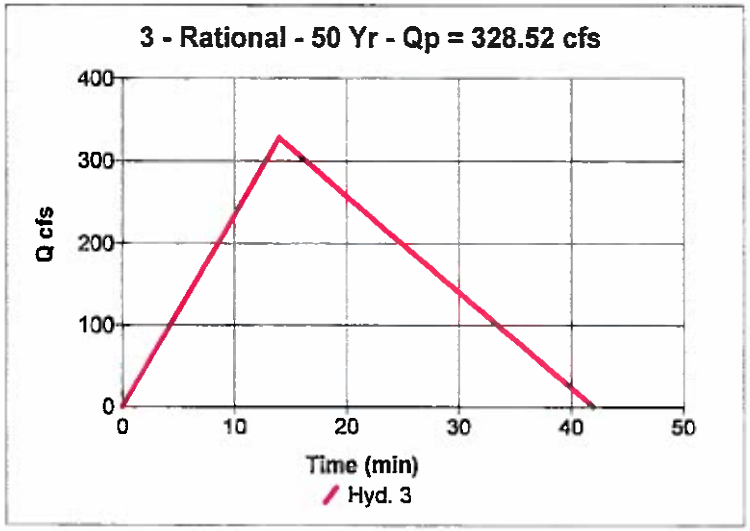
English

Hyd. No. 3

POST

Hydrograph type	= Rational	Peak discharge	= 328.52 cfs
Storm frequency	= 50 yrs	Time interval	= 1 min
Drainage area	= 86.0 ac	Runoff coeff.	= 0.8
Intensity	= 4.78 in	Time of conc. (Tc)	= 14 min
I-D-F Curve	= 2-5.IDF	Reced. limb factor	= 2

Total Volume = 413,936 cuft



Reservoir Report

English

Reservoir No. 1 - BASIN 1

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	116.00	21,237	0	0
2.00	118.00	28,471	49,708	49,708
3.00	119.00	32,170	30,321	80,029

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= ----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Eqn. Exp.	= 0.00	0.00	0.00	0.00
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	116.00	---	---	---	---	---	---	---	---	0.00
2.00	49,708	118.00	---	---	---	---	---	---	---	---	0.00
3.00	80,029	119.00	---	---	---	---	---	---	---	---	0.00

Reservoir Report

English

Reservoir No. 2 - BASIN 2

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	118.00	22,322	0	0
2.00	120.00	31,419	53,741	53,741
3.00	121.00	36,052	33,736	87,477

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Eqn. Exp.	= 0.00	0.00	0.00	0.00
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	118.00	---	---	---	---	---	---	---	---	0.00
2.00	53,741	120.00	---	---	---	---	---	---	---	---	0.00
3.00	87,477	121.00	---	---	---	---	---	---	---	---	0.00

Reservoir Report

English

Reservoir No. 3 - BASIN 3

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	116.00	38,760	0	0
2.00	118.00	51,124	89,884	89,884
3.00	119.00	57,410	54,267	144,151
4.00	120.00	63,770	60,590	204,741

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Eqn. Exp.	= 0.00	0.00	0.00	0.00
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	116.00	---	---	---	---	---	---	---	---	0.00
2.00	89,884	118.00	---	---	---	---	---	---	---	---	0.00
3.00	144,151	119.00	---	---	---	---	---	---	---	---	0.00
4.00	204,741	120.00	---	---	---	---	---	---	---	---	0.00

Reservoir Report

English

Reservoir No. 4 - BASIN 4

Pond Data

Pond storage is based on known contour areas

Stage / Storage Table

Stage ft	Elevation ft	Contour area sqft	Incr. Storage cuft	Total storage cuft
0.00	124.00	4,910	0	0
1.00	125.00	1,053	2,982	2,982
2.00	126.00	11,746	6,400	9,381

Culvert / Orifice Structures

	[A]	[B]	[C]	[D]
Rise in	= 0.0	0.0	0.0	0.0
Span in	= 0.0	0.0	0.0	0.0
No. Barrels	= 0	0	0	0
Invert El. ft	= 0.00	0.00	0.00	0.00
Length ft	= 0.0	0.0	0.0	0.0
Slope %	= 0.00	0.00	0.00	0.00
N-Value	= .000	.000	.000	.000
Orif. Coeff.	= 0.00	0.00	0.00	0.00
Multi-Stage	= -----	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len ft	= 0.00	0.00	0.00	0.00
Crest El. ft	= 0.00	0.00	0.00	0.00
Weir Coeff.	= 0.00	0.00	0.00	0.00
Eqn. Exp.	= 0.00	0.00	0.00	0.00
Multi-Stage	= No	No	No	No

Tailwater Elevation = 0.00 ft

Note: All outflows have been analyzed under inlet and outlet control.

Stage / Storage / Discharge Table

Stage ft	Storage cuft	Elevation ft	Clv A cfs	Clv B cfs	Clv C cfs	Clv D cfs	Wr A cfs	Wr B cfs	Wr C cfs	Wr D cfs	Discharge cfs
0.00	0	124.00	---	---	---	---	---	---	---	---	0.00
1.00	2,982	125.00	---	---	---	---	---	---	---	---	0.00
2.00	9,381	126.00	---	---	---	---	---	---	---	---	0.00

APPENDIX B

WATER DEMAND CALCULATIONS

WATER DEMAND CALCULATIONS

Proposed subdivision area uses:

Industrial lots = 65.9 acres
Common area landscaping = 9.1 acres
Roadways = 11.0 acres

Water demand for Industrial lots (6,000 gallons per acre per day):

Average Daily Demand (ADD) = (6,000)(65.9) = 395,400 gpd

Based on 30/70, potable/non-potable split:

ADD (potable) = 395,400 gpd x 30% = 118,620 gpd
ADD (non-potable) = 395,400 gpd x 70% = 276,780 gpd

Water demand for Common area landscaping (2,500 gallons per acre per day):

ADD (non-potable) = (2,500)(9.1) = 22,750 gpd

Water demand for Roadways (2,500 gallons per acre per day):

Based on 20% of ROW to be irrigated

ADD (non-potable) = (2,500)(2.2) = 5,500 gpd

Total ADD (non-potable) = 276,780 + 22,750 + 5,500 = 305,030 gpd

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