

MOLOKAI ELECTRIC COMPANY, LTD.

PROJECT DESCRIPTION  
AND  
ENVIRONMENTAL ASSESSMENT  
FOR  
COOKE GENERATING STATION  
Naiwa, Molokai, Hawaii

Prepared By

Environment Impact Study Corporation  
Honolulu and Maui, Hawaii

May, 1982

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OFFICE OF THE SECRETARY  
DEPARTMENT OF HEALTH

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PETITION: LAND USE DISTRICT CHANGE FROM AGRICULTURE TO URBAN

PETITIONER: Molokai Electric Company, Limited

PLACE OF BUSINESS: P.O. Box 378  
Kaunakakai, Molokai

STATE IN WHICH INCORPORATED: Hawaii

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# Proposed Project

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SECTION 1

DESCRIPTION OF THE PROPOSED PROJECT

I. INTRODUCTION

Molokai Electric Company, Limited, is the major electrical generating facility for the Island of Molokai. The existing diesel generating facilities located in Kaunakakai are not capable of meeting the current and future electrical demands for Molokai. The existing diesel generators are old and their reliability is decreasing with increasing age.

It was essential for Molokai Electric to expand its physical facilities to meet its public utility obligation to provide efficient and reliable electrical service. Three alternatives were considered: (1) expansion of the existing Kaunakakai facility; (2) development of a new site; and (3) a combination of maintaining the existing facility and development of a new site.

After extensive deliberation, Molokai Electric determined that the development of a new generating site, combined with the phasing-out of the existing Kaunakakai facility and the transfer of five diesel generators, was the only viable option available. The development of a new generating site would also enable Molokai Electric to not only use some of the existing diesel generators

(the most efficient and reliable), but to develop other means of generating electricity (gas turbine, steam generator and solar-thermal radiation).

In mid-1981, Molokai Electric commenced the industrial development of a biomass steam and fuel electrical generation facility at Palaau, Molokai pursuant to Special Permit SP80-350 approved by the Land Use Commission in Decision and Order entered on February 10, 1981.

## II. PROJECT SITE

### A. Location

The project site is identified as TMK 5-2-11: parcel 31. The site is legally described as Lot 32, area 50.099 acres, as shown on Map 11 (Figure 1-3) of Land Court Application No. 1861, owned in fee simple under Transfer Certificate of Title No. 233,532 issued to Molokai Electric Company, Limited.

The site is located approximately three miles west of Kaunakakai, and four miles south of Molokai Airport. Existing, interim access from Maunaloa Highway, a public highway, to the project site, is via Palaau Road, and Government Road, a public right-of-way. Permanent access from Maunaloa Highway will be over a roadway easement designated as Easement 26 on Map 11. Construction of this access road is nearly completed.

Please refer to Figures 1-1, 1-2 and 1-3.

B. Area

The total project area is 50.099 acres. Of the total area, an area of approximately 40 acres will be used for the development of the biomass generating facility, and approximately 10 acres will be set apart for the proposed solar thermal development.

C. Attributes of the Project Site

The project site proposed for urban classification has several advantages:

1. There is sufficient land area for the biomass generating facility and proposed solar thermal field (50.099 acres).
2. It is located in an area close to biomass sources and within an area having an excellent potential for solar energy development (low rainfall and high solar radiation of the area).
3. It is located at the electrical load center for the Island of Molokai.
4. A high voltage (34.5 KV), high capacity electrical distribution line originating from the Kaunakakai generating station transverses the project site.
5. The close proximity (3 miles) of the project site to the existing Kaunakakai generating plant enables dual site operation during construction and phasing-in of the new generating plant and phasing-out of the Kaunakakai plant.
6. The solid rock base underlying the project site provides for an ideal foundation for the new generating facility.
7. The site is located outside of flood and tsunami zones.

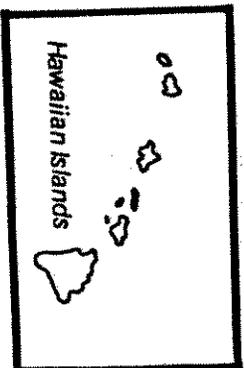
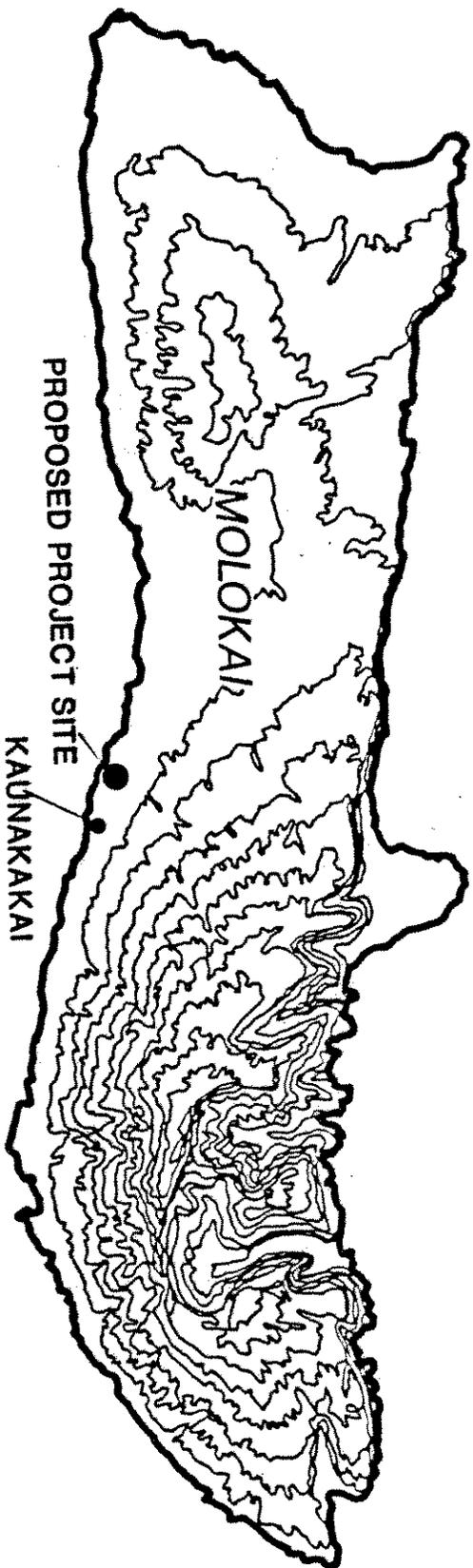


FIGURE 1-1  
ISLAND MAP

E.I.B.C.

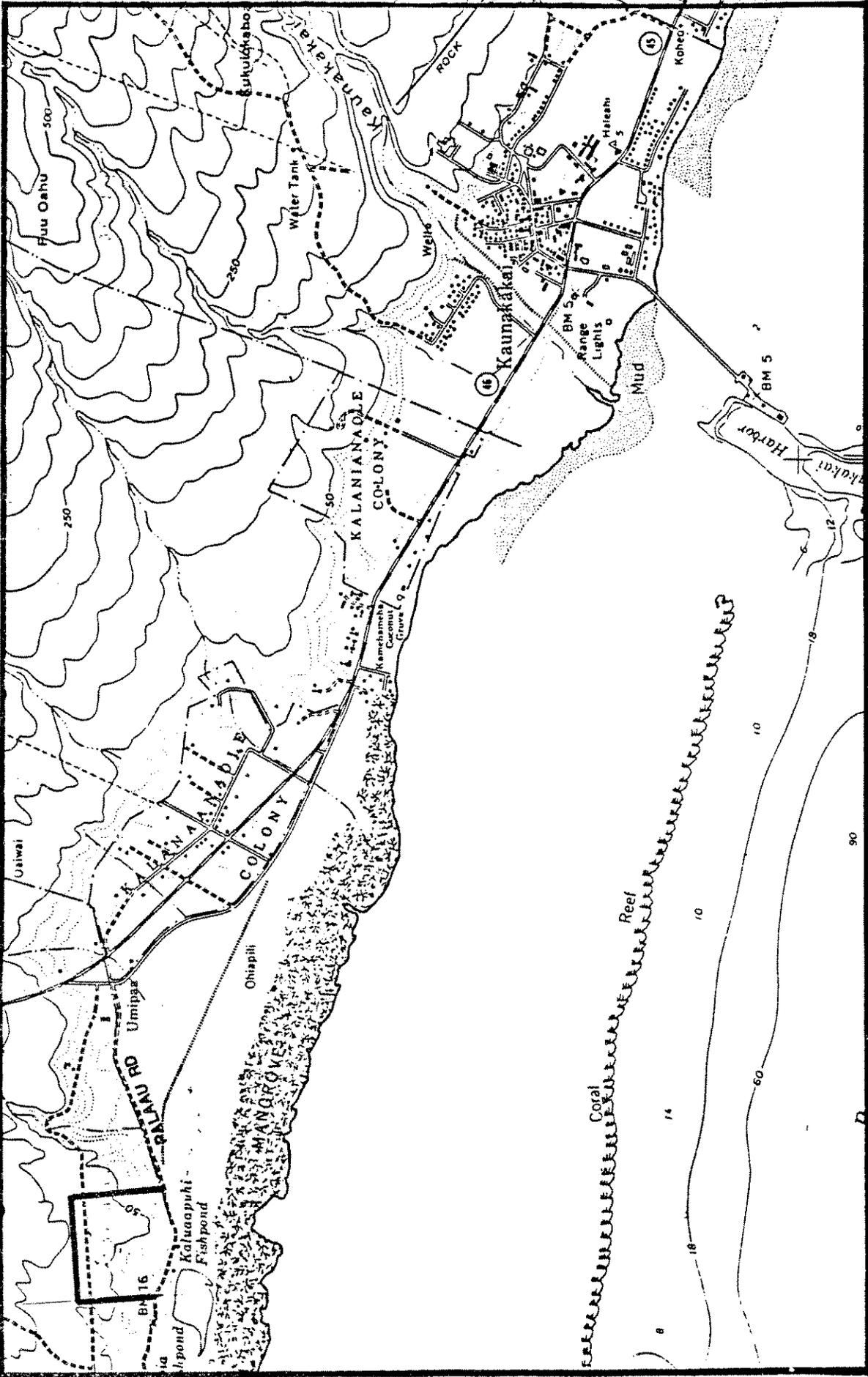


FIGURE 1-2  
VICINITY MAP

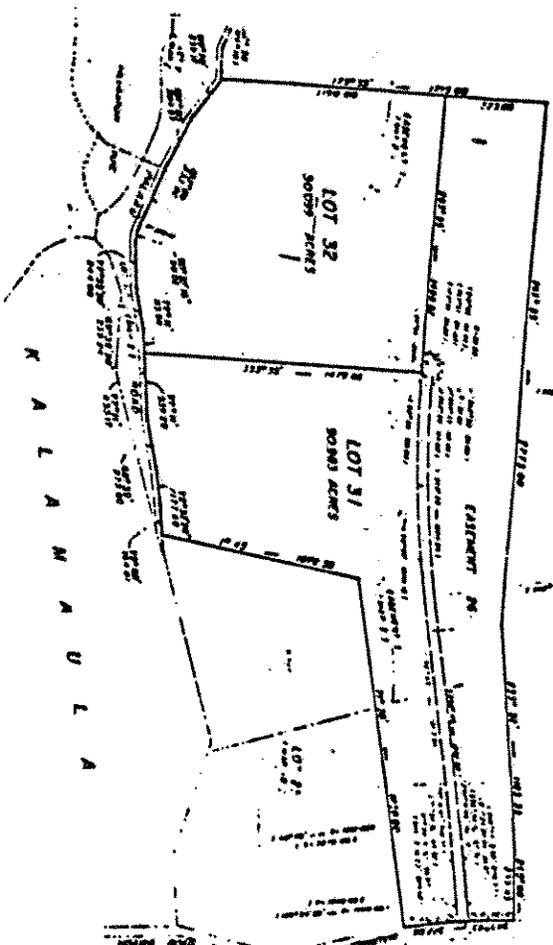
MAP

LAND COURT.  
STATE OF HAWAII

LAND COURT APPLICATION 1861

SUBDIVISION OF LOT 26 AS SHOWN ON MAP 10  
INTO LOTS 31 & 32 AND DESIGNATION  
OF EASEMENT 26 OVER AND ACROSS LOT 31

MAUNA AND KANANI'OLEKAU, HAWAII



*John A. ...*  
REGISTERED SURVEYOR  
LAND COURT OFFICE NO 10

ENGINEER LAND CO., INC.  
DESIGN ENGINEER OF THIS MAP

APPROVED AND AUTHORIZED BY ORDER OF THE COURT  
OF THE LAND COURT DATED \_\_\_\_\_  
AT \_\_\_\_\_ OF THE LAND COURT

NOTE  
EASEMENT NO. 26 30.00 ACRES

FIGURE 1-3

8. On-site water is available for the cooling towers.

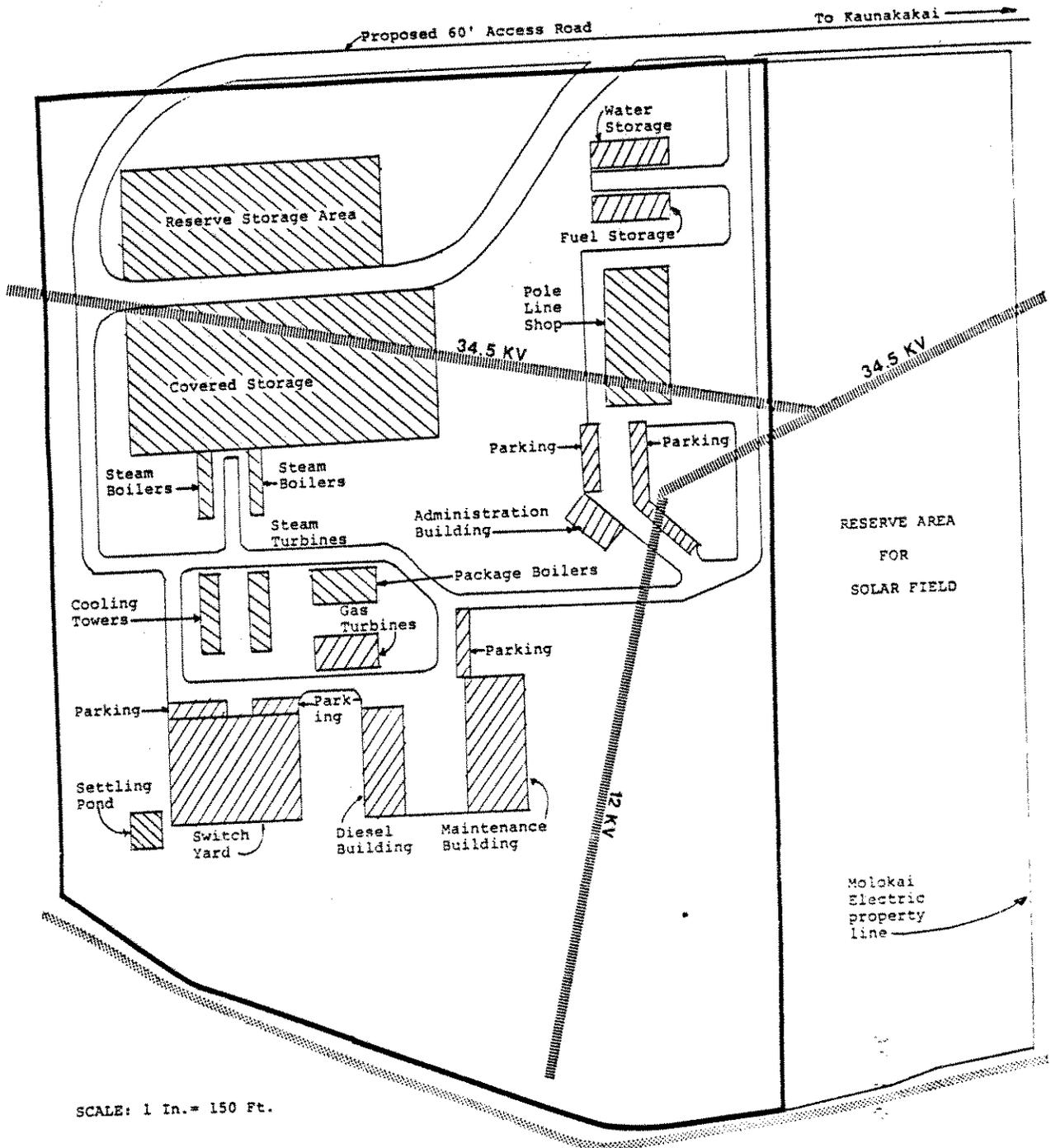
9. The surrounding area is generally uninhabited and no residential development in the area is expected to occur. The site is far enough away to minimize potential impacts of the facility on surrounding communities.

### III. PROJECT DESCRIPTION

#### A. General

Molokai Electric has developed a new electrical generating station which includes: the use of new equipment capable of using biomass, and fossil fuel; use of older diesel generators from the Kaunakakai station; and potential power from the proposed solar thermal field.

In addition to the installation of the power generating equipment, the project includes the following structures and improvements: water and fuel storage facilities; a pole line shop; administrative office buildings; switchyard; on-site roadway and parking; overhead power lines; boundary fencing; wells and water distribution system; on-site sewage disposal system; cooling towers; base yard; a settling pond for the collection and retention of runoff from storm water and washing procedures; and a fire protection/settling pond. Please refer to Figure 1-4.



LEGEND

-  To be operational by end of 1981.
-  To be operational by end of 1982.
-  Project Site Boundary
-  Palaau Road



FIGURE 1-4  
SITE LAYOUT SCHEMATIC

The entire facility is designed to meet current and future electricity demands for Molokai based on growth forecast for the island. The facility is part of an overall plan involving Molokai Electric Company, Limited, the County of Maui, the State of Hawaii, the Hawaii Natural Energy Institute and the U. S. Department of Energy to reduce Molokai's dependency on diesel fuel and to enable some measure of energy self-sufficiency for the island.

B. Electrical Generating Equipment

The electrical generating equipment includes a combination of steam turbines using biomass and fossil fuel; gas turbines; diesel generators and the proposed solar-thermal power. The following is a brief description of the generating equipment.

1. Steam Turbines

a. Fuel

Steam generation of electricity using biomass as a fuel source has a long history of providing reliable power as evidenced by the electricity produced by the sugar companies using bagasse as a fuel source.

Potential sources of biomass on Molokai are agricultural byproducts such as hay and

pineapple plant residue. Also an abundant supply of kiawe wood is available as a biomass fuel source. The potential for the cultivation of specific biomass crops such as koa haole or other fast-growing trees may also be available in the future.

Presently, Molokai Ranch has contracted to provide hay and kiawe wood chips to the facility at an approximate minimum rate of 17,000 tons per year. This amount of biomass is capable of generating approximately 3,300 KW, the generating capacity of the biomass unit.

Fuel oil will be required to start the biomass steam generator and will be available as a standby fuel. The fuel oil will also be used by the standby package boiler for the generation of steam. The boiler is required to be operable at all times for standby generation of steam during normal maintenance of the major biomass boiler or during emergencies.

b. Biomass Transfer

Provisions have also been made for the efficient transfer and storage of the

biomass fuel. The biomass is trucked to the site via a roadway presently under construction and running from Maunaloa Highway to the northeast corner of the project site. This road is being constructed by Molokai Ranch pursuant to an agreement between Molokai Electric and Molokai Ranch. From the roadway, an internal roadway within the project site will divert the trucks to a scale for weighing prior to dumping of the biomass into covered storage areas. The biomass will then be conveyed to the boiler via a conveyer belt for combustion.

c. Generation of Electricity

The steam generated from the boiler is then used to drive steam turbines, which in turn generate electricity. The waste steam from the turbine is routed to the cooling tower for condensation and the water routed back to the boiler. This system is a closed system and the recycling of the water eliminates the on- or off-site disposal of heated water and conserves the amount of water required.

d. Water Requirements for:

- Boiler, Cooling tower, Irrigation, Sanitary

Approximately 4,000 to 5,000 gallons per day (gpd) of industrial water will be needed to meet the requirements for the steam boiler, cooling tower, irrigation, and sanitary facilities (toilets). More than sufficient industrial water to meet this need will be provided from two basic sources:

(1) 1,000 gpd from Molokai Ranch's private water system pursuant to an agreement; and (2) two on-site source wells with peak flow capacity estimated at about 145 gpm or 8,700 gph. Pumps with a rated flow of 150 gpm could increase the flow capacity to 9,000 gph.

- Drinking

Potable water (drinking only) requirements are low, estimated at 7.5 gallons to 10 gallons per day for 15 to 20 people (0.5 gallons per person per day).

All other water uses, toilets, etc., will use water from the other source. The potable water source will be from a Hawaiian Homes water line, which will provide up to 300 gpd or 9,000 gallons per month. The application for 9,000 gallons per month has been approved by Hawaiian Homes.

e. Particulate Matter (dust)

A dust collector and wet scrubber will remove most, if not all, of the particulate matter from the boiler exhaust gas prior to discharge through the stack.

2. Gas Turbine and Diesel Generators

The gas turbine and diesel generators will be used as back up units and when additional electrical power is required.

The gas turbine generates electricity directly and efficiently. A significant added advantage is that the waste heat it produces can be used with the biomass steam generator. This combined cycle operation increases the efficiency of the turbine and produces additional power. For the proposed facility, the gas turbine started operation in December, 1981 and

produces 2,200 KW. The completion of the biomass boiler and steam turbine enables the combined cycle to be implemented producing an additional 800 KW or a total of 3,000 KW.

### 3. Solar Thermal

As an added complement to the proposed project, Molokai Electric has also submitted an application to the U.S. Department of Energy for a 250 kilowatt solar thermal generation grant. A condition of the grant is that an area of 10 acres be set aside for the experimental solar thermal generation project. As of April 26, 1982, Molokai Electric was still being considered as a possible recipient of this grant.

### C. Other Structures

The electrical generating station is a self-contained facility requiring other structures in addition to the generating equipment. The other required major structures and the dimensions are listed in Table 1-1.

### D. Employment

#### 1. Direct

There are presently thirty (30) people employed by Molokai Electric. The new generating

with 717 students in the secondary school. There are no post-secondary educational facilities on Molokai.

There are many public and private recreational facilities located across the island. An inventory of existing parks indicates that there are more private parks than public parks. All golf courses on the island are privately owned.

There is one State park, Palaau State Park (34 acres), where camping is permitted. Hiking and camping are also allowed in State forest reserves. In addition, there are seven public hunting areas where game mammals may be taken in accordance with State Fish and Game regulations.

F. Water

1. Molokai

Molokai depends almost entirely on the water resources of the east Molokai mountains for its domestic and agricultural supply. Water is transported by means of tunnels, ditches and pipe systems to drier areas. Deep wells in the central areas provide water from the basal supply while wells along the shoreline provide some water for the eastern section of the island. A five-mile tunnel delivers water from the windward side of the island to

Response time to the project site from the Kaunakakai Fire Station, which has one engine and one tanker, is approximately 4-5 minutes. Response time from the Hoolehua Station, which has one pumper, is approximately 5 minutes.

D. Medical

Molokai General Hospital, located in Kaunakakai, has a 25-bed capacity for acute care. The hospital offers out-patient care, intensive cardiac care, and emergency room services. Other services are offered by contractual agreement, such as pediatric and orthopedic services.

Molokai Clinic is a privately sponsored health service program. In 1978 there were four physicians in general practice on the island, and three dentists.

E. Schools and Recreation

The existing public school system on Molokai consists of four elementary schools and one secondary school. The elementary schools are located at Kaunakakai, Kilohana, Kualapuu, and Maunaloa. Molokai Intermediate and High School is located at Hoolehua.

The existing facilities consist of 89 classrooms served by a faculty of 100 teachers. In 1978 there were 825 students enrolled in elementary classes,

B. Police

Police services are centralized, with a district office located in Kaunakakai at the new civic center. Services are provided on a mobile beat system. At the present time, there are no plans for establishing substations on the island. Current response time to the project site is under 8 minutes; however, with the construction of the new access road the response time would be reduced to an estimated 4-5 minutes.

A six foot chain link fence has been installed around the proposed electric plant. Other on-site security measures may be instituted as necessary.

C. Fire

There are three fire protection facilities on the island. Two facilities, at Kaunakakai and at Hoolehua, are manned by the County of Maui. The third is located at Molokai Airport and is under the administrative responsibility of the State of Hawaii, Department of Transportation, Airports Division.

With expansion of population and improvements, other fire protection facilities are being considered for the east and west ends of Molokai.

however, recent studies have indicated that the harbor requires modernization to handle trans-Pacific vessels [2.38].

There are two other barge facilities on the island, at Kalaupapa and Hale O Lono. In addition, small boat facilities are found at Kaunakakai, Kolo, Palaau, Pukoo, Keawanui, and Kamalo. The only improved boat launching facility is at Kaunakakai.

A primary criterion for locating the plant at the site is its load center location and relative proximity to Kaunakakai town. Since fuel oil delivery is presently only available to Kaunakakai, a site near town is critical to lower future delivery costs.

### 3. Airports

Molokai Airport, the primary airport on the island, is located in Hoolehua and is easily accessible from various parts of the island. The island is served by Hawaiian Airlines, Aloha Airlines, Royal Hawaiian Airlines, and other commuter air services. A second, smaller, airstrip is located on the Kalaupapa Peninsula and serves only the community of Kalaupapa.

according to minimum County of Maui subdivision standards within the 56-foot right-of-way width of Easement 26 (refer to Figure 1-3). The access road extends from Maunaloa Highway, westward to, and terminates at the northeast corner of the project site. Molokai Ranch is installing the road as part of an agreement with Molokai Electric. It is unknown at this time whether Molokai Ranch will retain fee ownership of the roadway or will dedicate it to the County upon its completion. From the west terminus of the access road, a system of interior access roads for trucks and other vehicles will be constructed on the project site. (Refer to Figure 1-4.)

## 2. Harbors

Kaunakakai Harbor is a medium draft barge harbor located on the south central shoreline of the island. This harbor is the main port facility on the island, and the only all-weather harbor. It has a 530-foot-wide channel which is 23 feet deep, and contains a basin of 21 acres.

This harbor has direct access to Routes 450 and 460. It is considered adequate to meet the island needs for the next 10-20 years;

of the project site to Kaunakakai will not create employment disruption.

V . INFRASTRUCTURE

A. Transportation

1. Highways

The proposed project site is located on Palaau Road, approximately 4,000 feet west of the intersection with State Route 460, or Maunaloa Highway. Approximate transit time from the project site to Kaunakakai is 6-7 minutes.

Palaau Road is a 1- to 2-lane dirt road in fair condition, and periodic road maintenance by the County is conducted, as needed. Route 460 is a 2-lane paved roadway which connects with State Route 450 (Kamehameha V Highway) in providing access east of Kaunakakai. The latest 24-hour traffic counts taken on Molokai were in April, 1979. At that time, the count on Route 460 at Station C1A (Maunaloa Highway at Coconut Grove) was 3,973 vehicles per day [2.37]. The count on Route 450 at Station 1 (Kamehameha V Highway at Ala Malama Street and Maunaloa Highway) was 4,506 vehicles per day.

As part of the project, a new access road over one-half mile in length is being constructed

TABLE 2-7  
ISLAND OF MOLOKAI  
CIVILIAN LABOR FORCE  
(1970 - 1980)

<u>YEAR</u>	<u>EMPLOYED</u>	<u>AVERAGE ANNUAL</u>	
		<u>UNEMPLOYED</u>	<u>% UNEMPLOYED</u>
1970	2,100	200	8.6
1971	1,950	300	13.3
1972	2,500	500	16.1
1973	2,450	500	17.1
1974	2,500	450	14.5
1975	2,550	450	15.7
1976	2,550	450	14.5
1977	2,800	300	10.2
1978	3,100	350	10.8 <sup>1/</sup>
1979	3,150	400	11.2 <sup>1/</sup>
1980	3,200	300	8.4 <sup>1/</sup>

Source: [2.36]

<sup>1/</sup>

Revised 5.81. Page 12-A. Table 6-4. Labor Force Molokai, 1978-1980.

Table 2-7 illustrates overall employment and unemployment trends for the island of Molokai from 1970 through 1980. The data shows that there was a steady increase in unemployment from 1970 to 1973. After 1973 the unemployment rate decreased but in no year has it fallen below 10%.

Between 1976 and 1979, Maui County as a whole registered a decrease in the annual average unemployment rate, going from 10.6% to 6.3% in 1979. The State pattern showed a decrease from 9.8% in 1976 to 6.3% during 1979.

## 2. Project Employment

The proposed project generated temporary jobs (64 to 80) in the construction trades during development of the new site over an 18 month period.

The proposed facility will directly create about thirteen (13) new jobs, and all of the existing Molokai Electric personnel (30) will transfer to the new site. The total work force will be about forty-three (43).

## D. Relationship to Employment Centers

The primary employment center in the vicinity of the project site is Kaunakakai. The close proximity

TABLE 2-6

JOB COUNT BY INDUSTRY  
Island of Molokai

1972-1978 <sup>1/</sup>  
1979-1980

<u>INDUSTRY</u>	Annual Average					
	1972	1974	1976	1978	1979 <sup>3/</sup>	1980 <sup>4/</sup>
Total Non-Agr. Wage and Salary Jobs	700	800	1,000	1,150	1,150	1,100
Contract Construction	*	*	100	*	*	*
Manufacturing	*	*	*	*	*	*
Trans., Comm., Utilities	100	100	100	100	100	150
Trade - Retail	100	100	150	150	150	150
Finance, Ins. & Real Est.	*	*	*	50	50	100
Services: Miscellaneous and Hotels	100	150	200	400	400	400
Government	350	300	400	450	400	400
Federal	*	*	*	*	*	*
State	250	250	250	250	250	250
Local	50	50	150	150	150	100
Agriculture	800	550	300	250		
Non-Agr., Self-Emp., Unpaid Family Workers and Domestic	150	200	200	200	250	300
Agr. Self-Emp., Unpaid Family Workers	50	50	*	N.A. <sup>2/</sup>		
Labor Disputes	0	0	0	0	0	0

\* Less than 50

<sup>1/</sup> Department of Labor and Industrial Relations, State of Hawaii, March 1978, Labor Force Data Book.

<sup>2/</sup> N.A. - not available

<sup>3/</sup> Page 64-B. Table 44-B. Revised 5/81.

<sup>4/</sup> Page 64-C. Table 44-C.

TABLE 2-5

OCCUPATION OF EMPLOYED POPULATION  
16 YEARS AND OLDER, MOLOKAI, 1975 <sup>1/</sup>

<u>Occupation</u>	<u>Percent</u> <sup>2/</sup>
Professional, Technical, Managerial	25.7
Clerical, Sales	11.1
Service	9.4
Farming, Fishing, Forestry	28.7
Machine Trade	3.1
Structural Work	8.7
Miscellaneous	<u>13.3</u>
	100.0%

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<sup>1/</sup> 1,867 persons

<sup>2/</sup> OEO 1975 Census Update Survey: Maui County

C. Economic Characteristics

1. Regional Employment

An employment study conducted by the State Department of Labor and Industrial Relations covered the period from 1964 to 1975 [2.35]. A summary of employment trends on Molokai is presented as follows:

(Census Tracts 317, 318, and 319)

"The Island of Molokai experienced a loss of 311 employees between 1964 and 1975, primarily in Agriculture. Nevertheless, Agriculture remains the primary employer, along with State Government."

For many years pineapple farming and cattle raising were the major industries on Molokai. This is reflected in the employment figure for "Farming, Fishing and Forestry" given in Table 2-5. However, Dole Pineapple Company began phasing out pineapple on the island in the early 1970's. Table 2-6 shows the decline in agricultural jobs from 800 in 1972 to 250 in 1978.

Tourism, a rapidly growing statewide industry, is beginning to pick up momentum on Molokai with the completion of the Sheraton-Molokai Hotel and two ocean-front condominiums east of Kaunakakai. This is reflected by the increases in "Services" jobs between 1972 and 1978 (Refer to Table 2-6).

Out of an estimated study population of 3,339 that contained persons 3-34 years of age, 39.2% were not attending school, 37.8% were in the elementary grades (1-8), 14.5% were in the secondary grades (9-12), and 2.2% were in college. This compares with 45.9%, 28.1%, 15.6%, and 5.5%, respectively, for the County of Maui.

4. Income [2.34]

Household incomes on Molokai ranged from under \$2,000 to \$25,000 or more, with most (48.0%) falling between \$10,000 and \$25,000 or more. Another sizable portion (30.3%) fell rather evenly between \$4,000 and \$8,999.

Out of approximately 1,469 households, the five most common income categories in 1975 were as follows: \$5,000-\$5,999 (7.0%), \$10,000-\$11,999 (7.5%), \$12,000-\$14,999 (13.9%), \$15,000-\$19,000 (11.3%), and \$20,000-\$24,999 (9.0%). The mean household income in this area was \$11,920 and the median was \$9,970.

Personal income for the population 16 years of age or older ranged from no income to \$40,000 or more. Out of an estimated study population of 3,508, 19.6% reported no income, 25.6% reported \$2,999 or less, and 36.8% reported between \$3,000 and \$8,999.

## SECTION 6

### ALTERNATIVES TO THE PROPOSED ACTION

This section will discuss alternatives to the proposed action and reasons why these are not as suitable as the proposed project.

#### I. NO ACTION

As presented in all of the preceding sections, this alternative would not satisfy growing electrical demands on Molokai. The situation is critical and the facilities must be expanded to meet these demands.

The need for the expansion and the inadequacy of the present Kaunakakai site to meet this expansion have both contributed to plans to transfer some of the existing units to the new site where a new biomass facility is being developed. This will enable Molokai Electric to utilize the volume of indigenous biomass fuel available on the island during a time when both the technologic and economic climate allow such an option to be feasible.

In a time when the finiteness of fossil fuel reserves has been realized, the pursuit of alternate energy sources and the relief from dependence on fossil fuel has become very desirable. As previously presented, the island of Molokai provides an ideal situation to demonstrate a feasible plan for alternate energy development.

Economically, the proposed project will help to curb the rate of increase of service rates to consumers, which has resulted from the rising cost of fossil fuel. A "no action" alternative, therefore, would not only result in continued escalating service rates but also would not enable development toward alternate energy options.

## II. ALTERNATE SITES

The site selection for the generating plant considered the following:

1. sufficient land area for the biomass generating facility and solar thermal field;
2. location close to the biomass sources;
3. location near the electrical load center for the island;
4. close proximity to Kaunakakai;
5. solid foundation;
6. location outside of flood and tsunami areas;
7. accessibility by road;
8. private land in fee simple at reasonable cost;
9. location away from existing residential developments.

The project site met all of the site selection criteria.

## III. ALTERNATE ENERGY SOURCE DEVELOPMENT

The island of Molokai provides a unique opportunity in development of renewable alternate energy sources of

biomass, wind, solar, geothermal and hydroelectric power to meet electrical requirements. The beneficial economic impact is especially underworded inasmuch as current electricity demands are supplied totally by imported petroleum.

The proposed project involves the use of burning biomass to operate steam boilers which, in turn, will drive steam turbines to generate electricity.

REFERENCES TO SECTION 6

- [6.1] Molokai Electric Company, Ltd. June, 1979.  
Testimony and Exhibits for Application for  
Capital Expenditures in Excess of 10% of the  
Plant in Service. Docket No. 3727, Book 1 of  
2, MECL-308, page 9 of 33.

**Commitment  
of Resources**

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SECTION 7

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

This section considers the commitment of resources that is made once the project is implemented.

Private funds, labor, construction and building materials and fuel will be committed to the project. Additional maintenance and operation, manpower, and funds will be required. Over the long-term, however, significantly less fuel oil will be required at the proposed plant than would be required either by continuing existing operations or by comparable diesel expansion.

Unlike fossil fuel resources, sources of biomass, such as pineapple plants, hay and/or koa haole, are renewable resources which can be continually produced for the life of the project. The proposed project is a significant positive action toward energy self-sufficiency with related economic benefits for the island of Molokai, and to a lesser degree, the State of Hawaii through the use of indigenous natural sources in the production of electricity.

No significant vegetative communities nor critical wildlife habitat will be committed. Archaeologic sites will not be impacted.



**Short  
Term Uses · Long  
Term Productivity**

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## SECTION 8

### THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENCHANCEMENT OF LONG-TERM PRODUCTIVITY

This section briefly discusses the extent to which the proposed action involves trade-offs between short-term environmental gains at the expense of long-term losses, or vice versa, and discusses the extent to which the action forecloses future options, narrows the range of beneficial uses of the environment, or poses long-term risks to health or safety.

Although there is some temporary impact to the existing corn field operations, the overall and long-term impact is insignificant since an alternate site had been arranged for the operations and since the operations were already being removed from the project site. The move was completed in 1981, prior to commencement of construction. The overall agricultural productivity is expected to be similar to existing productivity. This inconvenience will be balanced by long-term gains with regard to energy self-sufficiency on Molokai.

The project will potentially expand the range of beneficial uses of the environment not only by significantly reducing the requirement for non-renewable fossil fuels for the island of Molokai, but also by creating a market for renewable biomass resources and by eventually eliminating the noise and congestion of the existing plant operation in downtown Kaunakakai. The proposed project is not expected to pose long-term risks to health or safety.



# **Government Policies to Offset Adverse Effects**

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## SECTION 9

### AN INDICATION OF WHAT OTHER INTERESTS AND CONSIDERATIONS OF GOVERNMENTAL POLICIES ARE THOUGHT TO OFF-SET THE ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

As indicated in Section 4 (Anticipated Environmental Impacts and Mitigative Measures to Minimize Adverse Impacts), most of the adverse impacts are short-term and related to construction activities. Adverse impacts anticipated from implementation of the proposed actions are insignificant when compared to the benefits to be gained.

The development of energy self-sufficiency on Molokai will be in accordance with objectives and policies presented in the interim State Energy and Agriculture Plans, the proposed Maui County General Plan, and the proposed Molokai Community Plan. It will also be in accordance with the goals of the Maui County Energy Plan, a research plan prepared to determine the feasibility of energy self-sufficiency. The importance of basic plan goals, such as the development of alternate energy sources using renewable resources, cannot be overstated and will be accomplished through implementation of the proposed project with minimal adverse environmental effects anticipated.

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# Approvals

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SECTION 10

LIST OF APPROVALS

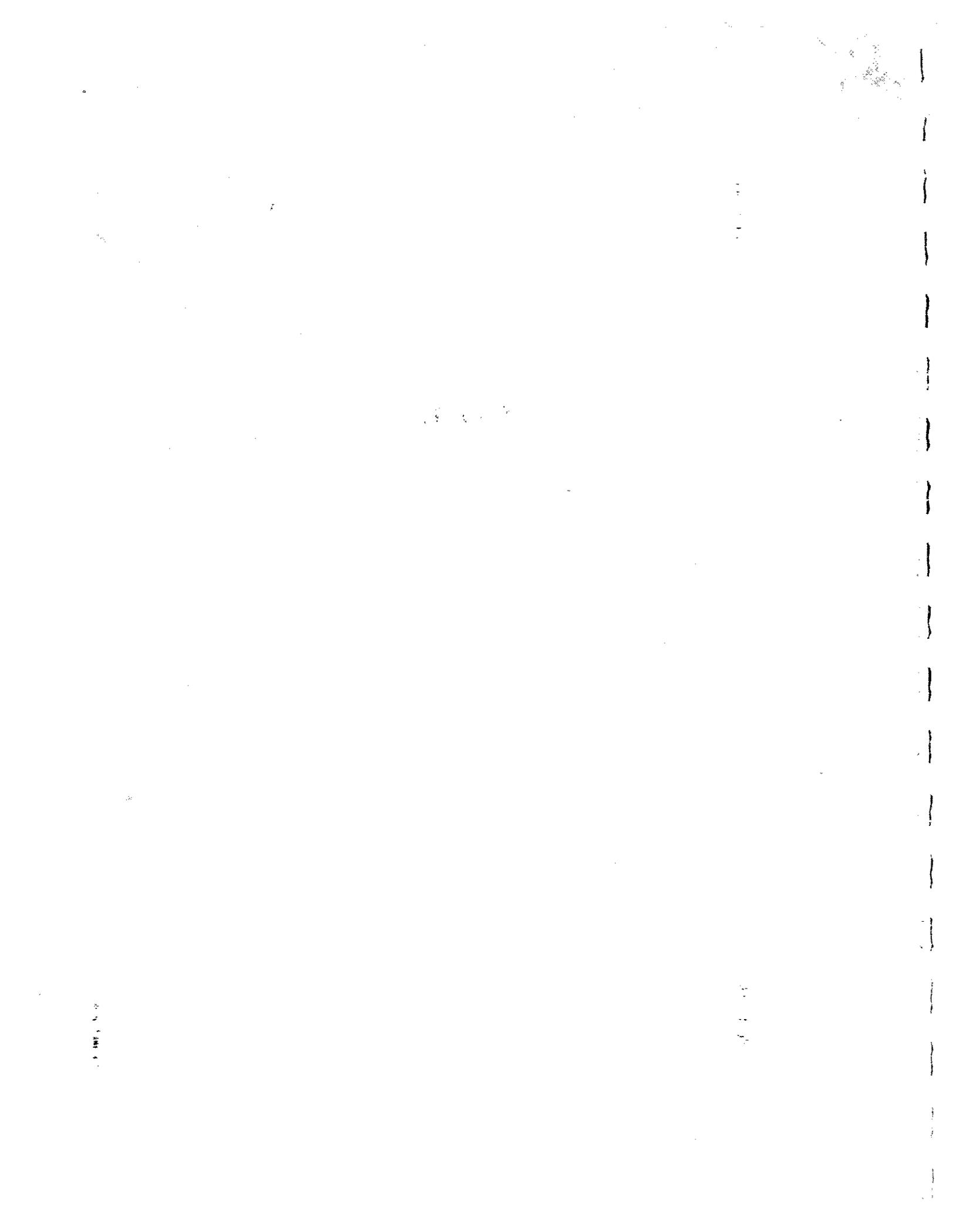
FEDERAL

STATE

1. Special Permit from the County of Maui Planning Commission and the State Land Use Commission  
Status: Granted.
2. "Authority to Construct" and "Permit to Operate" from the Department of Health  
Status: Obtained Authority to Construct 10/16/81. Permit to Operate application made 1/22/82 and 2/11/82.
3. Department of Health approval of sewage disposal plans  
Status: Obtained 1981.
4. Department of Health permit for potable water use  
Status: Pending.
5. Hawaiian Homes - potable water, up to 9,000 gallons per month for potable use  
Status: Approved April 1982.

COUNTY

1. Grubbing permit  
Status: Obtained 2/25/81; #8198.
2. Grading permit  
Status: Obtained 2/25/81; #8198.
3. Building permit  
Status: Obtained 1981.
4. "Minor Permit" for portion of site within the SMA boundary  
Status: Obtained 1981.



the dry western area and, along with a 1.5 billion gallon butyl lined reservoir, provides an adequate supply of water for the central and west end [2.39].

Water is distributed by three basic management systems - the State of Hawaii irrigation and Hawaiian Homes system, the County of Maui domestic systems, and private systems such as Molokai Ranch and Kalua Koi. Water supply and demand is summarized in Table 2-8. Note that in the year 2000 demand will exceed existing developed supply, but that 82-103 million gallons per day (mgd) remain potentially recoverable - more than enough to meet future projected demand past the year 2020.

## 2. Project Site

The water requirements for the project will be provided from three sources to meet the requirements for the boiler, cooling tower, irrigation, sanitary facilities (toilets), and potable water (drinking). The various uses dictate the quantity and quality of the water. The quantity and quality of the water required for the project is further characterized as "industrial" and "potable" (drinking).

TABLE 2-8  
WATER SUPPLY AND DEMAND  
MOLOKAI, 1975-2020

	<u>SUPPLY</u> <u>(MGD)</u>	<u>DEMAND</u> <u>(MGD)</u>
<u>Total Potentially Recoverable</u>		
Average Year	115	
Dry Year*	94	
<u>Presently Developed</u>		
1975	12	
<u>Demand</u>		
1975		4
2000		14
2020		14

\*A year in which streamflow is 60% of normal.

Source: [2.40]

a. Industrial Water

Industrial water is used for the cooling tower, the steam boiler, sanitary facilities (toilets), irrigation and fire protection. The cooling towers and steam boilers are the major users of the industrial water (4,000 to 5,000 gallons per day). Two water sources will be used: first, by Molokai Ranch via a waterline from the rock quarry to the project site pursuant to an agreement with the ranch (up to 1,000 gallons per day); second, from existing wells located on the project site and capable of producing 8,700 to 9,000 gallons per hour. The two water sources are adequate to meet all industrial water needs.

b. Potable Water (Drinking)

Potable water will only be used for drinking and the amount required for the 15 to 20 people is estimated at 7.5 to 10 gallons per day (0.5 gallons per person per day). This water will be provided by a potable water system owned and operated by the Hawaiian Homes Commission, which recently approved Molokai Electric's application for up to 9,000 gallons per month

(300 gallons per day), together with the transmission line easement. Water meter connection will be on Hawaiian Homes property, TMK 5-2-11:01. The waterline will cross Lot 26, Map 10 of Land Court Application 1861, under an easement to be given by the lot owners, Mr. and Mrs. R. W. Holden, and will cross Cooke Land Co.'s Lot 31 adjoining the project site, under an easement soon to be granted to Molokai Electric.

G. Storm Drainage

There are limited drainage improvements throughout the island. Natural channels provide drainage courses, except within the Kaunakakai area where major channels are lined. Drainage improvements are planned for the Kaunakakai, Ualapue, Kawela, Pukoo, and Paohaku areas [2.41].

No major drainage improvements are proposed for the electric plant at this time, as surface drainage patterns and amounts are anticipated to remain nearly the same as at present [2.42]. The site plan (Figure 1-4) has incorporated a settling basin, located next to Palaau Road (southwestern portion of the project site), to collect and retain storm runoff which may contain pollutants. However,

only small volumes of water will be generated, thus allowing for rapid evaporation of the water. This design will avoid potential adverse impacts to surrounding areas by the on-site containment and disposal of potential pollutants [2.43].

#### H. Waste Disposal

##### 1. Solid Waste

Solid waste generated at the administration building and by personnel activities will be collected by local refuse collectors and/or Molokai Electric. The waste will ultimately be disposed of at a County-operated sanitary landfill. The estimated solid waste generation from this portion of the plant is anticipated to be minimal.

Also associated with proposed plant operations is the generation of ash. Approximately 8,750 pounds per day of ash will be generated from the incineration process at average capacity [2.44]. The ash will be disposed of at the County-operated sanitary landfill. Other ash disposal potential include, use as fertilizer and asphalt paving or disposal in the rock quarry.

##### 2. Liquid Waste

There is only one public sewerage system on the island, serving the Kaunakakai area.

There are private disposal systems at Kualapuu, Maunaloa, and Kalua Koi. The remaining areas are served by individual disposal units. Liquid waste generated at the plant is minimal and will be disposed of on-site [2.45].

I. Communication

Telephone service has been provided to the project site, and design of communication lines has been coordinated with Hawaiian Telephone Company.

REFERENCES TO SECTION 2

- [2.1] National Climatic Center. 1973-1977. Climatological Data Annual Summary Hawaii and Pacific. Vol. 69, No. 13; Vol. 70, No. 13; Vol. 71, No. 13; Vol. 72, No. 13; Vol. 73, No. 13. National Oceanic and Atmospheric Administration, Asheville, N. C.
- [2.2] Division of Water and Land Development, Department of Land and Natural Resources, State of Hawaii. Monthly Rainfall Summaries (file data). Page 95.
- [2.3] Stearns, H. T. and G. A. Macdonald. 1947. Geology and Ground-Water Resources of the Island of Molokai, Hawaii. Bulletin 11. Hawaii division of Hydrography, prepared in cooperation with the U. S. Geological Survey. Page 10.
- [2.4] Ibid. Page 13.
- [2.5] Soil Conservation Service, U. S. Department of Agriculture. August, 1972. Soil Survey of Islands of Kauai, Oahu, Maui, Molokai, and Lanai, State of Hawaii. In cooperation with the University of Hawaii Agricultural Experiment Station.
- [2.6] Ibid. Page 92.
- [2.7] Department of Agriculture, State of Hawaii. January, 1977. Agricultural Lands of Importance to the State of Hawaii. Map Mo-3.
- [2.8] Hawaii Water Resources Regional Study. January, 1979. Hawaii Water Resources Plan. Page 35.
- [2.9] Ahuimanu Productions. December, 1977. An Ornithological Survey of Hawaiian Wetlands, Vol. 2. Prepared for the U. S. Army, Engineer District, Honolulu. Page 320.
- [2.10] Ibid.

REFERENCES TO SECTION 2 - Cont'd.

- [2.11] Department of Planning and Economic Development, State of Hawaii. 1978. Aquaculture Development for Hawaii: Assessments and Recommendations. Prepared by Hawaii Aquaculture Planning Program, Center for Science Policy and Technology Assessment. Map: Assessment Lands for Aquaculture: Molokai and Lanai.
- [2.12] Op. Cit. [2.9].
- [2.13] Kaneshiro, Katy. August 26, 1980. Personal communication. U. S. Army Corps of Engineers.
- [2.14] Op. Cit. [2.8] Page 37.
- [2.15] Division of Water and Land Development, Department of Land and Natural Resources, State of Hawaii. January, 1961. An Inventory of Basic Water Resources Data: Molokai. Page 94 (Well 13).
- [2.16] Ibid. Page 99 (Well D7).
- [2.17] Department of Health, State of Hawaii. June, 1979. Annual Report on Water Quality. Report for the Year Ended December 31, 1978. Page 22.
- [2.18] Ibid. Page 8 and 14.
- [2.19] U. S. Army Corps of Engineers, Pacific Ocean Division. September, 1977. Wetlands and Wetland Vegetation of Hawaii. Prepared by Margaret E. Elliott and Erin Marie Hall under Contract #DACW 84-77-C-0014. Page 150.
- [2.20] Ibid.
- [2.21] Hawaiian Waterbird Recovery Team. August, 1977. Draft Hawaiian Waterbirds Recovery Plan. Page 39.
- [2.22] Op. Cit. [2.9] Page 320 and 321.

REFERENCES TO SECTION 2 - Cont'd.

- [2.23] Op. Cit. [2.9] Pages 321 and 322.
- [2.24] Op. Cit. [2.9] Page 321.
- [2.25] Department of Land and Natural Resources, State of Hawaii. 1977. Conservation District Plan: Molokai.
- [2.26] State of Hawaii, Census Statistical Areas Committee. August 30, 1979. Estimated Population of Hawaii by Districts, 1978. Report CTC-42.
- [2.27] Department of Planning and Economic Development, State of Hawaii. March, 1978. Revised Population and Economic Projections, 1975-2000. Series II-F.
- [2.28] MKGK/Yamamoto, Inc. December, 1979. Draft Molokai Regional Development Plan: A Report to the Maui County Planning Commission, the County of Maui. Page II-15.
- [2.29] Office of Economic Opportunity (OEO). 1976. OEO 1975 Census Update Survey: Maui County. Prepared by Survey and Marketing Services, Inc. Page 28.
- [2.30] Ibid.
- [2.31] Op. Cit. [2.29] Pages 22 and 23.
- [2.32] Op. Cit. [2.29] Pages 47 and 48.
- [2.33] Op. Cit. [2.29] Pages 24 and 27.
- [2.34] Op. Cit. [2.29] Pages 51 and 55.
- [2.35] State of Hawaii Department of Labor and Industrial Relations, Research and Statistics Office, Labor Market and Service Research Section. Labor Force Distribution by Employer Site and Industry Category: State of Hawaii. Page 147.
- [2.36] State of Hawaii Department of Labor and Industrial Relations. Research and Statistics Office. March, 1978. Labor Force Data Book, A Compilation of Updated Labor Force Statistics. pages 11, 12 and 12a.

REFERENCES TO SECTION 2 - Cont'd.

- [2.37] Kuahara, Caroline. September, 1980. Personal communication. Department of Transportation, State of Hawaii.
- [2.38] Op. Cit. [2.28].
- [2.39] MKGK/Yamamoto, Inc. January, 1974. The County of Maui Open Space and Outdoor Recreation Policies Plan: Technical Report. Prepared for the Planning Department, County of Maui. Pages II-11 and II-12.
- [2.40] Op. Cit. [2.8] Pages 52 and 53.
- [2.41] Op. Cit. [2.28] Page II-12.
- [2.42] Vuillemot, Bud. August 29, 1980. Personal communication. R. M. Towill Corporation, Honolulu, Hawaii.
- [2.43] Ibid.
- [2.44] Vorfeld, Ted. September 2, 1980. Personal communication. Thermal Engineering, Honolulu, Hawaii.
- [2.45] Op. Cit. [2.42].

**Land Use Plans  
Policies  
Controls**

**3**



SECTION 3

LAND USE PLANS, POLICIES, AND CONTROLS

I. LAND USE

A. State Land Use Designation

1. Project Site

The project site is classified as Agriculture. Refer to Figure 3-1. A Special Permit No. 80-350 was approved by the Land Use Commission in Decision and Order entered on February 10, 1981. S.P. No. 80-350 allowed the construction and operation of a power plant facility for the production, transmission, distribution and sale of electricity on approximately 50.099 acres of land situated within the Agricultural Land Use District at Naiwa and Kahanui, Molokai, Hawaii.

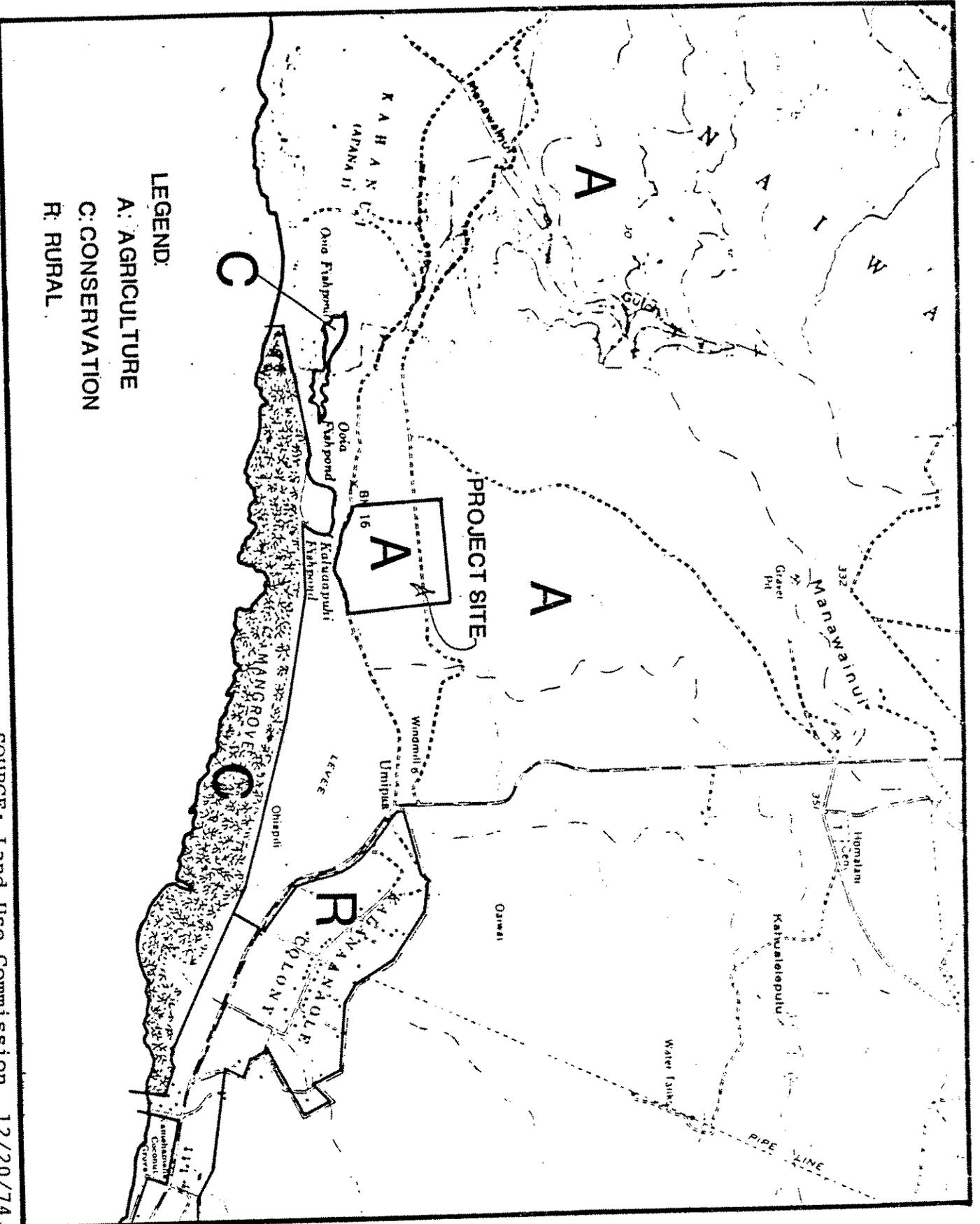
2. Adjacent Area

The adjacent area, outside of the project site, is classified Conservation and Rural. Refer to Figure 3-1.

B. County General Plan, Community Plans and Controls

1. County General Plan

The project site is designated for "Agriculture Use" in the existing Molokai General Land Use Plan, adopted on July 22, 1969 (Ordinance



LEGEND:  
 A: AGRICULTURE  
 C: CONSERVATION  
 R: RURAL

FIGURE 3-1  
 STATE LAND USE

SOURCE: Land Use Commission, 12/20/74,  
 Land Use District Boundaries,  
 Maps Mo2, Mo3.

No. 622). The current county zoning designation for the property is Agriculture with a two acre minimum lot size.

The County is currently updating the long-range land use plan, in accordance with the provisions of the General Plan of the County of Maui adopted on June 24, 1980 (Ordinance No. 1052). The County's General Plan specifies long-range social, economic and environmental objectives and policies for the County and a process for the preparation, review and adoption of community land use plans. The community plans serve to further implement the objectives and policies of the County General Plan by detailing appropriate future land uses, for specific geographic regions - in this case the Island of Molokai.

## 2. Community Plan

In January 1980, the County initiated the community plan program for the nine planning regions covering the islands of Maui, Molokai, Lanai and Kahoolave.

In October 1981, the nine community plans, prepared and approved by the various citizen advisory committees, were transmitted to the County Planning Commission for review. Public

hearings were conducted by the Commission during November and December 1981. The Commission in December 1981 voted to adopt all nine proposed community plans, with modifications, and transmitted the plans to the County Council for review and adoption. The County Council is currently reviewing the plans.

The proposed Molokai Community Plan, recommended by the Molokai Citizen Advisory Committee and Planning Commission, designates the project site as "Heavy Industrial Use."

### 3. Special Management Area

Approximately 5.2 acres of the project site (50.099 acres) is located within the Special Management Area (SMA). However, the new generating station has been designed to exclude from the SMA all major plant operations and construction of improvements, with the exception of two overhead powerlines and a boundary fence. An existing overhead 12 KV powerline, whose installation predated the SMA law, intersects the SMA in a north-south direction within Easement 1 (Figure 1-3).

The two new powerlines of 34.5 KV and 12.5 KV were constructed within an 80-foot wide corridor which extends from the plants' switchyard into

a small portion of the SMA. The powerlines run through the center of the corridor and intersect the SMA for a distance of 50 feet.

A portion of the boundary fence (5 feet high) along the southerly boundary was installed within the SMA for a distance of 1,230 lineal feet.

A Special Use Permit was filed on September 25, 1980 for the powerlines and fence and approved by the Maui County Planning Commission in 1981.

II. LAND USE COMMISSION DISTRICT REGULATION: STANDARDS FOR URBAN DISTRICT BOUNDARIES

The State Land Use Commission's standards for determining the boundaries for Urban District "U" are:

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

A new electrical generating station has been constructed on the project site. The structures, streets, services and land uses are characteristic of a heavy industrial area.

- (b) "It shall take into consideration the following specific factors:
  - 1. Proximity to centers of trading and employment facilities except where the development would generate new centers of trading and employment.

As discussed in Section 2, the site is in close proximity to the employment center of Kaunakakai. Furthermore, the project itself will generate thirteen new positions above the thirty permanent positions (a total work force of forty-three people).

2. "Substantiation of economic feasibility by the petitioner."

As defined elsewhere in the District Regulations, "economic feasibility" means the degree to which: (page 39)

- (a) "the market demand for goods and services proposed by the petitioner is accurately estimated and appears to be substantial enough to indicate a probability of sufficiently profitable endeavor to justify the rezoning requested, and
- (b) the costs of providing public services will be overcome by the public revenues to be accrued through taxes and other sources or will otherwise be offset by effects beneficial to the economy of the State."

Molokai Electric provides the major source of electricity for the Island of Molokai. The revenues from the sale of electricity are the major income source. The electrical rates charged by Molokai Electric are regulated by the State Public Utility Commission.

The estimated construction cost of the new generating station is \$10 million. Financing has been obtained from the following:

1.	Aetna Life Insurance and Casualty	\$ 7,800,000
2.	GECC	500,000
3.	Sale of Preferred Stock	400,000
4.	Sale of Common Stock	180,000
5.	Auto & Equipment Leasing	500,000
6.	Other Sources	620,000
		<u>\$10,000,000</u>

The cost for the entire construction will be from private sources and no State or County funds will be used.

3. "Proximity to basic services such as sewers, water, sanitation, school, parks, and police and fire protection."

All of the basic services are available in close proximity or have been provided as discussed in Section 2.

4. "Sufficient reserve areas for urban growth in appropriate locations based on a ten (10) year projection."

The project area of 50.099 acres will meet the land requirements of the generating station for a minimum of ten years or more.

- (c) "Lands included shall be those with satisfactory topography and drainage and reasonably free from the danger of floods, tsunami and unstable soil conditions and other adverse environmental effects."

As described in Section 2, the project site is located outside of the flood and tsunami zone; the topography is a gentle slope of four to five percent;

there are no major drainage problems; the soil is suitable for construction; and there are no other adverse environmental problems.

- (d) "In determining urban growth for the next ten years, or in amending the boundary, lands contiguous with existing urban areas shall be given more consideration than non-contiguous lands, and particularly when indicated for future urban use on State or County General Plans.

The project site is not contiguous to existing designated urban land. The project site does conform to the proposed Molokai Community Plan which designates the site as "Heavy Industrial Use."

Recently, March 23, 1982, the Land Use Commission held hearings on Docket No. A81-520, on a proposal by Cooke Land Company, Inc. to reclassify from Agriculture to Urban approximately 90.983 acres of land adjacent to the project site. A decision has not been rendered.

- (e) "It shall include lands in appropriate locations for new urban concentrations and shall give consideration to areas of urban growth as shown on the State and County General Plans."

The project site is an appropriate site for the development of the new electrical generating station. The site is located away from existing residential developments; has the necessary infrastructural items (road, access, water, etc.); is close to employment centers and public support facilities (fire and police protection); and conforms to the

designation of the proposed Molokai Community Plan (Heavy Industrial Use).

(f) "Lands which do not conform to the above standards may be included within this District:

1. When surrounded by or adjacent to existing urban development; and
2. Only when such lands represent a minor portion of this District."

The project site conforms to the proposed Molokai Community Plan designation for Heavy Industrial Use.

(g) "It shall not include lands, the urbanization of which will contribute towards scattered spot urban development, necessitating unreasonable investment in public supportive services.

The project site is essentially a self-contained facility and will not unreasonably burden public support services nor require major public investment. The requested change for urban designation is not considered spot urban development, for the request conforms to the designation contained in the proposed Molokai Community Plan.

(h) "It may include lands with a general slope of 20% or more which do not provide open space amenities and/or scenic values if the Commission finds that such lands are desirable and suitable for urban purposes and that official design and construction controls are adequate to protect the public health, welfare and safety, and the public's interest in the aesthetic quality of the landscape."

The project site is located on a gentle slope of 4-5%, and does not contain any unique geological formations, exceptional landscape or scenic views.

III. INTERIM STATE PLANS (Governor's Proclamation 5/3/82)

The following are the relevant objectives of the State Energy Plan:

Objective B - "Accelerate the transition to an indigenous renewable energy economy by facilitating private sector activities to explore supply options and achieve local commercialization and application of appropriate alternate energy technologies."

Molokai Electric Company, Limited, is proposing this project to provide for present and future electrical demands through the use of conventional and alternate energy resources.

The following are the relevant objectives of the State Agriculture Plan:

Objective G - "Achievement of optimal contribution by agriculture to the State's energy needs."

The project site is located on an island with available biomass sources and provisions have been made for the efficient transfer and storage of biomass fuel.

IV. INTERIM STATEWIDE LAND USE GUIDANCE POLICY (HRS, Section 205-16.1, as amended)

- (1) "Land use amendment shall be approved only as reasonably necessary to accommodate growth and development, provided there are no significant adverse effects upon agricultural, natural, environmental, recreational, scenic, historic, or other resources of the area."

As discussed in Sections 4 and 5, no significant impacts have resulted on agricultural, natural, environmental, recreational, scenic, historic, or other resources of the area.

- (2) "Lands to be reclassified as an urban district shall have adequate public services and facilities or as can be so provided at reasonable costs to the petitioner."

The project site is immediately adjacent to or reasonably close to necessary public services and facilities, as discussed in Section 2. The petitioner has provided on-site facilities and improvements.

- (3) "Maximum use shall be made of existing services and facilities, and scattered urban development shall be avoided."

The project will be served by existing services and facilities.

- (4) "Urban districts shall be contiguous to an existing urban district or shall constitute all or a part of a self-contained urban center."

The project and site is self-contained and can be viewed as a self-contained "urban center."

- (5) "Preference shall be given to amendment petitions which will provide permanent employment, or needed housing accessible to existing or proposed employment centers, or assist in providing a balanced housing supply for all economic and social groups."

The project will provide permanent employment, generating thirteen new positions.

- (6) "In establishing the boundaries of the districts in each county, the commission shall give consideration to the general plan of the county."

The proposed Molokai Community Plan designates the project area as Heavy Industrial use.

- (7) "Insofar as practicable conservation lands shall not be reclassified as urban lands."

No Conservation land will be reclassified as a result of this petition.

- (8) "The commission is encouraged to reclassify urban lands which are incompatible with the interim statewide land use guidance policy or are not developed in a timely manner. [L. 1975, c 193 §10; am L. 1979, c 105, §18]

This does not apply to the proposed project.

# **Environmental Impacts**

**4**



## SECTION 4

### ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATIVE MEASURES TO MINIMIZE ADVERSE IMPACTS

This section presents a discussion of environmental impacts anticipated to result from the proposed action. This discussion of anticipated impacts is based on the information presented in the first three sections of this report.

#### I. INTRODUCTION

This section discusses the anticipated impacts from implementation of the proposed project, which are presented as either primary or secondary impacts, both short-term and long-term.

Primary impacts are those expected to result directly from the proposed project. Short-term primary impacts are usually construction-related, and therefore, temporary. Primary long-term impacts are those anticipated to result directly after development of the proposed project.

Secondary impacts are those which may be indirect results of the proposed project. Short-term secondary impacts are those which result during construction and long-term impacts are those which can indirectly result after completion of the project.

#### II. PRIMARY IMPACTS OF THE PROPOSED PROJECT

This discussion presents factors which are expected to be affected directly by the the proposed project.

Discussion of each parameter will include anticipated short-term and long-term impacts associated with the proposed project.

A. Geology and Soils

Construction activities are not expected to cause adverse impacts to the geology or soils on the site. Most of the soil on the site consists of Very Stony Land, Eroded, with bedrock about 24 inches below the surface. Some of the soil will be removed and the plant foundations will be placed on this bedrock.

A small portion of the site (about 2.75 acres) consists of Mala Silty Clay, 0 to 3% slopes, which is classified as Prime Agricultural Land by the State Department of Agriculture. This soil type has an erosion hazard potential of no more than slight, and the area will remain undeveloped.

From a long-term view, the geomorphology of the site, which is underlain with a rock base, is necessary for stability of plant structures and is considered a positive long-term aspect of this site for this project.

B. Noise

During construction there will be an inevitable increase in ambient noise, since the site is currently

primarily in open space. There is some existing agriculturally related noise with the corn cultivation; however, this is intermittent. Noise levels which can be expected during construction are presented in Figure 4-1.

After completion of construction noise levels will decrease, but the overall noise associated with plant operations will result in an increase over existing ambient noise levels at the site.

This increase in noise is not expected to significantly affect residential areas because of its distance from existing residential areas (over 4,600 feet) and because there are no immediate plans nor interest in residential development in the immediate vicinity of the proposed project site.

The most significant impact associated with the increase in noise would be the potential impact to waterbirds such as the endangered Hawaiian stilt and Hawaiian coot, which have been observed at Kalua-apuhi Fishpond, approximately 600 feet from the plant operations. Although the immediate impact is unknown, other examples throughout the State indicate that these birds are able to acclimate to high noise conditions. Hawaiian stilts inhabit Keehi Lagoon on Oahu, next to Honolulu International Airport. Coot and stilt inhabit Kanaha Pond at Kahului,

FIGURE 4-1  
CONSTRUCTION EQUIPMENT NOISE RANGES

		NOISE LEVEL (dba) AT 50 FT					
		60	70	80	90	100	110
EQUIPMENT POWERED BY INTERNAL COMBUSTION ENGINES EARTH MOVING	COMPACTERS (ROLLERS)		H				
	FRONT LOADERS		-----				
	BACKHOES		-----				
	TRACTORS		-----				
	SCRAPERS, GRADERS			-----			
	PAVERS				H		
	TRUCKS			-----			
EQUIPMENT POWERED BY INTERNAL COMBUSTION ENGINES MATERIALS HANDLING	CONCRETE MIXERS		-----				
	CONCRETE PUMPS			H			
	CRANES (MOVABLE)		-----				
	CRANES (DERRICK)				H		
EQUIPMENT POWERED BY INTERNAL COMBUSTION ENGINES STATIONARY	PUMPS		H				
	GENERATORS		-----				
	COMPRESSORS		-----				
IMPACT EQUIPMENT	PNEUMATIC WRENCHES			-----			
	JACK HAMMERS AND ROCK DRILLS			-----			
	PILE DRIVERS (PEAKS)					-----	
OTHER	VIBRATOR		-----				
	SAWS		-----				

Note: Based on Limited Available Data Samples

Source: Noise From Construction Equipment and Operations Building Equipment, and Home Appliances, EPA, 1971

Maui, which is both exposed to noise from the industrial area of Kahului and the airport. It would appear that the birds at Kaluaapuhi Fishpond will accommodate to such an increase in overall noise in the area.

As discussed in Section 2, the existing plant influences ambient noise levels up to about 500 feet away, measured south of the plant with a slight E-SE wind. Under these conditions, the proposed plant may not impact wildlife at Kaluaapuhi Fishpond, which is 600 feet south of plant operations, with a southeasterly wind attenuating sound transmission sooner than what is expected for free-field conditions.

The phasing out of the Kaunakakai facility will have a positive environmental impact on Kaunakakai. The noise level of the town will decrease when the diesel generators are moved to the project site.

C. Air Quality

The project site is primarily in open space with corn cultivation and surrounding agricultural activities in the general vicinity. There were clearing operations associated with construction, which generated dust. This, however, was effectively controlled in the field with a water sprinkling program. Pollution from construction equipment was negligible.

The potential long-term air quality impacts will result from the electrical generating equipment and the trucks hauling the biomass to the plant site.

The steam generator using biomass as a fuel source must conform to the State of Hawaii air pollution standards. Presently, an Authority to Construct has been issued by the State Department of Health. The application for a Permit to Operate will be submitted by Molokai Electric when construction has been completed. The extensive permit process, special condition required and detailed testing of the equipment are safeguards imposed by the State to insure that the project conforms to State air quality standards.

The other potential pollutant source would be from the trucks bringing in the biomass. The estimated 16 to 17 trucks per day, over an 8-hour biomass receiving period, should not contribute a significant amount of air pollutants. For example, one of the most vehicularly active air pollution recording stations in Hawaii is located in Honolulu at the Department of Health, at the corner of Beretania Street and Punchbowl Street, adjacent to a bus stop. Beretania Street is a 6-lane city street and Punchbowl Street a 4-lane street, both leading into the downtown area and heavily traveled throughout the day. The bus stop located near this air pollution monitoring station

has estimated diesel bus traffic of about 1 bus every 5 minutes throughout an 18-hour day. Although this station exceeded the State air quality standards 10 times out of the year 1979, it was only for carbon monoxide, which is contributed not only by the buses but also the heavy traffic load.

Another air monitoring site on the leeward part of Oahu is located in Pearl City, approximately 1 mile southwest (downwind) from the Hawaiian Electric Company Waiiau Plant. The State standards were not exceeded at any time at this station in 1979.

It is reasonable to assume that the proposed plant will not contribute air pollutants which would result in exceeding the State air quality standards.

D. Water Quality

As presented in the discussion on impacts to soils, a portion of the soil has been removed and the erosion potential on most of the remainder of the site is minimal. Grading during construction was conducted so as to minimize siltation into adjacent areas.

E. Ground Water

Based on water quality of wells in the vicinity of the project site, the ground water below the site is brackish. Preliminary investigations and drilling were conducted to determine if water below the site

had the water volume and quality to satisfy the needs of the cooling tower and other uses. The amount produced from the on-site wells is adequate to meet project needs. As previously discussed in Section 2, other sources of water are available to meet the needs of the project.

Potable water is available and will be provided and water for the boiler is available from Molokai Ranch.

The wells are not expected to affect the overall ground water of the project site and should not affect the water quality of the well directly across Palaau Road from the site. This well was used to irrigate the existing corn fields at the project site. Since the fields have been relocated, this well will no longer be required so discussion of impacts to this well is precluded. The other two brackish wells mentioned in Section 2 have been abandoned, thus no impact is foreseen.

F. Biological

Flora and fauna observed at the proposed project site are common exotic species which can be found throughout the State. No rare or endangered species were found during a reconnaissance of the site and the site does not afford suitable wildlife habitat for endangered wildlife.

Kaluaapuhi Fishpond, where endangered Hawaiian stilts and coots have been observed, is about 600 feet from the plant operations. There may be an increase in noise in this area; however, as presented previously in the discussion on "Noise", the impact of the proposed plant to this habitat is not expected to be significant. Acclimation to noisy conditions have been demonstrated in other parts of the State near to airports, which have greater potential noise impact than what will result from the project.

G. Visual

The tallest portion of the proposed plant will be the stacks, estimated to be about 80 feet high. Other portions of the plant, such as the administration building will range from 10 to 35 feet high. Since plant operations will be located primarily on the mauka portion of the site, they will be visible from the road across this portion of the site. They may be partially visible from Palaau Road as well; however, views from this road will be buffered by existing kiawe trees and other vegetation along the road.

The project site is visible from Kaunakakai landfill and, farther east, from the end of Kaunakakai Wharf. After completion the major buildings at the plant will be barely visible from these areas.

## H. Archaeological

As discussed in Section 2 and Appendix B, there are two features of archaeological interest within the site, a possible heiau and a petroglyph rock. No significant impact is anticipated with regard to these features, as no construction or other disturbance is planned for the vicinity of the features.

Both features will be located within the proposed security fencing for the project site. In this respect, such action would provide more security for these structures than what currently exists.

If long-term future expansion of the plant operations necessitates construction in the vicinity of these two sites, it is recommended that the stone be moved and that further archaeological investigation be undertaken at the possible heiau, to determine function and period of use of the enclosure and the original location of midden found within it.

## I. Economic

### 1. Employment

Over the short-term, construction of the proposed plant generated temporary jobs in the construction trades over an 18-month period. This will be a short-term positive impact on the economy.

Over the long-term, the facility will directly create about 13 new jobs. In addition, all thirty of the existing Molokai Electric personnel will transfer to the new site. These jobs will be associated with operations and maintenance of the facility.

2. Project Cost and Operation

Construction cost of the proposed project is estimated at \$10 million in 1982 dollars. A portion of this outlay will remain on Molokai and will be a positive impact on the local economy.

Over the long-term, use of local sources of energy, such as biomass, will act to strengthen the economy of Molokai. Money paid for these sources will be largely kept on Molokai, as opposed to money spent for foreign oil.

With an estimated 67% self-sufficiency by 1983, there would be revenues of \$800,000 remaining on Molokai, and by 1984 there would be revenues of \$1,000,000 remaining on the island [4.1]. The contribution to the local economy would be \$1.80 for each \$1.00 retained on the island [4.2].

J. Transportation

Since the project site is not located on a major thoroughfare, there should be minimal impact on local traffic due to construction vehicles gaining access to the site.

Over the long-term, there will be up to 16 to 17 truck loads per day of biomass brought to the site, and up to 2 truck loads of ash removed from the site. This will result in 36 to 38 one-way truck trips per day, distributed over an 8-hour period. In addition, 30+ employees at the plant will probably arrive and depart by automobile, resulting in at least 40 one-way automobile trips per day (1.5 persons/car=20 autos X 2 times=40).

Thus, there will be a total of approximately 76 to 78 one-way trips, most of which will gain access to the new road via Maunaloa Highway. This would result in up to a 1 to 3% increase in traffic on Maunaloa Highway and is not considered a significant impact, particularly since a portion of the existing employees already travel on Maunaloa Highway.

K. Police and Fire

With construction of a new access road to the proposed site, police and fire services would have a response time to the site of 4-5 minutes. In

addition, on-site security and fire protection measures will be instituted as necessary. Thus, there should be no significant adverse impact on existing services.

L. Solid Waste

As discussed in Section 2, approximately 8,570 pounds per day (ppd) of ash will be generated when the plant is operated at maximum capacity. Average plant operation will be 50-75% of maximum capacity during the first two years.

Most of the ash will be collected daily and used by the biomass suppliers for fertilizer. A majority of the remainder will be used for asphalt paving material. Whatever is left which cannot be used in some way will be disposed of at Molokai Land Quarry as impermeable rock excavation landfill. Thus, no adverse impacts are anticipated on the County-operated Kaunakakai landfill.

Ash to be stored on the site will be contained in such a manner as to prevent the creation of air pollution or leaching into the ground water.

III. SECONDARY IMPACTS OF THE PROPOSED PROJECT

This portion discusses factors which are expected to be affected indirectly by the proposed project. Short-term and long-term impacts associated with the project will be included.

A. Land Use

The existing corn fields (approximately 15 acres) have been removed from production as a result of the proposed project. However, these operations have been relocated in the general vicinity. No net loss in acreage of corn production, therefore, is anticipated.

The proposed project does not appear to conflict with present and proposed land use in the vicinity of the site, which is primarily agricultural. Over the long-term the project may actually induce more intensive agricultural use of surrounding lands by farm operations which can supply the plant with biomass. In addition, since the plant itself is an industrial use, it may directly induce industrial growth as envisioned in the Molokai Community Plan.

B. Economic

The major secondary, or indirect, economic impact of the proposed project will be on electrical rates to the consumer. As discussed in Section 1, overall operations and maintenance costs of the proposed plant, using alternative energy sources, are expected to be lower than with equivalent diesel expansion. Thus, there should be a lower rate of

increase in electrical rates than at present. This would be a positive impact on the consumers over the long-term.

C. Energy Policy

The proposed project is a positive step toward decreasing the island of Molokai's dependence upon fossil fuel, an unrenovable energy source, and supports County and State policies regarding conversion to renewable indigenous alternate energy sources for the attainment of energy self-sufficiency. This is a positive secondary impact not only for Molokai but also for the County and State.

REFERENCES TO SECTION 4

- [4.1] Molokai Electric Company, Ltd. June, 1979.  
Testimony and Exhibits for Application for  
Capital Expenditures in Excess of 10% of the  
Plant in Service. Docket No. 3727, Book 2 of  
2, MECL-309, page 4 of 24.
- [4.2] Molokai Electric. Personal communication. March,  
1982.

**Adverse  
Environmental  
Effects**

**5**



## SECTION 5

### PROBABLE ADVERSE ENVIRONMENTAL IMPACTS

This section will briefly discuss probable adverse environmental impacts and mitigative measures when applicable, and the rationale for proceeding with the proposed action notwithstanding unavoidable effects.

#### I. PRIMARY IMPACTS

##### A. Probable Impacts and Mitigative Measures

A small portion of the site (about 2.75 acres) consists of Mala Silty Clay, 0 to 3% slopes, which is classified as Prime Agricultural Land by the State Department of Agriculture. This area will be removed from agricultural production, though it will remain undeveloped. However, no net loss in acreage of corn production will result, since the existing operations have been relocated in the general vicinity.

During the construction period there will be an increase in existing noise; however this will be of short duration and will be mitigated by the contractor ensuring proper functioning of mufflers and by limiting the hours of construction, if necessary. There are no residences close to the site.

After completion of construction, noise levels will decrease but plant operations will result in

an increase over existing ambient noise regimes at the site. The increase in noise is not anticipated to significantly affect wildlife habitat near the site, nor residential areas.

The project is expected to conform to existing State air quality standards.

Impacts on water quantity and quality of the nearby well is not expected to be significant.

Visual impacts as a result of the project are not anticipated to be significant, due to the lack of residential or other urban development nearby. From Maunaloa Highway the stack will present an insignificant intrusion into the view plane toward the ocean. No adverse impacts are anticipated on archaeological features. There will be a minor increase in traffic on Maunaloa Highway as a result of the proposed project, which is not considered significant.

B. Reasons for Proceeding

The probable short-term adverse impacts encountered during the construction phase of the proposed project are minor and can be controlled by using acceptable mitigative measures. Probable long-term impacts are also anticipated to be relatively minor and can be controlled by mitigative measures.

## II. SECONDARY IMPACTS

### A. Probable Impacts and Mitigative Measures

The proposed project will have an indirect, or secondary, impact on land use and electrical rates. The project may induce more intensive agricultural use of surrounding lands and/or foster the growth of other industrial uses in the general vicinity. It is also anticipated to result in lower operations and maintenance costs, the savings of which will be passed on to the consumer in the form of lower rates of increase in the electrical rates.

### B. Reasons for Proceeding

Both of these indirect impacts may be viewed as positive impacts which will act to strengthen the economy of Molokai.



# Alternatives

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TABLE 1-1

STRUCTURES AND APPROXIMATE SIZE

<u>ITEM</u>	<u>SIZE (ft)</u>
Covered Storage	475' X 220'
Reserve Storage Area	400' X 170'
Control Building	25' X 25'
Boiler	100' X 55'
Package Boiler	100' X 50'
Steam Turbine	60' X 30'
Cooling Tower	60' X 30'
Gas Turbine	50' X 25'
Switchyard	182' X 120'
Diesel Building	150' X 60'
Maintenance Building	200' X 90'
Administrative Building	80' X 50'
Poleline Building	200' X 90' (Fenced in area 260' X 220')
Carport	120' X 20'
Parking	20' X 63'
Archsite	110' X 95'
Water Storage	120' X 40'
Fuel Storage	120' X 40'
Settling Pond	50' X 50'

facility will create employment for thirteen (13) permanent people for a total of forty-three (43) permanent positions.

2. Indirect

During the construction phase of the project, between 64 to 80 temporary construction positions were created. Many of these positions were filled by Molokai residents who also acquired on-the-job training. It is very likely that additional jobs and/or opportunities will result from biomass production for the new facility.

E. Construction Cost

Construction cost is estimated at \$10 million in 1982 dollars.

# Existing Environment

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## SECTION 2

### DESCRIPTION OF THE EXISTING ENVIRONMENT

#### I. PHYSICAL CHARACTERISTICS

##### A. Climate

The climate of the south coast of Molokai is mild. At Molokai Airport, about 3.7 miles northwest of the project site, the average annual high temperature is approximately 78°F and the average low is approximately 71°F [2.1]. During most of the day, winds in the vicinity of the project site are primarily onshore breezes from the southeast. An exception is during the early morning hours, from about 1:00 a.m. to 5:00 a.m., when light offshore breezes from the northeast predominate.

East Molokai has very high rainfall, due to the presence of mountains rising nearly 5,000 feet in elevation. West Molokai is arid because it receives the little rainfall normally associated with low elevations in the tradewind latitudes. Rainfall measured at a given gauge at Oliwai (Station 536.3) averaged about 9 inches between October and March, and about 2 inches between April and September for

a 14-year period between 1950 and 1964 [2.2]. Generally, the project vicinity receives annual rainfall of 15 inches or less (refer to Figure 2-1).

B. Geology

The project site is located along the southern edge of the Hoolehua Plain, or isthmus of Molokai, which is composed of lava flows of the East Molokai Volcano, banked against the older West Molokai Volcano [2.3]. Most of the plain is covered with 10-30 feet of lateritic soil.

Overgrazing by introduced livestock and the cultivation of the land have accelerated erosion, and large flats of red soil washed from the plain have formed along the south shore. Ancient Hawaiian fishponds are being filled with mud from surface runoff, contributing to the development of mangrove swamps [2.4].

The island of Molokai is within Seismic Probability Zone 1, "Minor Damage". Refer to Figure 2-2. The proposed project will comply with the Maui County Building Code, including earthquake design criteria.

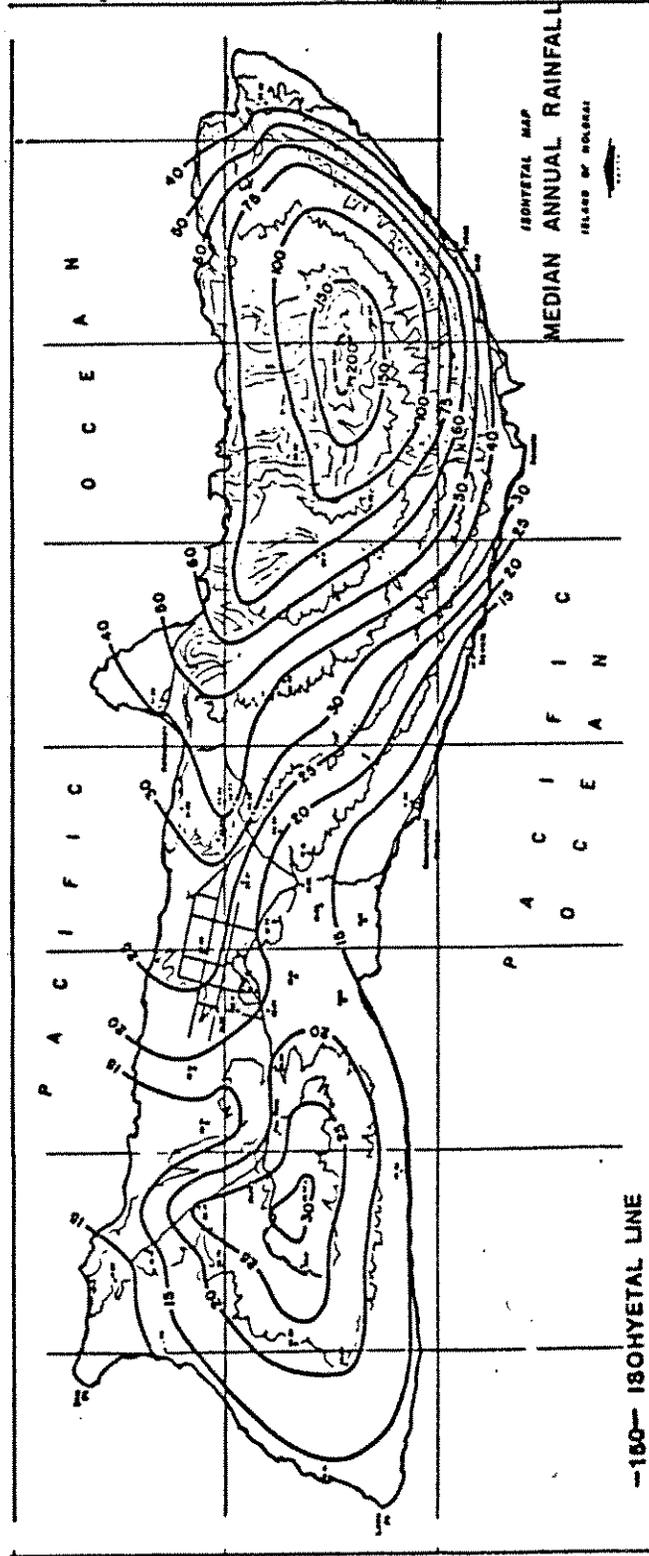


FIGURE 2-1

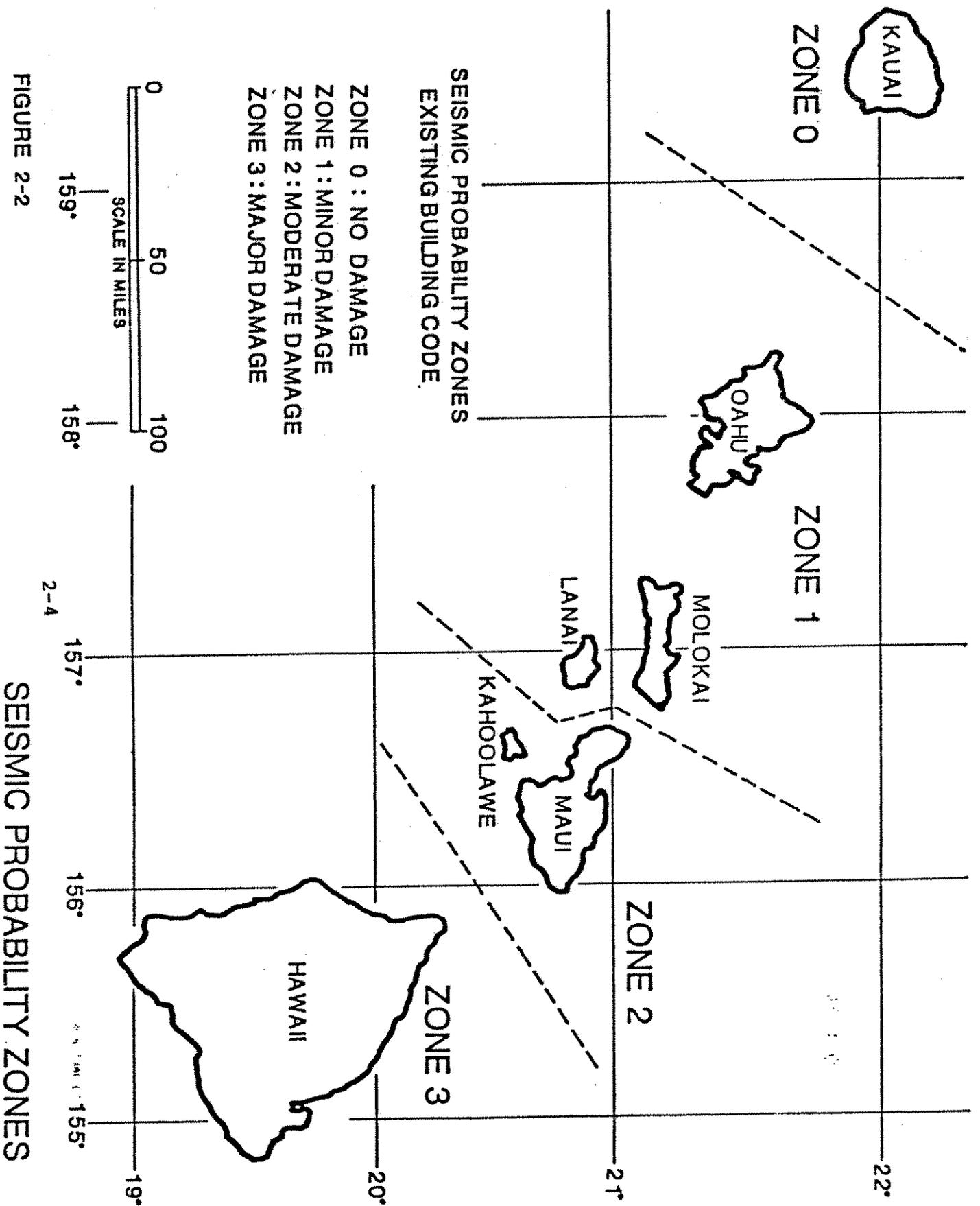


FIGURE 2-2

SEISMIC PROBABILITY ZONES

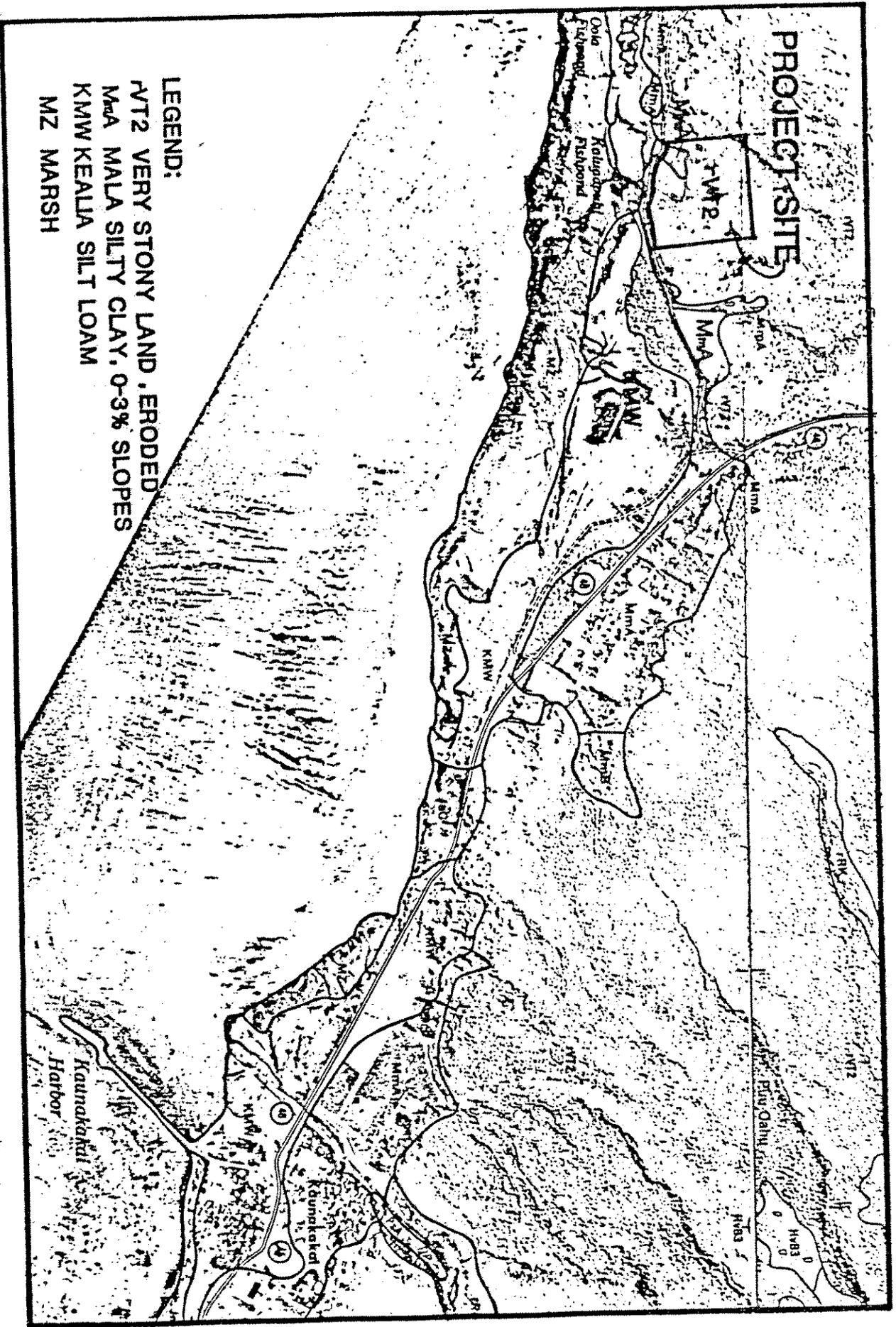
2-4

C. Soils [2.5]

Soils on the project site are primarily composed of Very Stony Land, Eroded (rVT2). Refer to Figure 2-3. This land type consists of large areas of severely eroded soils. About 50-75% of the surface is covered with stones and boulders. There are common shallow gullies and a few deep gullies. The soil material is like that of the Holomua, Molokai, Pamoia, and Wakapu soils. In most places, it is less than 24 inches deep to bedrock, but it is deeper in a few low-lying areas.

A small portion of the site consists of Mala Silty Clay, 0 to 3% slopes (MmA). This soil is on fans along the coastal plains. Permeability is moderate, runoff is slow, and the erosion hazard is no more than slight. Many shallow wells have been dug in this soil, the water being brackish [2.6]. The soil is underlain by coral or weathered rock at the depth of more than 40 inches.

The majority of the project site is classified with respect to its agricultural productivity rating of "E" [Land Study Bureau's Detailed Land Classification - Island of Molokai (1968)]. The "E" rating indicates very low agricultural productive capacity.



**LEGEND:**  
 VT2 VERY STONY LAND, ERODED  
 MVA MALA SILTY CLAY, 0-3% SLOPES  
 KMW KEALLA SILT LOAM  
 MZA MARSH

**FIGURE 2-3**  
**SOILS**

However, an area of Mala Silty Clay at the south boundary of the site is classified as Prime Agricultural Land by the State Department of Agriculture [2.7]. Refer to Figure 2-4. This area makes up about 2.75 acres, or 5.5% of the entire project site, and will be left free of structures.

D. Hydrology

1. Surface Water

The project site is located within hydrographic area III, Hoolehua. No major drainage basins are located within this hydrographic area in the project vicinity [2.8]. There are no streams or ponds located on the project site; however, Kaluaapuhi Fishpond is located across Palaau Road, approximately 200 feet from the southern border of the site (or approximately 600 feet from the proposed plant operations).

Kaluaapuhi Fishpond was a coastal pond at one time, but encroaching mangrove has since separated the pond from the ocean by several hundred yards. This process has also shrunk the size of the pond to less than 4 acres [2.9].

The pond has a well-developed fresh-water spring. The pond is presently used for harvesting rock crab and mullet, but the site is believed



to have relatively low potential for expanded aquaculture [2.10], [2.11]. The depth of the pond averages about 2 feet.

Ooia Pond, 1,400 feet southwest of the project site, has also been shrunk by mangrove encroachment and is now so overgrown by mangrove that the pond is barely visible from the air [2.12].

The project site is designated as being in an area of "minimal flooding" (Zone C), and as being outside of the designated tsunami hazard area, according to the U. S. Army Corps of Engineers [2.13].

## 2. Ground Water

Ground water in the vicinity of the project site is generally brackish basal water [2.14]. A well, drilled near Ooia to a depth of 4 feet, yielded water with a chloride content of 932 parts per million (ppm) [2.15]. Another well in the same vicinity but further east, drilled to a depth of 70 feet, yielded water with a chloride content of 935 ppm [2.16]. However, the presence of a fresh-water spring at Kaluaapuhi Fishpond indicates that there may also be fresh, or less brackish, water in the vicinity of the project site.

#### E. Water Quality

Specific offshore water quality data at the project site is unavailable, but data exists for nearby areas on the south coast of Molokai. Results of water quality sampling at Kaunakakai Harbor and Kalaeloa Harbor are presented in Table 2-1.

Note that on the particular day sampling was conducted at Kalaeloa Harbor, turbidity, total Kjeldahl nitrogen, nitrate and nitrite nitrogen, and total phosphorus exceeded the State standards. Total phosphorus and nitrate and nitrite nitrogen at Kaunakakai Harbor also exceeded the State standards. Other parameters samples were within State standards.

In addition, median concentrations of total nitrogen, total phosphorus, and turbidity at these two harbors over the years 1974-1978 are presented in Table 2-2.

Specific water quality data at Kaluaapuhi Fishpond are unavailable.

The data on water quality is presented for information only; the project is not anticipated to affect the water quality of the nearshore water or the fishpond.

#### F. Topography and Drainage

The project parcel is located on a gentle slope (4-5%), ranging in elevation from 94 feet above sea level to about 20 feet above sea level. At present,

TABLE 2-1  
WATER QUALITY DATA SUMMARY, 1978

MOLOKAI\*

PARAMETERS	SITE LOCATIONS	
	KAUNAKAKAI HARBOR	KALAELOA HARBOR
Temperature (centigrade)	25.5	25.0
Turbidity (NTU)	1.2	6.2
Dissolved Oxygen (mg/l)	5.9	6.1
pH (su)	6.8	6.8
Salinity (parts per thousand)	31.0	28.0
Total Nitrogen (mg/l)	.200	.400
Total KjEL (mg/l)	.200	.400
NO <sub>2</sub> and NO <sub>3</sub> (mg/l)	.100	.100
Total Phosphorus (mg/l)	.100	.100

\*Only one sampling was taken at each site

Source: [2.17]

TABLE 2-2

MEDIAN CONCENTRATIONS OF TOTAL NITROGEN, TOTAL PHOSPHORUS,  
AND TURBIDITY, 1974-1978

MOLOKAI

<u>PARAMETERS</u>	<u>SITE LOCATIONS</u>			
	<u>KAUNAKAKAI HARBOR</u>		<u>KALAELOA HARBOR</u>	
	<u>No. of Values</u>	<u>Median</u>	<u>No. of Values</u>	<u>Median</u>
Total Nitrogen (ug/l)	10	170	10	170
Total Phosphorus (ug/l)	10	15	10	24
Turbidity (NTU)	10	1.05	10	2.20

Source: [2.18]

surface runoff flows south toward the ocean. The installation of the siltation pond will trap storm runoff within the project site.

G. Mineral Resources

The project site contains natural deposits of bedrock.

H. Noise

Ambient noise levels were recorded at the site, using a Brüel and Kjaer Sound Level Noise Meter. The existing ambient noise environment is dominated by sounds of wind. Noise levels measured on a Sunday morning at various locations around the site varied from 30 dBA with no wind to 44 dBA with a light wind.

Operational noise levels were also recorded at the existing plant on Sunday September 7, 1980, when the plant was at about 50% capacity. Directly outside of the plant to the south, noise levels of 92-98 dBA were recorded. Across Kamehameha V Highway from the plant, about 33 feet away, levels of 82-86 dBA were recorded. Going south on Mohala Road, noise levels were measured every 100 feet from the site. Levels recorded were as follows (in dBA): 100 feet - 76; 200 feet - 69; 300 feet - 65; 400 feet - 61; 500 feet - 58; 600 feet - 56; 700 feet - 56; 800 feet - 55; 900 feet - 58; and 1000 feet - 56. Thus,

ambient noise levels of 55-56 dBA were influenced (increased) up to 500 feet away from the existing plant.

Upon completion of the new generating plant and phasing out of the existing Kaunakakai plant, the ambient noise level of Kaunakakai will decrease.

I. Air Quality

Ambient air quality data is unavailable for the project site and the adjacent areas.

J. Visual Characteristics

The project site is visible from Palaa Road and the dirt road along the northern portion of the site. The existing power lines are visible.

From the site one can see the mangrove swamp, ocean, and island of Lanai to the south. To the north and west is undeveloped land on the Hoolehua Plain, and to the east one can see corn fields, the Hawaiian Research warehouse on Maunaloa Highway, and the mountains of eastern Molokai.

II. BIOLOGICAL CHARACTERISTICS

A. Flora

On August 4, 1980 a biological reconnaissance was conducted on the project site. Flora at the site consist primarily of exotic species common to

arid, lowland coastal areas. The rest of the site is predominantly covered with koa haole (Leucaena leucocephala), kiawe (Prosopis pallida), spiny amaranth (Amaranthus spinosus) and several species of grasses.

No rare or endangered species of flora were observed or are believed to be present at the site. The site has previously been disturbed and exotic species are dominant. Refer to Appendix A for a checklist of flora observed.

In a study of wetlands in the State of Hawaii conducted for the U. S. Army Corps of Engineers, Kaluaapuhi Fishpond was classified as a wetland area which was termed Molokai's largest wetland, extending for a length of about 6 miles along the coastline [2.19]. The project site is not located within this wetland area; however, the wetland does extend along the shoreline just makai of the site. A species list of flora observed during this study is presented in Appendix A.

B. Fauna

Avifauna observed or likely present at the project site include the house sparrow (Passer domesticus), barred dove (Geopelia striata), spotted dove (Streptopelia chinensis), Japanese white-eye (Zosterops japonica) and Brazilian cardinal (Paroaria coronata).

Other avian species which may frequent the area include the gray francolin (Francolinus pondicerianus) and the endemic Hawaiian owl, or pueo (Asio flammeus sandwichensis). Because of the close proximity of the ocean, seabirds may pass through or near the site.

Other faunal species may also visit the site. Existing vegetation suggests the presence of mongoose (Herpestes auropuntatus), rats, mice, and axis deer (Axis axis). Refer to Appendix A for a checklist of fauna observed or likely present.

In the wetland study previously mentioned under "Flora", avifauna observed included the American golden plover (Pluvialis dominica fulva), California quail (Lophortyx californicus), pheasant (Phasianus sp.), and francolin (Francolinus sp.) [2.20].

Kaluaapuhi Fishpond and Ooia Pond have historically been used by the endangered Hawaiian coot and Hawaii stilt [2.21], [2.22]. Coot and migrant waterfowl still utilize Kaluaapuhi Fishpond, which is being used to harvest rock crab and mullet. The abrupt shoreline of the pond and partial rock wall limit the potential of this site for shorebird use.

Ooia Pond is nearly worthless to waterbirds in its present state; however, both ponds have potential for improvement through enlargement and clearing of vegetation [2.23]. Kaluaapuhi Fishpond and Kakakaia Pond, 5 miles to the east, together provide the best coot and migratory waterfowl habitat on Molokai [2.24]. The State Conservation District Plan for Molokai designates Kaluaapuhi Fishpond as a wildlife sanctuary [2.25].

### III. ARCHAEOLOGICAL/HISTORICAL CHARACTERISTICS

An archaeological reconnaissance was conducted on the project site in August, 1980. A discussion of the survey is presented in Appendix B. Results of this survey indicate that there are two features of archaeological interest within the site.

The first is a petroglyph located on a boulder near Palaau Road, and the second is a large enclosure located on a small rise that overlooks the project site and nearby fishponds. It is believed that the enclosure may be a religious structure. No construction or other disturbance is planned for the vicinity of these two archaeological features. Kaluaapuhi Fishpond, across Palaau Road from the project site, is a State Historic Site; this site is outside of the project site.

#### IV. SOCIOECONOMIC CHARACTERISTICS

##### A. Population

###### 1. Existing

The resident population of Molokai (Census Tracts 317 and 318) for the years 1960, 1970 and 1980 is given in Table 2-3. The location of these Census Tracts is shown in Figure 2-5. (The project site is located in Census Tract 317). 1980 Census data are also shown. The project site is presently unpopulated.

The population of Molokai increased from 4,740 in 1960 to 5,089 in 1970, an increase of 7% over the decade. The population fluctuated between 1970 and 1980, reaching 5,820 in July, 1975 and increased to 5,905 in 1980. The population increase between 1970 and 1980 was thus approximately 16% over the decade.

During the period April, 1970 to July, 1978, Maui County as a whole showed a population increase of 33.1 percent compared to 14.1 percent of the County of Hawaii, 16.6 percent of the County of Kauai, and 16.4 percent for the State total [2.26]. Final 1980 Census data indicate a Maui County population of 70,991, an increase of 53.8% over the 1970 population of 46,156.

TABLE 2-3  
RESIDENT POPULATION - MOLOKAI  
1960-1980

<u>Census Tract</u>	<u>1960</u> <sup>1/</sup>	<u>1970</u> <sup>2/</sup>	<u>1975</u> <sup>3/</sup>	<u>1980</u> <sup>4/</sup>	<u>% change</u> <u>1970-1980</u>
317 (East Molokai)		2,574		3,574	38.4
318 (West Molokai)		<u>2,515</u>		<u>2,331</u>	<u>-7.3</u>
TOTAL	4,740	5,089	5,820	5,905	16.0

1/ 1960 Census

2/ 1970 Census

3/ 1975 Census Update Survey, Maui County (breakout not available by Census Tract)

4/ The Population of Hawaii, 1980: Final Census Results.

Sources: Survey and Marketing Services, Inc. 1976. OEO 1975 Census Update Survey, Maui County.

U.S. Department of Commerce, Bureau of the Census. 1972. 1970 Census of Population and Housing, Census Tracts, Final Report, Honolulu SMSA.

The Maui News. July 2, 1980. "South Maui Has A Lot More Folks." Page A-2.

The Population of Hawaii, 1980: Final Census Results. Statistical Report 143, March 18, 1981. Research and Economic Analysis Division, DPED, State of Hawaii.

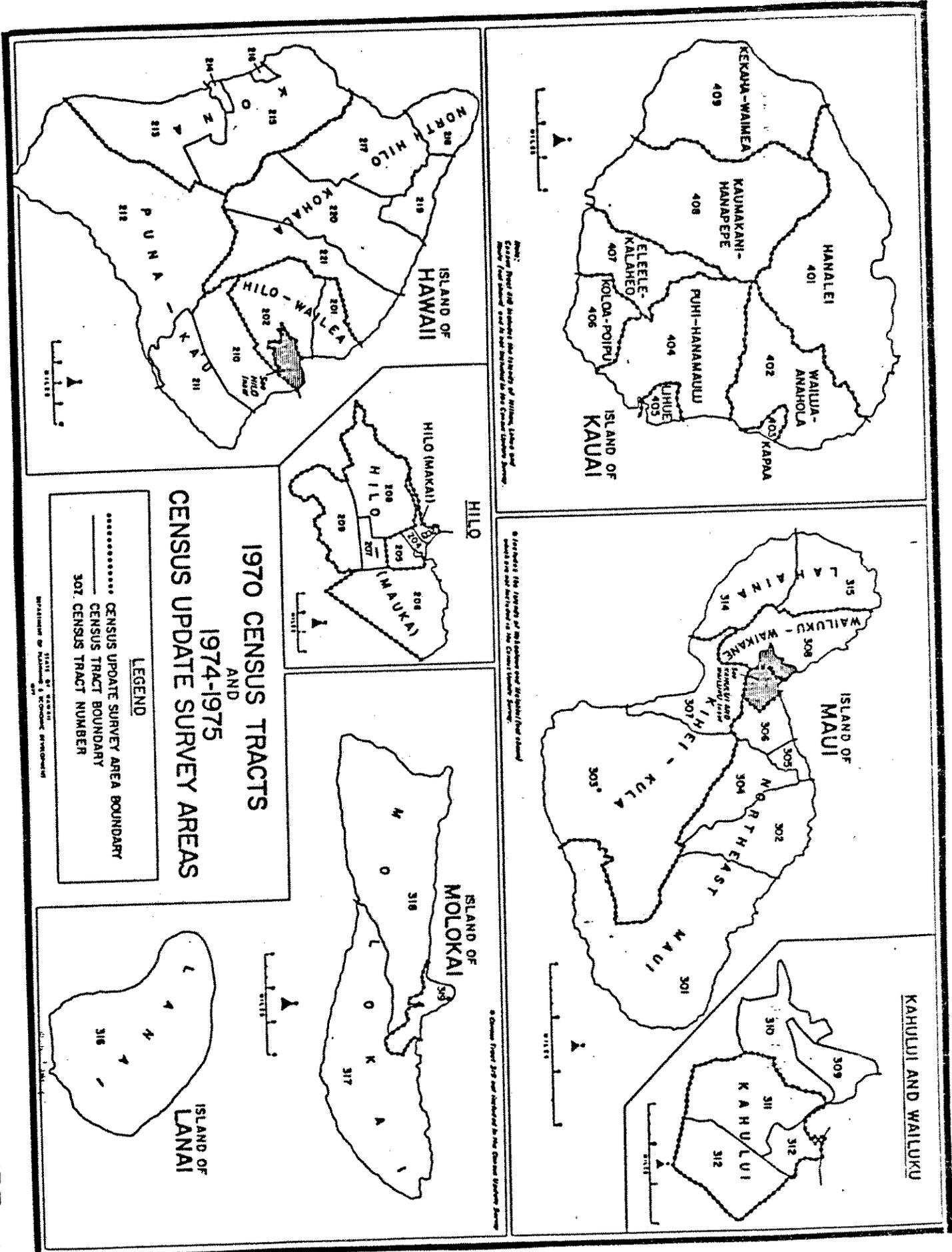


FIGURE 2-5

## 2. Projected

The State Department of Planning and Economic Development (DPED) has requested that all agencies use the series II-F population projection, as it is updated, in order to establish a uniform population planning base. The March 1, 1978 revised population projection for Maui County in the year 1990 is 94,900 and in the year 2000 is 124,700 [2.27].

Assuming a growth rate of 7-10% over the next decade, Molokai's resident population would range from approximately 6,318 to 6,495 persons. An increase in economic growth could mean an increase in these figures. Molokai Electric estimates that its demand for electricity increases at the average annual rate of 200 customers per year, and residential demand accounts for 80-85% of the service [2.28].

### B. Demographic Characteristics

#### 1. Ethnicity [2.29]

According to the OEO 1975 Census Update Survey for Maui County, the major ethnic groups represented on Molokai included Hawaiian or part-Hawaiian (50.6%), Filipino (27.5%), Japanese (9.8%), and Caucasian (6.1%). These figures

compare with a County-wide representation of 25.1% Japanese, 23% Hawaiian or part-Hawaiian, 21.3% Caucasian, and 15.5% Filipino. Refer to Table 2-4. The relatively high representation of Hawaiian and Filipino ethnic groups may reflect the character of the local plantation economy and the availability of homesteads on Molokai for Hawaiians.

2. Age-Sex Distribution [2.30]

Out of an estimated study population of 5,815, the largest age groups on Molokai were 5-9 (13.4%), 10-14 (12.3%), 0-4 (10.7%), and 15-19 (9.5%). These are also the largest age groups for the County as a whole. Refer to Figure 2-6.

The sex distribution for Molokai was 50.9% males to 49.1% females in 1975. This compares with a County distribution of 50.3% males to 49.7% females. Also refer to Figure 2-6.

3. Education [2.33]

Of an estimated study population of 2,881 that contained persons 25 years of age and older, 47.2% on Molokai had received a high school diploma, while 52.8% had not. These figures compare with 62.8% and 37.2%, respectively, for the County of Maui.

TABLE 2-4

ETHNICITY BY DISTRICT

	Total %	Northeast Maui %	Kihei- Kula %	Kahului %	Wailuku- Waikapu %	Lahaina %	Molokai %	Lanai %
Black, Negro	0.1	0.1	0.6	0.0	0.0	0.0	0.0	0.0
Caucasian, Not Portuguese	21.3	19.6	48.9	6.3	12.4	37.4	6.1	6.4
Portuguese	4.4	9.6	5.0	3.7	4.8	1.2	0.6	0.9
Chinese	0.7	0.4	1.6	0.7	1.0	0.2	0.2	0.1
Filipino	15.3	11.4	3.1	24.7	9.4	11.4	27.5	46.5
Hawaiian	1.6	1.7	1.0	0.6	1.5	1.6	3.9	3.2
Part-Hawaiian	21.4	24.4	17.7	11.6	20.3	19.5	46.7	17.5
Japanese	25.1	17.8	14.1	38.9	40.7	22.1	9.8	16.2
Korean	0.3	0.4	0.2	0.7	0.2	0.2	0.2	1.0
Puerto Rican	0.4	0.9	0.0	0.7	0.4	0.0	0.2	0.3
Samoan	0.1	0.1	0.2	0.1	0.1	0.0	0.1	0.0
Mixed (not Part-Hawaiian)	8.6	12.4	7.0	11.1	8.3	5.6	4.6	7.8
other	0.7	0.9	0.5	0.8	0.9	0.9	0.1	0.1
refused/don't know	0.1	0.3	0.0	0.1	0.0	0.0	0.1	0.0
Base (est. pop.)	59,661	10,775	9,347	11,186	10,810	9,278	5,815	2,450

Source: [2.31]

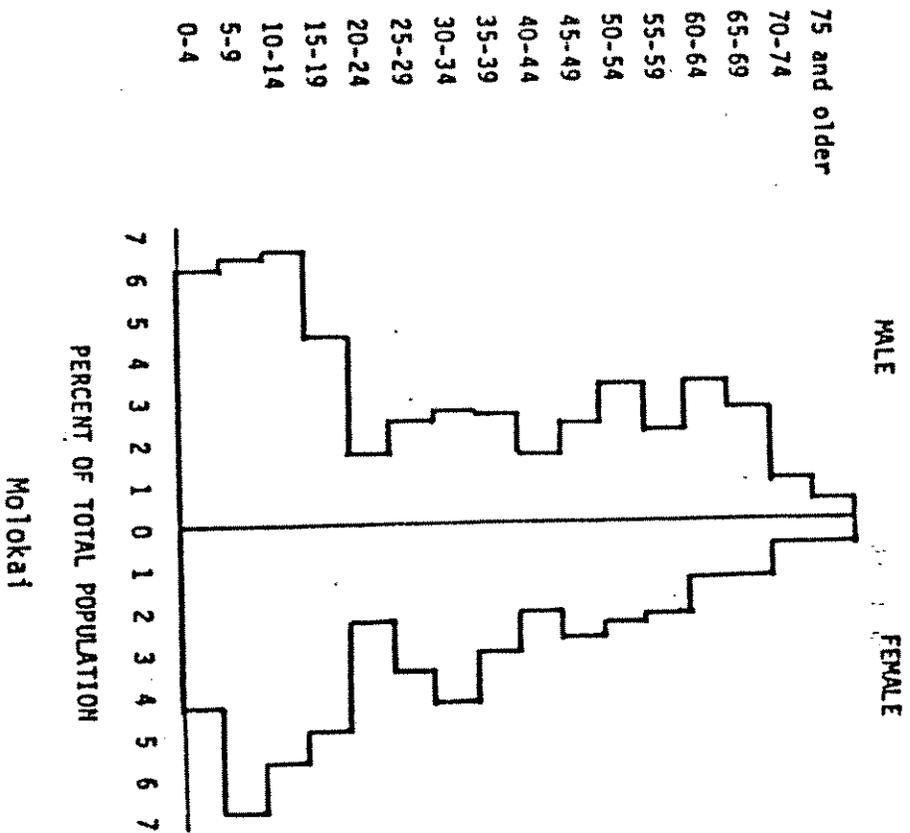
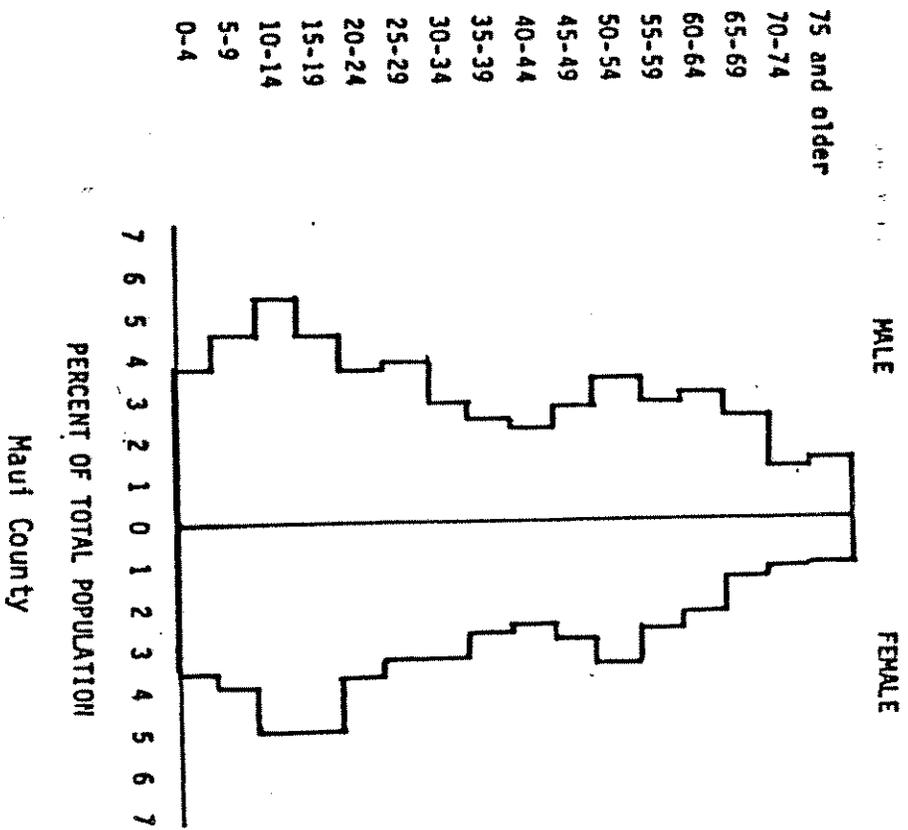


FIGURE 2-6

AGE-SEX DISTRIBUTIONS

SOURCE: (2.34)