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**FINAL**

**REVISED**

**ENVIRONMENTAL IMPACT STATEMENT**

**FOR THE**

**PROPOSED HALAWA TO KAMOKU 138 KV TRANSMISSION LINES**

**Prepared for:**

**Hawaiian Electric Company**

**Prepared by:**

**M&E Pacific, Inc.  
Environmental Engineers  
190 South King Street  
Honolulu, Hawaii 96813**

**February 1979**

**ENVIRONMENTAL CENTER  
University of Hawaii  
2550 Campus Road  
Honolulu, Hawaii 96822**

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FACT SHEET

Project Title: Proposed Halawa-Kamoku 138 KV Transmission Lines  
Project Location: Urban and Conservation Districts within City and  
County of Honolulu  
Type of Submittal: Revised Environmental Impact Statement  
Applicant: Hawaiian Electric Company, Inc.  
Approving Agency: Department of Land and Natural Resources  
Prepared By: M&E Pacific, Inc.

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ENVIRONMENTAL IMPACT STATEMENT  
FOR THE PROPOSED  
HALAWA TO KAMOKU 138 KV TRANSMISSION LINES

SUMMARY

1. DESCRIPTION OF THE PROPOSED ACTION

The proposed action involves the construction of two 138 KV lines to transmit electric power to energize the new Kamoku Substation located at the corner of Kapiolani Boulevard and Date Street. The Kamoku Substation is to provide load relief for the existing Pukele Substation which presently serves the area roughly bounded by the Pacific Ocean on the south, Waialae Nui on the east, Piikoi Street on the west, and the upper reaches of Manoa and Palolo Valleys on the north. Projections of electric demand within the Pukele Substation service area show that overload conditions on Pukele Substation components may occur during peak demand periods after late 1981. To provide the required load relief for the existing Pukele Substation, the new Kamoku Substation would serve the area roughly bounded by the Pacific Ocean on the south, University Avenue on the east, Lowery Avenue in Manoa on the north, and Piikoi Street on the west.

To energize the new Kamoku Substation two 138 KV feeder lines are required to ensure reliable service and to allow maintenance of the 138 KV lines. Hawaiian Electric Company (HECO) proposes the leeward Koolau route with two connecting lines down Palolo Valley. No final decision, however, on which route or routes will be taken has yet been made. All feasible, significant alternatives suggested by the consulted parties are presented in this EIS to facilitate the decision process.

The presented alternatives are in four categories.

Category I (Halawa Substation to Pukele Substation)

- A. Leeward Koolau Route - A double circuit overhead 138 KV line through conservation areas on northern outskirts of Honolulu.
- B. Trans-Koolau Route - A double circuit overhead 138 KV line through conservation areas across the Koolau Mountains to Pukele Substation via the Koolau Substation.

Category II (Pukele Substation to Kamoku Substation)

- A. Line 1 - A single overhead 138 KV line through Palolo Valley via Palolo Avenue.
- B. Line 2 - A single circuit overhead 138 KV line through Palolo Valley via 10th Avenue.

- C. Line A - A single circuit overhead 138 KV line through Manoa Valley primarily via University Avenue.
- D. Line B - A single circuit overhead 138 KV line through Manoa Valley via conservation land on the lower slopes of Waahila Ridge.
- E. Line C - A single circuit overhead 138 KV line through Palolo Valley via conservation land on the lower slopes of Kalaepohaku Ridge.
- F. Line D - A single circuit overhead 138 KV line along the ridge of Waahila Ridge midway between Manoa and Palolo Valleys.
- G. Line E - A variation of line 2 which uses alternate urban streets in the vicinity of Kamoku Substation.
- H. Line F - A variation of Line E which uses alternate urban streets in the vicinity of Kamoku Substation.
- I. Alternative G - A double circuit overhead line along the ridge of Waahila Ridge.
- J. Alternative H - An underground 138 KV line via urban streets.
- K. Alternative I - A double circuit 138 KV line along the ridge of Waahila Ridge and then an underground line through urban streets to Kamoku Substation.

Category III (Halawa Substation directly to Kamoku Substation)

- A. Urban Honolulu Route - Underground 138 KV line via Iwilei Substation and city streets.
- B. Submarine cable - 138 KV line along south shore of Oahu.

Category IV (Separate Power Plant)

New Power Plant located near Diamond Head Crater.

The overhead 138 KV lines that would be used in conservation areas will involve single steel poles approximately 75 to 120 feet high except where topography requires that steel towers be used. Existing right-of-ways will be followed when possible and new rights-of-ways, approximately 100 feet wide, will have to be obtained from the affected landowners, including the Department of Land and Natural Resources (DLNR). Construction of 138 KV lines in conservation areas will rely heavily on the use of helicopters.

Overhead 138 KV lines in urban areas would be hung on special steel poles which will be approximately 105 to 125 feet high and 2 to 3 feet in diameter.

Underground 138 KV lines through urban areas would require a wide trench. The electric lines would be encased in sealed steel conduits surrounded by cooling oil (or possibly cooling gas) under pressure. This type of system would necessitate having support facilities such as pumping and cooling stations and may constitute interference with other utilities.

## 2. DESCRIPTION OF THE ENVIRONMENTAL SETTING

The regional setting of the proposed project is the City of Honolulu and conservation districts located in the Koolau Mountain Range. Areas traversed by the alternative routes for the proposed 138 KV lines can be considered as either conservation area or urban area. The specific areas affected will depend primarily on the alternative route that is chosen.

The conservation areas in the Koolau Mountains can be characterized as generally being thickly vegetated, sometimes forested, sloping land that is interspersed with deep valleys. These areas are primarily used as a watershed and for recreation. These areas also serve as a habitat for birdlife and some small wildlife. No endangered species are expected to be disturbed and the existing known archaeological sites will not be disturbed by the proposed routes through these areas.

The urban area affected by the proposed project is the Pukele-Kamoku service area.

## 3. PROBABLE IMPACTS OF THE PROPOSED ACTION

The significant impacts can be categorized as to the character of area which the 138 KV lines traverse i.e. conservation lands and urban areas. Impacts will also depend upon the type of line used, such as overhead, underground, or underwater cable.

### A. Conservation Areas (Overhead Lines)

#### Short-Term Negative Impacts

- 1) Construction-related disturbance to vegetation around the pole sites.
- 2) Construction-related localized erosion potential.
- 3) Construction-related noise and dust primarily from the use of helicopters, which may also disturb birds and wildlife in the pole site area.

#### Short-Term Positive Impact

An increased opportunity for construction related employment associated with the project.

Long Term Negative Impacts

- 1) Aesthetic changes of the areas traversed by the 138 KV lines.
- 2) Potential hazard to firefighting aircraft.
- 3) Periodic maintenance, including trimming of trees.
- 4) Potential disturbance of endangered species and archaeological sites.

Long Term Positive Impact

Supply of reliable electric power to the Pukele-Kamoku Substation service areas.

B. Urban Areas (Overhead Lines)

Short-Term Negative Impacts

- 1) Construction-related noise/fugitive dust.
- 2) Construction-related interference with vehicular and pedestrian traffic.
- 3) Construction-related potential hazards to vehicular and pedestrian traffic.
- 4) Inconveniences to nearby residents (i.e. aesthetics, construction materials).

Short-Term Positive Impact

An increased opportunity for construction-related employment associated with the project.

Long Term Negative Impacts

- 1) Aesthetic effects on residential areas.
- 2) Potential danger from power lines.
- 3) Potential radio/TV interferences due to the lines.
- 4) Potential line noises.
- 5) Potential effect on property values adjacent the 138 KV lines.
- 6) Building restriction under power lines in easement areas.
- 7) Potential traffic hazard of the poles alongside city streets.

Long Term Positive Impact

Supply of reliable electric power to the Pukele-Kamoku Substation service areas.

C. Underground Cables

In addition to those presented for overhead lines in Urban Areas:

Negative Impacts

- 1) Interference with existing utilities during construction.
- 2) Potential interference with installation of future utilities.
- 3) Potential oil leakage.
- 4) High construction and maintenance costs
- 5) Long repair time in case of failure.

Positive Impact

Long-term aesthetic interferences eliminated in urban areas.

D. Submarine Cables

Negative Impacts

- 1) Benthic environment disturbances due to cable trench excavation.
- 2) Potential interference with shipping operations.
- 3) High construction and maintenance costs.
- 4) Very long repair time in case of failure.

Positive Impact

Long-term aesthetic interferences in urban areas eliminated.

4. PROBABLE UNAVOIDABLE ADVERSE IMPACTS AND MITIGATING MEASURES

CONSERVATION AREAS

<u>Impact</u>	<u>Mitigating Measure</u>
Clearing of trees and vegetation around pole sites and any new helipads	Consultation with the Division of Forestry (DOF) to minimize the extent of required vegetation cutting and cutting of slash to a height less than two feet from the ground and painting of cut surfaces on topped and pruned trees.

<u>Impact</u>	<u>Mitigating Measure</u>
Localized erosion at pole sites and any new helipads	Grass or other applicable control measure as required to minimize erosion and sediment transport to streams.
Disturbance of birds and wildlife	Selection of the leeward Koolau route to minimize disturbances to birds and wildlife at higher elevations; expeditious completion of work to minimize the duration of any disturbance.
Aesthetic effect of the 138 KV lines and poles	Selection of single steel poles as opposed to towers, except where not technically feasible. Poles and towers to be constructed to fit the topography (i.e., variable length supports) instead of platforming the site. Poles and wires will be painted to blend into background.
Interference with fire-fighting aircraft	Designation of the 138 KV line locations on aeronautical charts to minimize the safety hazard. Placement of airplane markers on long span lines if required by the Federal Aviation Administration.
Periodic maintenance disturbances and tree trimming	Initial routing design made to minimize potential problem areas and avoidance of excessive tree trimming.
Interference with specific areas such as Lyon's Arboretum or Pali Lookout	Selection of the alternative having the minimum impact and possible minor rerouting adjustments of the lines, if feasible.
Potential interference with archaeological sites or endangered species	Detailed archaeological and biological inspection of pole sites before construction and minor pole site adjustments, as required, to avoid interference.

#### URBAN AREAS

<u>Impact</u>	<u>Mitigating Measure</u>
Construction-related noise	Compliance with noise limitations as set forth in Chapter 44B, Hawaii Revised Statutes, which includes limiting construction to the period of 7 am to 6 pm.
Construction-related fugitive dust	Compliance with Chapter 43, Section 10, of the State of Hawaii's Air Pollution Regulations, which includes sprinkling to reduce dust, as required.

<u>Impact</u>	<u>Mitigating Measure</u>
Construction-related inconvenience to vehicular traffic	Construction will be limited to five pole segments at any one time. A minimum of one lane for traffic will always be kept open. Flagmen and appropriate traffic control signs will be used, as required.
Construction-related hazards to vehicular and pedestrian traffic	Lighted barricades and appropriate signs will be used to alert drivers to any hazards, and bridges will be placed over open pole holes during nonconstruction hours to minimize any hazards to pedestrians.
Aesthetic impact	Use of slim, tubular, metal poles that minimize the number of guy wires and poles required, and the relocation of 46 KV lines from wooden poles to the new steel poles and shortening the wooden poles to obtain a cleaner appearance.
Potential danger from falling lines	Conductor to be used will meet and exceed safety factor requirements as specified in the Public Utilities Commission's rules for overhead line construction. Line power would be shut off within a fraction of a second in case of failure.
Potential radio/tv interference or line noise	Proper maintenance of lines and insulators and prompt response to any complaint.
Maintenance-related interferences	Expeditious completion of required work to minimize the duration of these interferences.
Potential traffic hazard due to poles	Poles will be located behind curb lines.

#### UNDERGROUND LINES

The regular construction-related impacts will be similar to those already described.

<u>Impact</u>	<u>Mitigating Measure</u>
Interference with existing underground utilities during construction	Initial routing of lines to minimize interference with existing underground utilities.
Potential interference with addition of new utilities	Planning of locations to minimize conflicts and interferences.

<u>Impact</u>	<u>Mitigating Measure</u>
Potential oil leakage	Good design and construction and alarm monitoring of coolant pressure.

#### SUBMARINE CABLE

The regular construction-related impacts will be similar to those already described.

<u>Impact</u>	<u>Mitigating Measure</u>
Benthic disturbance due to cable trench elevation	Routing of line to minimize disturbances.
Interference with shipping navigation in the vicinity of Honolulu Harbor	Designation of submarine cable location on marine navigation charts and posting of signs denoting a cable crossing site.
Periodic redisturbance of bottom due to required repair	Design and placement to minimize interference with the cable. Proper equipment to locate the problem area quickly and conduct repair with minimum disturbance.

#### 5. ALTERNATIVES

Although HECO prefers the leeward Koolau route and overhead lines 1 and 2 through Palolo Valley, no final alternative has been chosen in this EIS and thus the alternative routes for the proposed 138 KV lines have all been presented in the project description section. The alternative of no action could have several significant adverse effects.

##### No Action

It is projected that, if no load relief is supplied by late 1981, overload conditions could occur at the Pukele Substation if a major component failed or was shut down during peak demand periods. The purpose of the new Kamoku Substation is to provide the required load relief for the existing Pukele Substation. The proposed 138 KV lines will energize the Kamoku Substation. Should overload conditions occur at Pukele Substation, electric service interruption would occur within the Pukele service area. The effects of electric service interruption would include stopped elevators, traffic disruption, adverse effects on commercial activity, and power outage in residential areas. Delay of the project could result in significantly higher costs.

## CONTENTS

	<u>Page</u>
DESCRIPTION OF THE PROPOSED ACTION	1
Background	1
Justification for the Proposed Project	6
General Description of the Proposed Action	13
Category I Alternatives (Halawa to Pukele Area)	17
Category II (Pukele Area to Kamoku)	24
Category III (Halawa to Kamoku)	37
Category IV (Separate Power Plant)	42
Description of Construction of the 138 KV Transmission Lines	43
Description of Construction of 138 KV Underground Transmission Lines	47
Construction Phasing and Timing	49
ENVIRONMENTAL SETTING	51
Conservation Areas	51
Urban Environmental Setting	60
THE RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES, AND CONTROLS FOR THE AFFECTED AREA	69
PROBABLE IMPACTS OF THE PROPOSED PROJECT	73
Halawa Substation to Pukele Substation Routes (Category I)	73
Pukele Substation to Kamoku Substation Routes (Category II)	75
Halawa Substation to Kamoku Substation Routes (Category III)	96
New Power Plant	98
PROBABLE ADVERSE ENVIRONMENTAL IMPACTS WHICH CANNOT BE AVOIDED	100
ALTERNATIVES TO THE PROPOSED ACTION	102
RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY	104
MITIGATION MEASURES PROPOSED TO MINIMIZE IMPACT	105
Conservation Areas	105
Urban Areas	106
Underground Lines	107
Submarine Cable	107
ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES	108

Contents, Cont.

	<u>Page</u>
AN INDICATION OF WHAT OTHER INTERESTS AND CONSIDERATIONS OF GOVERNMENT POLICIES ARE THOUGHT TO OFFSET THE ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION	109
SUMMARY OF UNRESOLVED ISSUES AND HOW ISSUES ARE TO BE RESOLVED PRIOR TO COMMENCEMENT OR WHAT OVERRIDING REASONS THERE ARE FOR PROCEEDING WITHOUT RESOLVING SUCH PROBLEMS	111
ORGANIZATIONS AND PERSONS CONSULTED	112

REFERENCES

APPENDIX A	Archaeological Reconnaissance Study
APPENDIX B	Bird and Mammal Study
APPENDIX C	Botanical Survey
APPENDIX D	Comments and Responses Made During the Consultation Process
APPENDIX E	Comments and Responses Made During the Public Review of the EIS

TABLES

Table 1	1981 Single Failure Analysis for Present Pukele System (MVA)	9
Table 2	1981 Single Failure Analysis for Present Pukele System (Percent of Emergency Capacities)	10
Table 3	Recorded and Projected Peak Loads for Oahu and Pukele Service Area	12
Table 4	Category I Halawa to Pukele Cost Breakdowns	23
Table 5	Category II Single Circuit Cost Breakdowns	36
Table 6	Category II Complete System Cost Breakdowns	38
Table 7	Category III Double Circuit Cost Breakdowns	40
Table 8	Birdlife Along the Proposed 138 KV Lines	57
Table 9	Representative Noise Levels	62
Table 10	Population and Housing Density Characteristics for Category II Alternative Locations	64
Table 11	Soviet Electric Field Exposure Standards for Electrical Workers	82

Contents, Cont.  
Tables

		<u>Page</u>
Table 12	Summary of American and Western European Research on the Biological Effects on Humans Due to Exposure to Electromagnetic Fields	84
Table 13	Comparison of Sales Prices for Residences Near 138 KV Lines	91

FIGURES

Figure 1	Existing 138 KV Circuits on Oahu	2
Figure 2	Percentage of System Demand by Area	3
Figure 3	Pukele-Kamoku Substation Service Areas	7
Figure 4	Schematic Diagram of Required Lines to Energize Kamoku Substation	15
Figure 5	Category I - Halawa to Pukele 138 KV Routes	19
Figure 6	Typical 138 KV Steel Poles	20
Figure 7	Typical View of Power Lines over Conservation District	21
Figure 8	Category II - Pukele to Kamoku 138 KV Routes	26
Figure 9	Category II Alternatives - Pukele to Kamoku 138 KV Routes	32
Figure 10	Soil Map of Oahu	53
Figure 11	Archaeological Sites and Vegetation Zones along the Halawa-Pukele 138 KV Route	54
Figure 12	Land Use Zoning	70
Figure 13	Land Use Designations	71
Figure 14	Typical View of 138 KV Lines along Urban Street	78
Figure 15	Electrostatic Field Gradient Beneath a 138 KV Line	83

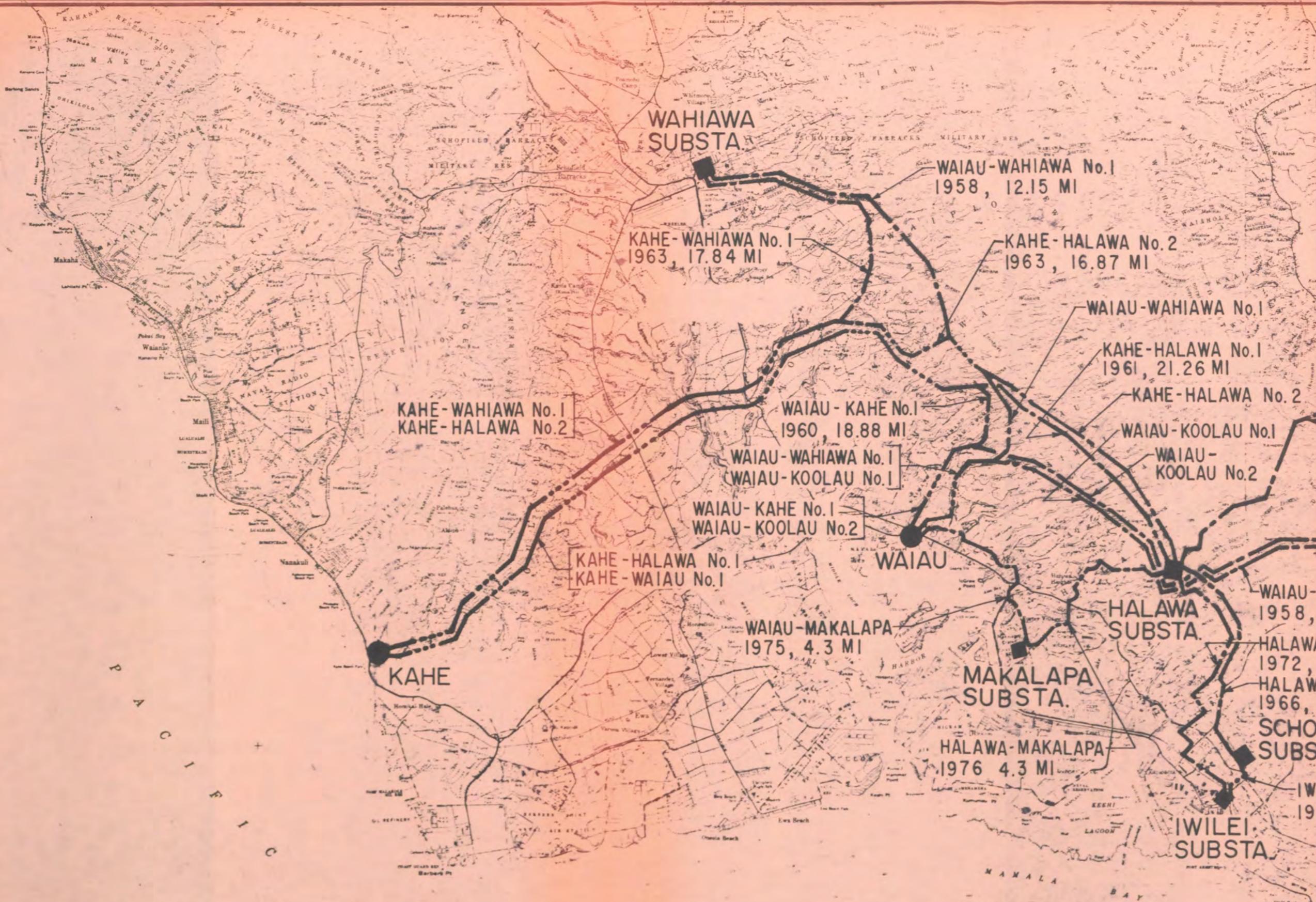
## DESCRIPTION OF THE PROPOSED ACTION

The project proposed by the Hawaiian Electric Company (HECO) is the connection of the new Kamoku Substation in the north Waikiki area to their major transmission system via two 138 KV circuits. The description of the proposed action given in this chapter begins with a discussion of the background for this project, followed by the technical justification, and ending with descriptions of the various alternative ways to meet the increasing demand for electrical power in the project area.

### BACKGROUND

An electric utility system basically consists of three major components: generation, transmission, and distribution. The generation facilities of the Hawaiian Electric Company on Oahu consist of 19 generating units contained within 3 generating plants. These generating plants are located in Honolulu (downtown), Waiiau (Pearl City), and Kahe (Leeward Oahu). The transmission system transports large quantities of electric power at 138 KV (138,000 volts) from the Kahe and Waiiau generating plants to various transmission substations (shown on Figure 1). Transmission substations on Oahu are located in Wahiawa, Halawa, Koolau, Pukele, Iwilei, Makalapa, and School Street. The function of transmission substations is to reduce the voltage from 138 to 46 KV, which is carried to users via 46 KV lines and then once again stepped down from 46 to 12 KV and subsequently to lower voltages by field transformers to supply the demands of homes, businesses, and other users.

The Honolulu-Waikiki-Diamond Head area of Oahu, shown on Figure 2, accounts for approximately 25 percent of the island's total system demand. The transmission substation presently supplying this area is the Pukele Substation, which is located at the mauka end of Palolo Valley. The Pukele Substation is now fully developed with two incoming 138 KV circuits, four 48/80 mva transformers and eight outgoing 46 KV circuits. The land on which the Pukele Substation is situated is completely occupied by existing facilities; thus, additional transmission equipment for expansion cannot be installed. It is projected in a study by HECO in 1977 entitled "Kamoku 138 KV Substation" that, because of continued growth in demand for



WAHIAWA  
SUBSTA.

WAI AU-WAHIAWA No.1  
1958, 12.15 MI

KAHE-WAHIAWA No.1  
1963, 17.84 MI

KAHE-HALAWA No.2  
1963, 16.87 MI

KAHE-WAHIAWA No.1  
KAHE-HALAWA No.2

WAI AU-KAHE No.1  
1960, 18.88 MI

WAI AU-WAHIAWA No.1  
KAHE-HALAWA No.1  
1961, 21.26 MI

KAHE-HALAWA No.2

WAI AU-WAHIAWA No.1  
WAI AU-KOOLAU No.1

WAI AU-KOOLAU No.1

WAI AU-KOOLAU No.2

WAI AU-KAHE No.1  
WAI AU-KOOLAU No.2

WAI AU

KAHE-HALAWA No.1  
KAHE-WAI AU No.1

WAI AU-MAKALAPA  
1975, 4.3 MI

HALAWA  
SUBSTA.

MAKALAPA  
SUBSTA.

HALAWA-MAKALAPA  
1976 4.3 MI

WAI AU-  
1958,

HALAWA  
1972,

HALAWA  
1966,

SCHO  
SUBS

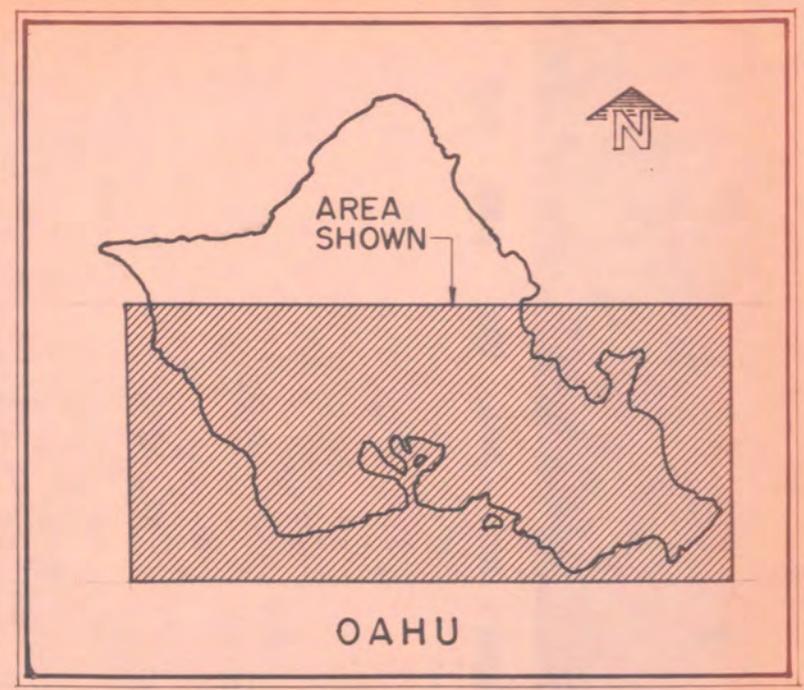
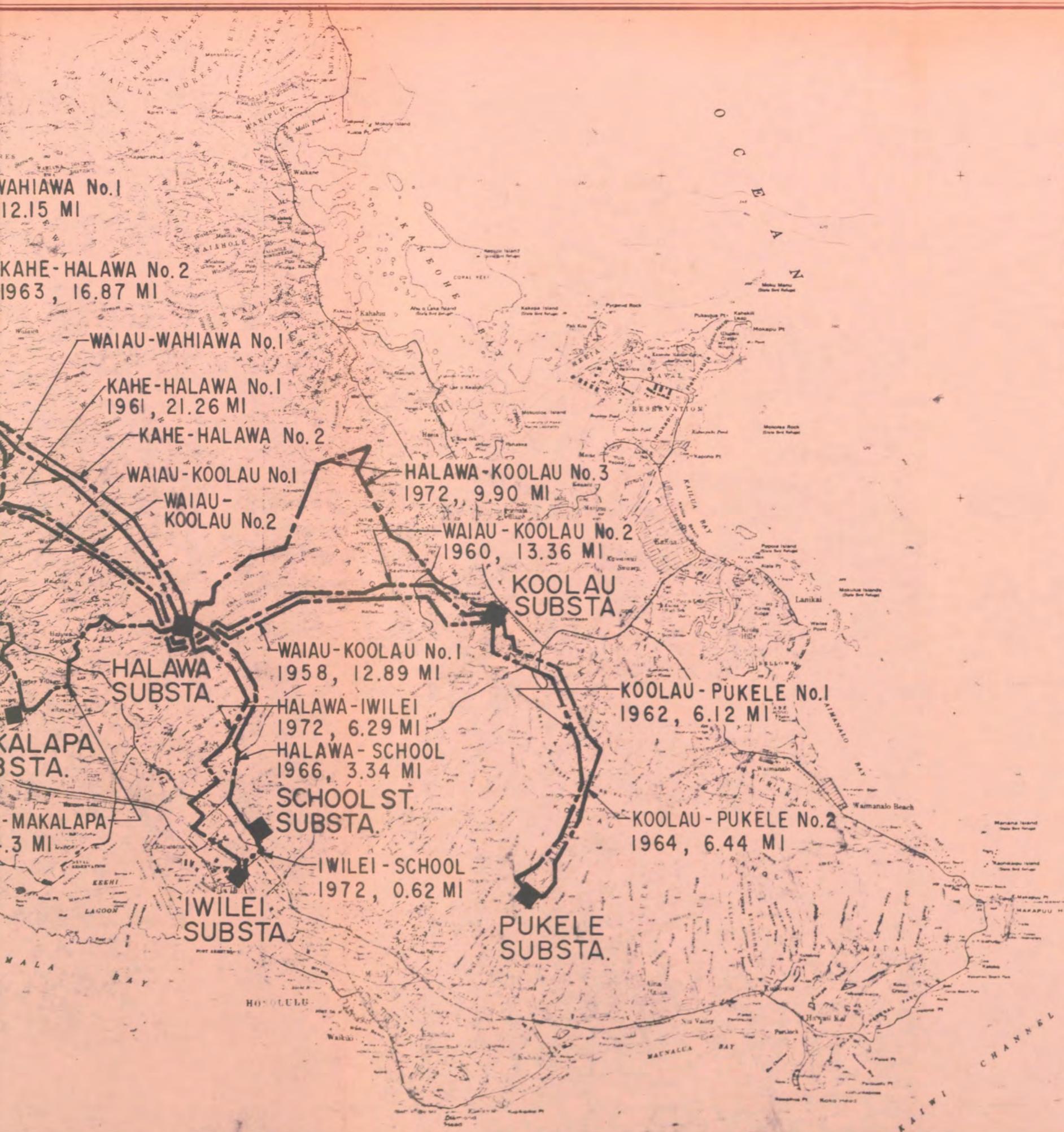
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GRAPHIC SCALE IN MILES

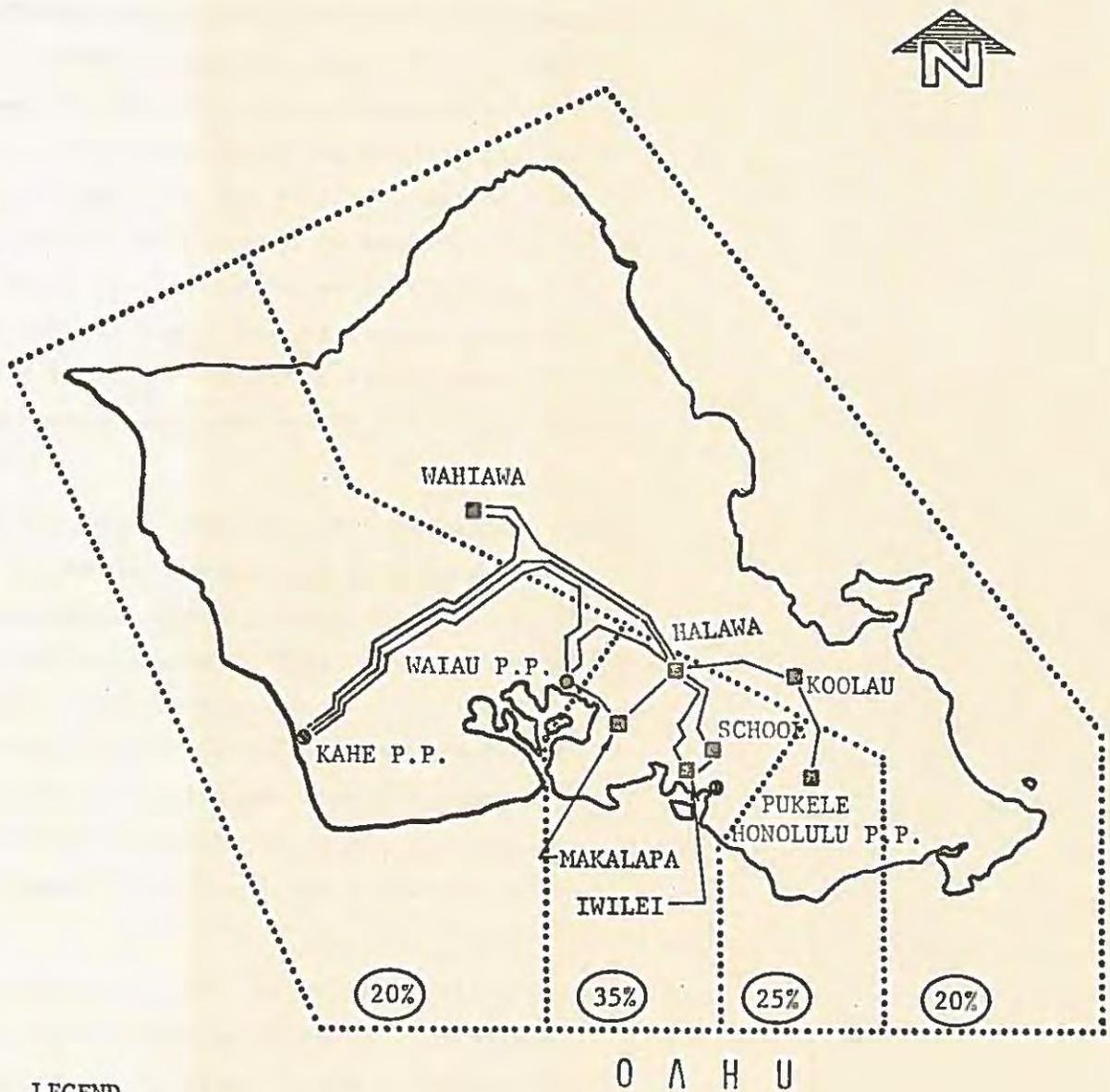


O C E A N



- EXISTING 138 KV LINE
- POWER STATION
- SUBSTATION

FIGURE I  
EXISTING 138 KV  
CIRCUITS ON OAHU



LEGEND

- Power Plants
- Transmission Substations
- 138 KV Lines Schematic
- (20%) Percentage of System Demand by Area

0 5 10 Miles

FIGURE 2

PERCENTAGE OF SYSTEM  
DEMAND BY AREA

Utilities Division (PUD). At this meeting, the proposed route was discussed in detail. Briefings for the Public Utilities Commission were held on August 3 and 16, 1973. On September 7, 1973, HECO's request for financial expenditures, based on HECO's estimate, for this project. On November 17, 1975, the PUC was briefed on the project. Also present at that meeting were PUC members, members of Palolo Valley and Kapahulu Community Associations, and HECO staff. Discussion on HECO's initial plans to route two circuits through Palolo Valley and Kapahulu to the new Kamoku Substation was heard. At the direction of PUC, HECO was told to cease construction of Pukele-Kamoku lines until the PUD had made an evaluation of the initially proposed route.

The community, through their elected representatives, was first informed of this project as early as February 28, 1973, just three days before the project was first informed of the project. At this meeting Cit Akahane, Koga, and Shigemura were briefed on the project. Other representatives were also invited but could not attend because a PUC representative session was in progress. On August 7, 1975, HECO met with Carlos Long Community Association and other Palolo residents to discuss them of HECO's construction plans and project schedules. In August 1975, an informational meeting was held with Representatives Carlos Long and Ken Kiyabu and HECO staff to arrange to hold meetings with Palolo business and community associations, including those in the area affected by the proposed 138 KV line construction. In August 1975, a second meeting with Carlos Long Community Association was held involving Palolo residents as well as with a representative of the Palolo area. This meeting was a follow up of the first meeting and was to provide the request to provide cost estimates for certain alternate routes. On November 3, 1975, HECO met with the Kaimuki community association to brief members of this association on the project for two 138 KV circuits to the new Kamoku Substation.

On June 16, 1977, HECO formally engaged M&E Pacific to prepare an environmental impact statement (EIS) for the project. The notice for this EIS was published in the May 8, 1977 issue of the Environmental Quality Commission Bulletin.

M&E Pacific consulted with governmental agencies and citizen groups to obtain the significant community concerns of this project. A list of the groups and individuals consulted is enumerated in the section entitled "Organizations and Persons Consulted."

Perhaps one of the most significant and productive meetings with the residents of Palolo Valley took place on October 26, 1977. This meeting was sponsored by the Palolo Community Council and attracted a large turn out of community leaders. Two significant events can be attributed to this meeting. First, the deadline for written comments by residents was extended. Second, three additional alternatives were identified for inclusion in this EIS.

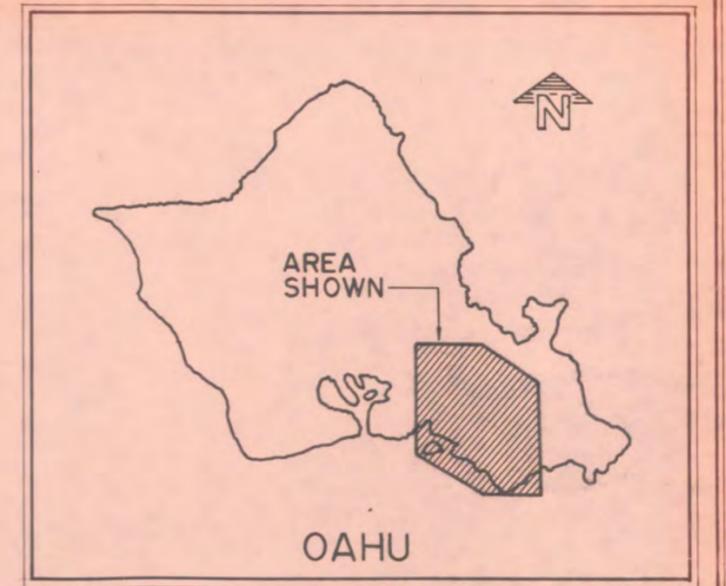
As a result of further community participation and the addition of new alternatives, it was decided that this EIS would cover all reasonable alternatives in the project description section. HECO continues to propose the leeward Koolau route and the two overhead lines in Palolo Valley. No final selection of routes, however, has been made. It is anticipated that the EIS public review process will contribute to the final selection process.

#### JUSTIFICATION FOR THE PROPOSED PROJECT

The need for the proposed project is based on the anticipated overload condition of the Pukele Substation and 46 KV transmission lines. The Pukele Substation serves the area shown on Figure 3. By dividing that area into two parts and providing a second substation and necessary connecting transmission lines, the anticipated overload condition of the Pukele Substation will be relieved.

In justifying this project, it is necessary to show that the consequences of not implementing the proposed project are substantially more undesirable than the possible adverse impacts associated with the project. In backing up the justification, it should also be shown that the various facts and projections used in estimating the consequences of no project and the impacts of the project are reasonable.

The engineering analysis of the Pukele Substation and service area that led to the recommendation for a second substation and associated transmission lines is a technical capacity evaluation of the consequences



scale : 2000' 0 2000' 4000' 6000'

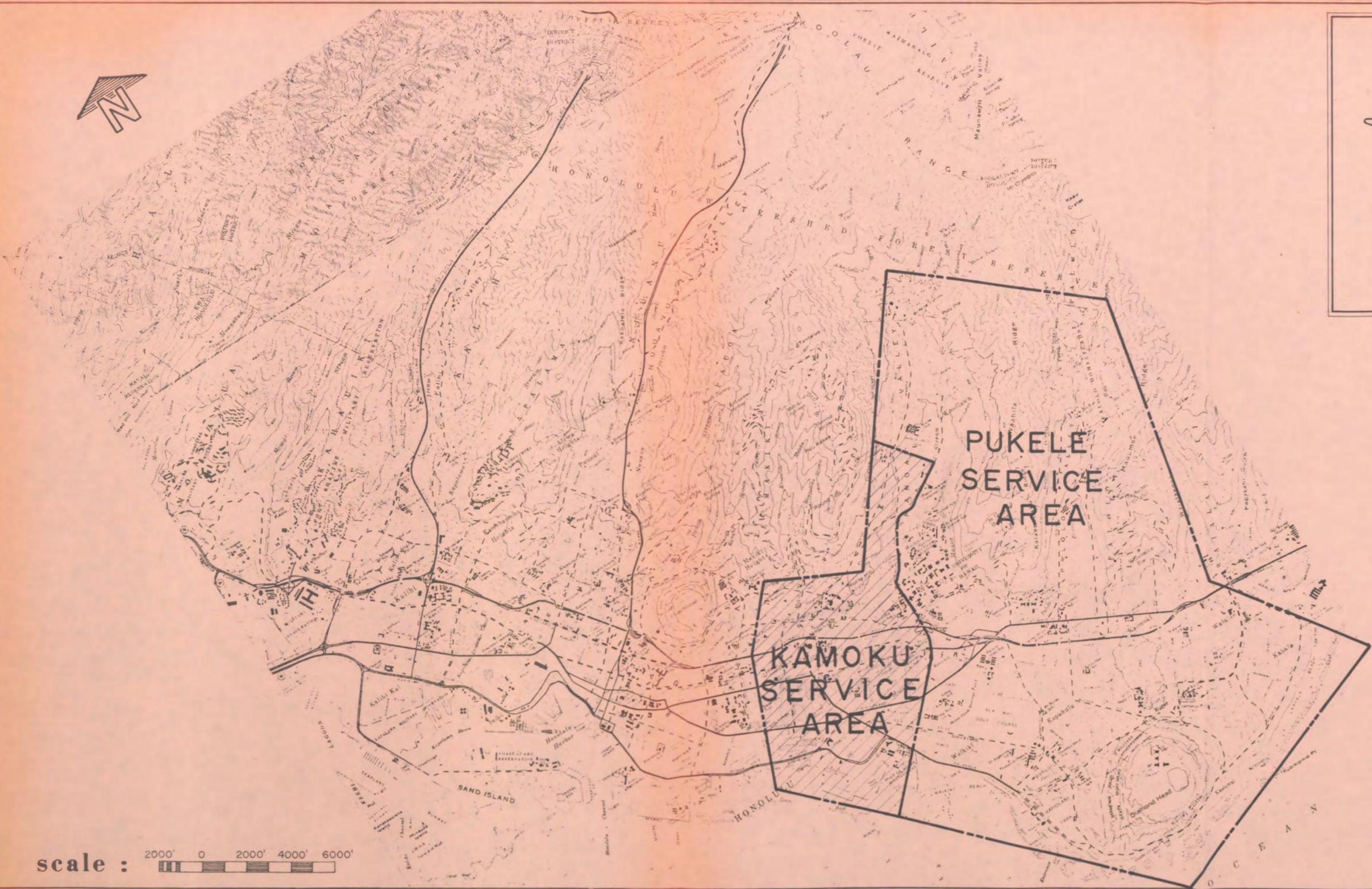


FIGURE 3  
PUKELE-KAMOKU  
SUBSTATION  
SERVICE AREAS

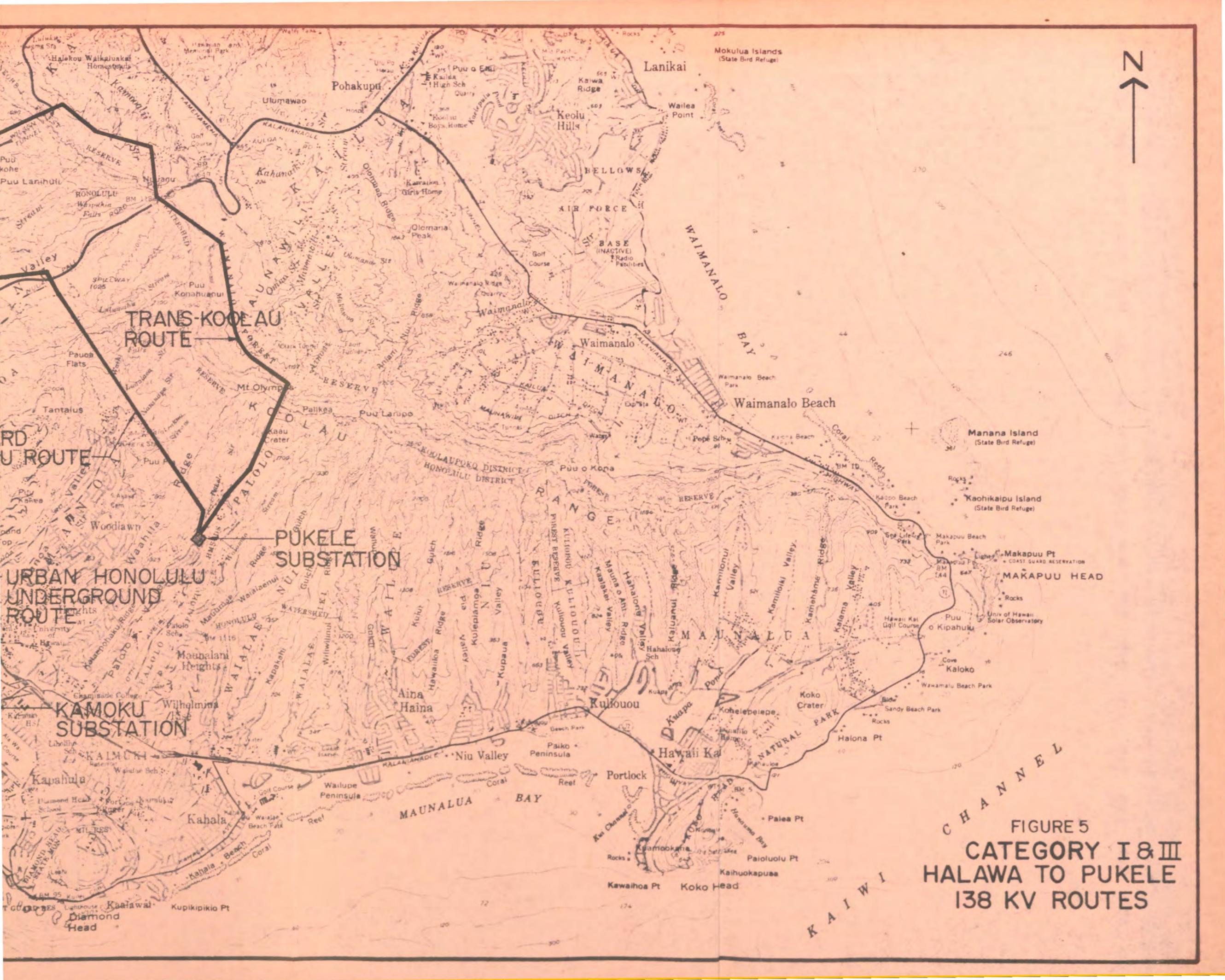


FIGURE 5  
**CATEGORY I & III**  
**HALAWA TO PUKELE**  
**138 KV ROUTES**

and options related to the shutdown of any one of the four Pukele transformers or any one of the eight Pukele 46 KV lines. Such shutdowns can, and occasionally do, occur due to failure resulting from adverse weather, accidents, or material deterioration. The interruption of service of major components also occurs when a transformer or line is shut down for maintenance or replacement. Because such interruptions are not uncommon and are a necessary part of system maintenance, it is essential that the system be able to continue functioning even with the temporary failure or shut down of any one of its major components. If such redundancy were not designed and built into the system, then a single failure or interruption would result in a cascade of failures as the load dropped from one component is placed on another component, and the entire service area would shut down. Such a level of service would not be acceptable to most people and would result in many inconvenient, undesirable, and dangerous conditions. Consequently, the basic approach of the single failure analysis of the Pukele system is considered eminently reasonable.

The results of the single failure analysis for the present Pukele Substation and 46 KV subtransmission lines are given in Table 1 for loads in MVA and in Table 2 for loads in percent of rating. It should be noted that the emergency ratings for the transformers and lines are higher than the normal operation ratings because it is assumed that the emergency will be limited to a duration of at most a few hours. Higher loadings for a short time period are tolerable but would result in component failure if applied for a long time period.

An analysis of the percentage figures in Table 2 shows that, of the twelve evaluations of the failure or shutdown of single major components during peak loads in 1981, six would result in loadings of greater than 100 percent of the emergency capacity of another major component (transformers 1, 2, 3, and 4 and lines 4 and 6). Two other single failures (lines 3 and 8) as well as normal operation would result in components operating at or above 90 percent of capacity. The remaining four possible single failures (lines 1, 2, 5, and 7) would result in the condition of another component operating at between 80 and 90 percent of emergency capacity. It should be noted that a line loading of 90 percent implies that only about 6 MVA of additional load would result in an overloaded condition.

TABLE 1

1981 SINGLE FAILURE ANALYSIS FOR PRESENT PUKELE SYSTEM (MVA)

	Loads in MVA											
	Pukele Transformers				Pukele 46 KV Lines							
	1	2	3	4	1	2	3	4	5	6	7	8
Normal	74.9	79.0	70.0	71.7	31.0	44.0	41.1	27.4	32.8	37.2	37.2	34.6
Emergency (Failure of:)												
Transformers Pukele 1	0.0	98.0	79.2	118.2	0.0	0.0	54.1	33.4	32.8	46.4	54.6	63.8
2	102.6	0.0	87.0	105.7	58.6	44.0	0.0	0.0	34.0	28.2	47.5	47.7
3	94.2	107.4	0.0	86.5	31.0	63.3	41.1	55.7	0.0	0.0	52.2	34.6
4	113.5	90.8	91.9	0.0	50.0	63.6	44.6	35.8	47.5	44.5	0.0	0.0
Lines:												
Pukele 1	44.0	92.0	70.0	89.5	0.0	44.0	54.1	27.4	32.8	37.2	37.2	52.5
2	31.0	85.1	79.2	100.3	31.0	0.0	41.1	33.4	32.8	46.4	54.6	45.9
3	102.6	27.4	70.0	84.8	58.6	44.0	0.0	27.4	32.8	37.2	37.2	47.7
4	74.9	41.1	87.0	82.0	31.0	44.0	41.1	0.0	34.0	28.2	47.5	34.6
5	74.9	89.7	37.2	86.5	31.0	44.0	41.1	38.2	0.0	37.2	52.2	34.6
6	94.2	96.8	32.8	71.7	31.0	63.3	41.1	45.1	32.8	0.0	37.2	34.6
7	82.3	87.3	91.9	34.6	31.0	51.4	41.1	35.8	47.5	44.5	0.0	34.6
8	106.0	82.5	70.0	37.2	50.0	56.2	44.6	27.4	32.8	37.2	37.2	0.0

6



TABLE 2

1981 SINGLE FAILURE ANALYSIS FOR PRESENT PUKELE SYSTEM(PERCENT OF EMERGENCY CAPACITIES)

	Loads in Percent of Rating											
	Pukele Transformers				Pukele Lines							
	1	2	3	4	1	2	3	4	5	6	7	8
Normal	88	90	82	82	57	81	75	50	60	68	68	63
Emergency (Failure of:)												
Transformers Pukele 1	0	80	68	99	0	0	87	53	52	74	87	102
2	88	0	75	88	94	70	0	0	54	104	76	76
3	81	86	0	72	50	101	66	89	0	0	84	55
4	97	73	79	0	80	102	71	57	76	71	0	0
Lines:												
Pukele 1	38	74	60	75	0	70	87	44	52	60	60	84
2	27	68	68	84	50	0	66	53	52	74	87	73
3	88	22	60	71	94	70	0	44	52	60	60	76
4	64	33	75	68	50	70	66	0	54	104	76	55
5	64	72	32	72	50	70	66	61	0	60	84	55
6	81	78	28	60	50	101	66	72	52	0	60	55
7	71	70	79	29	50	82	66	57	76	71	0	55
8	91	66	60	31	80	90	71	44	52	60	60	0

10

It is readily apparent from the results of this single failure analysis that various major components of the system would exceed or be very close to exceeding their emergency capacity rating during peak demand periods in the event of the failure of another major component. This overloading would, in turn, force the system to shed load in order to protect itself from further failure. This means that, as the population and power demand grow, there will be an increase in the frequency and duration of power outages unless the transmission and transformer capacity of the system is increased.

The projection of peak demand for Oahu for the 1977-1982 period was made by HECO in March 1977. These projections are given in Table 3 along with the actually recorded peaks from 1974 to 1976 for Oahu and from 1974 to 1977 for the Pukele service area. The average annual compound growth rates for 1974-1977 were 3.79 percent for Oahu and 3.86 percent for the Pukele service area, almost the same. The projected peak demand for Oahu in 1981 indicates an anticipated average annual compound growth rate of 4.35 percent from 1977. The corresponding figure for the Pukele service area, 3.92 percent, is lower. These figures indicate that during the next few years the growth rate of the Pukele service area is expected to be similar to the 1974-1977 period but slightly lower than the average growth of Oahu. This is in line with anticipated development patterns in leeward Oahu.

The projections for Oahu given in Table 3 were made by HECO in March 1977 using past trends and indications of future growth based on marketing analysis and economic forecasts as seen by community business leaders. Electrical demands increase not only with population increases but also on a per capita basis because of business growth and higher living standards. The 1981 projected peak for the Pukele service area was developed through an analysis independent of the projection for the peak demand for Oahu. The analysis for the Pukele service area considered the growth in load on each individual distribution substation transformer and included known, definite requests for new services.

In addition, it might be noted that, although a state population growth goal of 1.5 percent has been indicated by the state government, it

TABLE 3

RECORDED AND PROJECTED PEAK LOADS FOR OAHU AND THE PUKELE SERVICE AREA

<u>Year</u>	<u>Oahu Peak Demand (megawatts)</u>	<u>Increase over Previous Year (percent)</u>	<u>Pukele Service Area Peak (MVA)</u>	<u>Increase over Previous Year (percent)</u>
1974	838	-	226.3	-
1975	854	1.9	233.2	3.0
1976	899	5.3	249.3	6.9
1977	937*	4.2	253.5	1.7
1978	979*	4.5		
1979	1023*	4.5		
1980	1066*	4.2		
1981	1111*	4.2	295.6*	
1982	1157*	4.1		

\* Projected

is highly unlikely that implementation of a program to achieve this goal will be effective by 1981, even if constitutional questions are settled.

It should be noted that the transformer, transmission, and other electrical facilities are sized to accommodate the peak demand rather than the average demand, otherwise the frequency of overload and consequent outage would make the system unworkable. Because of this consideration, certain measures such as the use of solar water heaters, which decrease the average demand but have much less effect on peak demand, would not make a significant difference in the transformer and transmission requirement. This is especially true for the next few years, when the overloaded condition at the Pukele Substation system is expected to occur. During this time, direct solar energy is likely to satisfy only a very small percentage of the average demand. Because of the fact that direct solar systems rely on electric or gas backup during cloudy periods, the peak demands would still occur and have to be accommodated.

Other proposed measures to relieve the dependence on oil for the production of electricity on Oahu, such as coal, biomass, geothermal, ocean thermal, and wind, all require similar transformer and transmission systems and would not materially change the need for this project.

In sum, the justification for this project is based on the anticipated and undesirable overloaded condition of the major components of the Pukele Substation system within a few years. The increasing demand in the present Pukele service area noted in Table 3 is due to the increasing population, increasing per capita demand, and new as well as replacement commercial and light industrial establishments.

#### GENERAL DESCRIPTION OF THE PROPOSED ACTION

The proposed action involves routing two 138 KV transmission lines to connect the new Kamoku Substation with two other substations. The Kamoku Substation, located on the corner of Date Street and Kapiolani Boulevard, will provide load relief for the existing Pukele Substation now serving the area. The Kamoku Substation is planned to ultimately serve the area roughly bounded by the Pacific Ocean on the south, University Avenue on the east, Lowrey Avenue in Manoa on the north, and Piikoi Street on the west, as shown on Figure 3.

Initially, two 138 to 46 KV, 48/80 MVA transformers and two 46 KV circuits will be constructed for the Kamoku system to take load off the Pukele system. In the event either of the Kamoku 46 KV circuits fails, these loads would be temporarily taken up by the Pukele system until the Kamoku system is fully developed. Subsequently, additional transformers and 46 KV lines will be installed to supply the projected load increases in the area presently being served by the Pukele system.

The specific project being addressed in this EIS includes the two new 138 KV transmission lines that will serve the new Kamoku Substation as well as the new 138 KV transmission line connecting the Pukele and Halawa substations. These lines are shown schematically on Figure 4. No detailed consideration of the Kamoku Substation itself or the appurtenant 46 KV system is included in this EIS. This is because the Kamoku station will be completely enclosed and should not have significant environmental effect and because the 46 KV system is not yet designed since it will be constructed as future demand patterns dictate.

The organization of this section of the EIS dealing with the project description is more complex than usual since a number of alternatives are being included. This is different from the more common approach of describing the recommended alternative in detail and dealing with other alternatives in a separate section.

After some general considerations of power transmission systems, the alternatives being considered are presented in four general categories. The first category involves two alternative ways to bring two lines from the Halawa Substation to the vicinity of the Pukele Substation. The second category considers alternative ways to bring two lines aboveground or underground from the vicinity of the Pukele Substation to the Kamoku Substation. The third category considers three general alternatives of connecting the Kamoku Substation directly with the Halawa Substation. The final category considers the possibility of constructing a separate power plant to supply the Kamoku Substation. The alternative of no action is addressed under the heading "Justification for the Proposed Project."

The last part of this section contains a description of the physical characteristics of the proposed lines, the construction methods, and some estimates regarding timing.

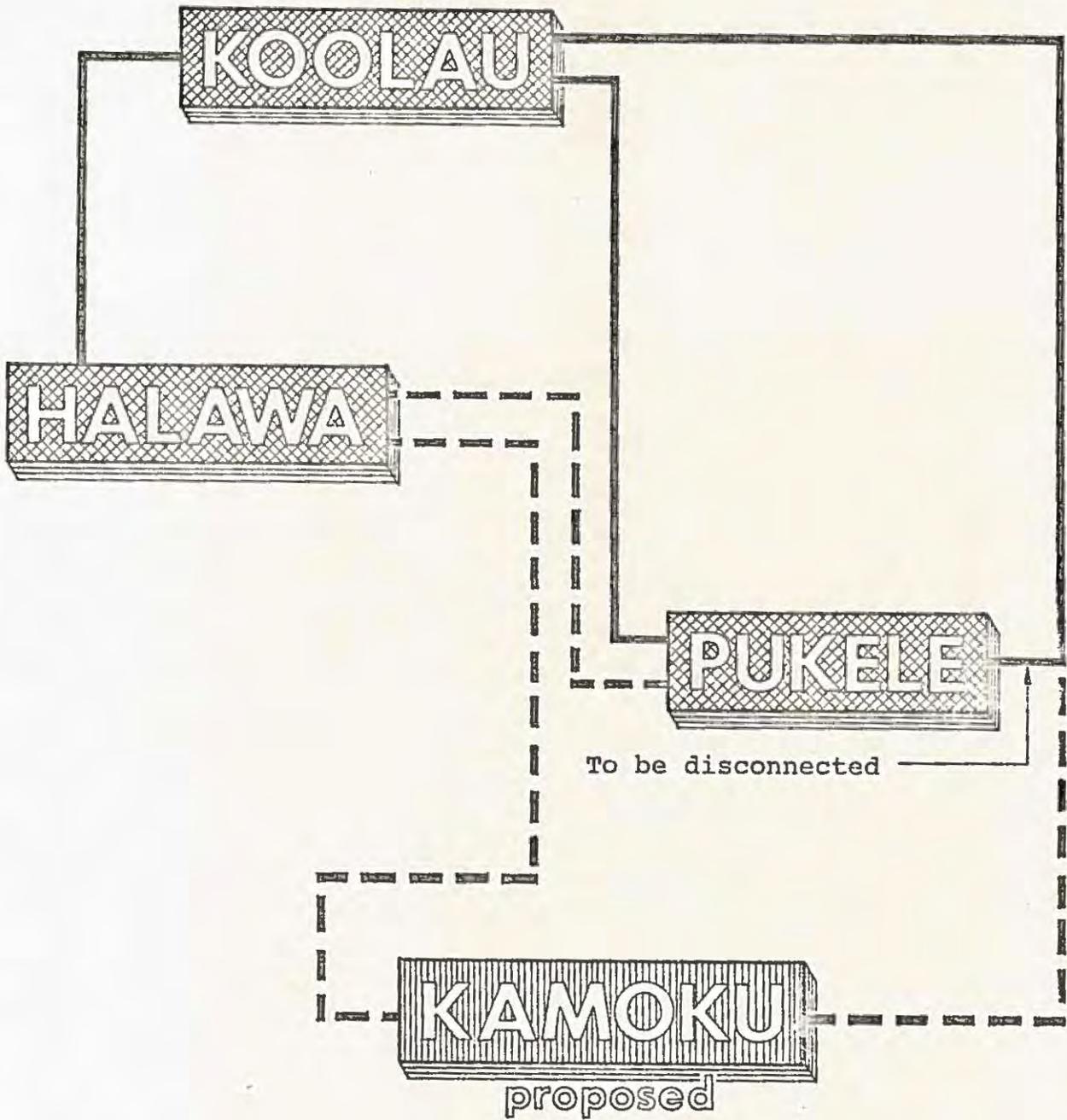


FIGURE 4  
 SCHEMATIC DIAGRAM OF  
 REQUIRED LINES TO ENERGIZE  
 KAMOKU SUBSTATION

————— EXISTING 138 KV CIRCUIT  
 - - - - - PROPOSED 138 KV CIRCUIT

## General Considerations of Power Transmission

The most efficient way to transmit electrical power is to use high voltage lines because this minimizes transmission losses, has lower capital costs, and requires less right of way per unit of power transmitted. For example, it would require six 46 KV lines to carry as much power as one 138 KV line. The six lines of the 46 KV system would therefore require considerably more materials and right of way and would consequently cost more and have a larger environmental effect than the 138 KV system. In addition, the greater transmission losses with the lower voltage lines would require more generator capacity and more fuel consumption. These considerations are the basis for selecting the 138 KV primary transmission system for Oahu; higher voltages, such as 230 KV, 345 KV, etc., are not needed for the system on Oahu and lower voltages are significantly less efficient.

A second general consideration for a power supply system is reliability. Since there is no absolute reliability, the degree of reliability required of a system is based on the factors of consumer acceptability, company policy, state of the art of the system components, and economics. Consumers have come to expect a high degree of reliability from their power supply system. In fulfilling this expectation in an economical manner, the general policy has evolved of increasing the reliability criteria for systems in proportion to the number of consumers served. For example, major transmission lines and substations are designed to meet a higher level of reliability than are local distribution lines. It should be noted, however, that recognition is given to the fact that there are economical and technical limits to increasing the reliability of the overall power supply system. These limits are in part accommodated by the provision of standby generating facilities at critical facilities such as hospitals and sewage pump stations.

Besides the continuing effort to make the various individual components of the system more reliable, the main way of increasing reliability is by providing redundancy of components. In the case of the 138 KV lines to the major substations, a minimum of two lines from different sources are required to tie each such station to the high voltage transmission system. This insures continuous service during maintenance or failure of

one line. After the transformers (at least two) at the substation have stepped down the voltage, the reliability of the 46 KV system is enhanced by interconnections among the various 46 KV circuits.

The existing Pukele system can be used to illustrate some of the measures that have been taken to provide reasonably reliable power. The Pukele Substation consists of four 48/80 MVA transformers that step down incoming 138 KV power to 46 KV, which is then distributed throughout the service area via eight interconnectable 46 KV overhead circuits. To energize the Pukele Substation, two 138 KV single circuits are routed from different transformers at the Koolau Substation over the Koolau Mountains, as shown on Figure 1. The Koolau Substation is, in turn, energized by two 138 KV circuits from the Waiiau generating plant and is also connected by one 138 KV circuit to the Halawa Substation. This redundancy and backup in 138 KV circuits, transformers, and 46 KV subtransmission lines allows the shut down of any one major component without interruption of service, provided that the resulting increases in load on the backup components do not exceed the capacity of those components. In the case of Pukele, this undesirable condition of backup component overload is expected to occur during peak loads in 1981.

Basically, the action proposed in this project is to disconnect one of the lines to the Pukele Substation from the Koolau Substation and extend it to serve the new Kamoku Substation. A second line would then be provided to each the Pukele and Kamoku substations from the main substation at Halawa. This arrangement would tie each the Pukele and Kamoku substations to both the Koolau and Halawa substations.

#### CATEGORY I ALTERNATIVES (HALAWA TO PUKELE AREA)

The alternative routes presented in this category are to bring two 138 KV circuits to the Pukele-Kamoku service area from the Halawa Substation.

##### Alternative I-A (Leeward Koolau Route)

This alternative would route two 138 KV circuits from the Halawa Substation along the leeward side of the Koolau Range on the outskirts of Honolulu through conservation land to the Pukele Substation as shown on

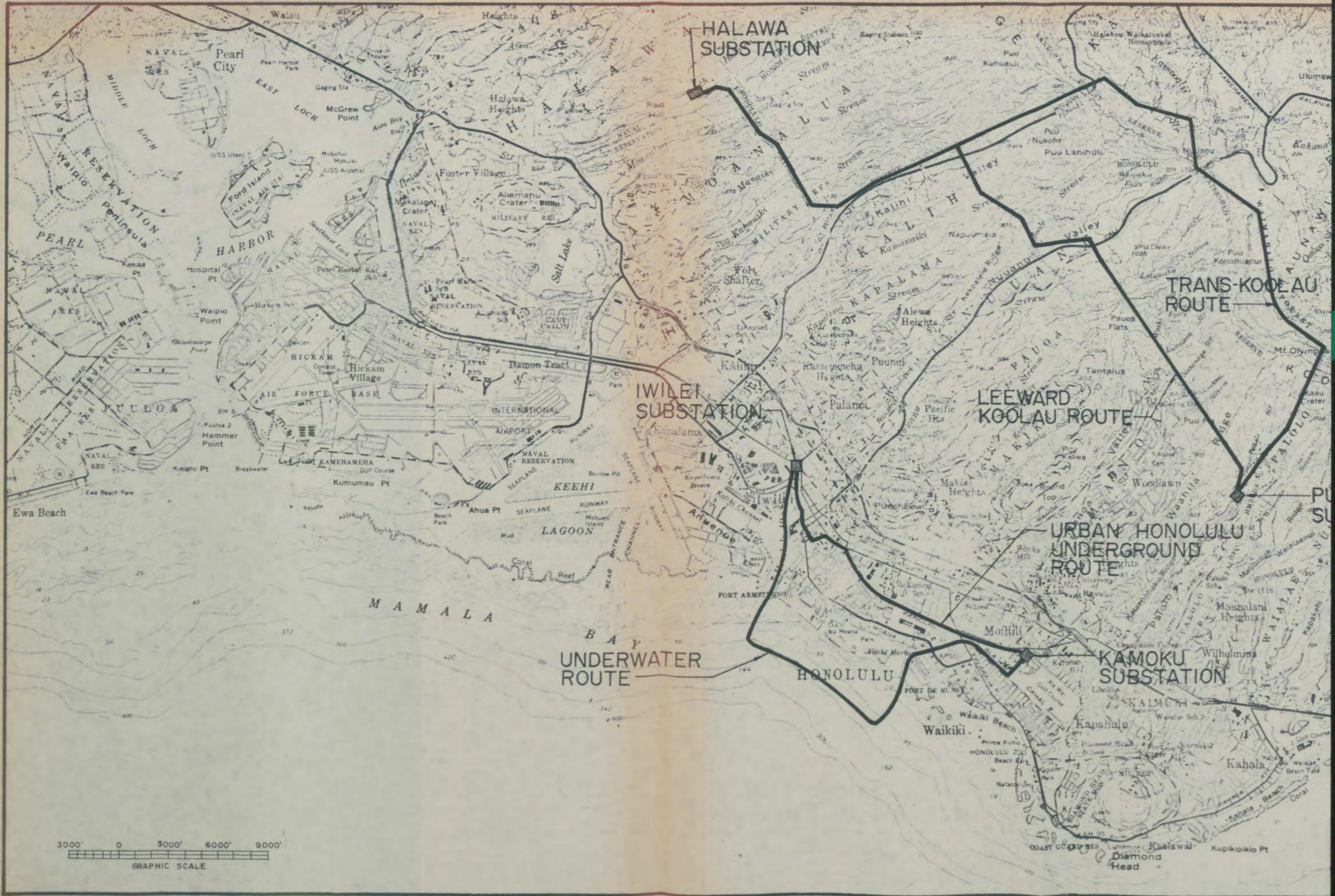
Figure 5. These two 138 KV circuits would be supported by a single set of poles along a single right of way. Placing two circuits on one pole line in this case would not significantly affect reliability since the two circuits go to two different substations, Pukele and Kamoku. The alignment would follow existing right of ways where possible, and almost all easements have been obtained from the various landowners who would be affected, including the Department of Land and Natural Resources (DLNR). Only two easements have not been acquired, a portion of the proposed line traversing Lyon's Arboretum in upper Manoa Valley and across some private property near Likelike Highway.

This line would require 65 steel poles and 9 steel structures. The distance between the poles or structures would range from approximately 800 to 2,000 feet. The total length of this route is approximately 10.2 miles. The poles and structures would be steel (see Figure 6) and vary in height from 75 to 120 feet. The total estimated cost for constructing this alternative is approximately \$9.67 million (see Table 4). Many of the poles would be on top of ridges, enabling the line to span long distances over valleys (see Figure 7), thus minimizing the number of poles and the amount of tree trimming required. The right of way through conservation lands would require an easement 100 feet in width.

This route had originally been approved by the DLNR, which oversees conservation areas in Hawaii. In addition, the State of Hawaii Department of Transportation (DOT) and the Board of Water Supply (BWS) have noted that this is their preferred routing for a Halawa to Pukele area 138 KV transmission line. The DLNR rescinded its approval as part of the EIS process.

The possibility of placing a line underground along this route or any conservation route is not considered reasonable since the 16-foot wide trench required would have considerably greater environmental impacts and higher costs than any overhead line.

The principal advantages of the leeward Koolau route are (1) low cost, (2) route preferred by affected agencies, (3) and maximum use of existing right of way. The major disadvantages are the aesthetic impacts on the back of Manoa Valley as well as other areas, such as upper Kalihi Valley and Nuuanu Valley.



HALAWA  
SUBSTATION

IWILEI  
SUBSTATION

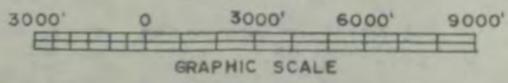
TRANS-KOOLAU  
ROUTE

LEEWARD  
KOOLAU ROUTE

URBAN HONOLULU  
UNDERGROUND  
ROUTE

KAMOKU  
SUBSTATION

UNDERWATER  
ROUTE



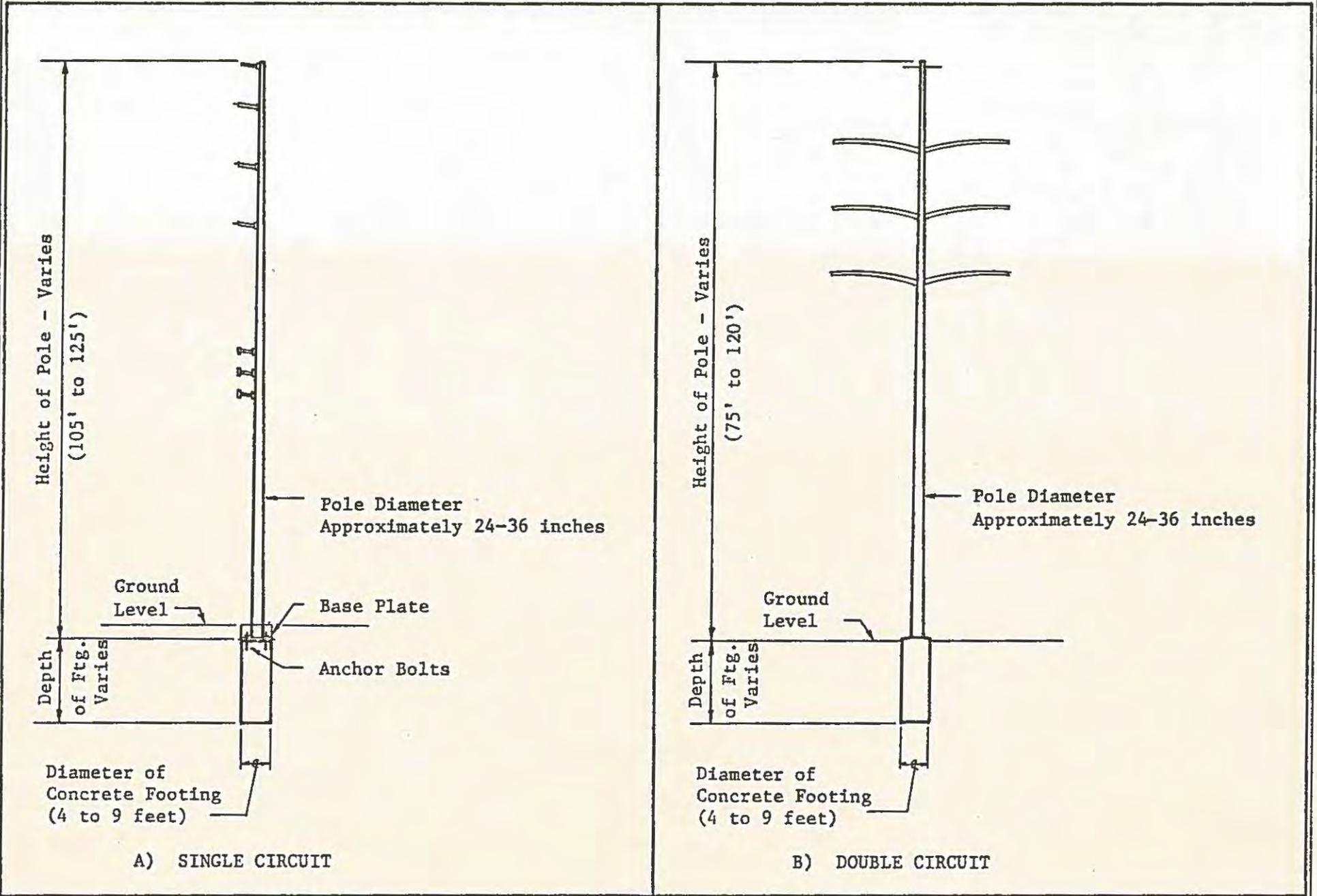


FIGURE 6 TYPICAL 138 KV STEEL POLES

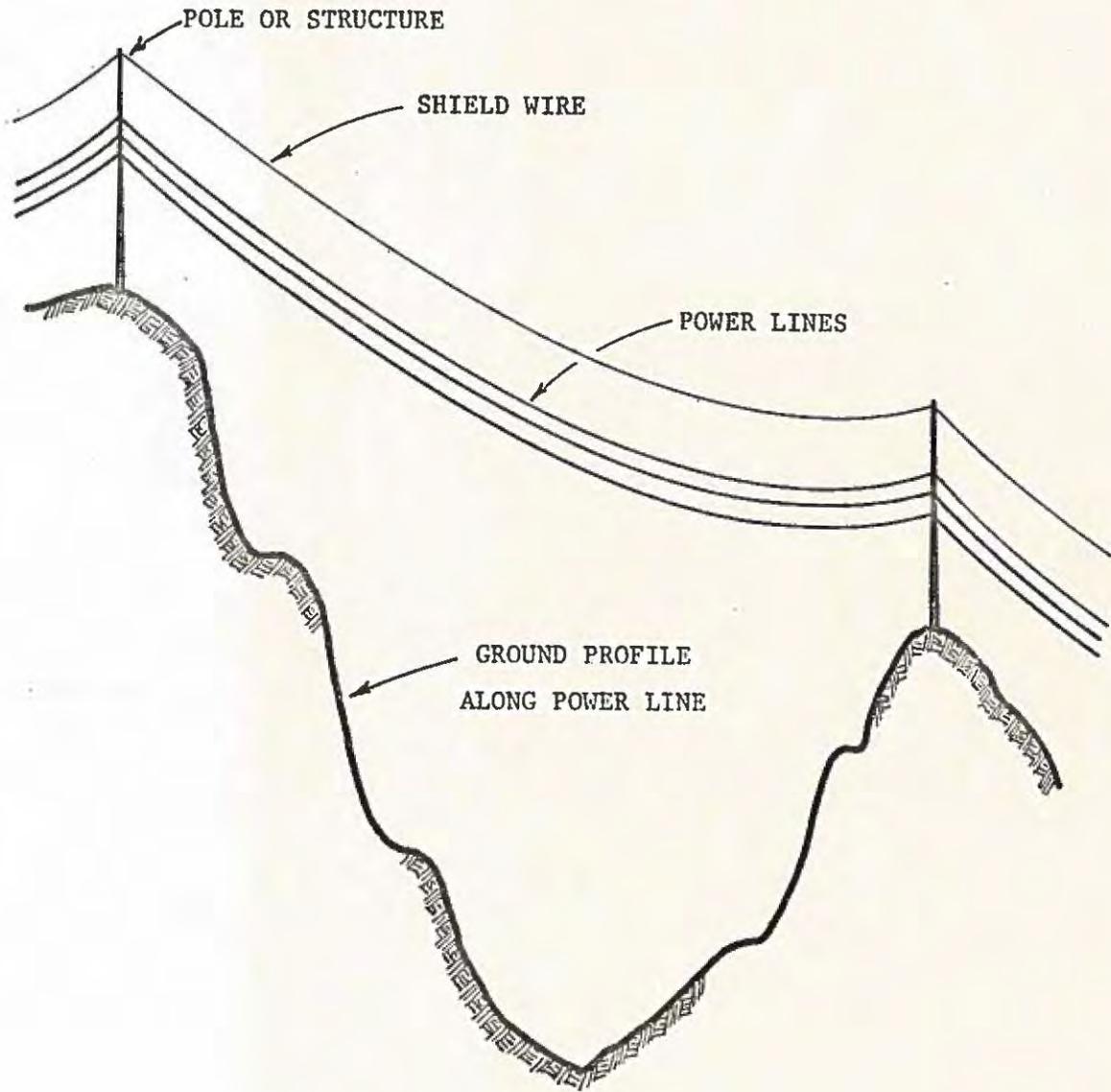


FIGURE 7

TYPICAL VIEW OF POWER LINES  
OVER CONSERVATION DISTRICT

### Alternative I-B (Trans-Koolau Route)

This alternative would route the two required 138 KV lines from the Halawa Substation over the Koolau Range to the vicinity of the Koolau Substation and then back over the Koolau Mountains to the area of the Pukele Substation, as shown on Figure 5. This alignment would parallel the Likelike Highway route and then cross the highway at the Wilson Tunnel and proceed parallel to the existing 138 KV lines across the Pali Highway over the Koolaus to the Pukele Substation area.

This alternative has been suggested to avoid the crossing of the back of Manoa Valley by Alternative I-A. The length of the trans-Koolau alternative is approximately 13.6 miles. Although a detailed engineering analysis, and hence a firm cost estimate, has not been performed for this alternative, the greater distance and more difficult terrain indicate that this alternative would be more costly than the leeward Koolau route. The approximate cost of this alternative is about \$11.68 million (see Table 4).

There are also some potential technical problems with this route because of unfavorable soil conditions at some of the important pole and structure sites. These conditions would make the stabilization of the pole foundations more difficult and result in a greater risk of foundation failure during windy and rainy weather. The greater inaccessibility and length would also make this route more difficult to maintain than the leeward Koolau route.

Other considerations related to this route are the aesthetic impacts on the Kaneohe reservoir park project and the Pali Lookout. It should also be noted that there would likely be much difficulty in obtaining all of the easements required for this route.

A general observation that can be made regarding the choice between the leeward Koolau route and the trans-Koolau route is that the benefits of this project are primarily to the people in the present Pukele service area with little or no benefit to windward residents. Consequently, it would be difficult to justify selecting a longer and costlier alternative (trans-Koolau) that impinges more on the aesthetic surroundings of the residents on the windward side than on beneficiaries of the project.

TABLE 4  
CATEGORY I HALAWA TO PUKELE COST BREAKDOWNS\*  
(Dollars in Thousands)

Alternative	Material	Labor	Contract	Subtotal	Easement Value	Total
I-A (Leeward Koolau Route)	3,055.5	2,742.4	3,854.8	9,652.7	21.0	9,673.7
I-B (Trans Koolau Route)	3,792.5	3,475.2	4,387.0	11,654.7	30.0	11,684.7

\* Unit costs and wages are based on December 1978 values but have been escalated to 1982, when construction is expected to be completed.

The principal advantage of the trans-Koolau route is the reduction of aesthetic impact on the leeward Oahu area. The major disadvantages are (1) higher costs (about 21 percent higher than the leeward Koolau route), (2) potentially more maintenance requirements, and (3) aesthetic impact on the windward side.

#### CATEGORY II (PUKELE AREA TO KAMOKU)

The alternative routes described in this category would bring two 138 KV circuits from the Pukele area to the new Kamoku Substation. One of these circuits would connect to one of the two existing circuits presently bringing power from the Koolau Substation to the Pukele Substation, while the other one would connect to one of the two new circuits from the Halawa Substation (via Alternative I-A or I-B, as previously described).

It should be noted that it is not reasonably possible to use a double circuit system along city streets since one of the circuits would then extend beyond the street right of way. The alternative of placing both circuits on one side of the pole would require excessively tall poles, more guy wires, and possibly more easements in private property. In addition, reliability would be reduced by having both circuits on one pole line since both circuits are feeding the same substation. Consequently, the overhead alternatives in Category II in the urban areas must be considered in groups of two since each route can only accommodate a single circuit. This means that there are several possible alternative ways of placing two lines along the routes being considered.

The underground placement of these lines through the urban areas is also being evaluated. The basic tradeoffs are between aesthetics, added potential traffic interference, and objection by residents for the overhead lines on the one hand, and much higher cost, interference with other utilities, construction-related disruption, and high maintenance requirements for the underground alternatives on the other hand.

A cost comparison of the various Category II alternatives is included after the description of the routes.

#### Line 1

This alternative would route a single circuit 138 KV circuit from the

Pukele Substation area along city streets through Palolo Valley to the Kamoku Substation (see Figure 8). The line would start from Pukele Substation, proceed along Myrtle Street and Carlos Long Street, and then along Palolo Avenue on the Koko Head (east) side of the street. The line would then proceed in the Ewa direction (west) along the mauka (north) side of Waiialae Avenue to Old Waiialae Road, cross the H-1 freeway, and then proceed along King Street. The line would then turn south along the ewa side of University Avenue to Date Street, and continue one block along Date Street on the mauka side to the intersection of Kapiolani Boulevard and Kamoku Street, where the Kamoku Substation is located.

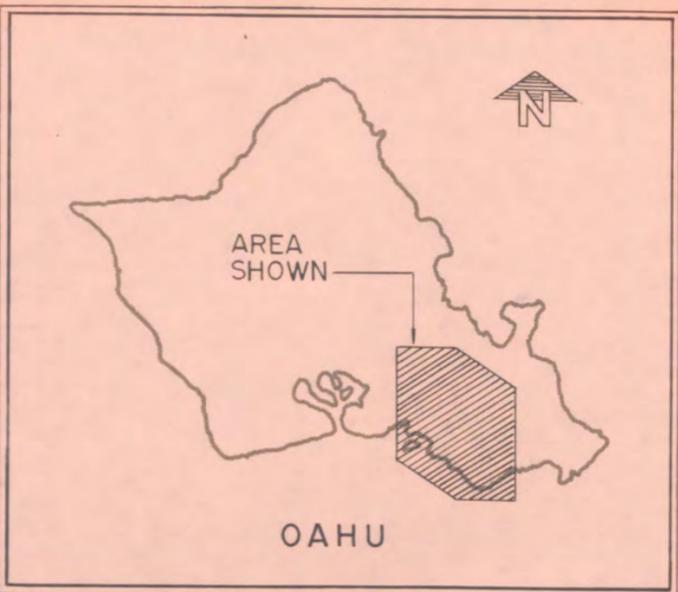
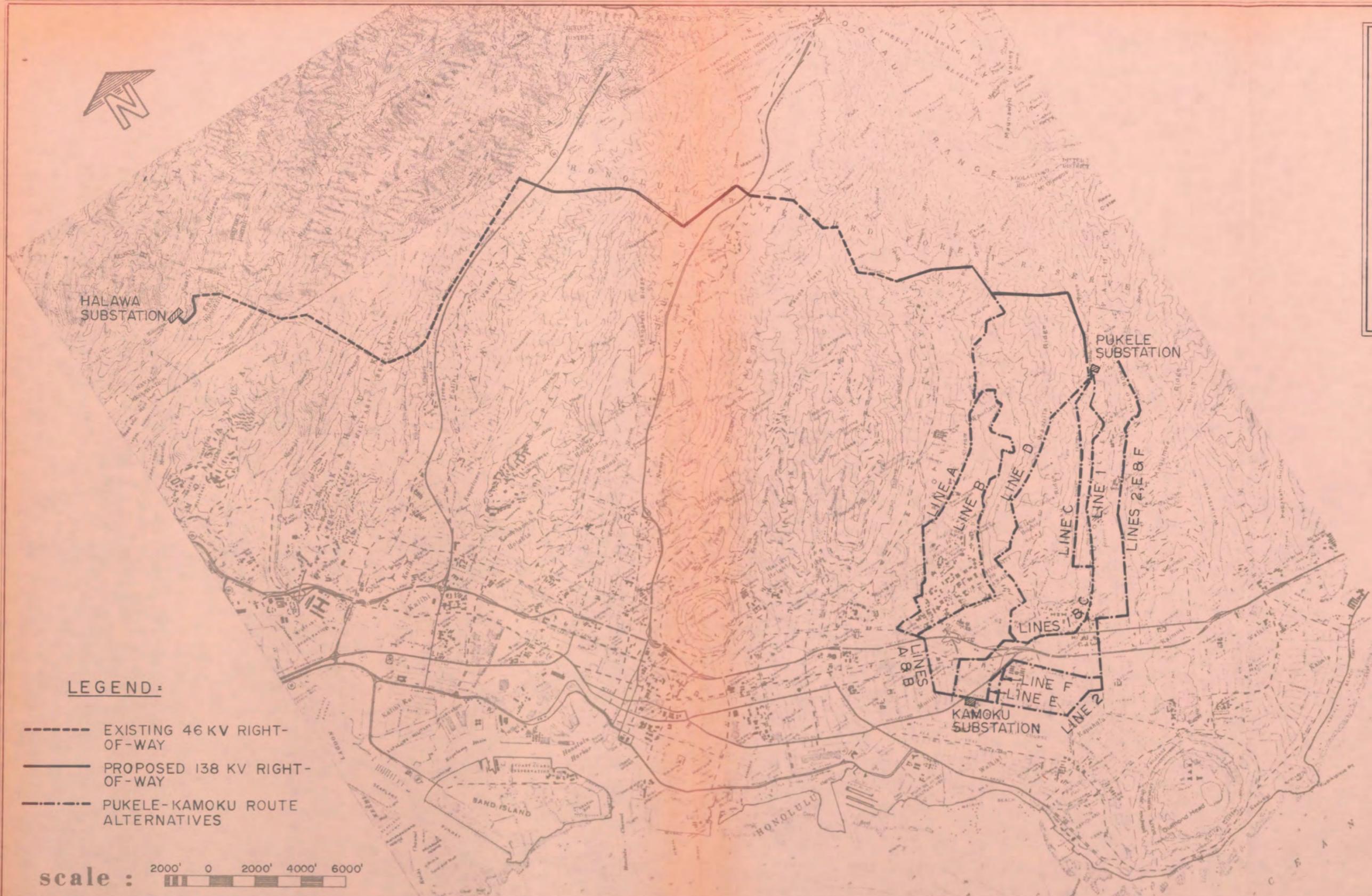
This line would be about 3.8 miles long and require 53 poles. The poles would be steel and range in height from 105 to 125 feet, with a diameter of approximately 24 to 36 inches. Supported by these poles would be a single 138 KV circuit with a protective shield wire on top (for lightning protection) and, in certain areas, a 46 KV circuit below (see Figure 6). The placement, in some areas, of the 46 KV line on the new steel poles would allow the wooden poles, which presently carry the 46 KV lines, to be shortened. These wooden poles, however, would still be needed to carry the local power distribution lines and the telephone lines. Consequently, there would be almost no reduction in the number of wooden poles as a result of this project.

The principal advantages of Line 1 include (1) low cost, (2) use of existing right of way, and (3) easy maintenance. The major disadvantages are (1) detrimental aesthetic effects, (2) added potential traffic hazard, and (3) objections by residents along the route.

## Line 2

This alternative would be an extension to the Kamoku Substation of one of the present 138 KV lines connecting the Pukele Substation to the Koolau Substation, as shown on Figure 8. The single circuit 138 KV circuit would be supported by steel poles similar to those described in Line 1 and run along city streets.

Starting at the mountain behind Palolo Valley, the line would follow the ridge behind the Palolo Chinese Home and cross onto 10th Avenue through an easement on the Chinese Home property. The line would continue



**LEGEND :**

- EXISTING 46 KV RIGHT-OF-WAY
- PROPOSED 138 KV RIGHT-OF-WAY
- - - - - PUKELE-KAMOKU ROUTE ALTERNATIVES

scale : 2000' 0 2000' 4000' 6000'

**FIGURE 8  
CATEGORY II  
PUKELE TO KAMOKU  
138 KV ROUTES**

down 10th Avenue on the Koko Head side, then along the makai side of Keanu Street to 7th Avenue. The line would proceed along the ewa side of 7th Avenue and turn onto Maunaloa Avenue and then to Mooheau Avenue. It would continue along Mooheau Avenue to Date Street. The line would then run along the golf course side of Date Street to the Kamoku Substation. Line 2 would be about 4.3 miles long and require 58 steel poles.

The principal advantages of Line 2 are (1) low cost, (2) use of existing right of way, and (3) easy maintenance. The major disadvantages are (1) detrimental aesthetic effects, (2) added potential traffic hazard, (3) objections by residents along the route, and (4) intrusion into Diamond Head Design District.

#### Line A

Line A would tie into the proposed leeward Koolau route (Alternative I-A, Category I) near Mount Puu Pia and bring a single 138 KV circuit through Manoa Valley to the Kamoku Substation. The other 138 KV circuit on the leeward Koolau route would continue on to the Pukele Substation to replace the 138 KV line from the Koolau Substation that is being diverted to the new Kamoku Substation.

The route followed by Line A, after crossing conservation land to Akaka Place, is along East Manoa Road, down Oahu Avenue, then down University Avenue. After a short detour along some side streets, the freeway crossing would be made near Wilder Avenue. The route would then continue along Isenberg Street to Date Street and to the new Kamoku Substation.

The length of Line A is about 4.3 miles and requires 74 steel poles. More poles are required along Line A than along Line 1 because the narrower streets and less straight alignments in Manoa would require shorter spans. Another consideration is that a significant amount of tree trimming and tree removal would be required, especially along East Manoa Road and University Avenue.

To avoid future relocation of Line A, in those areas where property line setbacks exist for future road widenings (i.e., along University Avenue, Vancouver Drive, Hunnewell Street, and Metcalf Street), it would be necessary to acquire easements in private property.

The major advantages of Line A are: (1) it avoids placing two 138 KV lines in Palolo Valley and (2) it is relatively easy to maintain. The

principal disadvantages are (1) higher cost, (2) requirements for additional easements and governmental agency approvals, (3) requirements for significant tree trimming and removal, (4) detrimental aesthetic impacts, (5) added potential traffic hazard, and (6) objections by residents along the route.

#### Line B

This alternative is somewhat similar to Line A in that it intercepts the proposed leeward Koolau double circuit line near Mount Puu Pia and brings one of the 138 KV circuits through Manoa Valley to the Kamoku Substation. The route followed by Line B is through conservation land, down Akaka Place, then up East Manoa Road and along a series of side streets (Alani Drive, Woodlawn Drive, Puhala Rise) to the lower slope of Waahila Ridge. The line then follows the lower slope of Waahila Ridge in conservation and University lands to Dole Street, then along Dole Street and across the freeway to Isenberg Street, along Isenberg to Date Street, and then to the Kamoku Substation at Date and Kamoku streets.

Line B would be about 5.0 miles long and require 79 steel poles. The average span for Line B is more than for Line A because a significant portion of Line B is in conservation and University lands along the lower slopes of Waahila Ridge. Construction along the slopes, however, would be costly and noisy since it would have to be done using a helicopter. Also, maintenance of the line in this area would be more difficult because of difficult access. It should also be noted that additional easements would be required as well as approval by DLNR.

The principal advantages of Line B are: (1) it avoids the necessity of putting two 138 KV lines in Palolo Valley and (2) it reduces the line length along urban streets, thereby reducing the potential traffic hazard. The major disadvantages are (1) higher cost, (2) need for additional right right of way and agency approvals, (3) reduced ease of maintenance, (4) detrimental aesthetic effects, and (5) objections by residents along the route.

#### Line C

This alternative is a variant of Line 1. It would begin at the Pukele Substation and proceed along the lower Kalaepohaku Ridge slope on

conservation land behind the houses. At Palolo Terrace, Line C would intersect Palolo Avenue and, from there, follow the same route as Line 1 to the new Kamoku Substation.

Line C would be about 4.0 miles long and require 54 poles. Construction and maintenance in the conservation area would have to be conducted using a helicopter and would consequently be costly and noisy.

The principal advantage of Line C is a reduction of line length along urban streets. The major disadvantages are (1) high costs, (2) detrimental aesthetic effects, (3) need for additional right of way and agency approvals, (4) reduced ease of maintenance, and (5) objections by residents along the route.

#### Line D

The route followed by Line D would reduce to a minimum the urban area and the distance that has to be traversed between the Pukele and Kamoku substations. Starting at the Pukele Substation, Line D would parallel the route of existing double circuit 46 KV lines up onto Waahila Ridge at the state recreation area, then along the ridge in the conservation area between St. Louis Heights and the University of Hawaii campus, and across Dole Street. The line would then proceed along Koali Road and Old Waiialae Road to intersect the route for Line 1. From there to the Kamoku Substation, Line D would follow the same alignment described for Line 1.

Line D would be about 3.7 miles long and require 36 steel poles, including one major structure. The average span along this line would be considerably longer than any of the other Category II alternatives because much less of Line D would be in an urban area. This characteristic, however, brings with it the negative aspects of somewhat higher construction cost because of the need to use helicopters, increased maintenance difficulty, as well as the need for additional easements and approval by DLNR.

Although the existing 46 KV circuits along Waahila Ridge would be transferred to the new poles and the old poles removed, Line D would not be able to follow the exact same route as the 46 KV line since service in the 46 KV lines cannot be interrupted for the construction period. This means that Line D would require the establishment of a route parallel to

the existing 46 KV route and the removal of a number of trees in the Waahila State Recreation Area to accommodate the expected sag areas.

Because of the taller poles and more wires, Line D would be more visible to Manoa and St. Louis Heights residents than the existing 46 KV lines. Another consideration would be the potential foundation problems along the portion of Line D along Koali Road because of the proximity of Manoa Stream.

The principal advantages of Line D are (1) the minimization of urban area disturbance for a single circuit line, (2) avoidance of the necessity of putting two 138 KV lines in Palolo Valley, and (3) shortest distance and minimum number of poles. The major disadvantages are (1) higher cost, (2) need for additional right of way and agency approvals, (3) reduced ease of maintenance, (4) detrimental aesthetic effects, (5) requirements for significant tree removal, and (6) potential pole foundation problems near Manoa Stream.

#### Line E

This alternative is a variation of Line 2. Line E would follow the same route as Line 2 through Palolo Valley and across the freeway but then proceed along Kaimuki Avenue to Kapiolani Boulevard. Line E would then follow Kapiolani Boulevard to Mahiai Street, down Mahiai Street to Date Street, then along Date Street to the new Kamoku Substation.

Line E would be about 4.5 miles long and require 58 steel poles. Line E is a variation of, but not an improvement on, Line 2 in that it is longer, requires more poles, and has potential interference problems along Kapiolani Boulevard with a pedestrian overpass and possible future H-1 freeway improvements.

The major advantages of Line E are (1) use of existing right of way and (2) easy maintenance. The major disadvantages are (1) higher cost, (2) added potential traffic hazard, (3) potential interference with existing and planned transportation facilities, and (4) objections by residents along the route.

#### Line F

Line F is a variation of Line E. It would follow the same route as

Line E, except it would avoid the difficulties along Kapiolani Boulevard by going along the Manoa-Palolo drainage canal through Kaimuki High School to Date Street. Line F would then follow Date Street to the new Kamoku Substation.

Line F would be about 4.4 miles long and require 56 steel poles. A potential difficulty with Line F is the possibility of poor conditions for foundations for the poles along the Manoa-Palolo drainage canal. Easement acquisition through the Kaimuki High School grounds may also be a major constraint.

The major advantages of Line F are (1) use of existing right of way and (2) easy maintenance. The principal disadvantages are (1) higher cost (2) added potential traffic hazard, (3) potential foundation difficulties, (4) objections by residents along the route, and (5) difficult easement acquisition.

#### Alternative G

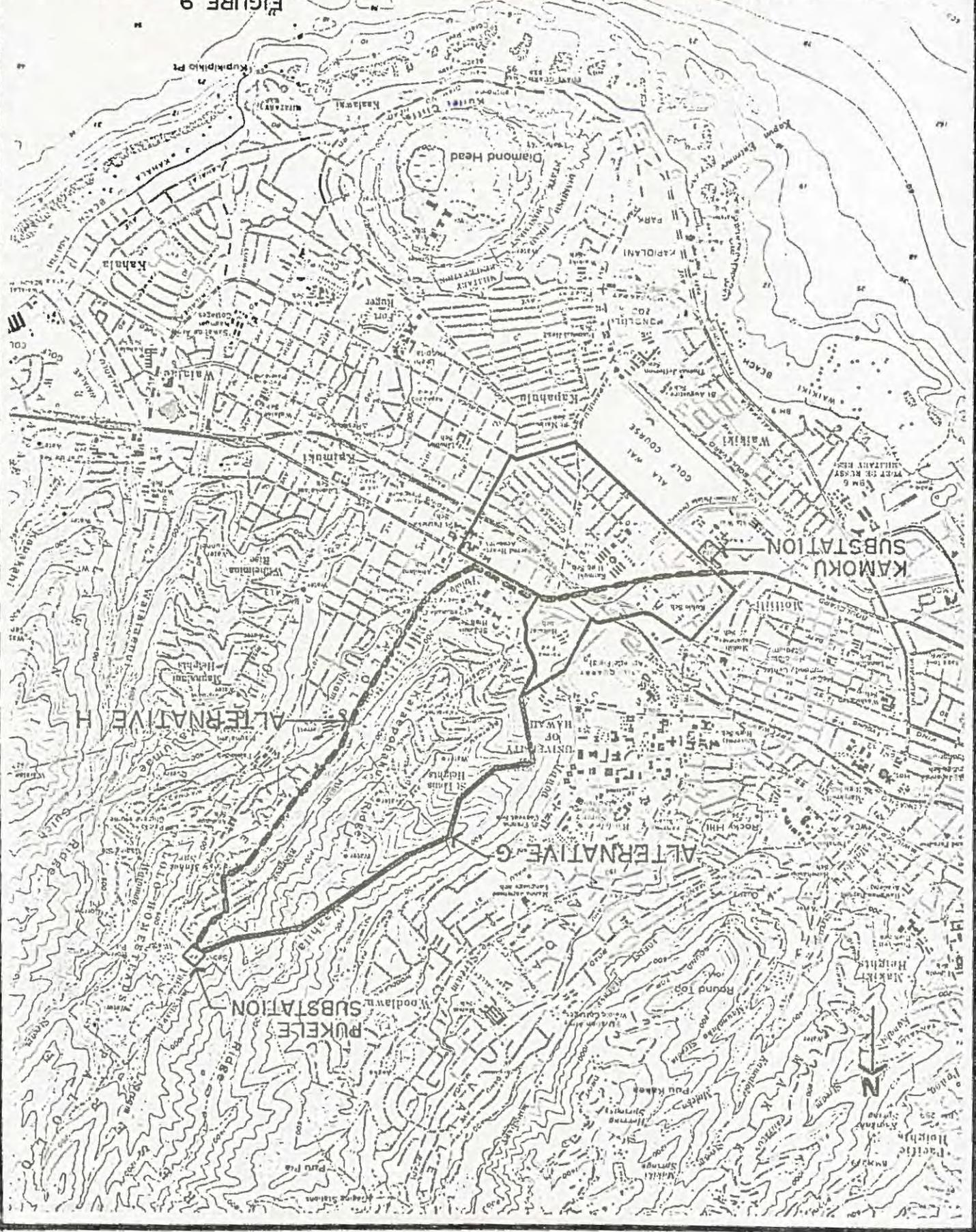
This alternative would obviate the need for two single circuit 138 KV lines through Manoa Valley and/or Palolo Valley by providing a double circuit line down Waahila Ridge to Dole Street along the same alignment described for Line D. At Dole Street, the double circuit line would be separated into two single circuit lines that would go to the new Kamoku Substation along different routes. One of these routes would be that described for Line D (Koali Road, Old Waiialae Road, King Street, University Avenue, and Date Street to the new Kamoku Substation). The other line would be located along Dole Street, St. Louis Heights Drive, Waiialae Avenue, and 7th Avenue, where it would then continue along the Line 2 alignment (7th Avenue, Maunaloa Avenue, Mooheau Avenue, and Date Street to the new Kamoku Substation) (see Figure 9).

Alternative G would have less impact on urban areas than any other of the overhead line alternatives in Category II but would have the difficulties associated with conservation area routes, as noted in the description of Line D.

By the placement of both 138 KV feeder circuits to the Kamoku Substation on a single pole line, Alternative G would make the system more susceptible to the simultaneous failure of both feeder circuits. Such

CATEGORY II ALTERNATIVES  
PUKELE TO KAMOKU  
138 KV ROUTES  
FIGURE 9

SCALE IN FEET  
1000' 0 1000' 2000' 3000' 4000'



failure could occur due to fire, lightning, aircraft crash, or pole collapse due to foundation failure. Since only three somewhat similar failures have occurred in nine years of record along about 145 miles of 138 KV lines on Oahu (causes: fire, lightning, and failure of wooden structure), it is difficult to assign a probability of occurrence to such an event for the Alternative G conditions. In any case, the probability would be proportional to the length of the double circuit line (about 2.1 miles in this case).

HECO has expressed great concern regarding the question of reduced reliability and the probable longer duration of total substation outage from a simultaneous failure if both circuits feeding a transmission substation are on the same pole line. If the probability of a simultaneous failure per year per mile of double circuit line were known with reasonable accuracy, a direct evaluation of the tradeoffs could be made. It should also be noted that accessibility for line repair along the Waahila route is limited to daylight and good weather. This means that, in the event of simultaneous line failures under storm conditions, repair could take several days. In this regard, the most recent "Survey of Electric Utility Planning Practices," given in Publication 67-41 of the Edison Electric Institute, shows that a majority of companies surveyed (26 out of 41) do not consider two overhead circuits on one steel tower or pole line as firm supply to a bulk substation.

The major advantages of Alternative G are (1) the minimization of impacts on the urban area for Category II overhead alternatives, (2) the elimination of about two miles of pole line from the proposed project, and (3) the use of the shortest line distance and minimum number of poles. The principal disadvantages are (1) increase in the possibility of simultaneous failure of both feeder circuits to the Kamoku Substation, (2) higher cost, (3) need for additional right of way and agency approvals, (4) detrimental aesthetic effects, (5) requirements for significant tree removal, (6) reduced ease of maintenance, (7) potential pole foundation problems near Manoa Stream, and (8) intrusion into the Diamond Head Design District.

#### Alternative H

This alternative would place both the 138 KV circuits from the Pukele area to the Kamoku Substation underground (see Figure 9). Two 138 KV

underground circuits would exit from the Pukele Substation onto Myrtle Street, Carlos Long Street, Palolo Avenue, and Waiialae Avenue to the Kapiolani interchange. The 138 KV circuits would then continue under the H-1 freeway along Kapiolani Boulevard to the Kamoku Substation at the corner of Date and Kamoku streets. Oil pumping stations would be required at various points along the route should a pipe-type cable system be installed.

The typical trench width for this route would be approximately 16 feet wide should a horizontal configuration of the five steel pipes be utilized. In this configuration, the trench depth would be approximately 5 feet and would not require as much excavation as a vertical configuration, which might be utilized in the downtown Honolulu area. A horizontal configuration, however, would probably cause more traffic congestion than would a vertical configuration since a wider portion of a roadway would be closed off during installation of the pipes.

It may be found with further study that the interference with other utilities would make this alternative technically infeasible in this area since accommodation of such a large use of the right of way would have had to have been planned for when the streets and other utilities were first laid out.

Other considerations with undergrounding high voltage lines are that the complexity and vulnerability of the cooling system and other appurtenant facilities require greater redundancy to equal the reliability of overhead lines. Even with equal reliability, underground lines are more difficult to maintain, with longer outages likely than with overhead alternatives in case of failure. The complexity of the system and the construction difficulties also make this system about three to four times as expensive as overhead lines. It might also be noted that there are no PUC regulations specifying how the extra costs of undergrounding major transmission lines should be paid. (A description of underground construction is given later in this section along with a description of construction methods for overhead lines.)

The principal advantages of Alternative H are (1) minimization of detrimental aesthetic effects and (2) the minimization of added potential traffic hazards. The major disadvantages are (1) very high cost (and no

ready vehicle for payment), (2) difficulty in maintenance, (3) construction interference with other utilities and possible technical infeasibility, and (4) long construction time.

### Alternative I

This alternative is a combination of Alternatives G and H. Alternative I would entail a double circuit overhead line from Pukele over Waahila Ridge to Dole Street, as described in Alternative G, and then an underground line for both circuits through the urban area to the new Kamoku Substation, as in Alternative H.

The cost of Alternative I, although still very high, would be intermediate between that of an overhead system and that of a complete underground system. This alternative would also minimize the detrimental effects on the urban area in Manoa and Palolo valleys. Alternative I, however, would retain most of the drawbacks of the double circuit line over Waahila Ridge as well as the problems of undergrounding in urban areas.

The primary advantages of Alternative I are (1) minimization of urban impacts in Manoa and Palolo valleys, (2) use of the shortest line distance between Pukele and Kamoku, and (3) elimination of the potential addition of traffic hazards. The major disadvantages are (1) high cost, (2) need for additional right of way and agency approvals, (3) detrimental aesthetic effects, (4) significant tree removal, (5) reduced ease of maintenance, (6) construction interference with other utilities and possible technical infeasibility, and (7) long construction time.

### Cost Comparison of Category II Alternatives

An updated cost estimate has been made by the engineering department of HECO for the various Category II alternatives. Table 5 gives the cost breakdown for single circuit overhead lines along the eight routes being considered for two single circuit overhead lines. The column designated "cancellation charges" is included to show how much HECO expects to lose in cancelling the order for the steel poles specifically designed for Lines 1 and 2. Perhaps the most fair cost comparison would be the subtotal without the cancellation charges. These cancellation charges,

TABLE 5

CATEGORY II SINGLE CIRCUIT COST BREAKDOWNS\*\*

(Dollars in Thousands)

<u>Line/ Alternate</u>	<u>Material</u>	<u>Labor</u>	<u>Contract</u>	<u>Subtotal</u>	<u>Easement Value</u>	<u>Credits</u>	<u>Subtotal</u>	<u>Cancellation Charges</u>	<u>Total</u>
1	2,250.8	2,749.0	254.8	5,254.6	1.0	--	5,255.6	--	5,255.6
A	2,474.7	3,022.4	280.2	5,777.3	21.0	(-)363.9*	5,434.4	715.9	6,150.3
B	2,678.8	3,271.6	303.3	6,253.7	21.0	(-)363.9*	5,910.8	715.9	6,626.7
C	2,287.5	2,793.8	259.0	5,340.3	221.8	--	5,562.1	296.1	5,858.2
D	2,314.8	2,827.1	262.0	5,403.9	270.6	--	5,674.5	443.6	6,118.1
2	2,253.1	1,880.8	401.1	4,535.0	4.8	--	4,539.8	--	4,539.8
E	2,400.5	2,003.8	427.3	4,831.6	4.2	--	4,835.8	170.5	5,006.3
F	2,424.7	2,024.0	431.6	4,880.3	84.2	--	4,964.5	175.8	5,140.3

\* Credit for single circuit from Puu Pia to Pukele Sub instead of a double circuit.

\*\* Unit costs and wages are based on December 1978 values but cost estimates have been escalated to 1982, when construction is expected to be completed.

however, are a real cost and would eventually have to be paid by the consumer.

Table 6 is a summary cost comparison between the least expensive single circuit overhead combination, Lines 1 and 2, and the various double circuit and underground alternatives, as described in this section. It should be reiterated that the final selection of which alternative to adopt will not be based on economics alone, but will take into account the various other factors noted in this EIS.

### CATEGORY III (HALAWA TO KAMOKU)

The alternatives in Category III would bring two 138 KV circuits directly from Halawa Substation to Kamoku Substation with no alteration of the existing connections between the Pukele and Koolau substations. Under this arrangement, however, some decrease in backup potential occurs since Pukele and Kamoku would each tie into two transformers at one substation (Koolau and Iwilei respectively), rather than at separate substations. Two general routes are considered, through the urban Honolulu area and via an underwater transmission cable in offshore waters (see Figure 5).

#### Alternative III-A (Urban Honolulu Route)

Three general possibilities were investigated for bringing the required two 138 KV lines through the urban Honolulu area. These possibilities were (1) two separate overhead lines through city streets, (2) a double circuit overhead line along the freeway, and (3) a double circuit underground line through city streets.

The two overhead line possibilities appear to be precluded by legal restrictions. In the special design districts such as the capital, Kakaako, Punchbowl, and Chinatown districts, the overhead lines would not be permitted. Unless these basic legal restrictions are removed, which is unlikely, the overhead lines would have to go through the residential areas mauka of the downtown and capital areas. This would mean more than about nine miles of urban, residential area affected, compared to about four miles in the Manoa-Palolo areas, making this an unreasonable solution. The double circuit freeway route would require a change in the state laws (Sections 264-23 and 264-24 and Chapter 91 of the Hawaii

TABLE 6

CATEGORY II COMPLETE SYSTEM COST BREAKDOWNS\*

(Dollars in Thousands)

<u>Line/ Alternate</u>	<u>Material</u>	<u>Labor</u>	<u>Contract</u>	<u>Subtotal</u>	<u>Easement Value</u>	<u>Credits</u>	<u>Subtotal</u>	<u>Cancellation Charges</u>	<u>Total</u>
1	2,250.8	2,749.0	254.8	5,254.6	1.0	--	5,255.6	--	5,255.6
2	<u>2,253.1</u>	<u>1,880.8</u>	<u>401.1</u>	<u>4,535.0</u>	<u>4.8</u>	--	<u>4,539.8</u>	--	<u>4,539.8</u>
	4,503.9	4,629.8	655.9	9,789.6	5.8		9,795.4		9,795.4
G	4,432.1	4,312.2	1,203.4	9,947.7	270.6	--	10,218.3	718.2	10,936.5
H	12,414.2	4,887.1	31,545.7	48,847.0	1,156.0	--	50,003.0	1,280.2	51,283.2
I (OH)	1,241.1	1,574.0	882.7	3,697.8	270.6	--	3,968.4	--	
(UG)	<u>4,805.8</u>	<u>2,242.7</u>	<u>13,496.7</u>	<u>20,545.2</u>	<u>963.3</u>		<u>21,508.5</u>		
	6,046.9	3,816.7	14,379.4	24,243.0	1,233.9		25,476.9	759.6	26,236.5

NOTE: Alternates G, H, and I are in lieu of installing Lines 1 and 2.

Alternate G is a double circuit line from Pukele Sub to Dole Street via Waahila Ridge. The line then splits into two separate single circuit lines from Dole to Kamoku Sub.

Alternate H is a double circuit underground line from Pukele Sub to Kamoku.

Alternate I is a double circuit overhead line from Pukele Sub to Dole Street via Waahila Ridge and thence underground to Kamoku Sub.

\* Unit costs and wages are based on December 1978 values but cost estimates have been escalated to 1982 for overhead lines and 1983 for underground lines, which are the years during which construction is expected to be completed.

Revised Statutes), which restrict utility use of the freeway right of way to crossings at right angles to the freeway. Installations in the longitudinal direction are prohibited. In any case, the use of double circuit lines for such a long distance would reduce the reliability of the system. Because of the basic legal restrictions, the two alternatives with overhead lines through the urban Honolulu area will not be discussed further.

The third possibility of an urban Honolulu route is to go double circuit underground from the Iwilei Substation to the Kamoku Substation. Two 138 KV underground circuits would exit from an expanded Iwilei Substation onto Kuwili Street, Iwilei Road, Nimitz Highway to Halekauwila Street, then along Halekauwila Street to Punchbowl Street, along Punchbowl Street to King Street, then, finally, along King Street and Kapiolani Boulevard to the new Kamoku Substation. An oil pumping station would be located at the rear of HECO's property along Cooke Street.

The typical trench width for this route would be approximately 10 feet wide because the multitude of underground utilities in the downtown Honolulu area precludes the use of a wider trench. To accommodate the five steel pipes required for the double circuit line, however, the trench would have to be excavated to depths of 10 to 20 feet because, in most cases, the steel pipes would have to be installed below existing storm drains, sewer pipes, and other underground utilities.

This alternative is not legally precluded but would have all of the types of difficulties associated with undergrounding described for the Pukele-Kamoku route, including very high cost, high maintenance requirements, long construction period, and interference with other utilities. The degree of these difficulties would be greater for the urban Honolulu area because the street right of ways are even more crowded with existing and planned underground utilities and the distances are longer. Since it would be necessary to place these underground lines below the existing underground utilities, this would be a difficult engineering and construction job. The approximate cost of this alternative is about \$65.25 million (see Table 7).

The principal advantages of the urban Honolulu underground route via the Iwilei Substation are (1) the elimination of an impact on the conservation area and (2) the shortest overall route for supplying power to the

TABLE 7

CATEGORY III DOUBLE CIRCUIT COST BREAKDOWNS\*

(Dollars in Thousands)

Alternative	Material	Labor	Contract	Subtotal	Easement Value	Total
III-A (Urban Honolulu Underground)	18,206.5	14,130.9	32,908.1	65,245.5	--	65,245.5
III-B (Underwater Route)	26,285.1	10,491.6	6,102.7	42,879.4	--	42,879.4

NOTE: Alternate III-A is a double circuit underground route from the Iwilei Substation along Kuwili Street, Iwilei Road, Ala Moana Boulevard, Halekauwila, Punchbowl, and King Streets, then along Kapiolani Boulevard to the Kamoku Substation.

Alternate III-B is a double circuit underwater route from the Iwilei Substation along Kuwili Street into Honolulu Harbor, along the coastline to the Ala Wai Yacht Harbor, up the Ala Wai Canal, and into the Kamoku Substation.

The existing 138 KV circuits from the Halawa Substation to the Iwilei Substation also have sufficient capacity to initially serve the Kamoku Substation.

\* Unit costs and wages are based on December 1978 values but cost estimates have been escalated to 1983 for underground and submarine lines, which is the year when construction is expected to be completed.

40

new Kamoku Substation. The major disadvantages are (1) a greater urban impact during construction than any other alternative, (2) the necessity for expansion of the Iwilei Substation, (3) interference with other utilities and possible technical infeasibility, (4) very high cost, and (5) difficult maintenance.

#### Alternative III-B (Underwater Route)

This alternative would use a combination of AC underground and submarine cable systems to route the two required 138 KV lines from the Iwilei Substation along the Oahu coastline to the Kamoku Substation. The overland route would be from Iwilei Substation via underground cables along Kuwili Street, Iwilei Road, Nimitz Highway, and down to Honolulu Harbor. The underwater route via submarine cables would then enter Honolulu Harbor, parallel the coastline at a depth of approximately 100 feet to opposite the entrance of the Ala Wai Yacht Harbor, and continue along the Ala Wai Canal to the area of Ala Wai Elementary School. The route would then continue overland via underground cables along Kamoku Street and into the Kamoku Substation at Date Street (see Figure 5). The approximate cost of this alternative is about \$42.9 million (see Table 7).

There are two types of underwater transmission systems that could be used. One system would be similar to the underground system that transmits electric power as alternating current (AC), except that a combination of underground and submarine cables would be used, and the other type system would transmit the electric power as direct current (DC). The AC underground cable system would utilize high pressure oil pipe-type cables similar to that described in Alternatives II-H and III-A as well as later in this section.

The AC submarine cable system would consist of seven single conductor (three single conductors per circuit plus one spare), high pressure oil filled cables. Along the coastline, the two circuits and the spare cable would be separated as far away from each other as feasible in order to preclude damage to both circuits by one event. For most of the route, cables will be installed in trenches to protect the cables from physical damage. Oil pumping stations would be required at both ends of the underwater route.

The DC submarine system would employ specially designed cables for underwater installation. The AC current from the Iwilei Substation,

however, would have to be converted from AC to DC for transmission and then inverted from DC to AC before feeding the Kamoku Substation. This would necessitate installation of rectifier and inverter equipment, which are higher maintenance items. Consequently, HECO prefers the AC underwater transmission system to the DC system.

Locally, there is no expertise and equipment to install undersea power cables. A special ship is required to lay the cable without kinking, twisting, etc. In addition, repair of the cable would present a problem if no equipment is available locally. The principal advantage of the underwater route is the minimization of impacts on land areas, as compared to other alternatives. The major disadvantages are (1) very high cost, (2) very difficult maintenance and long probable outage periods in case of failure, and (3) detrimental ocean environmental effects due to trenching requirements.

#### CATEGORY IV (SEPARATE POWER PLANT)

It has been suggested that another power plant could be constructed, possibly within Diamond Head crater, to supply power to the Kamoku Substation service area. Such an arrangement would eliminate the need for a connection to the Halawa and Koolau substations but would be likely to result in more negative impacts than can be attributed to the lines preferred by HECO.

A conventional power plant requires a steady fuel supply and a considerable amount of cooling water. Supplying the fuel would require a delivery system, probably from the processing facilities at Campbell Industrial Park at Barbers Point. That delivery system would be a pipeline, which would cause almost as much concern as an underground high voltage transmission system, or a fleet of tank trucks, which would be of justifiable concern to people along the delivery route. The cooling water for the power plant would have to be sea water since fresh water is in limited supply. Finding an acceptable location for the intake and outlet facilities for the cooling water system along the Waikiki or Diamond Head shoreline would be almost impossible.

Because of the difficulties with cooling water, air cooled diesel generators would be more appropriate for a power plant inside Diamond Head

crater. Fuel supply lines or tank trucks would still be required. Redundancy of generators would also be necessary to bring such a system to an acceptable level of reliability since no backup connections with the general 138 KV system on Oahu would exist. Other problems related to this alternative are possible air quality effects in an already stressed area, and high costs. In any case, present regulations would not permit the construction of a power plant in Diamond Head.

The principal advantage of a separate power plant is the elimination of the need for new power supply lines from Halawa. The major disadvantages are (1) high cost, (2) dangerous conditions due to urban area fuel supply system, (3) possible disruption due to cooling water supply system, (4) lack of backup possibilities from the rest of the system in case of failure, (5) detrimental air quality effects, and (6) legal restrictions on such construction.

#### DESCRIPTION OF CONSTRUCTION OF THE 138 KV TRANSMISSION LINES

The construction of overhead 138 KV transmission lines basically consists of the following components: (1) pole foundation construction, (2) pole installation, and (3) line stringing.

Two distinct types of construction methods will be used, depending upon whether construction is taking place in an urban area or in a conservation district. For construction within conservation districts, the restrictions imposed by the DLNR will limit access in the rough terrain and will therefore require extensive use of helicopters. Construction costs and times for 138 KV lines within conservation districts are known to be considerably greater than those for construction in urban areas. Conventional construction methods and heavy rolling equipment would be used in urban areas.

#### Construction of 138 KV Lines in Urban Areas

After necessary soil tests, construction of the 138 KV lines would begin with the digging of holes for the pole foundations. Three work crews would be required for this phase along with two mechanical augers, several dump trucks, and a backhoe. In general, five holes, at varying degrees of work completion, would be open at any given time. The size of

each hole would vary according to the load imposed by the pole and with the type of soil. If necessary, a soils consultant would issue a report for each hole. In general, the diameter of the holes would range from 4 to 9 feet and the depth may vary from 12 to 29 feet. A typical pole foundation is shown on Figure 6. Two augers would be actively digging holes. Workmen ahead of the augers would be using hand-held tools, such as picks, shovels, and possibly pneumatic drills, to probe the first few feet of the hole so that buried utility lines would not be damaged when heavy pieces of equipment are used to dig the holes. Workmen behind the augers would be preparing the holes for the concrete pouring of the pole foundations by installing the required steel reinforcement bars. The time needed to dig a hole varies from one to ten days, depending on the type of ground encountered. During nonwork periods, wooden bridges would be placed over any open holes to ensure safety for pedestrians. Flashing lights and barricades would also be positioned to warn motorists.

Anchor bolts, which are used to hold the poles in position, are approximately 2 inches in diameter and approximately 8 feet long. The number of anchor bolts required for each pole ranges from 4 to 36, depending primarily on the pole size and stresses on the pole. Concrete, averaging about 20 cubic yards for each pole footing, would be poured into the hole. The concrete is left to cure for 28 days.

The second step of construction is installing the steel poles. Each of the poles is custom designed for each location. Generally, each pole comes in three to five segments. In nonresidential areas (e.g., business districts) where driveways are few, the pole segments would be laid along the curbs of the streets outside of the active roadway area prior to pole assembly and installation. In residential areas the poles would be assembled in marshalling areas.

After the segments of the pole have been assembled, the pole is brought to the pole site. If the pole comes from a marshalling area, an 18-ton crane is used to unload it from the truck. After the attachment of the pole arms and associated hardware, a 70-ton crane is used to lift the pole so that the holes in the base plate of the pole slide over the bolts, which are then attached with appropriate nuts. The air space between the base plate and the ground is grouted with cement.

Stringing of the transmission wires is done for a series of poles that lie on a straight line. The end poles of the series are each anchored by at least two guy wires to balance the opposing forces due to wire tension. The following sequence is then followed to complete the stringing process. The arms attached to the poles would have rollers attached to them. A 3/4-inch diameter nylon rope is passed from the rollers of one pole to the next along the straight section. The nylon rope is, in turn, used to pull the 1-1/2 inch diameter conductor (wire) through the rollers. The cable comes in 10,000 pound reels of about 6,700-foot length. For pulling distances longer than 6,700 feet, conductors are spliced together.

After the conductors have been installed loosely, they are pulled to a tension of 8,000 pounds. The rollers are removed and the conductors held in place by clamps. The end poles have a special method of attachment. The two wires that meet the dead-end poles are held by compression attachments and the conductor is connected from one alignment to another without tension.

Restoration of the disturbed area around the pole bases is usually done simultaneously with stringing. This includes backfilling holes, planting grass, and generally returning the area as close as possible to its original condition.

#### Construction of 138 KV Lines in Conservation Areas

Construction methods within conservation areas would rely primarily on manual labor and extensive use of helicopters. Use of heavy equipment in these areas is not feasible because of inaccessibility due to rough terrain and limitations on access by the DLNR as conditions of the use permits. The heaviest equipment used may be pneumatic drills or small backhoes that would be flown in by helicopter.

The size of holes for pole footings dug would range from 4 to 9 feet in diameter and the diameter of the working area cleared may be in the range of 40 to 50 feet, depending on the conditions at the site. The depth of the pole footing holes will vary and depend upon soil type and support requirements.

Concrete for the pole footing would be carried by helicopters from various staging areas to the pole site. The type of helicopter used would

be capable of carrying a maximum of 3,500 pounds. Thus, to transport the approximately 20 cubic yards of concrete required per pole footing, a helicopter would have to make at least 23 trips. At an operating cost of about \$1,000 per hour, the use of helicopters in the above manner would be expensive. Helicopters would also be used to transport work crews to and from the construction site.

The poles to be used would be transported to the pole site in segments by helicopters. A helicopter would also be used as a crane during the pole erection stage. In addition to being bolted to the footing, each pole will be supported by guy wires where applicable. Stringing of the wires would be accomplished by using a thin diameter nylon rope to pull a light, 3/4-inch diameter wire that will be carried by a helicopter. This, however, necessitates using six wires per circuit rather than three larger size wires. Smaller diameter wires are used in conservation areas to reduce the loads on the steel poles or structures since the total tension for two smaller conductors is much less than for the single large conductor. This is partly because longer spans are used in conservation areas and partly because there would be less stress on the pole in case of line failure, which has historically occurred more often in conservation areas than in urban areas presumably because of better accessibility and maintenance in urban areas.

In addition to steel poles, steel tower structures similar in appearance to those located in Aiea State Park would be required for a 138 KV line through conservation areas. Each structure would require ten foundations, each foundation being approximately 4 feet in diameter and 15 to 20 feet deep. The structures would be constructed from "I" beam pieces flown in by helicopter, and the shape of the tower would be in an "A" frame. The height would be approximately 60 feet and the base legs approximately 30 feet apart.

Restoration would be done to return disturbed areas to as near original conditions as possible. Excavated soil would be backfilled and disposed nearby or, when necessary, flown out of the construction site for disposal. Appropriate grass would be planted to cover bare soil areas for soil erosion control.

## DESCRIPTION OF CONSTRUCTION OF 138 KV UNDERGROUND TRANSMISSION LINES

Construction of high voltage underground transmission lines in urban areas poses many different problems than construction of underground low voltage distribution systems (typically, 120 to 12,000 V). In low voltage underground distribution systems, cables are buried directly in the ground or installed in concrete encased plastic ducts. The trench width is typically 2 to 3 feet. This makes underground distribution relatively simple from a construction point of view. It is still more expensive, however, than an equivalent overhead line.

At the higher transmission voltages (138 to 500 KV), different cable and construction methods are utilized. This is mainly due to the higher electrical stresses, insulation requirements, heat generated by the cables, induction between the cables, and the need for greater reliability.

The modern pipe-type cable is the predominant system for high voltage, underground electrical transmission in the United States. Almost all high voltage underground circuits are pipe-type systems. The reasons for its predominance are its mechanical integrity and ruggedness, exceptionally high electric strength, and proven reliability. The pipe-type system is comprised of paper-insulated, oil-impregnated conductors installed in a steel pipe. The steel pipe is then filled with high quality degasified oil and pressurized.

The pipe-type system is different from the normal distribution underground system. The steel pipe that is used is a specially fabricated quality product. It is coated internally with a hard, smooth epoxy finish and externally protected against corrosion by an overall protective covering. Sections of this steel pipe are installed in the trench and are welded together. The weld and external coating must be intact. Standardized methods and procedures have been developed for all portions of the work, including welding, radiographic weld inspection, coating weld areas, etc. Sections of pipe are then pressure tested and prepared for cable installation by initial vacuum drying, purging, and pressurization.

In order to provide a good thermal environment, special backfill material may have to be used. This is determined by soil testing prior to construction.

After the pipe sections between manholes are completed, the hermetically sealed reels are moved to the job site. The cables are then pulled into the pipe with special pulling winches with features so that the maximum pulling tension that the cable can withstand is not exceeded. Splicing must take place in special environmentally controlled enclosures.

Upon completion of the installation of cables and terminations, the system is tested to be sure that there are no traces of moisture or gas. The oil is then pumped into the pipe while the system is maintained under vacuum.

To maintain the high electrical strength under all voltage and thermal effects, it is essential that the cable pipes be maintained under pressure at all times. To accomplish this, an oil pumping station is needed to monitor the pressure and pump in additional oil as required. Oil storage tanks are needed and the system must have controls, alarms, and backup components to assure system integrity and reliability. The oil may have to be force cooled with heat exchangers and associated equipment. These facilities require a certain amount of land that must be obtained at various points along the route of the line.

The pipe-type system is much more costly than an equivalent overhead line because of the special materials, products, and installation practices that are utilized as well as due to the long construction time and the probable need to relocate some of the existing underground utilities.

Gas filled pipe-type cable systems are also available. The use of oil is preferred, however, because of inherent electrical and thermal advantages.

In addition to the cost, there are other disadvantages to underground transmission. Because the pipes have to be separated to provide a good thermal environment, the trench for the pipes would be fairly wide. Two 138 KV circuits would require five pipes (one standby) and a trench width of approximately 16 feet. During construction on city streets, traffic would be congested because about one and one-half lanes would be occupied by the trench and excavating material. Considering the long construction time, the inconvenience to the public would be substantial.

Because of the trench width, many existing utility facilities such as gas, water, sewer, and drain lines and telephone cables would be disturbed. As the steel pipe is relatively inflexible, many of these utilities may have to be relocated. This would not only add to the cost of the project but also inconvenience the homeowner should services be interrupted during construction.

Dust and noise would also affect residents in the area of construction. As the construction time would be longer compared to a steel pole foundation, the homeowner would have to contend with the dust and noise along with the traffic problems.

Underground transmission has been used by some utilities as a means of transmitting bulk power where no other alternatives were available. It is not an attractive alternative compared to overhead transmission lines. HECO is following the development of different cable types, methods, and the "state of the art" in underground transmission. Of particular interest is the solid dielectric cable that could solve many of the problems associated with pipe-type cables. At present, it has not proved to be reliable at higher voltages due to breakdowns in the insulation material and difficulties in splicing. Perfection of the manufacturing process does not appear to be forthcoming within the time required for the Kamoku line.

#### CONSTRUCTION PHASING AND TIMING

Until the firm selection of the actual route or routes for the proposed 138 KV transmission lines, a detailed construction schedule cannot be made. If the selected alternative is an overhead system following the leeward Koolau route from the Halawa Substation to the Pukele Substation area and down to the Kamoku Substation via two routes of Category II, then a general estimate can be made.

After at least one year for the design and delivery of the steel poles from the mainland, the construction would proceed simultaneously at several points along the selected routes. The general sequence of construction would start with the placement of pole foundations, proceed to the assembly and erection of the poles, and finish with the stringing of the conductors. The entire construction period is expected to be about

30 months, of which approximately the last 10 months would be stringing conductors in the conservation area. If an underground alternative is selected for the urban area, the construction period is expected to be considerably longer.

It should be noted that it will be very difficult to complete the proposed project by late 1981 when the single failure analysis projected an impending overload of the Pukele system in the event of the failure of a major component during peak demand. A partial reason for the delay in beginning the construction phase of the project is the extended route selection and approval process of which this EIS is a part.

## ENVIRONMENTAL SETTING

The proposed project area can be divided into the general categories of conservation area and urban area. The approach taken to present the environmental setting is to describe the natural environment of the conservation areas traversed by the 138 KV lines and then describe the urban areas related to the project with emphasis on their socio-economic characteristics. Sites of historical or archaeological significance within the project affected areas are also presented. In describing the conservation areas, emphasis is placed on the leeward Koolau route because it has fewer drawbacks than the trans-Koolau route and consequently was studied in greater detail. This difference is not considered critical since the same mitigating measures would be applicable to both routes.

### CONSERVATION AREAS

The conservation areas traversed by the proposed 138 KV lines are located on the leeward slopes of the Koolau Mountain range on the northern outskirts of Honolulu. These areas are generally characterized by forested sloping land interspersed with numerous deep valleys. These areas contain various archaeological sites and are a habitat for several varieties of birds and a few types of mammals.

Preliminary investigations of the archaeology and flora and fauna in these areas were performed by specialists in these fields. Summaries of their findings are included in this section after a general overview of the climate and the soil characteristics. Full reports by these specialists are included as appendices to this EIS.

### Climate

The conservation areas in the vicinity of the project area have an average annual rainfall of about 80 inches and average monthly temperature ranging between about 68 and 75°F. The lower elevation urban areas have average annual rainfalls that range from about 20 to 50 inches per year, with an average monthly temperature range of 72 to 81°F. The lower temperatures and higher rainfall in the higher elevations support a more diverse ecosystem, including native trees and some native birds.

Like for the rest of Oahu, the prevailing winds throughout the year are the northeast trades, which are more persistent in summer than in winter and stronger in the afternoon than at night. The wind climate for both the conservation and urban areas can be approximated by data obtained from Honolulu Airport. About 64 percent of the time the wind comes from between northeast and due east with an average speed of about 12 mph. The predominant direction, which is east-northeast, prevails about 31 percent of the time, while about 4.5 percent of the time there are calm conditions with wind speeds less than 3 mph. Between October and April, there is an increased probability of significant storms caused by Kona weather. Very high wind speeds (i.e., hurricanes) are very rare in Hawaii, but can occur. Consequently, the designs of the proposed powerline, poles, and pole foundations have to take into account the effects of high wind loading and wet weather effects on the soil.

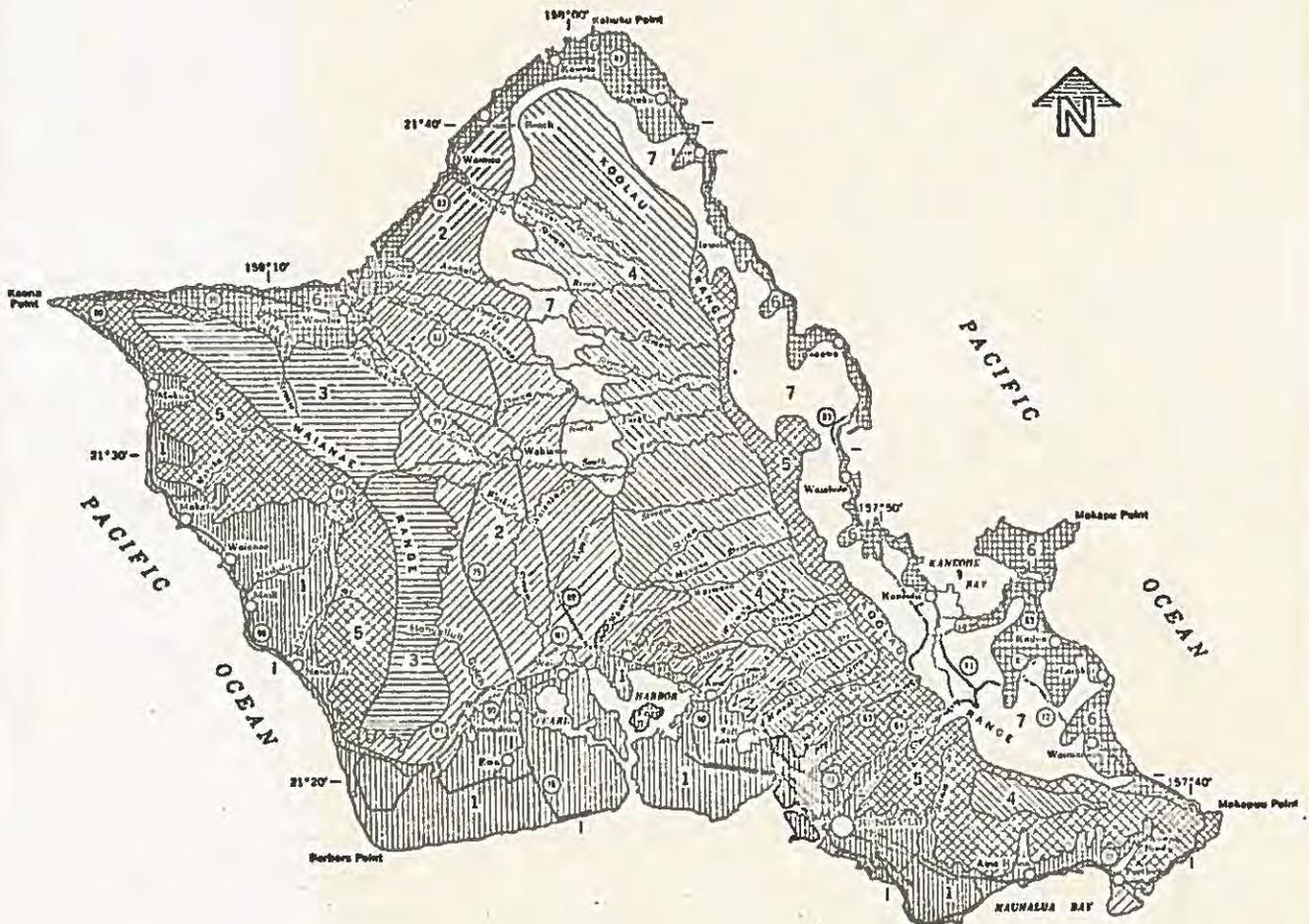
The various soil types on Oahu are shown on Figure 10. The soil associations traversed by the 138 KV lines include Helemano-Wahiawa, Kapaa, stony steep land, and Lolekaa-Waikane.

Of greatest concern are the areas near streams (e.g., Palolo and Manoa streams), which have proved to be difficult places for proper pole foundations. Additionally, potential and historical slide and creep areas, such as some areas in Palolo Valley, may cause problems with pole foundations or underground systems.

### Flora

Aerial photo-interpretation and field surveys, conducted by Environmental Impact Study Corp., revealed that approximately 70 percent of the proposed 138 KV leeward Koolau alignment will pass through previously disturbed areas. Four major vegetation zones (see Figure 11) were recorded along the route from Halawa Valley to Palolo Valley. The following are brief descriptions of these zones:

Scrub. The canopy vegetation in this zone consists largely of introduced species such as Christmas berry (Schinus terebinthifolius), guava (Psidium guajava), strawberry guava (P. cattleianum f. cattleianum) and kao-haole (Leucaena leucocephala). The height and density of the canopy



**SOIL ASSOCIATIONS**

- 
 Luaualei-Fill land-Ewa association: Deep, nearly level to moderately sloping, well-drained soils that have a fine textured or moderately fine textured subsoil or underlying material, and areas of fill land, on coastal plains
- 
 Helemano-Wahiawa association: Deep, nearly level to moderately sloping, well-drained soils that have a fine-textured subsoil; on uplands
- 
 Tropohumults-Dystrandents association: Gently sloping to very steep, well-drained soils that are underlain by soft weathered rock, volcanic ash, or colluvium; on narrow ridges and side slopes
- 
 Rough mountainous land-Kapaa association: Very steep land broken by numerous drainageways and deep, well-drained soils that have a fine textured or moderately fine textured subsoil; in gulches and on narrow ridges
- 
 Rock land-Stony steep land association: Steep to precipitous, well-drained to excessively drained, rocky and stony land
- 
 Kaena-Waiialua association: Deep, mainly nearly level and gently sloping, poorly drained to excessively drained soils that have a fine-textured to coarse-textured subsoil or underlying material; on coastal plains and talus slopes and in drainageways
- 
 Lolekaa-Waikane association: Deep, nearly level to very steep, well-drained soils that have a dominantly fine-textured subsoil; on fans, terraces, and uplands

**FIGURE 10**

**SOIL MAP OF OAHU**



LEGEND 8

- ARCHAEOLOGICAL SITE
- VEGETATION ZONES
-  SCRUB
-  SAVANNAH
-  FORESTRY PLANTINGS
-  OHIA - KOA
-  RESIDENTIAL
-  1-8 STUDY SITE ( APPROXIMATE )

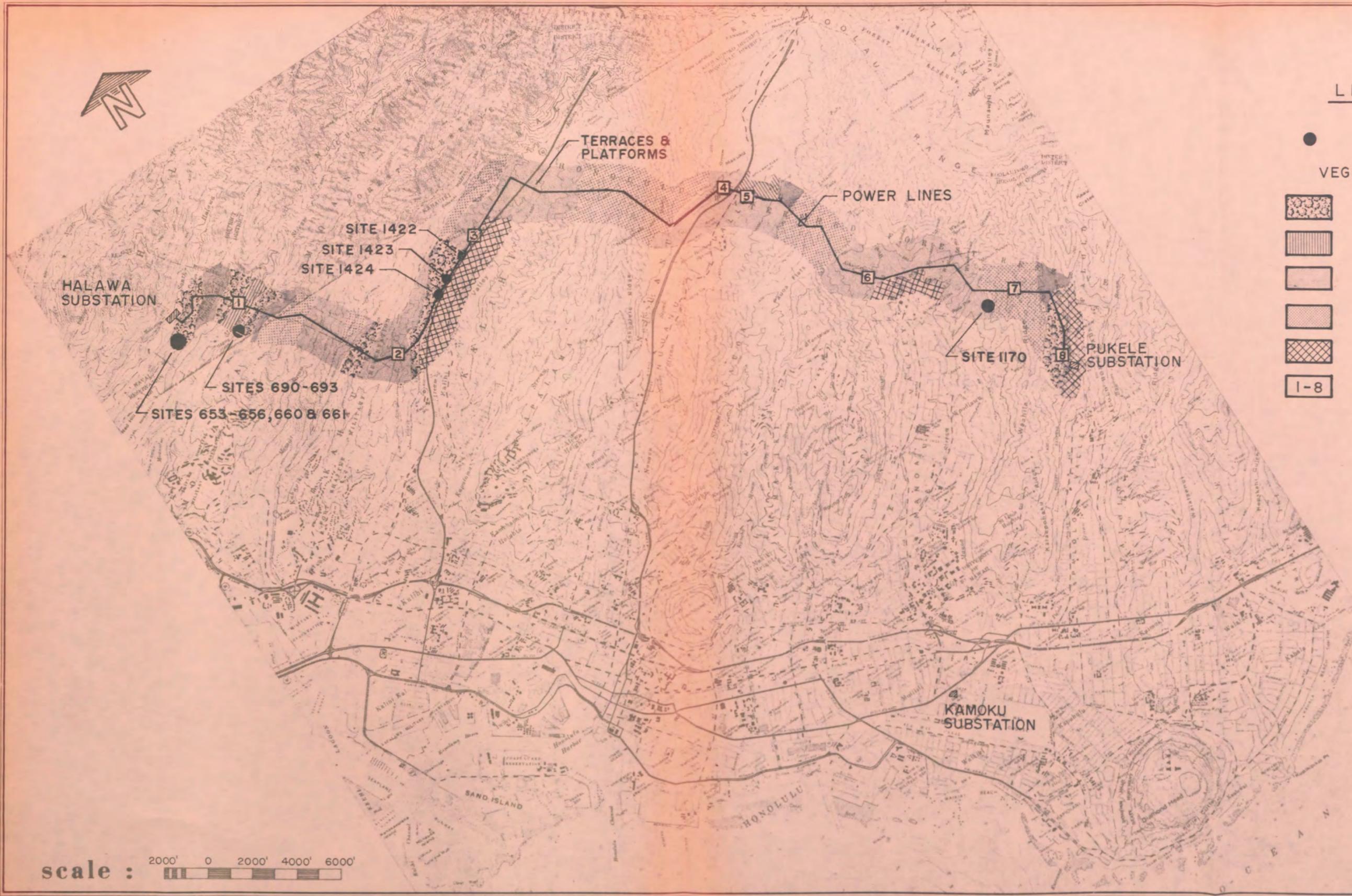
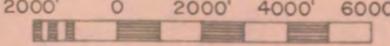


FIGURE 11  
ARCHEOLOGICAL SITES AND  
VEGETATION ZONES ALONG  
THE HALAWA-PUKELE  
138 KV ROUTE

scale : 

vegetation varies according to moisture and exposure factors. Groundcover consists primarily of exotic species. Groundcover density is inversely proportional to the density of the canopy cover.

Savannah. This zone is characterized by an open grassland with scattered trees and shrubs. Grass species include Themeda gigantea and broomsedge (Andropogon virginicus). The trees consist of a number of exotic species such as Java plum (Eugenia cuminii), guava, and Eucalyptus. Native koa (Acacia koa) trees are found occasionally. Areas along streams have trees and shrubs with a more closed canopy. Characteristic species include hau (Hibiscus tiliaceus), koa, kukui (Aleurites moluccana), and guava.

Forestry Plantings. Forestry plantings, much of which were planted in the 1920s and 1930s, were used to increase forest cover on the watershed areas and to control erosion. The plantings frequently consist of blocks composed of a single species. Eucalyptus robusta, paper bark (Melaleuca leucadendra), Norfolk Island pine (Araucaria heterophylla), fiddlewood (Citharexylum spinosum), Albizia, and black wattle (Acacia decurrens) are characteristic forestry species.

'Ohia-koa Forest. The 'ohia-koa forest is a transition area between the koa forests of the lower elevations and the 'ohia (Metrosideros collina ssp. polymorpha) forests of the upper elevations.

A number of native trees such as 'ahakea (Bobea elatior), Psychotria, 'ohia-ha (Eugenia sandwicensis), kalia (Elaeocarpus bifidus), kawa'u (Ilex anomala) and kolea-lau-nui (Myrsine lessertiana) and shrubs of many native genera such as Hedyotis, Clermontia, Cyanea, Cibotium, Coprosma, and Broussaisia are found here. Vines such as 'ie 'ie (Freycinetia arborea), malle (Alyxia olivaeformis), and hoi kuahiwi (Smilax sandwicensis) can be found at the base and trunks of trees. Uluhe (Dicranopteris linearis), with scattered trees intermixed, covers much of the steeper slopes in this vegetation zone.

### Birds

The survey summarized herein was conducted by Dr. Andrew Berger during June 1977, which is toward the end of the nesting season for some

species. Such species may have been missed as they tend to be very quiet after the mating season. Birds whose mating season continued throughout the summer were conspicuous as they continued to sing. The timing of this survey allowed for the maximum opportunity to observe the birds.

In the general description of bird life in this section, it should be remembered that there is a strong correlation between the type of vegetation at a given location and the presence of the species of birds in the same location. The dominant vegetation from the HECO Substation in south Halawa Valley to the substation in Palolo Valley consists of a very large number of introduced plants that were brought to Hawaii from many continents. Although it has been estimated that about 30 percent of the plants along the corridor consists of endemic species, these occur in small and scattered patches that represent merely a remnant of the original native ecosystem. Nowhere is there a semblance of a native ecosystem; the native plants are interspersed with many introduced plant species. Judging from the available literature, it seems that most of these native ecosystems were destroyed--primarily by introduced grazing animals--at least 100 years ago. There is no possible way to restore those native ecosystems. The vast majority of the endemic forest birds (the Elapaio being the only exception) have not been able to adapt to such drastic changes in the native ecosystems; therefore, very few native birds are found in the areas under consideration.

The following is a brief summary of birdlife found in the areas that would be traversed by the leeward Koolau route. A summary of the species found in each area is presented in Table 8, and a complete text of a birdlife and mammal survey done in these areas is in Appendix B.

Halawa Valley. Because the native forest in this area was destroyed over 100 years ago, almost all birds found at the lower elevations are introduced species. Fourteen species of introduced birds were sighted in elevations up to 450 feet. Three endemic species of birds, none of which are classified as endangered, were sighted in Halawa Valley, generally above the 450-foot level.

Moanalua Valley. Of the 16 species of birds identified in Moanalua Valley, 13 were exotic species that were introduced to Hawaii. The

TABLE 8

BIRDLIFE ALONG THE PROPOSED 138 KV LINES

	Halawa Substation	Moanalua Valley	Tripler Area	Ft. Shafter Area	Likelike Highway	Pali Highway	Manoa Valley*	Palolo Valley	Kamoku Substation
Pigeon	-	-	-	-	-	-	-	+	+
Spotted Dove	+	+	+	+	+	+	+	+	+
Barred Dove	+	+	+	+	+	+	+	+	+
Barn Owl	+	+	+	?	+	+	+	?	-
Melodious Lauhing-thrush	-	-	?	?	-	-	-	?	-
Red-whiskered Bulbul	+	-	-	-	-	-	+	-	-
Red-vented Bulbul	+	+	+	+	-	-	+	+	-
Mockingbird	-	-	+	-	-	-	-	-	-
Shama	+	+	+	+	+	+	+	+	-
Japanese Bush Warbler	+	+	+	+	+	+	+	+	-
Japanese White-eye	+	+	+	+	+	+	+	+	+
Common Myna	+	+	+	+	+	+	+	+	+
Hill Myna	-	-	-	-	-	-	+	-	-
Spotted Munia	+	+	+	+	+	+	+	+	-
Java Sparrow	-	-	-	-	-	-	+	?	+
House Sparrow	+	+	+	+	+	+	+	+	+
Red-crested Cardinal	+	+	+	+	-	+	+	+	+
Cardinal	+	+	+	+	+	+	+	+	+
House Finch	+	+	+	+	+	+	+	+	+
Elepaio	-	+	-	-	-	-	+	-	-
Amakihi	-	+	-	-	-	-	+	-	-

+ = present; - = not observed; ? = may occur at higher elevation; \* = upper Manoa Valley only

Apapane was seen or heard at elevations greater than 1,000 feet and the Amakihi at elevations about 560 feet. The elepaio occurs at elevations as low as 255 feet.

Region Mauka of Tripler Hospital and Fort Shafter. The region mauka of both Tripler Hospital and Fort Shafter is covered primarily by introduced vegetation.

One species of introduced bird found only in the Tripler area and no where else along the route is the mockingbird (Mimus polyglottos). The mockingbird is a very common species in some areas of Oahu but its distribution is spotty. It is found in residential areas (Red Hill and Tripler Hospital grounds) where mesquite is the dominant plant.

The following introduced species also inhabit this area: Spotted Dove, Barred Dove, Japanese Bush Warbler, Japanese White-eye, Shama, Myna, Red-vested Bulbul, House Sparrow, Red-crested Cardinal, Cardinal, and House Finch.

Likeliike Highway (Elevation 700 to 800 feet). Only a few species of introduced birds find suitable habitat in the luxuriant vegetation. The most common species are the Japanese Bush Warbler, Japanese White-eye, Shama, and Cardinal. The Elepaio and the Amakihi occur at high elevations.

The Pali Highway (Elevation 1,000 feet). The same bird species found adjacent to the Likeliike Highway are found in this general area.

Manoa Valley (Elevation between 500 and 600 feet). A large number of exotic trees, shrubs, and vines characterize this wet area and only a few species of birds are tolerant enough to adapt to these different habitats. Depending upon the nature of the vegetation, the following birds are found in upper Manoa Valley: Spotted Dove, Barred Dove, Barn Owl, Shama, Japanese Bush Warbler, Japanese White-eye, Myna, Spotted Munia, House Sparrow, Red-vested Cardinal, and House Finch. The Elepaio occurs regularly at elevations as low as the proposed power line.

Waahila Ridge (Elevation 1,000 to 1,300 feet). This open forest provides poor habitat for most species of birds. Birds seen in this area are the Spotted Dove, Barred Dove, White-eye, House Finch, and Amakihi.

Palolo Valley. In the area of the Pukele Substation at the end of Myrtle Street, the common introduced species found in residential areas were found.

#### Mammals

The Hawaiian Bat (Lasiurus cinereus semotus) is probably the only indigenous land mammal in the State of Hawaii but is not located in the project area. All the other animals are introduced species. Introduced species found in parts of the project area are the Bush-tailed Rack Wallaby (Petrogale penicillata), Black Rat (Rattus rattus), Hawaiian Rat (Rattus exulans), House Mouse (Mus musculus), Small Indian Mongoose (Herpestes auropunctatus), and pig (Sus scrofa).

#### Archaeological Evaluation

Fourteen sites of historic or archaeological interest are known to be located in the vicinity of the proposed 138 KV leeward Koolau route. Six of these are in south Halawa Valley, four in Moanalua Valley, three in Kalihi Valley, and one in Manoa Valley. Three of these sites, those in Kalihi Valley, were found during the course of archaeological fieldwork performed by Chiniago Inc. for M&E Pacific, Inc. The remainder are previously-known sites, the information concerning which is on file at the State Historic Preservation Office and in publications of Bernice P. Bishop Museum. A summary of the archaeological sites is provided below and on Figure 11.

1. 50-80-654 - This is an agricultural terrace measuring 5 by 10 meters and standing to a height of 30 centimeters.
2. 5080-10-655 - This is a clearing on a talus slope measuring about 1.2 meters in diameter. It was probably a small garden plot.
3. 50-80-10-656 - This is a possible house platform measuring 1.7 by 3.1 meters and standing to a height of 60 centimeters.
4. 50-80-10-660 - This site consists of terrace retaining walls covering an area measuring 5 by 7 meters.
5. 50-80-10-661 - This is a mound, possibly a grave, measuring 2.2 by 2.2 meters and standing 80 centimeters high.

Moanalua Valley. Moanalua Valley was not surveyed because of the existence of Ayres' published report indicating the presence of four historic sites in the vicinity of the proposed power line right-of-way:

"Site A7-75 is a cluster--a small frame house and two sheds--below the large rock-and-cement foundation of the one-time home of Douglas Damon (Site A7-76). Site A7-77 is a small foundation made of cut-lava blocks and cement. Site A7-78 is a small wood and corrugated-tin shed" (Ayres 1970: 14-15).

Sites A7-75 through A7-78 correspond to the State Historic Preservation Office site numbers 50-80-10-690 through 693.

Kalihi Valley. The existing 46 KV line was traced on the north side of the valley from the point where it ascends the cliffs to the west to a point below the bridge across Likelike Highway, and the approximate location of the proposed 138 KV line was searched on the south side of the valley. Both of these areas demonstrated the presence of some archaeological remains.

Because there is a possibility of disturbing archaeological sites or endangered species, more detailed surveys of each pole site will be conducted prior to construction once the final selection of the actual route has been made.

#### URBAN ENVIRONMENTAL SETTING

The urban areas through which the proposed 138 KV lines would pass in the Category II alternative routes are predominantly residential homes in mature neighborhoods. Lower voltage power lines attached to wooden poles are presently visible throughout these neighborhoods. These poles are generally 60 to 65 feet high. Near the top of some of these poles are 46 KV lines. At about 36 feet above ground level are 12 KV lines and at about 30 feet are found 120/240 V lines. The lowest level, which stands about 20 feet above ground level, is for telephone cables and wires. The wooden poles, which are dark brown in color, are about a foot in diameter and the distance between adjacent poles is about 150 feet. There are some connecting wires over the streets and some poles carry transformers.

## Housing Characteristics

Homes in the urban areas traversed by the alternative routes were generally built before 1960. In Palolo Valley, the houses tend to be older as one travels toward Waiialae Avenue. Many of these houses have been remodelled since the time they were built. Typically, the living areas of the houses are small, generally less than 1,200 square feet, and the lot sizes, except for the larger ones close by the valley sides, are generally about 5,000 square feet.

In upper Palolo Valley, where the houses were generally built around 1950, the lot sizes by the hillsides are large while those located in level areas are approximately 5,000 square feet. The typical dwelling area of these homes is generally about 1,100 square feet with a garage area of 350 square feet.

The homes located in the middle of the valley were built around the mid-1940s. As in upper Palolo, there is a certain variation in lot size but typically the lots are about 6,000 square feet. The dwelling areas of the houses are about 900 square feet plus another 280 square feet for a carport.

The houses in lower Palolo are generally the oldest in Palolo Valley. Many of these homes were built before 1940 and many of them have been remodelled, generally after 1950. The houses are typically more than 1,100 square feet in area plus another 280 square feet for a carport.

The houses between Palolo Valley and the Date Street area, as exemplified by those in the Mooheau Avenue area, are typically old, having been built before 1940. Some of these houses are two storied and, like the homes in lower Palolo, many have been remodelled. The lots are typically 5,000 square feet and the living area is about 1,100 square feet with a carport of 350 square feet.

The Kamoku-Date Street area has a predominance of low rise (3 stories) walk-up apartment buildings generally built around the time of statehood. There has recently been an increase in high-rise, apartment-condominium buildings characteristic of high density and high value land.

### Noise Factor

A noise level survey, taken by Dr. Iwao Miyabe in 1974 for the Hawaii State Health Department and summarized in the 1977, "The State of Hawaii Data Book," was designed to establish the existing and residual noise levels of various Hawaii communities. Noise readings were taken away from all heavily used roads and freeways and loud, identifiable noise from other sources was also measured. Table 9 shows comparative values for neighborhoods within the proposed project area.

It should be remembered that decibels are logarithmic values. In general, each 10 decibel increase seems subjectively twice as loud to the human ear. To provide a useful frame of reference for the numbers displayed in Table 9, the following noise level examples can be used. A man's voice 3 feet away is rated at 70 decibels, an air conditioning unit 20 feet away is rated at 60 decibels, light traffic 50 feet away is rated at 50 decibels, and a very quiet office is rated at 40 decibels.

TABLE 9  
REPRESENTATIVE NOISE LEVELS

Neighborhood	Noise Level (Decibels) Exceeded		
	10% of Time	50% of Time	90% of Time
Aina Haina (quietest)	53.5	45.0	40.0
Kaimuki	59.0	50.7	44.0
Kapahulu	55.0	49.7	44.0
Manoa	58.7	45.3	40.0
Moiliili	62.0	55.0	50.0
Palolo	58.5	49.4	44.0
Waikiki (very loud)	69.0	61.5	54.0

### Socio-Economic Characteristics

The urban part of the project area can generally be described as being bounded by the Pacific Ocean to the south, Waialae Nui to the east, north to the upper ends of Manoa and Palolo Valleys and Piikoi Street on the west. This area can also be considered to consist of all or part of

these census districts: Diamond Head-Aina Haina, Kaimuki-Kapahulu, Wilhelmina-Palolo, Manoa-Makiki, Moiliili-Makiki, and Waikiki. Census tracts include tracts 4 to 37.

The various proposed urban alignments of the 138 KV lines from the Pukele area to the Kamoku Substation traverse the Palolo area (census tracts 10, 11, and 12), the St. Louis Heights area (census tract 28), the west Kaimuki area (census tracts 13 and 15), the Manoa area (census tracts 29, 30, and 31), the lower Manoa area (census tract 27), and the Date Street-Moiliili area (census tracts 21, 22, 23, and 26). The following discussion is based on data from the 1977 State of Hawaii Data Book as shown in Table 10.

Some observations pertinent to the proposed project can be made regarding the population and housing characteristics in those areas included in Table 10 that would potentially be directly affected by the urban portion of the proposed 138 KV lines. The principal observation is that, from 1970 to 1976, the Palolo, Manoa, St. Louis Heights, and west Kaimuki areas have generally experienced a slight decrease in population with a slight increase in housing units, while the areas makai of these older sections, including the Moiliili area (as well as the Waikiki area and Oahu in general), have increased substantially in both population and housing density. These increases are primarily the result of the building of high-rise hotel, apartment, and condominium units in the lower flat areas. Since such building projects are continuing in the general Pukele Substation service area and are likely to continue in the foreseeable future, it is equally likely that the household related demand for electrical power will continue to increase.

Even though some of the housing areas in the present Pukele service area are not themselves significantly increasing their demands for electrical power, they are "in the same boat" with those areas that are growing and consequently would be equally adversely impacted if no additional capacity is provided for the entire area. In providing that capacity, the people living in the nongrowing areas have argued that consideration be given not only to minimizing the overall economic and environmental impacts of the relief project to the Pukele Substation

TABLE 10

POPULATION AND HOUSING DENSITY CHARACTERISTICS\*  
FOR CATEGORY II ALTERNATIVE LOCATIONS

General Area	1960 Census Tract Numbers	Land Area (Acres)	Resident Population April 1 1970	Resident Population July 1 1976	Persons Per Acre 1976	Employment in Area 1974	Housing Units April 1 1970	Housing Units July 1 1976
Palolo	10	1,951	3,650	3,406	1.7	-	894	899
	11	190	4,586	4,421	23.3	206	1,023	1,063
	12	280	7,888	7,514	26.8	720	2,148	2,177
West Kaimuki	13	231	5,146	4,856	21.0	1,131	1,589	1,586
	15	139	4,345	4,596	33.1	412	1,261	1,400
Dole Street Moiliili	21	300	3,347	4,066	13.6	926	1,211	1,513
	22	152	3,796	6,493	42.7	618	1,493	2,752
	23	89	4,195	5,134	57.7	463	1,654	2,256
	26	164	5,163	5,729	34.9	2,882	1,815	2,234
Lower Manoa	27	625	8,714	7,546	12.1	5,609	2,491	2,851
St. Louis Heights	28	624	4,316	3,828	6.1	412	1,161	1,166
	29	259	1,591	1,663	6.4	206	394	415
Manoa	30	410	4,966	4,938	12.0	618	1,561	1,634
	31	2,275	8,433	8,374	3.7	515	2,179	2,277
Honolulu	-	56,590	324,871	355,972	6.2	178,102	103,189	121,607
Oahu	-	383,345	630,528	718,428	1.9	276,237	174,742	212,615

\* Source: 1977 State of Hawaii Data Book

service area but also to minimizing the impacts on the stable urban areas not presently contributing to the growth in demand.

Another aspect of the question is that people living in all of the areas, including those presently not growing, are directly or indirectly benefiting economically from the general growth in the economy. This growth includes increases in the value of real estate and the need for more goods and services such as retail businesses, professional services, restaurants, schools, etc. Consequently, people, whether they reside in a stable or growing neighborhood, often depend on a growing economy for their livelihood; an economy that would be detrimentally affected by the loss of a reliable supply of electrical power.

The value of real estate is especially pertinent to those living in the older, more stable communities since generally a higher percentage of owner occupancy occurs under those circumstances.

In 1970, the percentage of housing units that were owner occupied averaged 46.9 percent for the City and County of Honolulu. The figure for upper Palolo (census tract 11) was 40.5 percent and for lower Palolo (census tract 12) 63.9 percent. All the census tracts in Manoa (29, 30, 31), St. Louis (18), and one in the west Kaimuki area (15) showed higher owner occupancy rates than the average for the whole City and County of Honolulu. The percentage occupancy rates for these census tracts ranged from 60 percent for census tract 15 to more than 80 percent in census tract 31 in Manoa. All four census tracts in Date Street area (tracts 21, 22, 23, and 26), where there is a predominance of apartments, have very low owner occupancy rates that ranged from 10.6 to 19.8 percent. The lower Manoa census tract and one of the west Kaimuki census tracts, 13, have somewhat lower owner occupancy rates than the average for the City and County of Honolulu. Upper Palolo Valley has lower than average owner occupancy rates because of the existence of public housing projects.

In summary, the urban areas through which the Category II alternative routes from the Pukele Substation area to the Kamoku Substation traverse could be divided into three broad categories. The Palolo area could be considered primarily a middle class residential area with a broad spectrum of income groups that include a significant segment qualifying for public housing.

The Manoa, St. Louis, and Waialae areas are also primarily residential in character but are more affluent on the average.

Moiliili and the Date Street area are less affluent than the Palolo area and the population may be more transient when judged by the low owner occupancy ratio for housing units.

The service area of the Pukele Substation is rich in most urban resources including educational facilities, recreational areas, health and welfare facilities, and economic outlets.

The Manoa Campus of the University of Hawaii, which had a student enrollment of 21,356 in the 1976-77 academic year, is the largest single educational institution in the State of Hawaii. Chaminade College, a baccalaureate awarding institution that had a student enrollment of about 2,500 in the 1976-77 academic year is also within the service area. Several public and private secondary educational institutions are located in the service area. These include Iolani School, Punahou School, Mid Pacific Institute, Kaimuki High School, and Roosevelt High School.

Some of the major recreational areas serviced by Pukele Substation are St. Louis Park, Waikiki Beach, Kapiolani Park, Honolulu Zoo, Ala Wai Golf Course, Magic Island, Ala Wai Yacht Harbor, Ala Moana Park, Waikiki Aquarium, the Ala Wai Canal, and Paradise Park. Waikiki Beach provides a recreational area not just for the people of Oahu but for tourists from the US Mainland, Japan, and other parts of the world. The pleasant climate, beautiful scenery, and the beaches are the main reasons for the fact that, in the less than one square mile of real estate bounded by the Ala Wai Canal, the ocean, and Kapiolani Avenue, there were 23,358 hotel rooms in 1976. This number accounted for 53 percent of the total hotel rooms available in the State of Hawaii at that time. In 1976, the Honolulu Zoo, with an attendance of 1,300,000 people, was second in attendance only to the National Memorial Cemetery, which attracted 2,395,027 visitors. The Pukele service area has two other places considered to be significant in terms of cultural interest. These are Paradise Park and Waikiki Aquarium, which, together with the Honolulu Zoo, account for 21.5 percent of the total attendance in such areas.

The Pukele service area has facilities for just about every kind of recreational interest. Ala Wai Yacht Harbor is the largest yacht harbor in the state. Kapiolani Park has facilities for baseball, football, soccer, and jogging. Waikiki Beach and Ala Moana Park are probably the busiest beaches for swimming in the State of Hawaii. Picnic facilities are provided by Magic Island, Waikiki Beach, Ala Moana Park, and Saint Louis Park. Concerts of many varieties are frequently held in the Waikiki Shell. Golf is played in the Ala Wai Golf Course. Canoeing and recreational crabbing and fishing take place in the Ala Wai Canal.

Health and welfare facilities located in the service area include Leahi Hospital, Kaiser Foundation Hospital, Shriner's Hospital, Kapiolani Children's Medical Center, Palolo Chinese Home, and the Salvation Army Girls' Home.

Military installations include Fort DeRussey, which is located in Waikiki and serves the recreational needs of the members of the United States Armed Forces. Fort Ruger, a communications installation, is located on the Koko Head side of Diamond Head Crater.

In terms of economic activity, the Waikiki area and the Ala Moana Shopping Center are some of the most economically active areas in the State of Hawaii.

The retail sales activity in Waikiki showed the second highest growth rate among Hawaii's major shopping centers between 1967 and 1972. The Waikiki compound's annual growth rate of 15 percent was surpassed only by the Kahala Mall's growth rate of 20 percent but was higher than the average rate of 10 percent for the major Oahu shopping centers. In terms of property taxes, the less than one square mile of Waikiki real property raised 11.6 percent of the Oahu tax revenue in 1976.

The Ala Moana Shopping Center was once considered the largest shopping center in the world. In 1972, with a sales volume of \$218 million, it had the highest volume of business in Oahu. The second highest sales volume went to the Waikiki area, which recorded \$169 million for 1972. The Kahala Mall Shopping Center is also located in the Pukele Substation service area. These three shopping areas account for 27 percent of the number of retail stores and 37.5 percent of the retail sales for Oahu.

The Pukele Substation service area has many areas of historical significance. The Waikiki area has been used since the days of the monarchy as a recreational site. Manoa Valley in the past used to supply much of the vegetables needs of Honolulu residents. A large part of Manoa Valley was used for grazing in the early part of this century. Some of these areas in Manoa Valley became so overgrazed that the Lyon Arboretum was instituted at about the time of the first world war. A major project of the arboretum between 1918 and 1955 was the restoration of overgrazed areas on Oahu. Many places located in the Pukele Substation service area are recorded in the Hawaii Register of Historic Places. Some of these places recorded in the Register include: Waikiki Natatorium, Gilmore Hall at the University of Hawaii, Rose Chang Lee Home, Gump Building, La Pietra, Moana Hotel, Royal Hawaiian Hotel, Halekaulani Hotel, and Punahou School Campus.

Parts of the Pukele service area have experienced unprecedented growth in the last ten years. To control the quality and quantity of this growth, a number of ordinances have been passed recently. Foremost amongst these are City and County of Honolulu Ordinance No. 4573, also known as an ordinance to establish "The Waikiki Special Design District". Recently passed were a number of ordinances to make the Diamond Head area a "Historic, Cultural and Scenic District" to protect the historic, cultural, and scenic significance of Diamond Head.

Although more closely directed in some areas, population and economic related growth is expected to continue in the overall Pukele service area and will therefore have to be supplied with reliable electrical power. As noted earlier, the basic objective of this EIS is to describe the environmental consequences of the several alternative ways of providing that power so that a rational decision can be made on which alternative should be adopted, taking into account not only economic and engineering criteria but also environmental and social factors.

THE RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS,  
POLICIES, AND CONTROLS FOR THE AFFECTED AREAS

Under Section 101-4 of the Hawaii Revised Statutes, utility companies are given the power of eminent domain to ensure deliverance of reliable electric power and other services. The alternative routes for the proposed 138 KV lines, however, pass through various areas that require easements, impose restrictions, and require special approval.

Land areas in the State of Hawaii are zoned according to one of the following three districts: conservation, urban, or agriculture. The zoning and land use of the project area are shown on Figures 12 and 13. Passage of the proposed 138 KV lines through conservation areas will require both approval of a conservation district use application and acceptance of this EIS by the Department of Land and Natural Resources (DLNR). The past policy of the DLNR with respect to transmission lines passing through conservation districts has been a realization of the necessity of these lines, and approval has been granted if certain conditions are met to minimize the impact of the lines. The easements through conservation districts, if granted, would generally be 100 feet wide, and mitigative measures, as stipulated by the Division of Forestry, would be required.

Passage of the proposed 138 KV lines within the rights of way of city streets in urban areas, except in special districts, is not restricted. The lines would generally follow utility easements within the street right of way, as granted by the City and County of Honolulu. The utility, in turn, pays for this easement in the form of assessments made by the City and County. The heights and configuration of the lines along city streets are regulated by the Public Utilities Commission's General Order No. 6, which covers the rules for overhead electric line construction in the State of Hawaii. The Public Utilities Commission is also required by law to hold a public hearing for proposed power lines through residential districts of 46 KV and higher voltages.

Should the proposed 138 KV lines be routed directly from the Halawa Substation to the Kamoku Substation through urban Honolulu, restrictions imposed by several special management districts traversed would be encountered. These special design districts, established by the City and County of Honolulu, include the following:



7000 70

1. Historic, Cultural, and Scenic District No. 1
2. Hawaii Capital District
3. Waikiki Special Design District
4. Punchbowl District
5. Kakaako District
6. Chinatown District
7. Interim Development Control District for the proposed rapid transit system

Line 2 and one of the circuits of Alternative G would be within the Diamond Head Design District along the makai side of Date Street. The provisions of the ordinance establishing the Diamond Head District call for the undergrounding of utilities. According to a legal opinion rendered by the City Corporation Counsel's Office, the city could not enforce the undergrounding provision in this case because the ordinance was enacted after HECO's approved plans for overhead construction.

When electric lines traverse property outside of the street right of way, HECO must obtain an easement from the landowner. The landowner is compensated for this easement at a just price, which is generally in line with present market values of the affected area. The proposed leeward Koolau route would require easements from several private landowners. Easements through property owned by the Roman Catholic Church at the rear of Manoa Valley (Tax Map Key: 2-9-55-10 and 2-9-59-13) and the Old Chinese Home at the rear of Palolo Valley have already been granted. It is quite possible, however, that an easement through the Lyon's Arboretum, located at the rear of Manoa Valley, will not be granted. It has been expressed by the University of Hawaii that an easement cannot be granted because the deed transferring the arboretum property to the university mandates that the university maintain and preserve the premises as an arboretum and botanical garden only. Adjustments in the route will be required where easements are difficult to obtain.

The use of a submarine cable would require traversing the special management area established along the shoreline by the Interim Shoreline Protection Ordinance of the City and County of Honolulu. Installation of cables and support facilities within this special management area would require review and approval by the City and County of Honolulu's Department of Land Utilization. Approval by the Corps of Engineers would also be required for any shoreline work associated with a submarine cable.

## PROBABLE IMPACTS OF THE PROPOSED PROJECT

Impacts due to the installation of the proposed 138 KV transmission lines will depend primarily on the character of the area traversed by the lines and upon what type of line is constructed. Areas traversed by the 138 KV lines can broadly be classified as either urban or conservation. The types of lines possible include overhead single and double circuit, underground, and submarine. Presented in this section of the EIS are the probable impacts for each of the general routes based on the types of areas traversed and the types of lines. The impacts of constructing a new power plant near the Kamoku service area will also be presented.

### HALAWA SUBSTATION TO PUKELE SUBSTATION ROUTES (CATEGORY I)

#### Leeward Koolau Route via Conservation Land

Short-Term Negative Impacts. Impacts in this category would be primarily construction-related disturbance of the area surrounding the pole sites. For each pole an area of approximately 40 to 50 feet in diameter will have to be selectively cleared of trees and vegetation. There will be a potential for some localized erosion at the pole sites because of excavation and temporary absence of vegetative cover. Also associated with the construction activities will be a moderate amount of noise and dust, which, in turn, will be a disturbance to birds and wildlife in the area surrounding the job sites. The noise will be primarily due to the necessity of having to use a helicopter for construction.

Short-Term Positive Impacts. Associated with a large construction project such as this 138 KV transmission line will be an increased opportunity to obtain jobs.

Long-Term Negative Impacts. The aesthetic character of the conservation areas traversed by this line would be changed. Some residents on the northern outskirts of Honolulu would probably see the lines. Hikers using the Waahila Trail (as shown in "State Forest Hiking Trails on Oahu," Division of Forestry) would probably be within sight of a tower structure where the leeward Koolau route for the Halawa-Kamoku 138 KV line crosses Waahila Ridge (Figure 12). Particular areas that might also be affected aesthetically are the vicinity of Lyon's Arboretum at the rear of Manoa Valley, the rear of Nuuanu and Kalihi valleys, and where the line crosses the Likelike and Pali highways.

In the event of a forest fire within conservation areas surrounding the transmission lines, the use of firefighting aircraft would be hampered in those areas. Firefighting aircraft must be able to fly at low altitudes for maximum effectiveness, and the presence of high poles and lines would restrict low flying because of the safety hazard.

The transmission lines will require periodic maintenance, which will generally be an annual inspection and cleaning of the conductor and associated hardware. This will involve periodic disturbance in the vicinity of the poles and include trimming of trees in localized sag areas of the line.

The installation of poles in conservation areas has a potential of disturbing archaeological sites and endangered species. A preliminary survey, however, has identified archaeological sites as described in the environmental setting section of this EIS, and no endangered species have as yet been identified in the affected areas. Once a route is chosen, there will be more detailed surveys made at each pole site to determine if any interference with archaeological sites or endangered species would occur. Should the results of these final surveys indicate any interference, the pole site can be altered or mitigating measures employed.

Long-Term Positive Impacts. As outlined in the justification of the project section of this EIS, the purpose of these 138 KV transmission lines is to energize the new Kamoku Substation that is to provide load relief for the existing Pukele Substation. It is projected that, by late 1981, overload conditions could occur at the Pukele Substation, thus significantly reducing the reliability of electric service in that area. Timely construction of the Kamoku Substation and the required 138 KV lines to energize it will prevent overload conditions from occurring and ensure reliable electric power for the residents within the Pukele service area.

Helipads cleared during line construction could be used by the Division of Forestry as staging areas during firefighting efforts.

#### Trans-Koolau Route

Short-Term Negative Impacts. There would be construction-related impacts similar to those described for the leeward Koolau route. Because

of the greater distance of the trans-Koolau route, however, the impacts would be proportionally greater. It should also be noted that this route has a greater potential for disturbance of native birds or endangered plants because these are more likely to be found at the higher elevations traversed by this alternative.

Short-Term Positive Impacts. Regardless of the route chosen, there will still be an increased opportunity for project-related employment in Hawaii.

Long-Term Negative Impacts. The impacts described for the leeward Koolau route apply for this route, but with several qualifications and additions.

Using this route would require an additional right of way adjacent to the existing one, thus compounding the impacts on the conservation areas traversed, especially with respect to tree trimming requirements.

The contours of the land and the Pali Highway's circuitous route on the windward side would force this line into a narrow corridor close to and just under the Nuuanu Pali state park lookout. This would be aesthetically objectionable considering the popularity of this lookout.

Additionally, there would be aesthetic interference with the Kaneohe Reservoir Park project (Kamooalii Flood Control Park).

Long-Term Positive Impacts. The long-term positive impact of this line is to increase the reliability of electric power supply to the Pukele-Kamoku service areas. Any helipads constructed would also be available for firefighting purposes.

#### PUKELE SUBSTATION TO KAMOKU SUBSTATION ROUTES (CATEGORY II)

##### Routes Traversing Urban Areas Using Overhead Lines

Short-Term Negative Impacts. Impacts in this category will generally be due to construction-related activities.

According to the U.S. Environmental Protection Agency's document entitled, "Noise from Equipment and Operations, Building Equipment and Home Appliances" (December 1, 1977), the noise levels from the equipment

used at 50 feet from the source rated in A-weighted decibels will be as follows: trucks, 82 to 93 decibels; backhoes, 73 to 93 decibels; and compressors, 75 to 87 decibels.

Fugitive dust from excavation may be present on dry, windy days.

Vehicular and pedestrian traffic will be inconvenienced, especially during the allowable construction hours from 7 am to 6 pm. Active construction will generally be between 8 am and 5 pm. It is expected that not more than one traffic lane will be blocked off at the site of a pole erection and at most a short stretch of the road will be affected at any one time.

Uncompleted holes and construction materials may pose a hazard to pedestrian and vehicular traffic. Bridges over pole holes for pedestrians and lighted barricades, however, will be used to minimize the safety hazards.

The aesthetics of construction equipment, excavated soil, and construction-related materials may be unpleasant to some residents but will only last the duration of construction. Some inconvenience to nearby residents may also occur but, again, will only be temporary.

Short-Term Positive Impacts. Job opportunities associated with the project will increase.

Long-Term Negative Impacts. The primary impact and one that appears to cause concern for many potentially affected residents is the aesthetic impact of the 138 KV transmission lines traversing residential areas. Other potential impacts or concerns include danger from the power lines, health effects, radio/TV interference, line noise, effect on property values, and building restrictions due to the lines. Each of the impacts discussed can be considered common to all of the urban routes from the Pukele Substation to the Kamoku Substation unless specifically addressed otherwise.

1. Aesthetics. As described earlier, each 138 KV circuit will consist of four wires (three transmission and one top shield) on steel poles 105 to 125 feet high that, in some areas, will also support a three-wire 46 KV circuit below the 138 KV lines.

Poles and lines of these heights will be highly visible and many residents feel they are incongruous in a residential neighborhood atmosphere. The steel poles to be used, however, will have a modern, neat, straight line appearance as opposed to the "jungle of wires" appearance on many existing wooden pole lines (Figure 14). Examples of 138 KV lines in urban areas of Oahu are on School Street, near Pearlridge Shopping Center, and the Iwilei-School Street line.

2. Potential danger from electric power lines and poles. Potential danger exists from electric power lines of whatever voltage because in the very remote case of a line break, there is a possibility of a person or vehicle being struck by the falling wire. The possibility of the wire from the 138 KV system falling on a house is even more remote because of the minimum 11 to 18 foot horizontal clearance provided between the power line and property lines. The probability of a line breaking can be considered by examining the line's characteristics and the manner of support.

The conductor planned for 138 KV lines along city streets is a 1,590,000 circular mil (1 circular mil is 0.0000007854 square inches), all aluminum conductor with a diameter of 1.454 inches, a weight of 1.493 pounds per foot, and a rated tensile strength of 27,000 pounds. The design criteria of the line specify that the conductor will not exceed a maximum tension of 9,200 pounds at 50 deg F and a 9-pound wind (9 pound wind is 60 miles per hour). This maximum design tension is 34 percent of the rated strength of the conductor and corresponds to a safety factor of 2.93. Under normal conditions (80 deg F, no wind), the conductor tension drops to 7,200 pounds, or 27 percent of the rated strength, for a safety factor of 3.75. General Order No. 6 (PUC rules for overhead line construction) requires a minimum safety factor of 2.0 for conductors. Thus, the required safety factor for the 138 KV conductor will be met and even exceeded.

Through the use of compatible materials, proper greasing, and periodic inspection and maintenance of the hardware, the conductor can be expected to perform reliably for many years. The use of compatible materials (aluminum clamps holding aluminum



FIGURE 14

TYPICAL VIEW OF 138 KV LINES ALONG URBAN STREETS

conductors) virtually eliminates the environment for corrosion. Due to the aluminum's exposure to air, however, some oxidation will occur. This oxidation process provides a hard, inert oxide coat to form a coherent protection of the underlying metal.

It can thus be seen that, since the conductor tensions will be less than the breaking strength and the elements of corrosion will have been largely eliminated, the two most likely causes of conductor failure are taken care of.

Closer analysis of safety is obtained by examining the number and types of actual power line failures on Oahu over a period of time. The following tabulation shows the number of 138 KV miles in service on Oahu and the number of failures for the period 1970 to 1977:

<u>Year</u>	<u>Circuit Miles</u>	<u>Failures</u>
1970	132.10	3
1970	132.10	0
1972	145.96	0
1973	145.96	1
1974	145.96	6
1975	145.96	2
1976	154.56	1
1977	<u>154.56</u>	<u>1</u>
	1,157.16	14

$$\text{Average number of miles per year} = \frac{1,157.16}{8} = 144.645$$

$$\text{Average number of failures per year} = \frac{14}{8} = 1.75$$

$$\text{Average number of failures/mile/year} = \frac{1.75}{144.645} = 0.012$$

This 0.012 failure rate can be translated into 1.2 failures for every 100 miles of line per year.

In analyzing the 14 failures over the 8-year period, it should be noted that all the failures occurred in mountainous areas. There have not been any cases of fallen 138 KV lines along city

streets. Three of the fourteen failures were attributed to the failure of wooden members of the structures. The Pukele Substation to Kamoku Substation 138 KV lines will not be using any wooden members.

The higher incidence of failures in the mountainous areas compared to urban areas may be attributed to the greater thoroughness of inspection in urban areas. HECO maintains a regular schedule for inspecting lines. The inaccessibility of many structures in the mountainous areas discourages anything more than aerial observation of each structure. Hence, defects in smaller line components (bolts, washers, etc.) are not easily detected. The lines along city streets, however, are more accessible and inspections can be more thorough.

In the event that a line does break, the flow of current through the line is protected by a circuit breaker. This breaker is a switching mechanism that automatically stops the current flow within a fraction of a second after fault current is detected by the continuous current monitoring system. Thus, the possibility of someone coming in contact with a live 138 KV line is extremely remote.

Another potential danger associated with the placement of the 138 KV overhead lines in the urban area is the addition of a potential traffic hazard. The steel poles would be placed in the area between the curb and the sidewalk and could therefore be struck by a vehicle that is out of control or is traveling over the curb for some other reason. Such a collision is not likely to do much damage to the pole but could damage the vehicle. The proposed poles could actually be considered to be less of a traffic hazard than the existing poles located in a similar area because they are spaced at wider intervals. Since there would be a net increase in the number of poles, however, there would be a corresponding increase in objects to potentially collide with.

3. Potential health effects. Health concerns associated with high voltage transmission lines are associated with exposure to the electric fields created by the line and the possible production of photochemical oxidants. Adverse health effects due to exposure to electric fields under extra high voltage (EHV) power lines (greater than 400 KV) have been reported in Russia and Spain.

Reports from the USSR (Korabkova et al, 1972; Lyskov et al, 1975; and Krivora et al, 1975) state that workers in high voltage switchyards (500 and 750 KV stations) occasionally experienced nausea, lassitude, loss of appetite, and reduced sex drive. Switchyard workers in Spain reported a similar syndrome.

In the United States, carefully conducted medical and psychiatric examinations were given over a nine-year period to ten men working on 345 KV lines. None of these men showed any changes attributable to electrical fields in physical, mental, or emotional characteristics. Furthermore, it must be pointed out that 345 KV lines have been in operation in many countries for one or two decades and there have been no adverse effects reported due to these lines.

The Russian and Spanish experience was not duplicated in these countries. It seems, then, that the physical discomfort claimed by the Russian and Spanish workers could be due to factors other than the electric field. Candidates include noise (100 Hz transformer noise); noxious vapor from paint, chemicals, or switchyard equipment; and diseases possibly endemic to the regions.

In Russia, safety regulations were created to protect workers from substation and overhead lines that carry 400, 500, and 750 KV AC current. The Russian safety regulations are given in Table 11.

TABLE 11

SOVIET ELECTRIC FIELD EXPOSURE STANDARDS FOR ELECTRICAL WORKERS

Electric Field Intensity (KV/m)	Permissible Duration of Personnel Stay in Electric Field During 24 Hours (minutes)
5	Unlimited
10	180
15	190
20	10
25	5

Figure 15 shows a typical electrostatic ground gradient profile beneath a 138 KV line. The curve for the 138 KV lines, obtained by a computer program, shows that the maximum field gradient is less than 0.65 KV/m directly beneath the line. This is much less than the Russian safety regulations for unlimited exposure (5 KV/m or less). It is important to note, however, that American researchers trying to duplicate the Russian effort obtained electric field intensity values that were generally 63 percent of the Russian values. The lower American value average was very likely due to the fact that American power lines tend to be higher above the ground and that somewhat different measuring techniques were used. Even when this factor is applied, the 138 KV electrical field is much less than the Russian standard. It should be pointed out that there is no American standard on electrical field exposure.

The Electric Power Research Institute (EPRI) has been studying the effect of exposure to very high voltages on plants, bees, and other small animals. There appears to be some effect on plants and small animals at voltage gradients of 50 KV/m and more. Most of the work by EPRI, however, does not represent conclusive results. Table 12 summarizes most of the health effects from high voltage exposure research done to date.

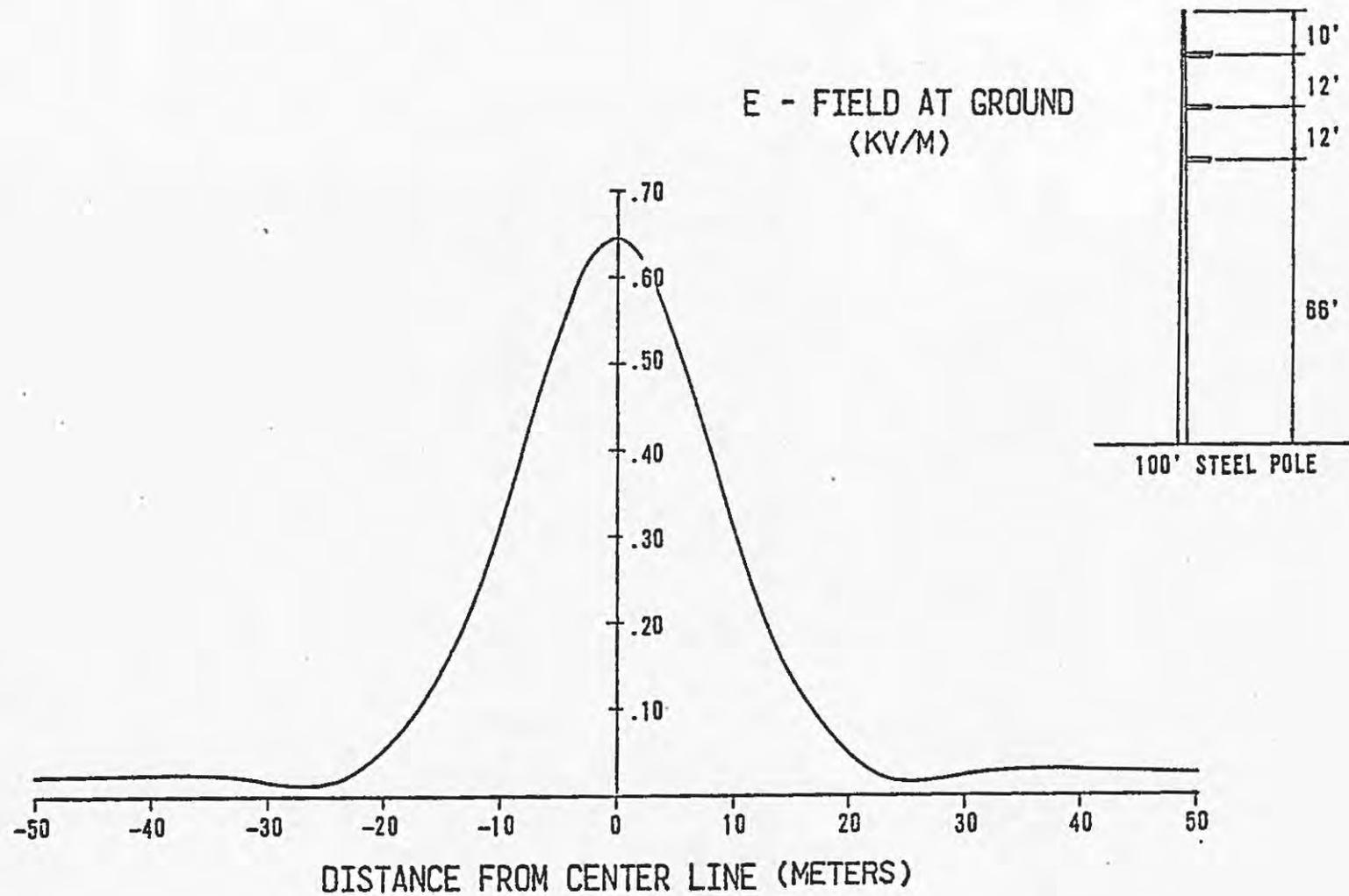


FIGURE 15

ELECTROSTATIC FIELD GRADIENT BENEATH A 138 KV LINE

Source: Hawaiian Electric Company

TABLE 12

SUMMARY OF AMERICAN AND WESTERN EUROPEAN RESEARCH ON THE BIOLOGICAL EFFECTS  
ON HUMANS DUE TO EXPOSURE TO ELECTROMAGNETIC FIELDS

Subject (Investigator)	Frequency	Stress	Indicator	Results
Humans (Koeppen)	50 Hz	7.5/2.5/27 KV 30 minutes	EKG	No effects
525 Humans and Controls (Strumza)	50 Hz	Long duration fields within 25 m of 200/400 KV line vs fields beyond 125 m for controls	Visits to and by physicians; use of medicine, medical histories	No significant difference was observed in subject and control groups
10 Males 10 Females	50 Hz	100 KV/m	Psychological test, subjective responses	No statistical difference was observed in test performance, some discomfort reported by a few subjects, also influenced by weather
Farm Workers and Livestock 18 Farms (Busby)	60 Hz	Fields from 765 KV line	Questionnaire response	No significant effect attri- buted to fields from lines
Human 11 American Linemen (Kouwenhoven)	60 Hz	Fields encountered in normal line and bare-hand work	Physical examina- tion, CV, ECG, kidney visual, auditory, emotional status	No effects
10 Humans (R. Hauf)	50 Hz	1, 15 KV/m intermit- tent 45 minute exposure	ECG, EEG, pulse, blood pressure, reaction time	No significant changes except for small decrease in reaction time

Table 12, Cont.

Subject (Investigator)	Frequency	Stress	Indicator	Results
6 Humans (3 Males) (G. Hauf)	50 Hz	1/15/20 KV/m, alternating 45 minute exposure	EKG, EEG, blood pressure, reaction time	No pathological changes
22 Male Mice (Knickerbocker, et al)	60 Hz	160 KV/m, 1500 hours	Weight gain, physiological parameters, necropsy	No difference between subjects and controls
Male Guinea Pigs, Mice, Rats (Meda)	50 Hz	100 KV/m, 18 hrs/day	EEG, ECG, blood analysis	No chronic changes of significance/transitory changes, EEG and ECG, some suggestion of infection-like responses
Rats (Strumza)	50 Hz	17 KV/m, 4 to 23 months	Clinical and biological	No differences between subjects and controls
Mice (Moos)	60 Hz	1 KV/m	Lifetime of mice given lethal 900 rad x-ray	No significant effect attributed to electric field
Chickens (Krueger & Gariola)	60 Hz	3600 V/m	Weight gain	No statistically significant difference between subjects and controls
Rats (Spittka)	50 Hz	50 to 70 KV/m	Trained rats in Skinner Box reaction time	Inconclusive--reaction time altered, short- and long-term effects suggested
Livestock (Ware)	60 Hz	Fields from 765 KV line	Survey 166, Farms 106 questionnaire response	104 responses, no effect was noted, 1 suggested grazing pattern altered; 1 concerned loss of cow

On the national level, much of the environmental concern regarding electrical field effects has been directed at 500 and 765 KV lines. These lines, because of the extra high voltage (EHV), have problems and design considerations that are not applicable to 138 KV transmission lines as used on Oahu.

Currently, this is what can be said about the biological effects due to exposure to electromagnetic fields:

- a. Reports of the detrimental effects on switchyard workers in the Soviet Union cannot be confirmed from similar research in the United States.
- b. No experiment thus far has indicated that electric fields several times greater than the maximum encountered under a 138 KV line can cause biological effects of significance.

From these results it can be concluded that there is no reason to believe that electrical fields from overhead 138 KV lines will have any effect on human health.

Another health concern is the photochemical oxidants produced by possible corona discharge. Corona discharge is the partial ionization of air due to a voltage gradient (KV/inch) exceeding a critical value. Corona is usually a concern at voltage levels of 345 KV and above. It can be fairly well predicted and controlled since it is dependent on conductor size, line configuration, type of conductor, condition of its surface, and weather. The electric breakdown of air causes a variety of chemical changes that lead to production of oxidants. Of these oxidants, ozone ( $O_3$ ) is thought to be the most important.

Ozone occurs in nature from three main sources: (1) it occurs on the surface of the earth by slow diffusion from the ozone layer 13 to 16 miles above the earth's surface where short-wave length ultraviolet light from the sun is absorbed by oxygen that becomes ozone; (2) it is also formed by the action of sunlight on nitrogen dioxide, an important component of automobile exhaust; and (3) it can be generated by corona from electric apparatus and transmission lines.

The Environmental Protection Agency prescribes 0.08 ppm (parts per million) as a maximum one-hour arithmetic mean concentration. A concentration of 0.02 ppm is thought to damage plants in ten hours. For animals, 1 to 15 ppm are the limits. The maximum average concentration allowed by the American Medical Association is 0.1 ppm during an eight-hour day for human exposure.

In tests conducted by the Commonwealth Edison Company and the IIT Research Institute, ozone levels were measured in the vicinity of the 345 and 765 KV transmission lines. The average levels of ozone were from 0.009 to 0.014 ppm. It was concluded that high voltage transmission lines of 765 KV do not generate ozone levels measurable over the ambient at ground level.

In analyzing the Pukele to Kamoku 138 KV line, corona is not a factor at 138 KV. The critical disruptive voltage is not reached with the type of conductor and line configuration proposed for these lines. HECO's 138 KV transmission lines therefore do not contribute to the ambient ozone levels.

4. Radio and TV interference. The potential for interference with radio and TV reception due to the 138 KV lines does exist under certain conditions. The primary cause of objectionable radio interference (RI) and television interference (TVI) for lines operating at 138 KV and below is sparking. Sparking is a complete ionization of air across a metal to metal or metal to porcelain gap that occurs during each voltage cycle in single or multiple bursts. The cause of sparking is an abnormal condition, resulting from subjecting spark gaps to high voltage stress. (Spark gaps are minute separations between charged power line components caused by either physical separation (air) or the build up of a nonconductive corrosive film.)

Spark gaps can occur because of loose hardware, insufficient tension on suspension insulators, and insulation contamination. Besides transmission lines, RI/TVI can occur due to subtransmission lines and distribution lines as well. It is not

inherent to a 138 KV line. The existence of spark gaps is a condition that can be corrected through maintenance efforts and is minimized by careful design and installation, regardless of the voltage transmitted.

The Pukele to Kamoku 138 KV lines should not create or add to RI/TVI because the possible causes outlined above will be eliminated or minimized. There will be no slack suspension insulators. Spark gaps will be minimized as the higher tensions and nearby conductors maintain a good contact between components. In addition, with steel pole construction, hardware is minimized since there are no bonding wires, through bolts, etc. Insulation contamination will be minimized with the application of silicone grease to the insulators when the line is constructed.

During the period 1967 to 1977, HECO received seven complaints regarding RI/TVI that were directly attributed to 138 KV lines. Of the seven complaints, four were attributed to contamination, one to faulty insulators, one to loose hardware, and one to an indefinite cause. In all cases, corrective measures were taken and the RI/TVI problems were alleviated to the complainant's satisfaction.

There is, however, a voltage related cause of RI called corona discharge, which is the partial ionization of air due to a voltage gradient (KV/inch) exceeding a critical value. The incidence of corona discharge can be fairly well predicted and thereby controlled through design factors (conductor diameter and insulator type). Corona will normally cause RI only in the lower radio frequencies. The reason for this is that the rise time of the corona discharge current is slower as opposed to that due to sparking. At 138 KV, corona is not a factor in the design and operation of the line and has not been experienced on existing 138 KV lines in the HECO system.

The radio amateur is more sensitive to RI because of the low signal levels normally used. A 138 KV line, however, will not necessarily add to or create RI. With the type of line

construction to be utilized, noise levels that affect the radio amateur's operation or the general public are not expected.

5. Potential effects on property value. Concern has been expressed by residents adjacent to proposed 138 KV line routes that the value of their property will decline because of the presence of the 138 KV transmission line. While future events cannot be definitely predicted, the approach taken in evaluating this question is to show that, in the past, construction of 138 KV lines near residential properties did not have a discernible effect on market values.

Most of the existing 138 KV lines on Oahu are located in conservation areas, but some of these lines do pass close to residential properties, such as the Waiiau-Wahiawa No. 1, Waiiau-Koolau No. 1, Waiiau-Kahe No. 1, Waiiau-Koolau No. 2, Waiiau-Makalapa, Halawa-Makalapa, Halawa-Iwilei, Halawa-School, and Iwilei-School (see Figure 1).

Many of these lines are only a few years old and could not be effectively evaluated with respect to potential property value effects. A comparison was made, however, between the market values of various residences and condominium/townhouse units located near older 138 KV transmission lines and the average values for properties in that tax division. Some of the areas chosen for comparison included Foster Heights Villa, Pacific Annex, and homes in the Waiiau area, all located in tax division 9.

For condominiums in the Hillside Terrace, Foster Heights Villa, Pacific Annex, and Lele Pono projects located in Waiiau in the vicinity of the 138 KV lines, the average sales price for 246 units sold in 1975 was \$58,450, which was 17.8 percent higher than the average sales price of \$49,600 for the whole tax division 9. Similarly, in 1976, 86 units in these projects were sold for an average price 10 percent higher than for the whole of tax division 9. The higher prices for the units near the 138 KV lines relative to the average for the tax division are

undoubtedly due to the fact that these condominiums were newer than the average. In any case, there is no indication that the 138 KV lines had a significantly detrimental effect on condominium prices.

A comparison of residential homes near 138 KV lines again showed that the average sales prices were generally higher than the average sales prices for the whole tax division. This comparison was made for homes in the Waiiau-Waimalu area and is summarized in Table 13. It should be noted that these homes were also recently built and were selling for substantially more than the average homes located in tax division 9.

For older homes located near 138 KV lines, the stability of the neighborhood and market values appeared to be maintained despite the presence of the 138 KV lines. There are 9 properties on Ohehana Street that are very close to the 138 KV lines running along Salt Lake Boulevard. These homes were constructed in 1962 and the 138 KV lines were constructed in 1975. Only two transactions involving these properties have taken place since the original sale of these homes; one in 1962 for \$22,816 and the other in 1975 for \$57,000. This 1975 sales price is comparable with other similar homes of that age in the area.

Judging from past events, it can thus be said that the location of the 138 KV lines near residential properties has neither significantly decreased their market value nor affected the neighborhood stability with respect to the turnover rate.

6. Restrictions on private properties near 138 KV lines. The latest revision of the Public Utilities Commission's General Order No. 6, covering the Rules for Overhead Electric Line Construction in the State of Hawaii, lists basic minimum clearance of wires above ground, buildings, structures, etc. for various voltages. For example, the minimum clearance to ground for a 138 KV line is 30 feet. HECO, however, designs for the minimum clearance only in conservation areas. In urban areas, ground to conductor clearances are in the 50 to 70-foot range to accommodate circuits that cross or are parallel to the 138 KV circuits.

TABLE 13

COMPARISON OF SALES PRICES FOR RESIDENCES NEAR 138 KV LINES

Year	Streets	Number of Sales	Average Sales Price	Average Sales Price in Tax Division 9
1972	Kiawe	20	\$71,320	\$52,000
1973	Kiawe	3	75,233	81,000
1974	Kiawe, Ipuala Loop	31	83,528	67,000
1975	Kileka, Piki Ipuala, Hoomalu	28	92,239	66,000
1976	Kileka, Ipuala	8	90,287	68,500

When the electric lines traverse private property, HECO obtains an easement from the landowner. No restrictions are placed on the easement area for small shrubbery and foliage. Although parking lots have been allowed and small sheds built under the line, no dwelling construction is allowed. The lines are located to make them least obtrusive to the owner. The width of the easement generally depends on the voltage and the amount of conductor swing, which is related to the distance between poles and the sag of the conductor. Within private property in mountainous terrain, the 138 KV easements are generally 100 feet in width because the spans between poles vary from 800 to 2,000 feet. Along city streets, 138 KV overhead lines generally do not traverse private property, and no building restrictions are placed on the homeowner within his own property. Along most of the proposed routes in urban areas for the two required 138 KV lines, no building restrictions, no minimum distances from the line, and no future restrictions will be placed on the homeowner where easements have not been obtained.

7. Maintenance-related interference. Regularly scheduled maintenance of the 138 KV lines will be required to ensure reliability of service, safety, and absence of radio/TV interference associated with the lines. Large trucks with hydraulic buckets that reach to line height will most probably be employed to inspect and maintain the lines. Minor inconveniences to residents and traffic may occur due to these activities.
8. Potential line noise. There are two potential sources of high voltage transmission line related noise. As explained in the discussion on radio/TV interference, spark gaps can occur because of loose hardware, insufficient tension on insulators, and insulation contamination. This sparking would create an audible noise to those nearby. This is a maintenance related problem, however, as shown by past experience with noise complaints due to sparking and is easily remedied.

The other potential line related noise source is low frequency noises due to the corona discharge effect that is a partial

ionization of the air surrounding the line. While not audible by everyone, it may be audible to some persons when extra high voltages are transmitted and ambient noise levels are low. It is anticipated, however, that little noise, if any, will be audible at the 138 KV level.

#### Routes Traversing Conservation Areas Between Pukele and Kamoku Substations

Two 138 KV circuits are required to traverse this route; thus, there is a choice of using two single circuit lines or one double circuit line. Impacts are similar for each choice, but the degree of impact on conservation areas will obviously be greater for two single circuit lines in that two pole lines and two rights of way will be required, thus affecting a larger area.

Short-Term Negative Impacts. The impacts in this category would be similar to those discussed in the leeward Koolau route. This generally includes local disturbances to vegetation, wildlife, and soil in the vicinity of the pole sites.

Short-Term Positive Impacts. Job opportunities associated with the project will increase.

Long-Term Negative Impacts. As discussed in the leeward Koolau route section, the impacts to conservation areas between the Pukele and Kamoku substations would also generally include aesthetic changes, potential interference with firefighting aircraft, periodic disturbances from required maintenance of the lines, and potential disturbances of archaeological sites or endangered species.

The routes through conservation areas from the Pukele to the Kamoku substations propose to use either a portion of Waahila Ridge or Kalae-pohaku Ridge. None of these routes presently appear to interfere with any archaeological sites or endangered species, and the primary difference in impact will be the aesthetic changes imposed on the areas traversed and to those within view of the line.

Alternative B, which proposes to follow the lower slopes of Waahila Ridge on the Manoa Valley side, would have an aesthetic impact primarily to residents in Manoa Valley and on the University of Hawaii (Manoa)

campus. The line would be highly visible to residents in Manoa Valley since it must traverse several narrow streets. The route near the base of Waahila Ridge also passes a short distance from the Manoa campus' east border and would be highly visible.

Alternative C, which traverses the Palolo side of Kalaepohaku Ridge, would have aesthetic impact mainly on Palolo Valley residents. The line traversing the ridge would be highly visible to residents in that area of Palolo.

Alternative D, which would traverse the top of Waahila Ridge approximately midway between Manoa and Palolo valleys, would have several aesthetic impacts. This proposed route would pass through Waahila Ridge State Park and require a new right of way for the 138 KV line and the installation of large, new poles and a structure to carry both the new 138 KV lines plus the existing 46 KV lines traversing park area. This will require significant tree trimming. While the existing 46 KV lines in the park area have already affected the park's aesthetic climate, the addition of the new 138 KV lines will only compound and add to the aesthetic impacts. A 138 KV line on top of Waahila Ridge would also be visible to residents of Manoa Valley and St. Louis Heights. This route, however, would have the least direct impact on the urban areas between Pukele and Kamoku.

Long-Term Positive Impacts. Again, the supply of reliable electric power to the Pukele-Kamoku substation areas would be assured.

#### Underground Alternative Through Urban Streets Between the Pukele and Kamoku Substations

Short-Term Positive Impacts. Job opportunities associated with the project will increase.

Short-Term Negative Impacts. These impacts would be primarily construction related and would be similar to the impacts due to the construction of overhead lines but to a greater degree. Underground 138 KV lines would require excavation of a continuous trench about 16 feet wide. Traffic flow on the affected streets would be impaired, possibly requiring the use of alternate streets during construction. The construction period required for underground lines would be significantly longer than for

overhead lines. The noise, dust, danger, traffic interference, inconvenience, and aesthetic impacts due to construction activities would thus persist for a longer period.

An important consideration in planning any underground utility is whether it will interfere with other underground facilities already in place, such as water supply lines, gas lines, telephone lines, sanitary sewers, and storm sewers (drainage). If the proposed 138 KV underground lines were installed in a horizontal alignment (side by side), they would occupy a substantial portion of the right of way on the street. This might require that in-place utilities be moved, thus adding to the expense and time required. If placed in a vertical alignment (one over another), the 138 KV lines might interfere with sewer and drainage systems. Subsequently, this may require the installation of dual sewer systems on each side of the underground 138 KV lines on the affected streets. This, again, would significantly increase time and expense.

Long-Term Positive Impacts. The additional 138 KV lines that would energize the Kamoku Substation would provide load relief for the Pukele Substation, thus eliminating the possibility of outages in the Pukele-Kamoku service areas due to overloads. Underground lines, however, are also inherently less accessible and more complex than overhead lines and, in the event of a failure, require more time to locate the failure and rectify the problem.

Several of the long-term negative impacts associated with overhead lines will be eliminated by the use of underground lines. The poor aesthetics associated with overhead pole lines would be eliminated. Danger from falling lines, line-related noise, and danger from interference of poles would have been eliminated as well. Finally, any concerns with respect to decreasing property values because of overhead 138 KV lines would be fully satisfied.

Long-Term Negative Impacts. Inherent to underground utilities are the problems of reduced accessibility, potential oil leakage, interference with other underground facilities, and high maintenance costs. Access to a trouble spot in the underground 138 KV line would, in many cases, require excavating a portion of the street as compared to easy access to

overhead lines. Oil under pressure would surround the underground cable for cooling purposes and, in the event of a pipe or seal failure, some oil leakage could occur. Maintenance requirements are thus increased. Oil pumping and cooling facilities would require property acquisition by HECO at several locations along the route. The large right of way requirement of the 138 KV underground lines under streets would preclude the addition of other underground utilities within that right of way. Additional utilities could include water lines, sewer expansion such as large box drains, and gas lines.

### HALAWA SUBSTATION TO KAMOKU SUBSTATION ROUTES (CATEGORY III)

#### Urban Route Through Downtown Honolulu

Short-Term Positive Impacts. Job opportunities associated with the project will increase.

Short-Term Negative Impacts. Impacts in this category would be primarily construction related. For portions of the overhead 138 KV lines, the impacts would be similar to those described under the previous section on impacts due to overhead line construction in urban areas. For portions of the route employing underground 138 KV lines, the impacts would be similar to those discussed previously for underground 138 KV lines in urban areas but to a greater degree because of the higher density of the urban areas traversed in this routing.

Long-Term Positive Impacts. Reliable electric power for the Pukele-Kamoku substation service areas would be provided.

Long-Term Negative Impacts. The impacts would be a combination of those discussed previously for overhead and underground lines through urban areas. For overhead line portions, the impacts would include aesthetic effects, potential dangers, potential radio/TV interference, potential property value effects, potential line noise, and continual maintenance interferences. For underground portions, the impacts would be major problems with interference with present and future underground utilities and transportation alternatives as well as high costs.

## Ocean Route Using Submarine 138 KV Cables

Short-Term Positive Impacts. Job opportunities associated with the project will increase.

Short-Term Negative Impacts. Impacts in this category would primarily be construction-related impacts on the benthic environment along the proposed route. The submarine cable would have to be buried deep enough to prevent disturbance of the cable by water movement. During excavation of this required trench, the immediate benthic community would be disturbed and, in the case of reefs, destroyed. Turbidity from digging could have temporary effects on the immediate water column and the subsequent settling of the excavation material could also affect surrounding areas such as reefs. The construction of overhead lines to connect to the submarine cable would have similar impacts to those already described.

Long-Term Positive Impacts. Again, the two 138 KV circuits to the Kamoku Substation would provide load relief for the Pukele Substation.

Long-Term Negative Impacts. Impacts in this category would primarily be inherent reliability reducing factors associated with submarine transmission lines, poor maintenance possibilities, and high cost.

A submarine cable is exposed to several stresses unavoidable in the marine environment, including the increasing pressure with depth and the corrosive action of salt water. While submarine cables are designed to withstand these stresses, the possibility of failure is increased.

There is also a possibility of disturbing the cable. The primary source of disturbance would be ship anchors, but the possibility of damage by exceptional water movement, such as large surf or tsunami, while remote, does exist.

Maintenance of a submarine cable presents several difficulties that are primarily related to inaccessibility of the cables. A specially equipped ship along with a dive team and appropriate equipment would have to be stationed in Hawaii for maintenance of the cable. In the event of a cable failure, the first task of finding the exact location of the failure can be time consuming. Once located, the cable must be raised to the surface, repaired, and then reinstalled on the bottom. While the total

time required for resumption of service would vary with each event and depend on weather and ocean conditions, the time required could be as long as several weeks or longer, if the repair ship is not stationed in Hawaii.

Finally, there would be very high costs associated with construction of the cable as well as maintaining it.

## NEW POWER PLANT

### Short-Term Positive Impacts

Job opportunities associated with the project will increase.

### Short-Term Negative Impacts

These impacts would primarily be construction related. While the proposed plant would be constructed inside Diamond Head crater, the movement of equipment and material would affect residents nearby. There would also be the construction-related noise, dust, danger, traffic interference, aesthetics, and other inconveniences to nearby residents.

### Long-Term Positive Impacts

A reliable source of electric power for the Pukele-Kamoku Substation service areas and for other areas that might be supplied by this power plant would be provided.

### Long-Term Negative Impacts

Impacts for this category would generally include those due to fuel supply, possible cooling water supply and discharge, and the aesthetics of plant operation. Other considerations are that there would be a high cost compared with the new 138 KV transmission lines from the Halawa Substation and that 138 KV lines leading from the plant would be required in any case.

Fuel, probably oil, would have to be transported to the power plant either via a large number of tanker trucks or an oil supply line that would have to be constructed. Either method to supply fuel to the plant would have significant impacts on residents along the routes chosen for fuel supply.

For operation of a conventional power plant, some cooling process is required. Because of the limited fresh water supply on Oahu, the use of sea water appears to be the most feasible method. This would involve constructing a pipeline for intake and another for discharge of the warm water. The discharged water is higher in temperature than the receiving water and can have detrimental effects on the aquatic environment. If diesel generators are used, no cooling water problems are anticipated.

Operation of the plant could entail discharge of smoke. This would have an aesthetic impact as well as possible air quality effects on the surrounding areas.

Finally, at least two 138 KV circuits leading from the power plant to the Kamoku Substation would be required, accompanied by all of the associated impacts, depending upon whether overhead or underground lines are chosen.

### PROBABLE ADVERSE ENVIRONMENTAL IMPACTS WHICH CANNOT BE AVOIDED

The significant impacts, both positive and negative, associated with the proposed project were described in the previous section of this EIS. The listing given in this section is a summary of the adverse impacts only. Mitigative measures for most of these impacts are described in a later section of this EIS.

The construction-related adverse impacts in the conservation area include clearing of vegetation at each pole site, potential erosion, helicopter noise, and local disturbance of wildlife. Long-term adverse impacts in the conservation area include detrimental aesthetic effects, potential interference with firefighting aircraft, and periodic maintenance-related disturbance.

Urban area overhead line construction-related adverse impacts include noise, dust, pedestrian and vehicle traffic interference, and detrimental aesthetics. Urban area overhead line long-term adverse impacts include adverse aesthetic effects, potential danger to traffic and from structural failure, potential radio or TV interference, potential detrimental effect on property values, and periodic maintenance-related interference.

Underground lines in urban areas would have the following adverse construction-related impacts: noise, dust, pedestrian and vehicle traffic interference, detrimental aesthetics, and interference with other utilities. Long-term adverse effects from underground lines include interference with existing and planned underground utilities, longer time required to repair failures, maintenance-related interferences, and high costs.

Underwater lines would have the following construction-related adverse impacts: temporary water quality deterioration, interference with shoreline and benthic ecosystems, noise, and detrimental aesthetics. The long-term adverse impacts would be low reliability, potential interference with shipping practices near Honolulu Harbor, maintenance- and repair-related disturbance of the benthic ecosystems, and high costs.

A new power plant in Diamond Head crater would have the following adverse construction-related impacts: noise, dust, shoreline interference

from possible cooling water facilities, traffic interference, detrimental aesthetics, and potential interference from construction of fuel supply line. The long-term adverse effects of such a power plant would include noise, air quality effects, adverse aesthetics, possible shoreline interference with recreation activities and the marine ecosystem, potential fuel line or fuel truck dangers, and high costs.

## ALTERNATIVES TO THE PROPOSED ACTION

Since there is no final chosen alternative for the proposed action, all of the alternatives being considered have been presented in the section entitled, "Description of the Proposed Action." The alternatives being considered are categorized as follows:

1. Routes from Halawa Substation to the Pukele Substation area
2. Routes from the Pukele Substation area to the Kamoku Substation
3. Routes from Halawa Substation directly to the Kamoku Substation
4. Construction of a new power plant

These four categories of alternatives were also divided according to the type of 138 KV line that might be used, including the following:

1. Overhead single circuit 138 KV lines
2. Overhead double circuit 138 KV lines
3. Underground 138 KV lines
4. Submarine cable 138 KV lines

In addition to the various alternative ways being considered for supplying more power to the Pukele service area, the alternative of no action has been considered (described in a subsection of this EIS entitled, "Justification for the Proposed Project"). With the anticipated continued increase in demand in the Pukele service area, it is expected that, by late 1981, the peak demand will have increased to the point where the failure or shut down of a single major component of the system during the daily peak demand would result in the overload of another major component. Such a condition would lead to the increased frequency and duration of power outage for all or part of the Pukele service area. Such a level of service would not be acceptable to most people since it would lead to many inconvenient, undesirable, and dangerous conditions. Examples of such conditions include traffic light failures, elevator stoppages, reliance on emergency power in hospitals, as well as such inconveniences as no lights or television in residential areas.

Since there is no convincing reason to believe that the peak demand in the Pukele service area will decrease in the foreseeable future, the no action alternative would only delay the project, perhaps with the result that future action is taken hastily under semi-emergency conditions, resulting in greater construction-related impacts.

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

The short-term effects of the proposed project on the natural environment as well as on man's environment are all construction related. The basic long-term tradeoff for an overhead system appears to be between the benefits of a reliable power transmission system and the detrimental aesthetic impact of the power lines. The long-term impact on the natural environment is not likely to be significant in that it primarily consists of the continuing need to maintain the line with possible minor tree trimming in sag areas.

For underground lines, the basic tradeoff is between the benefits of enhanced aesthetics and the high capital and maintenance costs along with potential interference with other underground systems.

The long-term economic productivity of the Pukele service area would be enhanced by the proposed project. No significant alteration of the long-term productivity of the natural environment is anticipated.

## MITIGATION MEASURES PROPOSED TO MINIMIZE IMPACT

Several measures will be implemented to minimize possible adverse impacts.

### CONSERVATION AREAS

<u>Impact</u>	<u>Mitigating Measure</u>
Clearing of trees and vegetation around pole sites and any new helipads	Consultation with the Division of Forestry (DOF) to minimize the extent of required vegetation cutting and cutting of slash to a height less than two feet from the ground and painting of cut surfaces on topped and pruned trees.
Localized erosion at pole sites and any new helipads	Grass or other applicable control measure as required to minimize erosion and sediment transport to streams.
Disturbance of birds and wildlife	Selection of the leeward Koolau route to minimize disturbances to birds and wildlife at higher elevations; expeditious completion of work to minimize the duration of any disturbance.
Aesthetic effect of the 138 KV lines and poles	Selection of single steel poles as opposed to towers, except where not technically feasible. Poles and towers to be constructed to fit the topography (i.e., variable length supports) instead of platforming the site. Painting of poles and conductors to blend with surroundings in conservation areas.
Interference with fire-fighting aircraft	Designation of the 138 KV line locations on aeronautical charts to minimize the safety hazard and the placement of airplane markers on long span lines if required by the Federal Aviation Administration.
Periodic maintenance disturbances and tree trimming	Initial routing design made to minimize potential problem areas and avoidance of excessive tree trimming.
Interference with specific areas such as Lyon's Arboretum or Pali Lookout	Selection of the alternative having the minimum impact and possible minor rerouting adjustments of the lines, if feasible.

<u>Impact</u>	<u>Mitigating Measure</u>
Potential interference with archaeological sites or endangered species	Detailed archaeological and biological inspection of pole sites before construction and minor pole site adjustments, as required, to avoid interference.

URBAN AREAS

<u>Impact</u>	<u>Mitigating Measure</u>
Construction-related noise	Compliance with noise limitations as set forth in Chapter 44B, Hawaii Revised Statutes, which includes limiting construction to the period of 7 am to 6 pm.
Construction-related fugitive dust	Compliance with Chapter 43, Section 10, of the State of Hawaii's Air Pollution Regulations, which includes sprinkling to reduce dust, as required.
Construction-related inconvenience to vehicular traffic	Construction will be limited to five pole segments at any one time. A minimum of one lane for traffic will always be kept open. Flagmen and appropriate traffic control signs will be used, as required.
Construction-related hazards to vehicular and pedestrian traffic	Lighted barricades and appropriate signs will be used to alert drivers to any hazards, and bridges will be placed over open pole holes during nonconstruction hours to minimize any hazards to pedestrians.
Aesthetic impact	Use of slim, tubular, metal poles that minimize the number of guy wires and poles required, and the relocation of 46 KV lines from wooden poles to the new steel poles and shortening the wooden poles to obtain a cleaner appearance.
Potential danger from falling lines	Conductor to be used will meet and exceed safety factor requirements as specified in the Public Utilities Commission's rules for overhead line construction. Current will be automatically shut off in case of failure.
Potential radio/tv interference or line noise	Proper maintenance of lines and insulators and prompt response to any complaint.
Maintenance-related interferences	Expeditious completion of required work to minimize the duration of these interferences.
Potential traffic hazard due to poles	Poles will be located behind curb lines.

### UNDERGROUND LINES

The regular construction-related impacts will be similar to those already described.

<u>Impact</u>	<u>Mitigating Measure</u>
Interference with existing underground utilities during construction	Initial routing of lines to minimize interference with existing underground utilities.
Potential interference with addition of new utilities	Planning of locations to minimize conflicts and interferences.
Potential oil leakage	Good design and construction of alarm monitoring of coolant pressure.

### SUBMARINE CABLE

The regular construction-related impacts will be similar to those already described.

<u>Impact</u>	<u>Mitigating Measure</u>
Benthic disturbance due to cable trench elevation	Routing of line to minimize disturbances.
Interference with shipping navigation in the vicinity of Honolulu Harbor	Designation of submarine cable location on marine navigation charts and posting of signs denoting a cable crossing site.
Periodic disturbance of the bottom due to required repair	Design and placement to minimize interference with the cable. Proper equipment to locate the problem area quickly and conduct repair with minimum disturbance.

ANY IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

The primary commitments of resources are the capital, labor, land, and energy expended in construction of the proposed 138 KV lines. The magnitude of commitment will depend upon the alternative routes and the type of line selected. The underground alternatives would constitute a greater commitment of resources in that greater amounts of material and effort will be required for their construction. In addition, space in the street right of way can be considered a resource in the urban Honolulu area; undergrounding of the 138 KV lines would constitute a significant commitment of this resource.

AN INDICATION OF WHAT OTHER INTERESTS AND CONSIDERATIONS OF GOVERNMENTAL  
POLICIES ARE THOUGHT TO OFFSET THE ADVERSE ENVIRONMENTAL  
EFFECTS OF THE PROPOSED ACTION

It is basic governmental policy of the State of Hawaii to have an electric utility that will supply sufficient, reliable electric power to meet present and anticipated demands. Chapter 269 of the Hawaii Revised Statutes creates a Public Utilities Commission (PUC) to regulate utilities within the state. As mandated by its franchise under PUC regulations, Hawaiian Electric Company (HECO) is responsible for supplying sufficient, reliable electric power to meet the demands within its service area.

This governmental policy, to supply sufficient, reliable electric power, has been reiterated in The Hawaii State Plan and the General Plan: City and County of Honolulu. In the State Plan, the statement of objectives is to provide "dependable, efficient, and economical statewide energy and communication systems capable of supporting the needs of the people." A stated objective of the General Plan is to "maintain a high level of service for all utilities." It is apparent that governmental policy supports sufficient electric utility facilities to meet the demand.

A significant restraint placed upon HECO by the PUC is that rates charged customers for services should be based upon the lower costs associated with overhead transmission lines of sound engineering design. When customers are willing to contribute the difference in cost between overhead and underground lines, these lines can be constructed according to HECO's tariff rules no. 13 and 14. This means that HECO is limited to using overhead transmission lines unless users make up the difference in cost between overhead and underground lines or unless special approval for expenditures for underground line construction can be obtained from the PUC.

Environmental considerations are not addressed in the PUC regulations, which are primarily concerned with the supply of cost-effective, reliable electric power based on sound engineering design. Environmental considerations, however, are addressed in Chapter 343 of the Hawaii

Revised Statutes, which establishes the Environmental Quality Commission (EQC) and outlines procedures and requirements for environmental impact statements. Regulations of the EQC require that an environmental impact statement be prepared for actions having significant environmental effects.

SUMMARY OF UNRESOLVED ISSUES AND HOW ISSUES ARE TO BE RESOLVED  
PRIOR TO COMMENCEMENT OR WHAT OVERRIDING REASONS  
THERE ARE FOR PROCEEDING WITHOUT RESOLVING SUCH PROBLEMS

The major unresolved aspect of this project is the decision of which alternative will be adopted. This EIS is part of that decision process, which will ultimately involve agreement among HECO, the PUC, and the DLNR. Public hearings are also required since lines greater than 46 KV in urban areas are involved.

Depending on which alternative is chosen, further unresolved factors include the securing of any needed right of way and easements and the obtaining of all governmental approvals needed for the chosen alternative. If an alternative is chosen involving underground lines, the additional issue of how the extra cost will be paid for must be resolved by the PUC.

## ORGANIZATIONS AND PERSONS CONSULTED

### U.S. GOVERNMENT AGENCIES

1. Fish and Wildlife Division, Department of the Interior
2. Department of the Army, Pacific Ocean Division, Corps of Engineers

### STATE OF HAWAII AGENCIES

1. Department of Land Utilization
2. Division of Forestry, Department of Land and Natural Resources
3. Department of Parks, Outdoor Recreation
4. Historic Sites Division, Department of Land and Natural Resources
5. University of Hawaii, Chancellor, Environmental Center, Facilities Planning
6. Department of Regulatory Agencies, Public Utilities Commission
7. Department of Transportation

### CITY AND COUNTY OF HONOLULU AGENCIES

1. Fire Department
2. Board of Water Supply
3. Department of Public Works

### COMMUNITY GROUPS AND ORGANIZATIONS

#### State Representatives

1. Representative Ted Morioka
2. Representative Calvin Say

#### State Senators

1. Senator Dennis O'Connor
2. Senator Anson Chong
3. Senator W. Buddy Soares

### Neighborhood Boards

1. Palolo (No. 6)
2. Manoa (No. 7)
3. Moiliili (No. 8)

### Community Associations

1. Palolo Community Council
2. Waiomao Community Association
3. Carlos Long Community Association
4. Manoa Community Association
5. Moiliili-McCully Community Council

### Other Groups or Organizations

1. League of Women Voters
2. Hawaiian Electric Company

### INDIVIDUALS CONSULTED

1. Mr. Seth Whitman Rehfeldt
2. Rev. Charles C. Luttrell (President, Palolo Community Council)
3. Mr. Tamotsu Sahara (University of Hawaii, Facilities Planner)
4. Ms. Jennifer Eckert
5. Mrs. Earl Hirakawa
6. Mr. Jack Gillmar
7. Mr. and Mrs. F.J. Boody
8. Ms. Mary K. Manabe
9. Ms. Marie Wagner
10. Ms. Elsie Yamamoto et al.
11. Mr. and Mrs. Frank Walker Smith III
12. Mr. Ronald Fukuhara
13. Mrs. Janet Thebaud Gillmar
14. Dr. Douglas S. Yamamura (Chancellor, University of Hawaii)
15. Ms. Barbara Ryan
16. Mr. Eugene Montoya (Chairman, Neighborhood Board No. 8)
17. Mr. Dennis Callan

18. Mrs. Patricia Akamine (President, Moiliili-McCully Community Council)
19. Mr. Roy Shigemura
20. Ms. Carolyn A. Corn (Botanist, Department of Land and Natural Resources)

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A P P E N D I X    A

Archaeological Reconnaissance Study

ARCHAEOLOGICAL RECONNAISSANCE OF PROPOSED 138KV TRANSMISSION  
LINE FROM HALAWA SUBSTATION TO PUKELE SUBSTATION, HONOLULU, HAWAII

William Barrera, Jr.  
CHINIAGO INC.

Under a contract with Sunn, Low, Tom and Hara, an archaeological reconnaissance survey of the right-of-way of a proposed Hawaiian Electric Company 138KV transmission line was performed by Chiniago Inc. The purpose of the survey was to determine the presence or absence of archaeological and historic remains, and to determine whether there would be a need for further archaeological work before the powerline could be built.

Fieldwork took place on various days during July and August, 1977. In those areas where the proposed pwerline is intended to follow the present right-of-way of an existing 46KV powerline, the existing line was followed and its vicinity was searched for prehsitoric or historic remains. In those places where the proposed right-of-way was not so marked, we were only able to approximate the right-of-way using various reference points present on a USGS map with a scale of 1:24000. In these areas, the presence or absence of sites as noted in this report does not necessarily present a true picture of the site density in the actual right-of-way, but does provide an indication of what should be expected in those areas.

In those places where the right-of-way ascends steep hillsides or cliffs where the likelihood of finding archaeological remains is low, or where the likelihood that any powerline towers would be placed is low, we did not survey. The right-of-way through Halawa Valley, Moanalua Valley and the east side of Upper Manoa Valley was not searched, because of the existence of previous archaeological reports indicating the presence of sites in those areas.

SOUTH HALAWA VALLEY

A report published by Bernice P. Bishop Museum Anthropology Department in 1970 details the results of an intensive survey of South Halawa Valley. This report indicates the presence of archaeological sites in the vicinity of the proposed transmission line. These sites are as follows.

50-80-10-653

This is a wall measuring 5.3 meters in length, 20 to 60 centimeters in width, and standing between 20 and 60 centimeters in height. It was suggested that this is the remains of a rectangular platform.

50-80-10-654

This is an agricultural terrace measuring 5 by 10 meters and standing to a height of 30 centimeters.

50-80-10-655

This is a clearing on a talus slope measuring about 1.2 meters in diameter. It is probably a small garden plot.

50-80-10-656

This is a possible house platform measuring 1.7 by 3.1 meters and standing to a height of 60 centimeters.

50-80-10-660

This site consists of terrace retaining walls covering an area measuring 5 by 7 meters.

50-80-10-661

This is a mound, possibly a grave, measuring 2.2 by 2.2 meters and standing 80 centimeters high.

#### MOANALUA VALLEY

Moanalua Valley was not surveyed because of the existence of Ayres' published report indicating the presence of four historic sites in the vicinity of the proposed powerline right-of-way:

"Site A7-75 is a cluster--s small frame house and two sheds--below the large rock-and-cement foundation of the one-time home of Douglas Damon (Site A7-76). Site A7-77 is a small foundation made of cut-lava blocks and cement. Site A7-78 is a small wood and corrugated-tin shed" (Ayres 1970: 14-15).

Sites A7-75 through A7-78 correspond to the State Historic Preservation Office site numbers 50-80-10-691 through 693.

#### KALIHI VALLEY

The entire right-of-way through Kalihi Valley was not searched. The existing 46KV transmission line was traced on the north side of the valley from the point where it ascends the cliffs to the west to a point below the bridge across Likelike Highway, and the approximate location of the proposed 138KV line was searched on the south side of the valley. As the surveys of both of these areas demonstrated the presence of archaeological remains, it was decided that a survey of the remainder of the north side of the valley would be unnecessary.

Archaeological remains discovered on the south side of the valley consist of extensive, well-built agricultural terraces and structures that might be burial platforms. Due to the number of remains, the density of the vegetation, and the uncertainty as to the precise location of the proposed powerline right-of-way, these sites were not recorded. Remains recorded on the north side of the valley are presented in the appendix.

#### NUUANU VALLEY

No sites were observed during our survey of the Nuuanu Valley portion of the proposed powerline. The section on the south side of the Pali Highway, however, is densely overgrown with hau, and the possibility that remains are present in that area should be recognized.

#### PAUOA FLATS

No archaeological remains were observed on our survey of the ridgetop behind Pauoa Flats.

#### MANOA VALLEY

No remains were observed in the west side of Manoa Valley, behind the Lyon Arboretum.

The presence of records on file at the State Historic Preservation Office indicating the presence of archaeological remains in the vicinity of the powerline on the east side of Manoa was the basis for our decision not to survey that area. The State Historic Preservation Office information consists of a Hawaii Register of Historic Places site form describing Site 50-80-14-1170, a complex of mounds that possibly represent human burial places, a stone wall 75 meters in length, and a series of "corrugations" running across a slope that may represent agricultural features.

#### PALOLO VALLEY

No historic sites were observed during our survey of the existing 46KV transmission line extending inland from the Pukele Substation. The extreme inland portion of this part of the proposed powerline right-of-way was not surveyed because of the difficulty of access to the area. Although no sites have been recorded in the area, the possibility of their presence should not be discounted.

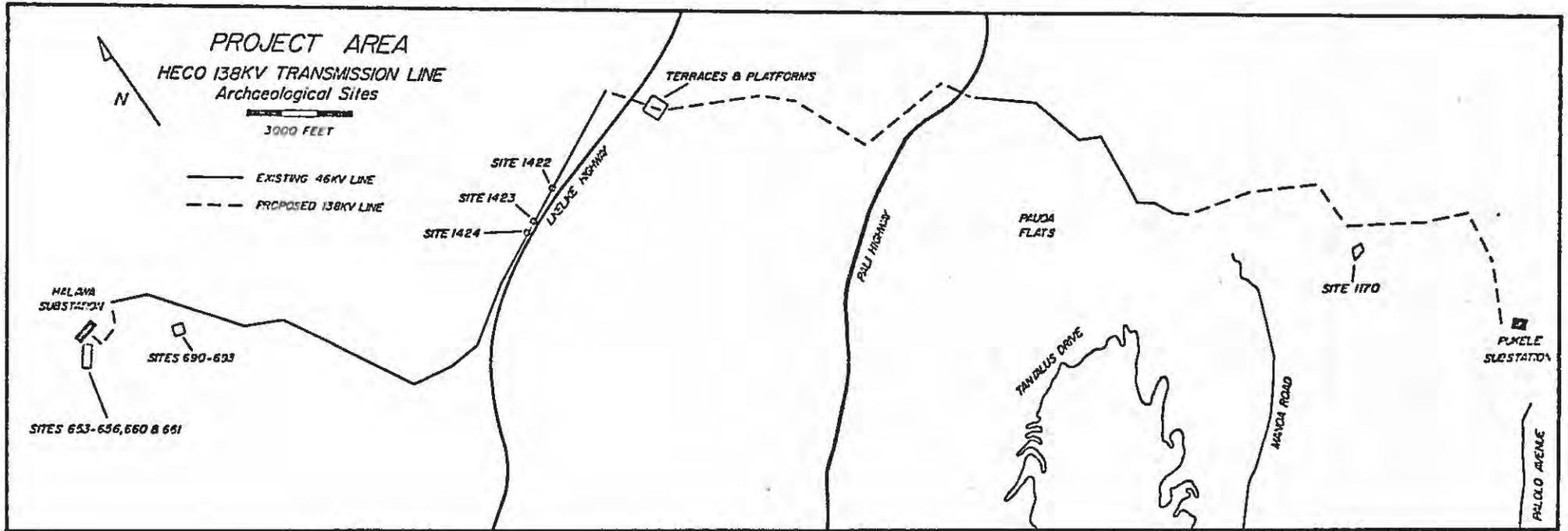
### ARCHAEOLOGICAL VALUES

Fourteen sites of historic or archaeological interest are known to be located in the vicinity of the proposed powerline. Six of these are in South Halawa Valley, four are in Moanalua Valley, three are in Kalihi Valley, and one is in Manoa Valley. Three of these sites, those in Kalihi Valley, were found during the course of archaeological fieldwork performed by Chiniago Inc. for Sunn, Low, Tom and Hara. The remainder were previously-known sites, the information concerning which is on file at the State Historic Preservation Office and in publications of Bernice P. Bishop Museum.

### IMPACT ON ARCHAEOLOGICAL VALUES

Construction of the powerline will have minimal impact upon archaeological values, provided that certain necessary precautions are taken. The specific locations of tower sites, access and equipment roads, helicopter landing areas, and any other places that will be subjected to disturbance by the construction of the powerline can be inspected by a professional archaeologist prior to such disturbance. If archaeological values are found in those areas, three alternatives are possible:

1. The location of the destructive activities may be moved,
2. The archaeological remains may be excavated to remove essential data and construction allowed to proceed, and
3. In the case of an especially valuable archaeological site, preservation may be necessary, in which case there will be no choice as to whether or not to move the destructive activities elsewhere.



## CONCLUSION AND RECOMMENDATIONS

This brief walk-through reconnaissance survey has demonstrated the presence of archaeological remains in the vicinity of the proposed Hawaiian Electric 138KV transmission line. In one instance, the north side of Kalihi Valley, archaeological sites were found directly beneath the existing 46KV line. These were located in the valleys or gullies between the ridges upon which powerline poles are present, and so were not affected by their construction. This indicates that it would be quite feasible to construct the 138KV line with minimal damage to archaeological sites even if they are present, by situating the towers in those places where there are no sites. Provided that no disturbance occurs to the ground between the towers, no information of archaeological or historical relevance would be endangered by the powerline.

Care should be exercised, then, in the location and construction of the towers. It will be necessary for an archaeologist to inspect the tower locations prior to any disturbance in order to avoid historic-site destruction or disturbance. Any and all areas which will be subjected to physical disturbance should be inspected by an archaeologist, including the rights-of-way of any access or equipment roads that might be necessary during powerline installation. In the event that sites of archaeological or historical importance are discovered in such locations, the nature of the specific site must be taken into account before any recommendations as to its final disposition can be made. In most cases it will probably suffice to conduct archaeological excavations to remove the endangered data, but it is possible that a site of such importance may be found that it should be left in place and not be disturbed. In this case, it will be necessary to choose an alternative location for the transmission tower.

**A P P E N D I X    B**

**Bird and Mammal Study**

Baseline Study of Birds and Mammals along the Proposed  
HECO 138 KV Transmission Line from the Halawa Substation  
to the Proposed Kamoku Substation

By Andrew J. Berger

This fauna baseline study of birds and mammals was prepared under contract with Mr. Paul T. F. Low of Sunn, Low, Tom & Hara, Inc., dated June 16, 1977. On May 31, 1977, I had met in the company offices with Dr. Hans Krock and Mr. James Hara in order to discuss the scope of the work involved. I made it a point, therefore, to visit all areas discussed in this report at least once during June in order to have the best chance of identifying all bird species that inhabit this extensive region. The nesting season for some species is approaching the end in June, and such species become very quiet--or stop singing entirely--during the summer months, so that it is then possible to miss the more secretive birds. Birds whose nesting season extends throughout the summer continue to sing, and, therefore, are conspicuous. It is unlikely that I missed any species that inhabits the regions surveyed.

My contract as a subconsultant specified that I (1) survey the literature on birds and mammals covering the proposed project route, (2) conduct a general field survey of the birds and mammals that occur in the vicinity of the proposed route, (3) prepare a report in the general EIS format on the findings of the field survey and the literature search, and (4) be available in the future to respond to written EIS comments concerning birds and mammals regarding any aspect of the proposed project by the Hawaiian Electric Company.

I. HECO Substation, South Halawa Valley: elevation approximately 360 feet.

The dominant vegetation surrounding the substation and of the valley, both at lower elevations and extending higher up the valley, consists of introduced trees, shrubs, and vines. Examples are: Christmas berry (Schinus terebinthifolius), mango (Manigera indica), guava (Psidium guajava), hau (Hibiscus tiliaceus), koa haole (Leucaena leucocephala), monkeypod (Samanea saman), kolomona (Cassia surattensis), Formosan koa (Acacia confusa), lantana (Lantana camara), Indian pluchea (Pluchea indica), and morning glory (Ipomoea sp.). A few prickly pear cactus (Opuntia megacantha) survive on the barren ridge on the western side of the valley; scattered Norfolk Island pines (Araucaria heterophylla) have been planted along the top of the eastern ridge. This is only a small sample of the numerous exotic plants in the region; St. John (1973) listed more than 4,600 species of exotic flowering plants that have been introduced to Hawaii from Asia, Africa, and North and South America. Native Kukui (Aleurites moluccana) trees grow at lower elevations in the valley but scattered clumps of koa (Acacia koa) and ohia (Metrosideros collina, var polymorpha) are found primarily at higher elevations and on well-watered slopes.

A. Introduced Bird Species

Because the native forest was destroyed a hundred or more years ago, we find that all birds found around the substation--and at lower elevations--are introduced species. I found the following species at elevations up to approximately 450 feet.

Family Columbidae, Pigeons and Doves

1. Spotted Dove (Streptopelia chinensis). This Asian dove was

introduced to the Hawaiian Islands at an early date; the exact date is unrecorded but the birds are said to have been very common on Oahu by 1879. The species is now abundant on all of the islands and is classified as a game bird in Hawaii. This dove also is called the Lace-necked Dove because of the conspicuous band of white spots on the back of the neck.

Although this species occurs where rainfall exceeds 100 inches per year, the highest densities are found in drier areas where the introduced kiawe or mesquite (Prosopis pallida) is a dominant plant. The Spotted Dove occurs throughout South Halawa Valley but in small numbers. The diet, as determined by examining contents of crops of 91 birds, was found to consist of 77 percent weed seeds and about 23 percent fruits; animal matter was "almost negligible" (Schwartz and Schwartz, 1949). Tapeworm parasitism was found to be heavy, however, indicating that the small amount of animal matter eaten by the doves was important in contracting the parasites.

2. Barred Dove (Geopelia striata). This species also is called the Zebra Dove in its native habitat in the Orient and Australia. This species is said to have been introduced to Hawaii sometime after 1922 (Bryan, 1958). It is now common to abundant on all of the islands in the chain. The Barred Dove also prefers the drier areas where weed seeds are abundant. Schwartz and Schwartz (1949) reported densities as great as 400 to 800 birds per square mile in some areas on Oahu (e.g., from Barbers Point to Makaha) and Molokai in 1947, and there is little doubt but that this dove is one of the most common species of introduced birds in

Hawaii. The Barred Dove also is classified as a game bird in Hawaii. One study of the food habits of the Barred Dove in Hawaii revealed that the diet consists of 97 percent seeds and other plant material and of 3 percent animal matter (including several species of beetles, weevils, and wireworm larvae). The Schwartzes emphasized that even though the Spotted Dove and the Barred Dove are both predominantly seed eaters, they do not compete for food because "only one plant occurred as more than 2 percent by volume in the diet of both birds. This one, uhaloa, occurs in great abundance throughout most dove range and is more than ample to supply the needs of both species of doves," as well as those of several species of other game birds (e.g., quail, pheasant) in Hawaii.

Barred Doves are common throughout the valley along roads, trails, and other open areas.

#### Family Tytonidae, Barn Owls

3. The first Barn Owls (Tyto alba pratincola) were imported from California and released in Hawaii (at Kukuihaele, island of Hawaii) during April 1958. Barn Owls were released at Hauula, Oahu, on two different occasions. Seven birds were imported from the San Diego Zoo and released during September 1959; 11 additional birds were imported from the San Antonio Zoo, Texas, and released at Hauula during October 1960 (Tomich, 1962). As with the mongoose in the last century, the Barn Owls were introduced in the hope that they would prey on the rats in the sugarcane fields. No food habits study of the Barn Owls on Oahu has yet been conducted, however. Tomich (1971) found on Hawaii

that almost 90 percent of Barn Owl pellets that he examined contained only the remains of house mice. He commented that, although the Barn Owl sometimes feeds on rats, it is not likely a significant factor in the economic control of rats in Hawaii. The fact is that the owls did not stay near the sugarcane fields where they were released but have spread throughout most of Oahu. The Barn Owl is nocturnal in habits and I did not see any during my field work in South Halawa Valley. Barn Owls not infrequently are killed by being hit by cars along Likelike Highway and the Pali Highway, however, and I have records of Barn Owls in Manoa Valley and Moanalua Valley (I found a dead owl there on April 14, 1977). It seems likely, therefore, that the species also occurs in South Halawa Valley.

Family Timaliidae, Babblers and Laughing-thrushes

4. Melodious Laughing-thrush (Garrulax canorus). This bird is native to southern China southward to Laos; it is a favorite cage bird of the Chinese, who call it Hwa-mei. Many of these birds escaped during the great fire in downtown Honolulu in 1900. Later introductions were made to the other islands, and this babbler is now widely distributed in the islands. The birds are tolerant of wet and dry habitats but prefer dense thickets. I did not happen to see or hear this species in South Halawa Valley, but Shallenberger (1976) reported it in North Halawa Valley. The Melodious Laughing-thrush apparently is far more common on the windward side of the Koolau Range, but it seems likely that it is widely distributed on the leeward side as well, especially at elevations higher than those involved in this study.

Family Pycnonotidae, Bulbuls

5. Red-vented Bulbul (Pycnonotus cafer). The members of this family of birds are classified as "prohibited entry" to the state by the Quarantine Branch of the Department of Agriculture. Nevertheless, two species are now well established on Oahu. The Red-vented Bulbul was first reported in the wild on Oahu in 1966; Berger (1975b) has summarized the spread of the species since that time. Bulbuls eat fruits as well as insects, and they have proved to be a serious nuisance on other Pacific islands where they have been introduced. There is a large population of Red-vented Bulbuls in South Halawa Valley; they are most common at lower elevations, but I saw several birds at an elevation of about 450 feet.

Family Turdidae, Thrushes and Bluebirds

6. Shama (Copsychus malabaricus). According to Caum (1933), this attractive Indian thrush was first released on Oahu by the Hui Manu in 1932; Bryan (1958) said that this species was introduced to Kauai in 1931 and that it was established on that island and in the Tantalus region of Oahu. Although no special study has been made of the distribution and abundance of this species on Oahu, it is now widely distributed in the wetter areas on both sides of the Koolau Range. The birds are noted for their attractive plumage and melodious songs. Shamas prefer dense vegetation, and they more often are heard rather than seen. The Shama is common throughout South Halawa Valley.

Family Sylviidae, Old-World Warblers

7. Japanese Bush Warbler (Cettia diphone cantans). This warbler, which is native to Japan and Formosa, was first released on Oahu in 1929. Berger (1975c) discussed the current distribution of this species on Oahu, and he (1977) described the first nests found in Hawaii. The Japanese Bush Warbler is one of the most common bird species in South Halawa Valley, occurring in the valley floor at lower elevations as well as along the slopes of the valley walls. The birds prefer dense vegetation in moderate to very wet areas. Their song is loud and distinctive, but the birds are secretive and are difficult to locate except when feeding young out of the nest.

Family Zosteropidae, White-eyes and Silver-eyes.

8. Japanese White-eye (Zosterops j. japonica). Caum (1933) wrote that the Japanese White-eye was first imported from Japan to Oahu by the Territorial Board of Agriculture and Forestry in 1929. Later importations were made by the Mejiro Club and by the Hui Manu. Berger (1975d) summarized early introductions. The White-eye rivals the House Sparrow and the European Starling in North America as a successful exotic species, and the Japanese White-eye undoubtedly is now the most common land bird species in Hawaii (Berger, 1972). It is found from sea level to tree line (on Maui and Hawaii) and it is found in the driest and the wettest habitats on all islands. The White-eye occurs throughout South Halawa Valley.

Family Sturnidae, Starlings and Mynas

9. Common Indian Myna (Acridotheres tristis). The Common Myna, which is native to Ceylon, India, Nepal, and adjacent regions, "was introduced from India in 1865 by Dr. William Hillebrand to combat the plague of army worms that was ravaging the pasture lands of the islands. It has spread and multiplied to an amazing extent; reported to be abundant in Honolulu in 1879, it is now extremely common throughout the Territory" (Caum, 1933). The Myna is still common to abundant in lowland areas of the inhabited islands, being most common in residential and urban areas as well as in the vicinity of human habitation in rural areas. The Myna is common in the quarry area but apparently rarely visits the higher elevations in the valley.

Family Ploceidae, Weaverbirds and their Allies

This is a large family of birds, predominantly Old World in distribution; the best known example in Hawaii is the House Sparrow.

10. Spotted Munia or Ricebird (Lonchura punctulata). This Asian species was released in Hawaii by Dr. William Hillebrand about 1865 (Caum, 1933). Caum wrote that the Spotted Munia "feeds on the seeds of weeds and grasses and does considerable damage to green rice." Rice is no longer grown in Hawaii, but the Spotted Munia has recently become a serious pest by eating the seeds of experimental sorghum crops. "A report by the Senate Committee on Ecology, Environment and Recreation says ricebirds and linnets caused a 30 to 50 percent loss in the sorghum fields of Kilauea on Kauai last year. ... seed-eating birds at Kohala ate about 50 tons of sorghum grain in a 30-acre experimental field that

was expected to produce 60 tons" ("Honolulu Advertiser," March 14, 1972, page B-2). Senate Bill No. 1603-72 appropriated \$25,000 to the Department of Agriculture "for the establishment of a system of protection and control of wildlife on the islands of Hawaii, Maui, Lanai, Molokai, and Kauai." The seriousness of the problem is outlined in the attached copy of a statement on Senate Bill No. 1603-72 by Mr. Fred Erskine, Chairman of the Department of Agriculture. No official report of the results of the initial control program was released, but the unofficial information is that it was not very successful. As a result of the bird depredations on the experimental sorghum crops, plans by the Department of Agriculture to diversify agriculture in Hawaii by growing small grain crops apparently have been greatly modified.

The Spotted Munia is an abundant and prolific species that nests throughout the year. It is sporadic in movements, frequenting any open areas that provide a supply of weed seeds. It may be seen along roads and other open areas in the valley.

11. House Sparrow (Passer domesticus). The House Sparrow (also called the English Sparrow) was first imported to Oahu in 1871 when nine birds were brought from New Zealand (where the species had previously been introduced from England). Caum (1933) wrote that "whether or not there were further importations is not known, but the species was reported to be numerous in Honolulu in 1879." The House Sparrow in North America (first introduced to Brooklyn, New York, in 1852) became a serious pest, and tens of thousands of dollars were spent in attempting to control the

population. The House Sparrow apparently never became a serious pest in Hawaii; it is omnivorous in diet, eating weed seeds as well as insects and their larvae. For the most part, House Sparrows live near man and his buildings. They are common in the lower reaches of the valley but only infrequently move upward as far as the substation.

Family Fringillidae, Sparrows, Cardinals, and Buntings

12. Red-crested Cardinal (Paroaria coronata). This species traditionally has been called the Brazilian Cardinal in Hawaii, but the native range includes Uruguay, Paraguay, Brazil, and parts of Bolivia and Argentina. This species was released in Hawaii on several occasions between 1928 and 1931 (Caum, 1933). The Red-crested Cardinal is a common species in urban and residential areas as well as in the introduced vegetation in lowland areas of both leeward and windward Oahu. It is not a bird of forests or dense thickets. I found it only around the quarantine station in South Halawa Valley.
13. Cardinal (Cardinalis cardinalis). This species has a number of vernacular names: e.g., Virginia Cardinal, Kentucky Cardinal, Kentucky Redbird. Its native range is the eastern part of mainland United States east of the plains and northward into Ontario. The Cardinal was released in Hawaii several times between 1929 and 1931 (Caum 1933, Berger, 1975d). The Cardinal is now widely distributed on Oahu, being a characteristic bird in the dry leeward regions as well as in the much wetter windward areas. It is one of the most common introduced bird species in South Halawa Valley, being found around the quarantine station

as well as at virtually all higher elevations in the valley and on the slopes of the valley walls.

14. House Finch (Carpodacus mexicanus frontalis). Also known as the Papayabird in Hawaii, the House Finch was introduced from California prior to 1870 "probably from San Francisco" (Caum, 1933). The House Finch is now one of the most abundant of the introduced birds in Hawaii. Although House Finches eat overripe papaya and other soft fruits at times, the species is predominantly a seed eater. House Finches and Spotted Munias caused devastating damage to the experimental sorghum crops in 1971 and 1972, as already mentioned. The House Finch inhabits residential areas as well as open areas in the country, and it occurs throughout South Halawa Valley.

#### B. Endemic Species

Endemic birds, by definition, are those species that are unique to the Hawaiian Islands, and, therefore, are not found in any other part of the world. Three species have been sighted in South Halawa Valley, but none as low as the elevation at the HECO substation (Shallenberger, 1976). None of these species is classified as an endangered or threatened species.

#### Family Muscicapidae, Old-World Flycatchers

1. Elepaio (Chasiempis sandwichensis gayi). This species, which has no English name, played an important role in Hawaiian mythology. It is widely distributed on Oahu, being found in both the Waianae and Koolau mountains. It seems to be the most adaptable of all of the endemic Hawaiian land birds in that the

Elepaio occurs in what little remains of the native forest on Oahu, is found in mixed forests containing both native and introduced species of plants, and even inhabits areas (e.g., upper Manoa Valley, Moanalua Valley, and parts of South Halawa Valley) where virtually the entire vegetation consists of exotic plants. The Elepaio tends to be very quiet during the nonbreeding season (Berger, 1972), and I did not see or hear this species during my field trips to South Halawa Valley. However, Shallenberger (1976) wrote that "the first 'elepaio was observed at an elevation of less than 450' on the valley floor, and numerous additional sightings were made along the stream bed from this elevation on up."

#### Family Drepanididae, Hawaiian Honeycreepers

2. Amakihi (Loxops virens chloris). There are four subspecies or geographical races of this species, one of which is found on Oahu. The Amakihi is the second most abundant of the surviving species of honeycreepers on Kauai, Oahu, Maui, and Hawaii. The original habitat of the Oahu Amakihi was the ohia and koa forests of the island. Most of these have been destroyed and replaced by exotic vegetation so that the total population of Amakihi is greatly reduced. Although the birds feed from the flowers of some introduced plants, the birds have not yet been found to nest in any tree on Oahu except for ohia. The birds do not occur at the elevation of the substation nor at the level of existing powerlines. Shallenberger (1976) wrote that "the first 'amakihi sighting was made at 650' in the first patch of 'Ohi'a trees in the valley." He added that Amakihi "were more common in the

upper reaches of the valley."

3. Apapane (Himatione sanguinea). The striking red and black Apapane is the most common of the surviving species of honeycreepers. It is, however, less adaptable than the Amakihi in that it does not occur where there are large stands of introduced vegetation. I neither saw nor heard this species in South Halawa Valley, and Shallenberger (1976) commented that Apapane "were scarce throughout the valley although their calls could be heard almost any time of the day at the extreme mauka end of the valley," meaning near the Pali or summit of the Koolau range, which is an area not involved in the installation of the proposed powerline nor in my field survey.

## II. Moanalua Valley.

The vegetation in Moanalua Valley represents a greatly disturbed flora, which in no way can be viewed as an even near-virgin area. Thus, in referring to the "long history of habituation by the Hawaiians in Moanalua Valley," Bishop and Herbst (1970) state that the information they obtained "does lead one to the conclusion that the flora of the floor of the valley must have been maintained in a disturbed state for a very long time." They add that "the disturbance of the valley floor continued into the earlier part of this century in the form of ranching. Cattle were grazed in Moanalua for about twenty years beginning in 1905. By this time several weedy tree species, such as the guavas, had been introduced to Hawaii, so that even the cows were unable to keep the pasturage open and the land had to be cleared periodically by hand. Present day reports indicate that such clearing often extended far up

into the side valleys and slopes, so that many of the present distributional limits of the native forest may date from this period."

An area so utilized by man and his domestic (or feral) animals is not one that provides anything more than very marginal habitat, at best, for native birds. The fully documented degradation of the original forest of Moanalua Valley is clearly reflected in the kinds of birds now found there. Thus, of the 16 species of birds I identified in Moanalua Valley, 13 were exotic species that were introduced to Hawaii by man. I found the same bird species that occur in South Halawa Valley.

I have made repeated field trips to Moanalua Valley since 1971. I have seen or heard the Apapane only at elevations greater than 1,000 feet. I have seen and heard the Amakihi at elevations above 560 feet; at such low elevations the Amakihi almost certainly is a bird of passage, sometimes foraging for food, but they probably never nest in this area because of a lack of ohia trees of suitable height and density. The habitat within the floor of Moanalua Valley from 240 feet elevation up to at least 1,370 feet is either unsuitable or marginal as nesting habitat for the Amakihi, and probably is totally unsatisfactory for the Apapane. The best potential nesting habitat for both of these species in Moanalua Valley consists of extensive stands of ohia on some of the very wet upper slopes of the valley and along the summit area of the Koolau range of mountains. These areas are well above the elevation proposed for the new powerlines.

It should be pointed out, also, that not all of the slopes above 1,300 feet elevation have suitable vegetation for the nesting activities of the Amakihi and Apapane. For example, as one stands in the stream bed at elevations between 1,300 and 1,400 feet and looks up the slopes

to the summits of the ridges near the head of the valley, one sees that the southeast slope consists of rock outcroppings, grasses, false staghorn fern (Dicranopteris linearis), and scrubby growth. The higher slope that forms the northwest wall of the valley also has rock outcrops, many dead trees, grasses, shrubs, and scrubby ohia. Neither of these slopes provides adequate nesting habitat for the endemic forest birds, although they may, on occasion, feed there or fly through as birds of passage. Similarly, the extremely dense thickets of false staghorn fern that cover open and previously disturbed areas form totally unsuitable habitat for any species of endemic bird. These comments also apply to all other areas along the proposed route of the powerline.

The Elepaio occurs at elevations as low as 255 feet, again demonstrating the adaptability of this species to introduced vegetation both for nesting and obtaining food.

Powerlines already span Moanalua Valley, and there is no evidence that they are detrimental either to the few native species or the many introduced species in the valley.

### III. Region Mauka of Tripler Hospital and Fort Shafter.

The regions mauka of both Tripler Hospital and Fort Shafter are covered primarily by introduced vegetation. Some of the more common plants are Christmas berry, eucalyptus, koa haole, ironwood (Casuarina sp.), strawberry guava (Psidium cattleianum), pluchea, and introduced grasses.

The high point above the Tripler Hospital complex is approximately 700 feet elevation. There are large erosion scars here bounded on one side by a plantation of eucalyptus trees, and there are dense thickets

of koa haole and other exotic plants. A deep depression mauka of the high point contains an almost impenetrable jungle of hau trees, after which the elevation increases again.

One species of introduced bird occurs in the Tripler area that is not found elsewhere along the survey route: the Mockingbird (Mimus polyglottos). This North American species was introduced to the Hawaiian Islands from California several times between 1928 and 1933. The Mockingbird is a very common species in some areas of Oahu but its distribution is spotty. It occurs in residential areas (e.g., Red Hill, Tripler Hospital grounds) and in outlying areas where mesquite is the dominant plant (e.g., Barber's Point). I saw Mockingbirds at elevations at 620 feet elevation just beyond the upper limit of housing quarters for medical personnel, but I did not observe it at higher elevations in this region.

The following introduced species also inhabit this area: Spotted Dove, Barred Dove, Japanese Bush Warbler, Japanese White-eye, Shama, Myna, Red-vented Bulbul, House Sparrow, Red-crested Cardinal, Cardinal, and House Finch.

An extensive Casuarina grove extends from a short distance above the uppermost housing area at Fort Shafter mauka beyond the first ridge (elevation about 590 feet along the powerline clearing) downward into a shallow valley and then upward to a more distant ridge at an elevation of approximately 750 feet. Such Casuarina groves are virtually devoid of other plant species and very few bird species occupy them. I saw only Spotted Doves, Barred Doves, and House Finches within this grove. Red-vented Bulbuls and Cardinals inhabit the margins of the grove where other vegetation predominates. Japanese Bush Warblers, Shamas,

Japanese White-eyes, Cardinals, House Finches, and Spotted Munias are widely distributed in the remaining mixed vegetation on ridges and the slopes of the valleys. I neither saw nor heard any endemic bird species in these areas.

IV. Likelike Highway, Elevations between 700 and 800 feet.

Introduced plants also predominate here on both sides of the highway. This is an area of relatively heavy rainfall, and the vegetation is very dense on both sides of the road. Only a few species of introduced birds find suitable habitat in the luxuriant vegetation. The most common species are the Japanese Bush Warbler, Japanese White-eye, Shama, and Cardinal. Other common species in open areas or those of less luxuriant growth higher on the ridges are the Spotted Dove, Barred Dove, Japanese White-eye, Myna, Spotted Munia, Red-crested Cardinal, and House Finch. The Elepaio and the Amakihi occur at higher elevations (900 feet and upward) and the Japanese Bush Warbler, Japanese White-eye, Shama, and Cardinal also are common near the entrance to the Wilson Tunnel.

V. Pali Highway, at 1,000 feet Elevation.

The introduced vegetation is especially dense on the western side of the road; dense thickets of hau, ironwood, bamboo, and false kamani line the eastern side of the road and extend downward into the valley. The same bird species found adjacent to Likelike Highway occur here in these thickets: that is, Japanese White-eye, Shama, and Cardinal. On the ridge to the west and in the more open valley to the east are found other common introduced species: Spotted Dove, Barred Dove, Japanese White-eye, Shama, Spotted Munia, Cardinal, Red-crested Cardinal, and House Finch.

VI. Manoa Valley, elevations between 500 and 600 feet.

A large number of exotic trees, shrubs, and vines characterize this wet area. A small sample would include guava, banana, mango, papaya, koa haole, octopus tree, albizzia, monkeypod, panax, eucalyptus, false kamani, Norfolk Island pine, paperbark (Melaleuca leucadendra), fiddlewood (Citharexylum spinosum), silk oak (Grevillea robusta), macadamia (Macadamia ternifolia), and Java plum (Eugenia cuminii). In some areas the vegetation is very dense; old groves of paperbark and eucalyptus are open stands with little ground cover; still other areas, both in the valley and on the slopes, are relatively open. Only a few species of birds are tolerant enough to adapt to these different habitats.

Depending upon the nature of the vegetation, therefore, the following birds occur in upper Manoa Valley: Spotted Dove, Barred Dove, Barn Owl, Shama, Japanese Bush Warbler, Japanese White-eye, Myna, Spotted Munia, House Sparrow, Red-crested Cardinal, Cardinal, and House Finch.

In addition, a small population of the Hill Myna (Gracula religiosa) still inhabits the introduced vegetation at the Lyon Arboretum and surrounding areas. This small group presumably constitutes the offspring of eight birds that escaped from a Honolulu petstore in 1960 and 1961 (Donaghho, 1966). The most recent reported sighting of the Hill Myna was on December 19, 1976 (Elepaio, 37, 1977:84).

Two additional species of exotic birds have now spread at least as far up the valley as Paradise Park and the Lyon Arboretum; these species will continue to expand their range to higher elevations.

1. Red-whiskered Bulbul (Pycnonotus jocosus). This prohibited species was first reported in the wild in Hawaii in 1966 (Berger, 1975b). The species is now very common in Manoa Valley and in the Makiki area of Honolulu.

2. Java Sparrow (Padda oryzivora). This sparrow long has been a popular cage bird, and it seems probable that Java Sparrows were released intentionally in the Diamond Head area in the 1960s. The population has exploded since that time and the species is now found in large numbers from Diamond Head to downtown Honolulu and throughout Manoa Valley. This seed eater is a pest in its native range in Java and Bali as well as in many other regions in Asia where it was introduced many years ago. Flocks of 25 or more birds are now common in Honolulu. The continued expansion of this species throughout Oahu certainly will doom any attempt to grow small grain crops on the island. This danger for North America was recognized by the U.S. Fish and Wildlife Service during March 1977 when it proposed to prohibit the importation into the United States of the Java Sparrow--as well as bulbuls of the genus Pycnonotus (Federal Register, vol. 42, no 44, pp. 12972-12978, March 7, 1977). It undoubtedly is too late to eradicate the Java Sparrow and the two species of bulbul from the island of Oahu.

Three endemic species of birds also occur in upper Manoa Valley; none is classified as threatened or endangered by the U.S. Department of Interior or by the State Division of Fish and Game. The Oahu Elepaio occurs regularly at elevations as low as the proposed powerline. In the past, I have seen Elepaio as low as 400 feet along the Woodlawn trail, and I saw one bird at an elevation of approximately 480 feet on June 15, 1977. The Amakihi and the Apapane are primarily birds of passage in the introduced vegetation in this part of the valley, and it is not

uncommon to see or hear Amakihi at elevations of 500 feet or lower, where the birds surely forage for food. The typical nesting habitat for both the Amakihi and the Apapane is in groves of ohia trees that occur at higher elevations. Moreover, there is no evidence that the present powerline that spans this part of the valley (where the floor is about 500 feet elevation) has in any way interfered with any bird species that lives in the valley.

VII. Waahila Ridge, Elevations Approximately 1,000 to 1,300 feet.

This narrow ridge (also formerly called St. Louis Heights Ridge) is clothed primarily with exotic vegetation, with an increasing mixture of native koa and ohia as one approaches the head of Manoa Valley. A large plantation of Norfolk Island pine occupies the makai end of the ridge (elevation about 1040 feet and upward); the needles of this tree inhibit the growth of any substantial ground cover, and this open forest is a poor one for most species of birds. The usual occupants are the Spotted Dove, Barred Dove, White-eye, and House Finch, although Amakihi not infrequently forage for food in these trees.

As one walks mauka along the ridge, one encounters dense thickets of strawberry guava, followed by a plantation of Casuarina, another barren area. The broader makai end of the Waahila Ridge narrows at a knoll at an elevation of about 1,290 feet, before the trail drops off to lower elevations. The first present powerline crosses the ridge just beyond this knoll. A second powerline crosses the ridge from the Woodlawn area of Manoa Valley to pass down into Palolo Valley.

The birds found in the vegetation along the ridge are much the same

as those found elsewhere on the leeward side of the Koolau Range: Spotted Dove, Barred Dove, Japanese Bush Warbler, Japanese White-eye. Shama, Spotted Munia, Cardinal, and House Finch. Elepaio apparently do not occur until one approaches the mauka point where the Waahila Ridge Trail meets the Woodlawn Trail; Amakihi and Apapane also occupy this area at certain times of the year. There is one questionable report of "one (possibly two) Oahu Creepers" in this area (Elepaio, 34, 1973:18). The Oahu Creeper (Loxops maculata maculata) has now been listed as an "endangered" species (Federal Register, vol. 41, Wednesday, October 27, 1976, page 47188). The region where this species may have been seen is well mauka of the route of the proposed powerline.

#### VIII. Palolo Valley

I made only one field trip to Palolo Valley going as far as the HECO substation (elevation approximately 500 feet) at the end of Myrtle Street. The majority of the vegetation consists of common introduced species; scattered clumps of koa and ohia occur on the valley slopes. The common introduced bird species found in residential areas were found, and three species (Barred Dove, Common Myna, and House Sparrow) actually were calling from inside the fence of the substation. A flock of Common Pigeons (Columba livia) also was seen here. Shamas and Japanese Bush Warblers were heard singing at higher elevations in the valley.

#### Mammals

Only one endemic land mammal occurs in the Hawaiian Islands: the Hawaiian Bat (Lasiurus cinereus semotus). Although this bat has been observed on Oahu, it is thought not to be a permanent resident (Kramer,

1971). All other mammals are introduced species, and all are destructive to plants, birds, and/or the products of man.

1. Brush-tailed Rock Wallaby (Petrogale penicillata). This small, marsupial from Australia was brought to Hawaii in 1916; a pair was taken to Alewa Heights to a private zoo, but they escaped the following day (Kramer, 1971). The population numbered 100 or more during the 1930s and 1940s. Tomich (1969) estimated the total population as consisting of "only a few dozens of individuals." Henry Ishibashi estimated that the population numbered about 30 animals in 1974 (Elepaio, 35:103-104). He added that the wallabies "haven't caused any ecological damage because that area [in Kalihi Valley] was previously stripped of vegetation by cattle and there aren't many indigenous plants there." The presence of this wallaby in the Kalihi area is of no significant importance in relation to the proposed powerline.
2. Roof Rat or Black Rat (Rattus rattus). The Roof Rat reached the Hawaiian Islands from sailing ships, presumably during the 18th century. Three different color types occur in Hawaii. This rat is very common and is found from sea level well up into the mountains (as high as 9,800 feet on Maui). Roof Rats are serious predators on the eggs and young of ground- and tree-nesting birds in Hawaii. Roof Rats are primarily nocturnal in habits and I did not see any during my field trips for this study. I have seen them in several areas on previous visits to some of the areas studied, however, and it seems certain that they are found throughout the area under consideration.
3. Polynesian or Hawaiian Rat (Rattus exulans). The early

Polynesian settlers in Hawaii are presumed to have brought this rat with them. No study of the distribution of this rat has been conducted on Oahu, but it is known to occur from sea level into the mountains (Kramer, 1971, Tomich, 1969). It occurs in both native and introduced forests, grassy gulches, and shrub-grown areas. This species, too, is said to be primarily nocturnal in habits, and I did not encounter it in my present study, although it certainly occurs in most, if not all, regions on Oahu.

4. House Mouse (Mus musculus). The date of introduction of the House Mouse to Hawaii is unknown, but it is said to have been common by 1825. It "can be found inhabiting almost every biotic community that occurs from sea level up to at least 6,500 feet" (Kramer, 1971). It is ubiquitous around human habitation, and, in Hawaii, also is found in sugarcane fields, in fallow fields, and in forests and scublands in fairly wet areas. I did not attempt to determine the abundance and distribution by trapping because of the general distribution of the House Mouse and because its occurrence is not significant with regard to an environmental impact statement.
5. Small Indian Mongoose (Herpestes auropunctatus). The mongoose was first imported to the Hamakua Coast of Hawaii during September 1883 to combat rats in the sugarcane fields. They were imported to Oahu and other islands about 1888. The mongoose is an abundant pest on all of the islands (except Lanai and Kauai), and is found from sea level to the highest peaks on Oahu. Being diurnal in habitat, they are the easiest mammal to observe, and I saw one or more mongooses on each field trip I made. Mongooses

eat the eggs and young of ground-nesting birds and even climb trees at times; they are serious predators on introduced game birds as well as on the endemic waterbirds.

6. Pig (Sus scrofa). The Polynesian ancestors of the Hawaiians brought pigs with them, and Captain Cook and later ship captains released English pigs on the islands. In 1925, the central forest of Oahu "was riddled with wild pigs" which were destroying the undergrowth. Since that time, however, there has been a great reduction of pigs on Oahu, and hunters often are unsuccessful in killing any during their trips. Pigs do occur at higher elevations in some of the valleys, but I did not see any pigs, or their signs, at the elevations where I worked.

### Discussion

The following discussion is necessary in order to give perspective to my conclusions with respect to possible criticisms by those who consider themselves "environmentalists" or "conservationists."

In the decade of the seventies one must view any development realistically and honestly. Power is vital to modern life and to the living standards currently demanded by our society and its economy. At the same time, leaders throughout most of the world recognize that overpopulation and pollution of the environment actually threaten the existence of modern civilization and that these problems are now critical. Wilderness areas must be preserved for the direct benefit of mankind and for the gene pools of the plants and animals that form native ecosystems. We cannot now know fully how important these gene pools may be to mankind in the future.

It is in relation to the native ecosystems that judgement and unequivocal intellectual honesty must be exercised. The Hawaiian Islands once had a unique biota, plants and animals that were found nowhere else in the world. Only a small remnant of those large endemic ecosystems still exist. Of the rainforest ecosystems still extant, everything possible should be done to preserve them. Among these are the Alakai Swamp on Kauai, the outer northeast slope of Haleakala Crater on Maui, and a few selected areas on the island of Hawaii. There presumably are areas along the Pali and the higher ridges that approach it in the Koolau Range on Oahu that should be given strict protection because of their plant and animal life. It is not scientifically justifiable, however, to propose that all development be prohibited in areas whose endemic plant and animal life were devastated 100 or more years ago by man and the

mammals he introduced, especially when these areas are now clothed predominantly by introduced vegetation and which are inhabited primarily by introduced birds, mammals, and other animals. There is nothing Hawaiian about any of these plants and animals; none are on any of the threatened or endangered species lists. The fact is that many of these plants and animals are inimical to the endemic flora and/or fauna and a number are serious pest species.

Island ecosystems are said to be "fragile," by which is meant simply that small alterations can result in extensive changes in the total environment. One reason for this is that ecosystems on islands as remote as the Hawaiian Islands (more than 2000 miles from a continental land mass) have a depauperate flora and fauna as compared with those on a continent. The reason is simple: the Hawaiian Islands are so far from a continent that relatively few ancestral plant and animal species reached the islands and became established. For example, many ornithologists recognize about 169 different families of birds in the world (Van Tyne and Berger, 1976). Of these, one family (Hawaiian honeycreepers, family Drepanididae) is unique to the Hawaiian Islands. Of the remaining 168 bird families, only 10 have endemic representatives in Hawaii (Berger, 1972).

Hawaiian ecosystems tend to be fragile because their relatively few species of plants and animals evolved together; they are more or less mutually interdependent. Most of the endemic forest birds, for example, seem not to be able to adapt to extensive changes in the native forests. And we find that about one-third of these unique Hawaiian birds already are extinct and more than another third are classified as threatened or endangered by both state and federal governments. It is a fact that no

one knows how large an area of virgin or near-virgin native forest is essential to prevent the extinction of any endemic forest bird, in part because the causes of the previous extinctions and reductions in numbers are still unknown. Nor do we know what the limiting factors are for the surviving populations of endemic birds.

It is extremely naive, therefore, for an environmentalist to suggest that any endemic forest bird can be saved from extinction by attempting to protect areas where the native forests were destroyed 100 or more years ago and where the predominant vegetation now consists of exotic plants that were introduced to Hawaii from Asia, Africa, and North and South America. To make such an assertion is to be biologically naive. In order to save species, one must save the ecosystems in which they evolved, and this is the philosophy underlying the work of the several Hawaiian Recovery Teams appointed by the U.S. Fish and Wildlife Service. The vast majority of all plant species along the proposed powerline are introduced plants that are foreign to the Hawaiian Islands. The scattered clumps of ohia and koa trees that occur on the ridges and walls of some of the valleys do not in any sense represent a native ecosystem at the elevations concerned in this project; they are, therefore, of no great significance to the endemic birdlife; they are merely remnants of a forest that used to be.

It should be emphasized, as well, that powerlines already exist over much of the proposed route for the new powerline. Five possible alternate routes have been suggested to lead from upper Manoa Valley or from the Pukele Substation in Palolo Valley to the Kamoku Substation on Date Street. None of these alternate routes would affect adversely the birds or mammals of the areas. Most of the birds species listed for

Manoa Valley and Palolo Valley occur along these routes; no new bird species would be encountered.

#### Conclusions

It is my considered opinion that the small amount of alteration required for the installation of new powerlines would have no significant impact on the present environment, which consists predominantly of exotic vegetation. Moreover, a number of the introduced trees, shrubs, and vines are pest species that compete with the native Hawaiian flora.

A number of the exotic bird species have caused extensive economic loss because of their food habits; other introduced species are potential pests if their range continues to expand and if a more diversified agriculture is attempted.

All of the introduced mammals have proven to be serious pests by preying on native animals, by causing serious losses to agriculture and other products, and by serving as reservoirs for diseases that can be transmitted to man or his domestic animals (Alicata, 1969). Birds, too, carry diseases that effect man and domestic birds; Hull (1963) discussed 27 different diseases that can be transmitted from birds or their droppings to man. Psittacosis or ornithosis is one example of such diseases in Hawaii; other examples are given by Kishimoto and Baker (1969), Bisseru (1967), Navvab Gojrati (1970), and Berger (1974-1975).

Consequently, the destruction, rather than the preservation, of introduced mammals is to be encouraged. In addition, the State Division of Fish and Game of the Department of Land and Natural Resources routinely issues permits to farmers and others to kill introduced birds that are causing damage to crops or buildings, and, as pointed out

earlier, more extensive efforts to control bird pests already have been attempted by the state government.

In summary, there are no virgin or near-virgin native ecosystems at any place along the proposed powerline. The entire route passes through areas whose native ecosystems were devastated more than 100 years ago, with the result that the vast majority of all plant life now consists of introduced species. Moreover, there already are powerlines in the areas under consideration, and there is no evidence that they have been a detriment to either birds or mammals, whether native or introduced. Consequently, I can see no way in which the installation or the operation of the new powerlines would effect adversely either endemic or introduced birds or mammals.

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Birds from Halawa Substation to the Proposed Kamoku Substation

	Halawa Substation	Moanalua Valley	Tripler Area	Ft. Shafter Area	Likelike Highway	Pali Highway	Manoa Valley*	Palolo Valley	Kamoku Substation
Pigeon	-	-	-	-	-	-	-	+	+
Spotted Dove	+	+	+	+	+	+	+	+	+
Barred Dove	+	+	+	+	+	+	+	+	+
Barn Owl	+	+	+	?	+	+	+	?	-
Melodious Laughing-thrush	-	-	?	?	-	-	-	?	-
Red-whiskered Bulbul	-	-	-	-	-	-	+	-	-
Red-vented Bulbul	+	+	+	+	-	-	+	+	-
Mockingbird	-	-	+	-	-	-	-	-	-
Shama	+	+	+	+	+	+	+	+	-
Japanese Bush Warbler	+	+	+	+	+	+	+	+	-
Japanese White-eye	+	+	+	+	+	+	+	+	+
Common Myna	+	+	+	+	+	+	+	+	+
Hill Myna	-	-	-	-	-	-	+	-	-
Spotted Munia	+	+	+	+	+	+	+	+	-
Java Sparrow	-	-	-	-	-	-	+	?	+
House Sparrow	+	+	+	+	+	+	+	+	+
Red-crested Cardinal	+	+	+	+	-	+	+	+	+
Cardinal	+	+	+	+	+	+	+	+	+
House Finch	+	+	+	+	+	+	+	+	+
Elepaio	-	+	-	-	-	-	+	-	-
Amakihi	-	+	-	-	-	-	+	-	-

+ = present; - = not observed; ? = very occasional; at higher elevations; up Manoa all, only.

STATEMENT OF BOARD OF AGRICULTURE CHAIRMAN FRED ERSKINE  
ON  
SENATE BILL NO. 1603-72

Senate Bill No. 1603-72 would appropriate \$25,000 through general revenues to the Department of Agriculture for use in a project of developing critically needed control methods against certain wild bird pests.

These bird pests, primarily the rice bird and linnet, are causing extensive damage to grain crops in Kauai and Hawaii. A recent State Fish and Game Division study of the bird problem in sorghum fields at Kilauea reveals that Metcalf Farms, Inc., is experiencing 30% to 50% crop losses due to feeding by large flocks of rice birds and linnets. Kohala Corporation similarly reports that, because of bird predation, they were able to harvest only 10 tons of sorghum from a 30-acre planting, which was supposed to produce at least 60 tons of grain.

I need not point out the seriousness of this problem and the grave implications that it holds for our hope of establishing a major grain production industry in Hawaii. This new industry represents the key to the expansion of our livestock industries and to realizing our ultimate goal of greater agricultural self-sufficiency for the State.

We know of no universally accepted and proven methods for controlling crop damage by wild birds, and we will need to develop a control program, based upon local conditions. If the appropriation is granted, the \$25,000 will be used to fund a crash program aimed at finding and implementing effective methods for reducing grain crop loss by selective control of pestiferous wild birds that are destructive to sorghum and other grain crops.

We recommend amending Section 1 of the Bill to read: "For the establishment of a system of control of pestiferous wild life in the State." The Bill would then more accurately reflect its primary purpose.

Although this is not an Administration bill, the Department of Agriculture supports the passage of Senate Bill No. 1603-72 with the stated amendment.

3/7/72

A P P E N D I X   C

**Botanical Survey**

A REPORT ON  
THE BOTANICAL SURVEY  
FOR THE  
PROPOSED HECO 138 KV TRANSMISSION  
LINE, HALAWA SUBSTATION TO PALOLO SUBSTATION

PREPARED FOR  
M & E PACIFIC, INC.  
HONOLULU, HAWAII

BY  
ENVIRONMENT IMPACT STUDY CORPORATION  
HONOLULU, HAWAII

SEPTEMBER, 1977

TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION. . . . .	1
LITERATURE REVIEW . . . . .	3
METHODOLOGY . . . . .	4
DISCUSSION. . . . .	5
Description of Vegetation Zones. . . . .	5
1. Scrub. . . . .	5
2. Savannah . . . . .	7
3. Forestry plantings . . . . .	7
4. 'Ohia-koa forest . . . . .	8
Description of Study Sites . . . . .	9
Study Site 1: Moanalua Valley. . . . .	9
Study Site 2: Kahauiki Ridge . . . . .	10
Study Site 3: Kalihi Valley. . . . .	10
Study Site 4: Nuuanu Valley. . . . .	11
Study Site 5: Nuuanu Valley. . . . .	11
Study Site 6: Manoa Valley . . . . .	11
Study Site 7: Waahila Ridge. . . . .	12
Study Site 8: Palolo Valley. . . . .	12
FINDINGS AND RECOMMENDATIONS. . . . .	14
LIMITATIONS OF THE SURVEY . . . . .	15
SPECIES CHECKLIST . . . . .	16
REFERENCES. . . . .	26

LIST OF FIGURES

<u>Figure</u>		<u>Page</u>
1	Location Map. . . . .	2
2	Vegetation Zones. . . . .	6

## INTRODUCTION

The Hawaiian Electric Company proposes to construct a 138 KV transmission line from the Halawa substation to the Pukele substation located in Palolo Valley (Figure 1). Environment Impact Study Corporation was contracted to conduct a botanical reconnaissance of the proposed alignment, portions of which will follow existing powerline routes. The 10.14 mile alignment crosses five major valleys and several ridges (Figure 2). A limited botanical survey was conducted along the proposed alignment in July, 1977, to inventory the flora, describe major vegetation zones and search for rare and endangered plants as listed in the Federal Register of 1976. Since the exact location of the proposed powerline was not established on the ground this survey covers a representative area indicative of vegetation through which the proposed route is located.

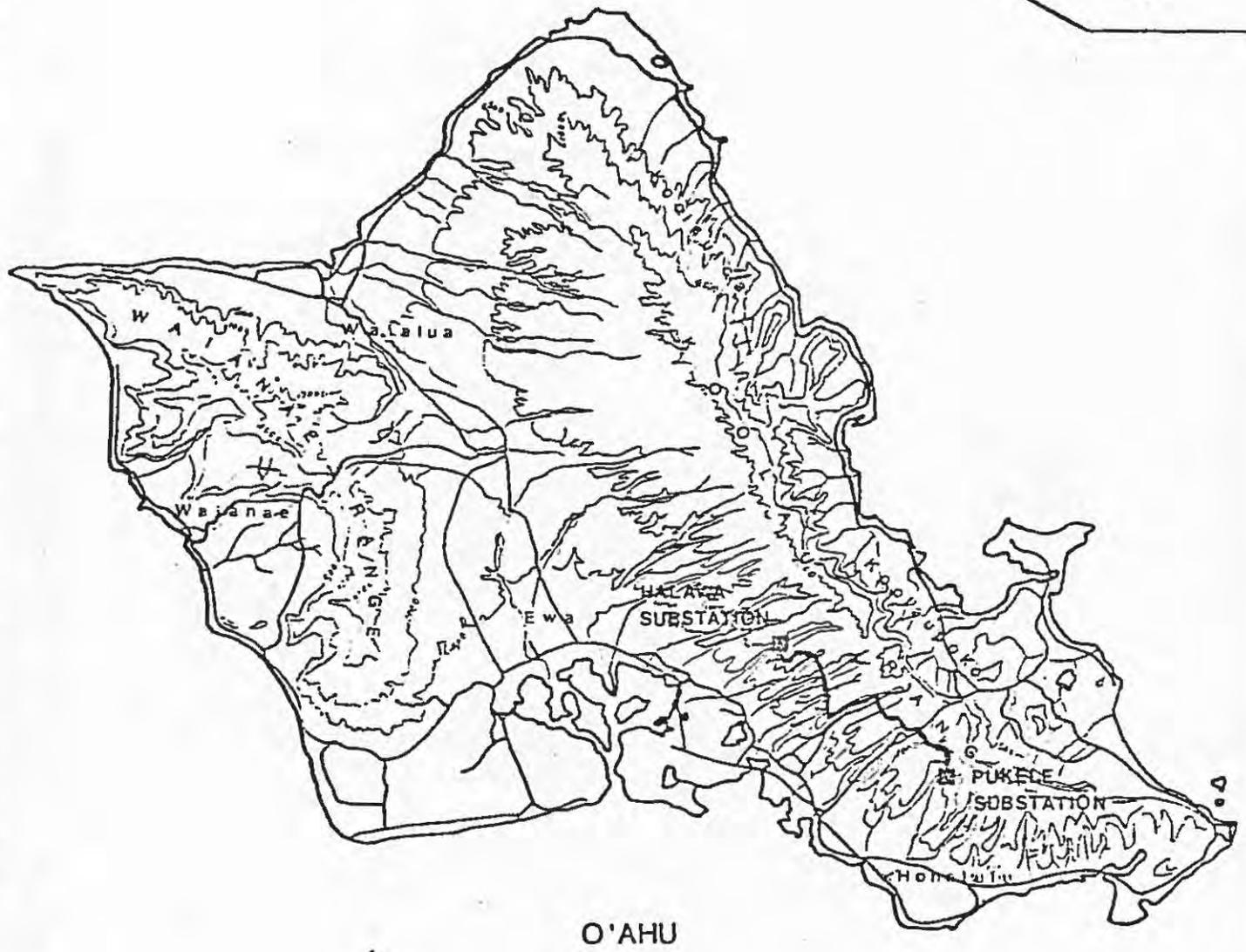
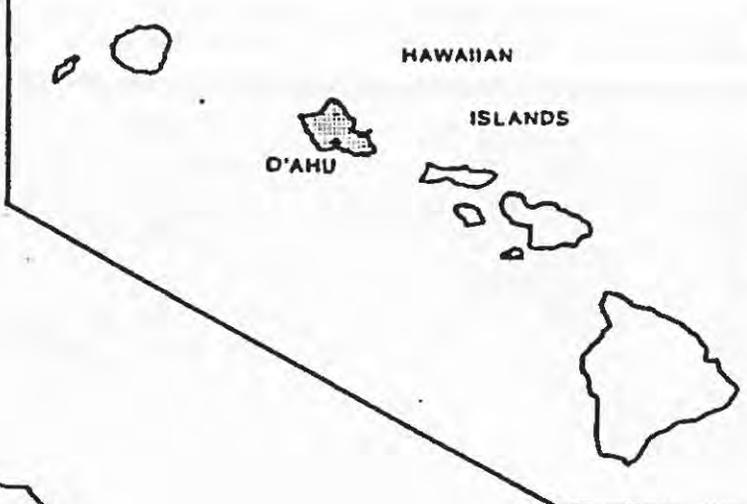
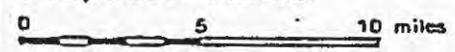


Figure 1

LOCATION MAP  
HECO 138KV Transmission Line  
Proposed Route



SCALE



Environment Impact Study Corp.

## LITERATURE REVIEW

Many botanists have collected in the area from Halawa to Palolo, especially along the less-disturbed ridges. Most of these collections are deposited in the herbaria of the Bishop Museum and the University of Hawaii. Species unique to the ridges and valleys of this area, for example Pritchardia macrocarpa, can be found described in various monographic and taxonomic works.

Two reports deal specifically with Moanalua Valley. The first by Bishop and Herbst (1970) gives a comprehensive discussion of the vegetation zones and species found within the valley. The second by Lamoureux (1971) was prepared as part of an environmental impact statement for the now defunct Interstate Route H-3 through Moanalua Valley and is primarily an assessment of the flora and vegetation on and adjacent to the powerline route.

A general description of the vegetational aspects and species found along the Manoa cliffs - Pauoa Trail area can be found in Fosberg (1961a).

## METHODOLOGY

The major vegetation zones along the alignment were delineated through interpretation of recent large scale aerial photographs in conjunction with field observations. The vegetation zone corridor on the map covers an area one-fourth mile on each side of the alignment. The delineations were prepared to acquaint the reader with general zones and variations may occur.

Species observed and notes on the vegetation of representative areas were recorded in the field. Collections were made of plants that could not be positively identified so that later determination could be made in the laboratory. Binocular observations were employed to survey steep and inaccessible areas.

## DISCUSSION

The proposed alignment passes through several vegetation zones. Elevation and rainfall gradients change from Halawa to Palolo Valley. These gradients have a pronounced effect on the types of vegetation present. The Halawa and Moanalua alignment areas are found at the mouth of the valleys in the drier, lower elevation areas. The alignment along the Kalihi and Nuuanu areas is farther up the valleys and ridges. Elevation increases and rainfall is greater because of closer proximity to the Koolau summit. The alignment transects the amphitheater area in Manoa Valley and approaches the summit on Waahila Ridge.

The following descriptions of the major vegetation zones along the proposed alignment are generalized and have been drawn from Fosberg (1961b) and field observations (Figure 2).

### Description of Vegetation Zones

#### 1. Scrub

The scrub zone is found in dry to moderately wet areas at low to middle elevations, especially in disturbed places and on dry slopes. The vegetation in this zone consists largely of introduced species such as Christmas berry (Schinus terebinthifolius), guava (Psidium guajava), strawberry guava (P. cattleianum f. cattleianum) and koa-haole (Leucaena leucocephala). The scrub may be low stature (1-4 m. tall) or high stature

(6-10 m. tall), fairly dense or more open depending on availability of moisture and exposure factors such as wind. Groundcover consists of grasses, weedy herbaceous species such as Spanish needle (Bidens pilosa), Jamaica vervain (Stachytarpheta jamaicensis) and red pua-lele (Emilia sonchifolia) and seedlings from the canopy cover. Density of the ground cover is generally inversely proportional to the density of the canopy cover.

## 2. Savannah

This zone is characterized by an open grassland with scattered trees and shrubs. The trees consist of a number of introduced species such as Java plum (Eugenia cuminii), guava, and Eucalyptus. The native koa (Acacia koa) may occasionally be found here. A more closed canopy is developed along the stream beds and consists of such species as hau (Hibiscus tiliaceus), koa, kukui (Aleurites moluccana) and guava.

## 3. Forestry plantings

Various types of planted forests are located throughout Oahu. Much of this work was undertaken during the 1920's until the latter part of the 1930's. Plantings were undertaken primarily to increase the forest cover on the watershed areas of Oahu and

control erosion. Seed spotting and broadcasting also were done from airplanes (McEldowney, 1930). Forestry plantings frequently consist of blocks composed of a single species such as Eucalyptus robusta, other species of Eucalyptus, paper bark (Melaleuca leucadendra), and Norfolk Island pine (Araucaria heterophylla). Certain planted species such as fiddlewood (Citharexylum spinosum), Albizia and black wattle (Acacia decurrens) have become naturalized and have spread to other areas of Oahu.

#### 4. 'Ohia-koa forest

The 'ohia-koa forest can be found in moderately moist to wet areas at middle elevations. Koa forms a greater percentage of the vegetation type in the lower elevations of the forest, while 'ohia (Metrosideros collina ssp. polymorpha) becomes the more dominant component in the upper elevations of the forest. The 'ohia-koa forest lies between the koa forests of the lower elevations and the 'ohia forests of the upper elevations and represents a transition area where the two vegetation zones overlap.

A number of native trees such as 'ahakea (Bohea elatior), Psychotria, 'ohia-ha (Eugenia sandwicensis), kalia (Elaeocarpus bifidus), kawa'u (Ilex anomala) and kolea-lau-nui (Myrsine lessertiana) and shrubs of many genera such as Hedyotis, Clermontia, Cyanea, Cibotium, Coprosma, and Broussaisia are found here. Vines such as 'ie 'ie (Freycinetia arborea), maile (Alyxia olivaeformis) and hoi kuahiwi (Smilax sandwicensis) can be found at the base and trunks of trees. Uluhe (Dicranopteris linearis), with scattered trees intermixed, covers much of the steeper slopes in this vegetation zone.

#### Description of Study Sites

##### Study Site 1: Moanalua Valley

The valley floor in this study site is an open savannah composed primarily of the grass Themeda gigantea. Scattered throughout the Themeda are Java plum, guava, Eucalyptus, koa, monkeypod (Samanea saman) and mango (Mangifera indica) trees. Most of the herbaceous, weedy species can be found bordering the jeep road that runs along the valley floor. A grove of Livistonia palms can be found near an old house site.

Along Moanalua stream the trees become denser. Here kukui and several hau thickets can be found. Groundcover commonly consists of basket grass (Oplismenus hirtellus) and Hilo grass (Paspalum conjugatum).

On the drier, western slopes of the valley the vegetation consists of Christmas berry and guava scrub with a few scattered, open, grass areas. A grove of Eucalyptus is planted on the ridge above. Strawberry guava and Christmas berry make up the dominant scrub cover on the wetter, eastern slopes. A few native species such as alahe'e (Canthium odoratum) and 'ulei (Osteomeles anthyllidifolia) can be seen. On the ridge above, koa and a few 'ohia trees can be seen.

The valley at one time was used extensively for grazing cattle and the lower valley has been greatly disturbed.

#### Study Site 2: Kahauiki Ridge

Vegetation consists primarily of forestry plantings such as ironwood (Casuarina equisetifolia), Eucalyptus, and paperbark on the ridge and portions of the upper slopes. Localized clumps of strawberry guava are common. Along the jeep road are a few areas dominated by broomsedge (Andropogon virginicus). Much of the area (up to 50%) may be devoid of vegetative cover. A scrub of koa-haole, Christmas berry, and guava covers the slopes below.

#### Study Site 3: Kalihi Valley

About 50% of the study site consists of an open, grassy community composed primarily of broomsedge. Much of the area exhibits signs of erosion. The remainder of the study site consists of forestry plantings such as ironwood, Formosan koa (Acacia confusa) and Eucalyptus. Canopy cover is

approximately 90%. Groundcover is composed of more shade tolerant species such as 'awapuhi kuahiwi (Zingiber zerumbet), palmgrass (Setaria palmaefolia), basketgrass and downy wood-fern (Cyclosorus dentatus). The mosses Rhizogonium spiniforme and Racopilum cuspidigerum are quite common on rocks under the canopy.

Study Site 4: Nuuanu Valley

A high stature, closed forest composed of Eucalyptus, ironwood, and Formosan koa is found in study site 4. The vine maile pilau (Paederia foetida) is commonly found draped over the trees. Understory shrubs include guava, cinnamon (Cinnamomum zeylanicum), and koa-haole. Thimbleberry (Rubus rosaefolius) and palm grass form the common groundcover.

Study Site 5: Nuuanu Valley

This study site lies adjacent to the Nuuanu Reservoir. The area around the reservoir consists of an open, grassy area fringed by forestry plantings.

The proposed alignment will pass through a large planting of ohe (Schizostachyum glaucifolium) and hau. Groundcover is sparse and consists of downy wood-fern and awapuhi kuahiwi. A few scattered strawberry guava, guava, kukui, and cinnamon plants can also be found.

Study Site 6: Manoa Valley

Study site 6 is part of the Lyon Arboretum complex located in Manoa Valley. A number of their plantings are scattered throughout the area. Much of the amphitheater

area consists of forestry plantings. In the study area fiddlewood is abundant. Along the lower inner face of the Manoa cliffs area are extensive plantings of bamboo (Bambusa vulgaris var. auri-variegata) and Albizia.

#### Study Site 7: Waahila Ridge

A forest of 'ohia and koa covers much of the study site. This was the least disturbed site and consisted of a large number of native species. Many of the weedy species such as broad-leaved carpetgrass (Axonopus compressus), Jamaica vervain, and palmgrass were confined to the trailsides. A large colony of the native white hibiscus, Hibiscus arnottianus, was seen on the slopes facing Palolo Valley. The lichen Usnea was very common on the branches and twigs of trees in the study site. Large, pale-green tussocks of the moss Leucobryum were frequently found on the ground near the base of trees.

Uluhe covers much of the open steeper slopes and ridges. Trees such as 'ohia, koa, 'ahakea, and kalia (Elaeocarpus bifidus) were scattered throughout the uluhe and accounted for 25% of the cover. Large groves of kukui were noted in the gullies below.

#### Study Site 8: Palolo Valley

The study site is located immediately adjacent to the Pukele substation. A scrub composed largely of Christmas berry, and strawberry guava dominates the slopes directly above the substation. Vegetation on the higher slopes is a

mixture of koa, Eucalyptus, and Christmas berry. An open, grassy, terraced area covered largely by broomsedge, California grass (Brachiaria mutica) and natal redtop (Rhynchelytrum repens) is located behind the substation.

## FINDINGS AND RECOMMENDATIONS

The following percentage cover by vegetation zones along the proposed alignment were approximated as follows:

- 50% - Forestry plantings
- 30% - 'Ohia-koa
- 20% - Scrub, savannah, and residential

Approximately 70% of the proposed alignment will pass through previously disturbed areas.

Rare and endangered plants were not found during this preliminary survey, however, additional surveys should be conducted at each pole site when final stake-outs are completed. It is recommended that the sites for the proposed helipads also be investigated before construction commences.

It is recommended that a more in-depth survey be conducted in the 'ohia-koa zone, specifically, the alignment areas behind Kapalama, Tantalus, and on Waahila Ridge. Exocarpus gaudichaudii which is on the Federal Register (1976) of rare and endangered plants has been collected from the Waahila area and is known to be near the proposed alignment.

Earth cuts and site clearings should be kept to a minimum to ease the amount of erosion. These disturbances will also hasten the invasion of the more aggressive, exotic, weedy species which may succeed the predominantly native vegetation found on some of the higher elevation ridges.

### LIMITATIONS OF THE SURVEY

This botanical survey was taken at specific sites along the proposed alignment. The general descriptions are indicative of adjacent areas, however, exact species lists will differ with each site. The species recorded are also indicative of the season and environmental conditions prevalent during this survey. Surveys taken during different seasons and environmental conditions will undoubtedly result in variations in the species list.

Survey sites chosen were also limited by the lack of surveying flags marking the exact alignment and accessibility to certain areas. Botanically, the most important areas along the alignment are the ridges and slopes of the 'ohia-koa zone. This zone is usually difficult to survey because of access. Exocarpus gaudichaudii, a rare and endangered species, has been previously recorded near the proposed alignment on Waahila Ridge but was not located during this survey. A literature and herbarium search indicated that many taxa are known from the Waahila area but were not located in the survey.

Identification of certain plants such as Cyrtandra and Clermontia have been identified only to the generic level due to lack of fruits and flowers necessary for proper identification.

## SPECIES CHECKLIST

Families are listed alphabetically within each of four groups: Pteridophyta, (including fern allies), Gymnospermae, Monocotyledonae, and Dicotyledonae. Genera and species are arranged alphabetically. Taxonomy and nomenclature of pteridophytes follow Wagner's unpublished Checklist of Hawaiian Pteridophytes except where more commonly accepted names are listed. Taxonomy and nomenclature of flowering plants follow St. John (1973). Common Hawaiian names used in the checklist are in accordance with Porter (1972) or St. John (1973).

For each species the following information is provided:

1. Scientific name.
2. Vernacular name, when commonly used, or Hawaiian name when known.
3. Status of the species. The following symbols are employed:
  - E endemic to the Hawaiian Islands, i.e. occurring naturally nowhere else in the world.
  - I indigenous, i.e., native to the Hawaiian Islands but also occurring naturally (without the aid of man) elsewhere.
  - X exotic, i.e., plants of accidental or deliberate introduction after the Western discovery of the islands.
  - P Polynesian introduction; it includes those plants brought by the Polynesian immigrants previous to Captain Cook's discovery of the island.

4. Endangered species as listed in the Federal Register 1976 are designated by an asterisk after the status of the species.
5. Relative abundance of the species within the study area sites. The rank is based entirely upon a comparison of the frequency with which a species occurs, as compared to all other species, within the study site. It does not denote, necessarily, the abundance of that particular species in the Hawaiian Islands.

The following symbols and explanations are employed:

- A ABUNDANT, generally the major or dominant species in a given area
  - C COMMON, generally distributed throughout a given area in large numbers
  - O OCCASIONAL, generally distributed through a major portion of a given area, but in small numbers
  - U UNCOMMON, observed uncommonly but more than 10 times in a given area
  - R RARE, observed 2 to 10 times in a given area
  - S SINGLE, only 1 specimen observed
6. The number heading each column refers to the study site discussed in the text and shown in Figure 2.
    - 1 Study Site 1: Moanalua Valley
    - 2 Study Site 2: Kahauiki Ridge
    - 3 Study Site 3: Kalihi Valley
    - 4 Study Site 4: Nuuanu Valley
    - 5 Study Site 5: Nuuanu Valley
    - 6 Study Site 6: Manoa Valley
    - 7 Study Site 7: Waahila Ridge
    - 8 Study Site 8: Palolo Valley

CHECK LIST OF PLANTS

HECO BOTANICAL SURVEY

SCIENTIFIC NAME	COMMON NAME	STATUS	STUDY SITE							
			RELATIVE ABUNDANCE							
			1	2	3	4	5	6	7	8
<b>PTERIDOPHYTA</b>										
<b>ADIANTACEAE</b>										
<i>Pityrogramma calomelanos</i> (L.) Link	Gold fern, silver fern	X		U					0	
<b>ASPIDACEAE</b>										
<i>Cycloporus dentatus</i> (Forsk.) Ching	Downy wood-fern	I	0	0	0		0	0	0	0
<i>C. parasiticus</i> (L.) Farwell		X			0					
<i>Elaphoglossum crassifolium</i> (Gaud.) Anderson & Crosby	'Ekaha	E							U	
<b>BLECHNACEAE</b>										
<i>Blechnum occidentale</i> L.	Blechnum	X		0					0	0
<i>Doodia kunthiana</i> Gaud.	'Okupukupu	E							R	
<i>Sadleria pallida</i> H. & A.	Amay	E							0	
<b>DAVALLIACEAE</b>										
<i>Nephrolepis cordifolia</i> (L.) Presl.	Kupukupu	I		U						
<i>N. exaltata</i> (L.) Schott	Sword fern, pamoho	I	0	0	0			0	0	0
<b>DENNSTAEDTIACEAE</b>										
<i>Pteridium aquilinum</i> var. <i>decomposition</i> (Gaud.) Tyron	Kilau	E			0				0	
<b>DICKSONIACEAE</b>										
<i>Cibotium splendens</i> (Gaud.) Krajiná	Hapu'u pulu	E							0	
<b>GLEICHENIACEAE</b>										
<i>Dicranopteris linearis</i> (Burm.) Underw.	Uluhe, uluhi	I			0				C	
<b>GRAMMITIDACEAE</b>										
<i>Adenophorus tamariscinus</i> (Kaulf.) H. & Grev.	Wahine-hono-mauna	E							0	
<i>Grammitis tenella</i> Kaulf.	Kolokolo	E							0	
<b>LINDSAEACEAE</b>										
<i>Sphenomeris chinensis</i> (L.) Maxon	Pala'a	I		0	0				0	0
<b>LYCOPODIACEAE</b>										
<i>Lycopodium phyllanthum</i> H. & A.	Wawae-iole	I							R	
<b>OPHIOGLOSSACEAE</b>										
<i>Ophioglossum pendulum</i> (Presl.) Claussen	Lau-kahi	I							R	
<b>POLYPODIACEAE</b>										
<i>Microsorium scolopendria</i> (Burm.) Copel.	Lau'e, lauwa'e	X	U						0	
<i>Phlebodium aureum</i> (L.) J. Smith	Lau'e haoie	I	U	U	U	U	0			
<i>Pleopeltis thunbergiana</i> Kaulf.	Pakahakaha	I						U	0	

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS	STUDY SITE															
			RELATIVE ABUNDANCE															
			1	2	3	4	5	6	7	8								
<b>PSILOTACEAE</b>																		
<i>Psilotum complanatum</i> Sw.	Moa	I																
<i>P. nudum</i> (L.) Beauv.	Moa	I																
<b>SELAGINELLACEAE</b>																		
<i>Selaginella arbuscula</i> (Kaulf.) Spring	Lepelepe-a-moa	E																
<b>GYMNOSPERMIAE</b>																		
<b>ARAUCARIACEAE</b>																		
<i>Araucaria heterophylla</i> (Salisb.) Franco	Norfolk Island Pine	X		U														
<b>MONOCOTYLEDONAE</b>																		
<b>ARACEAE</b>																		
<i>Colocasia esculenta</i> var. <i>antiquorum</i> (Schott) Hubb. & Rehd.	Taro, kalo	P								U								
<i>Scindapsus aureus</i> (Andre) Engl.	Taro vine	X						C										
<i>Syngonium</i> sp.		X							U									
<b>CANNACEAE</b>																		
<i>Canna indica</i> L.	Ornamental canna, ali'ipoe	X						U										
<b>COMNELINACEAE</b>																		
<i>Commelina diffusa</i> Burm. f.	Honohono, honohono wai	X	0	0	0	0	0	0	0									
<b>CYPERACEAE</b>																		
<i>Cyperus brevifolius</i> (Rottb.) Hassk.	Kyllinga, kill'o'opu	X	0							0								
<i>C. polystachyus</i> Rottb.		I	0		0					U	0							
<i>C. rotundus</i> L.	Nut grass	X	0															
<i>Fimbristylis dichotoma</i> (L.) Vahl	Tall fringe rush	I								0								
<i>Gahnia beecheyi</i> Mann	'Uki	E								0								
<i>Machaerina angustifolia</i> (Gaud.) Koyama	'Uki	I								U								
<i>M. mariscoides</i> subsp. <i>meyenii</i> (Kunth) Koyama	'Uki, 'aha-niu	I																
<i>Rhynchospora sclerioides</i> H. & A.	Hawaiian beak rush	E								0								
<b>DIOSCOREACEAE</b>																		
<i>Dioscorea bulbifera</i> L.	Iini	P																
<b>GRAMINEAE</b>																		
<i>Andropogon virginicus</i> L.	Broomsedge	X		0	C					U	C							
<i>Axonopus compressus</i> (Sw.) Beauv.	Broad-leaved carpetgrass	X			0	0				C								
<i>Bambusa vulgaris</i> var. <i>auri-variegata</i> Beardie	Bamboo	X							U									
<i>Brachiaria mutica</i> (Forsk.) Stapf	Californiagrass, paragrass	X	C	0		C			0		C							
<i>Chloris divaricata</i> R. Br.	Stargrass	X	U															
<i>Chrysopogon aciculatus</i> (Retz.) Trin. pilipili-'ula	Golden beardgrass, pilipili-'ula	X		U														
<i>Coix lachryma-jobi</i> L.	Job's tears, kukae-kolea	X	R															

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS	STUDY SITE															
			RELATIVE ABUNDANCE															
			1	2	3	4	5	6	7	R								
GRAMINEAE continued																		
<i>Eleusine indica</i> (L.) Gaertn.	Wiregrass, manienie ali'i	X	O	U														
<i>Eragrostis</i> sp.		E	R															
<i>Melinis minutiflora</i> Beauv.	Molassesgrass	X		O		O												
<i>Opismenus hirtellus</i> (L.) Beauv.	Basketgrass, honohono-kukui	X	O		O		O	A	O	O								
<i>Paspalum conjugatum</i> Berg.	Hilo grass, mau'u malihini	X	C	C	C	O	O	O	C	C								
<i>P. orbiculare</i> Forst. f.	Ricegrass, mau'u-laiki	X	O	O	O													
<i>P. urvillei</i> Steud	Vaseygrass	X						U										U
<i>Pennisetum purpureum</i> Schumach.	Napiergrass	X		U	U					U								
<i>Pennisetum</i> sp.		X				U												
<i>Rhynchelytrum repens</i> (Willd.) C. E. Hubb.	Natal redtop	X	O	U														U O
<i>Sacciolepis indica</i> (L.) Chase	Glenwoodgrass	X				O												O
<i>Schizostachyum glaucifolium</i> (Rupr.) Munro	Ohe	P								C								
<i>Setaria geniculata</i> (Poir.) Beauv.	Perennial foxtail, mau'u kaleponi	X			C	C	O											C O
<i>S. palmaefolia</i> (Koen.) Stapf	Palmgrass	X				C	C	O	A									C O
<i>Themeda gigantea</i> (Cav.) Hack.		X	O	R	O													
<i>Trichane insularis</i> (L.) Nees	Sourgrass	X		U														
LILIACEAE																		
<i>Cordyline terminalis</i> (L.) Kunth	Ti, ki	P	O	O	O			U	O	O	O	O						
<i>Dianella sandwicensis</i> H. & A.	'Uki, 'uki 'uki	E																U
<i>Sansevieria hyacinthoides</i> (L.) Druce	African bow string hemp	X		R														
<i>Smilax sandwicensis</i> Kunth	Hoi-kuahiwi	E																O
MUSACEAE																		
<i>Heliconia</i> sp.		X					R											
<i>Heliconia</i> sp.		X																R
<i>Musa</i> sp.	Banana, mala	P					R											
ORCHIDACEAE																		
<i>Arundina bambusaefolia</i> (Roxb.) Lindl.	Bamboo orchid	X			R	U												O
<i>Spathoglottis plicata</i> Bl.		X	U	U	O													U U
PALMAE																		
<i>Livistona</i> sp.		X	O															
<i>Phoenix</i> sp.	Date palm	X	R															
PANDANACEAE																		
<i>Freycinetia arborea</i> Gaud.	'Ie 'ie	E			O													O
<i>Pandanus odoratissimus</i> L. f.	Hala	I?				U												
ZINGIBERACEAE																		
<i>Hedychium flavescens</i> Carey	Yellow ginger, 'awapuhi melemele	X								O	O							
<i>Zingiber zerumbet</i> (L.) Roscoe	'Awapuhi kuahiwi	P				O				O	O							O

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS	STUDY SITE							
			RELATIVE ABUNDANCE							
			1	2	3	4	5	6	7	8
<b>DICOTYLEDONAE</b>										
<b>ACANTHACEAE</b>										
<i>Dicliptera chinensis</i> (L.) Juss.	Dicliptera	X					0			
<b>ANACARDIACEAE</b>										
<i>Mangifera indica</i> L.	Manqo, manako	X	0							
<i>Schinus terebinthifolius</i> Raddi	Christmas berry, wilelaiki	X	A	0	0				U	A
<b>APOCYNACEAE</b>										
<i>Alyxia olivaeformis</i> Gaud.	Maile	E		R					0	
<b>AQUIFOLIACEAE</b>										
<i>Ilex anomala</i> H. & A.	Kawa'u, ka'awa'u	E							U	
<b>APALIACEAE</b>										
<i>Brassia actinophylla</i> Endl.	Octopus tree, umbrella tree	X	0		U			0		0
<b>CASUARINACEAE</b>										
<i>Casuarina equisetifolia</i> Stickm.	Common ironwood, paina	X		0						
<i>C. aff. glauca</i> Sieb.	Salt marsh ironwood	X			A	A	0			
<b>CELASTRACEAE</b>										
<i>Perrottetia sandwicensis</i> Gray	Olomea	E							U	
<b>COMPOSITAE</b>										
<i>Ageratum conyzoides</i> L.	Ageratum, maile-honohono	X	0	0						
<i>Bidens pilosa</i> L.	Beggar's tick, Spanish needle, ko'oko'olau	X	0	0						
<i>B. sandwicensis</i> Less.	Hawaiian islands bidens	E							U	
<i>Emilia javanica</i> (Burm. f.) C. B. Robins	Red pua-lele	X	0		0					
<i>E. sonchifolia</i> (L.) DC.	Lilac pua-lele	X	0		0					
<i>Erechtites hieracifolia</i> (L.) Raf.	Fireweed	X	0		0		U	U	U	
<i>Eriqeron canadensis</i> L.	Canada fleabane, ilioha	X		0	0				U	0
<i>Eupatorium riparium</i> Regel	Pamkani	X								
<i>Pluchea indica</i> (L.) Less.	Indian pluchea	X	U							
<i>P. odorata</i> (L.) Cass.	Pluchea, shrubby fleabane	X	U							U
<i>Siegesbeckia orientalis</i> L.	Siegesbeckia	X	U				0			
<i>Sonchus oleraceus</i> L.	Sow thistle, pua-lele	X			0					
<i>Taraxacum officinale</i> (L.) Weber	Dandelion, lau-lele	X					U			
<i>Veronica cinerea</i> (L.) Less.	Ironweed	X	0	U						
<i>Youngia japonica</i> (L.) DC.	Oriental hawkbeard	X							R	
<b>CONVOLVULACEAE</b>										
<i>Ipomoea alba</i> L.	Moon flower	X				0				
<i>I. cairica</i> (L.) Sweet	Koali	I	0							
<i>I. congesta</i> R. Br.	Koali-'awania	I	0							
<i>Ipomoea</i> sp.		X				U				

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS	STUDY SITE RELATIVE ABUNDANCE									
			1	2	3	4	5	6	7	8		
<b>EBENACEAE</b>												
<i>Diospyros ferrera</i> (Willd.) Bakh.	Lama	E		0								
<b>EUPHORBIACEAE</b>												
<i>Aleurites moluccana</i> (L.) Willd.	Candlenut tree, kukui	P	0		0		0	0	0	0		
<i>E. hirta</i> L.	Garden spurge	X	0							0		
<i>Euphorbia multifloris</i> H. & A.	'Akoko	E								0		
<i>Macaranga grandifolia</i> (Blanco) Merr.	Bingabing, macaranga	X						R				
<i>Manihot glaziovii</i> Muell-Arg.	Ceara rubber	X								0		
<i>Phyllanthus debilis</i> Willd.	Phyllanthus weed	X	0									
<b>GESNERIACEAE</b>												
<i>Cyrtandra</i> sp.		E								S		
<b>GOUDENIACEAE</b>												
<i>Scayvola gaudichaudiana</i> Cham.	Naupaka-kuahiwi	E								0		
<b>LAURACEAE</b>												
<i>Cinnamomum zeylanicum</i> Bl.	Cinnamon	X				0	0	U				
<i>Persea americana</i> Mill	Avocado	X					R					
<b>LEGUMINOSAE</b>												
<i>Acacia confusa</i> Merr.	Formosan koa	X	U		C	A		0				
<i>A. koa</i> Gray	Koa	E	0	0	0			0	A	0		
<i>Albizia falcataria</i> (L.) Fosb.	Albizia	X						A				
<i>Albizia</i> sp.		X			0							
<i>Cassia leschenaultiana</i> DC.	Partridge pea, lauki	X	0	0	0							
<i>Crotalaria mucronata</i> Desv.		X	U									
<i>Desmanthus virgatus</i> (L.) Willd.	Virgate mimosa	X	0	0								
<i>Desmodium triflorum</i> (L.) DC.	Three-flowered beggarweed	X	U									
<i>D. uncinatum</i> (Jacq.) DC.	Spanish clover, pua pilipili	X	0	0		0		C		C		
<i>Leucaena leucocephala</i> (Lam.) de Wit	Koa-haole	X	0	U	0					0		
<i>Medicago lupulina</i> L.	Black medic	X				U						
<i>Mimosa pudica</i> var. <i>unijuga</i> (Duchass. & Walp.) Griseb.	Sensitive plant	X	0							0		
<i>Samanea saman</i> (Jacq.) Merr.	Honkeypod	X	0									
<b>LOBELIACEAE</b>												
<i>Clermontia</i> sp.		E								S		
<i>Cyanea angustifolia</i> (Cham.) Hbd.	'Aku	E							0			
<b>LORANTHACEAE</b>												
<i>Korthalsella complanata</i> (v. Tiegh.) Engler	Hulumoa	E								U		
<b>LYTHRACEAE</b>												
<i>Cuphea carthagenensis</i> (Jacq.) Macbride	Tarweed	X	U	U						U		

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS	STUDY SITE								RELATIVE ABUNDANCE								
			1	2	3	4	5	6	7	8	1	2	3	4	5	6	7	8	
<b>MALVACEAE</b>																			
<i>Hibiscus arnottianus</i> Gray	Native white hibiscus, kokio 'o-ke'oke'o	F																	
<i>Hibiscus tiliaceus</i> L.	Hau	F	0		U	U	A												
<i>Malvastrum coromandelianum</i> (L.) Garcke	False mallow, hauuoi	X	U																
<i>Sida spinosa</i> L.	Prickly sida	X	0																
<b>MELASTOMATACEAE</b>																			
<i>Clidemia hirta</i> (L.) D. Don	Koster's curse	X			U					0									
<b>MENISPERMACEAE</b>																			
<i>Cocculus ferrandianus</i> Gaud.	Huehue, hue'ie	F		U						U									
<b>MORACEAE</b>																			
<i>Cecropia peltata</i> Sandmark	Trumpet tree, quarumo	X								0									
<i>Ficus microcarpa</i> L. f.	Chinese banyan	X								0									U
<b>MYRSINACEAE</b>																			
<i>Myrsine lessertiana</i> A. DC.	Kolea-lau-nui	F																	U
<b>MIRTACEAE</b>																			
<i>Eucalyptus robusta</i> Sm.	Swamp mahogany	X		0															
<i>Eucalyptus</i> sp.	Eucalyptus	X	U			A	A	0	C										0
<i>Eugenia cumini</i> (L.) Druce	Java plum, palama	X	A	0	0														0
<i>E. jambos</i> L.	Rose apple, 'ohi'a-loke	X	U																R
<i>E. sandwicensis</i> Gray	'Ohi'a-ha, ha	F																	0
<i>Melaleuca leucadendra</i> (Stickm.) L.	Paper bark	X		0															
<i>Metrosideros collina</i> subsp. <i>polymorpha</i> (Gaud.) Rock	'Ohi'a-lehua	F	U		U														A
<i>M. macropus</i> H. & A.	'Ohi'a-lehua	F																	R
<i>M. tremuloides</i> (Heller) Knuth	Lehua-'ahihi	F																	0
<i>Psidium cattleianum</i> Sabine f. <i>cattleianum</i>	Strawberry guava, waiawi-'ula 'ula	X	C	A	0	0				0									C
<i>P. cattleianum</i> f. <i>lucidum</i> Deg.	Yellow strawberry guava, waiawi	X	U	U															
<i>P. guajava</i> L.	Guava, kuawa	X	C	C	0	0	0	0	0	U	0								
<b>OXALIDACEAE</b>																			
<i>Oxalis corniculata</i> L.	Yellow wood sorrel	X				U													
<b>PASSIFLORACEAE</b>																			
<i>Passiflora edulis</i> f. <i>flavicarpa</i> Deg.	Yellow lili'ko'i	X	0	U															
<i>P. laurifolia</i> L.	Yellow granadilla, lili-wai	X																	R
<i>P. suberosa</i> L.	Huehue-haole	X		0															0
<b>PLANTAGINACEAE</b>																			
<i>Plantago major</i> L.	Common plantain	X								0									

23

C-24

CHECK LIST OF PLANTS

SCIENTIFIC NAME	COMMON NAME	STATUS	STUDY SITE																		
			RELATIVE ABUNDANCE																		
			1	2	3	4	5	6	7	8											
<b>PROTEACEAE</b>																					
<i>Grevillea robusta</i> A. Cunn.	Silk oak, silver oak	X			0								U								
<b>ROSACEAE</b>																					
<i>Osteomeles anthyllidifolia</i> Lindl.	Uala, 'ulei	E		0	R																
<i>Rubus rosaefolius</i> Sm.	Thimbleberry	X			R	0	0	0	0				U								
<b>RUBIACEAE</b>																					
<i>Bobea elatior</i> Gaud.	Ahakea	E																			U
<i>Borreria laevis</i> (Lam.) Griseb.	Buttonweed	X					0														
<i>Canthium odoratum</i> (Forst. f.) Seem.	Alahe'e, walahe'e	I		0	0																R
<i>Hedyotis</i> sp.		E																			R
<i>Paederia foetida</i> L.	Malle pilau	X		0	U	0	C	0	C												0
<i>Psychotria kahuana</i> (C. & S.) Fosb.	Kopiko-kea	E																			0
<b>SAPINDACEAE</b>																					
<i>Dodonaea sandwicensis</i> Sherff	A'all'i	E																			0
<i>Sapindus oahuensis</i> Hbd.	Aulu	E																			5
<b>SAXIFRAGACEAE</b>																					
<i>Broussaisia arguta</i> Gaud.	Kanawao	E																			U
<b>SOLANACEAE</b>																					
<i>Solanum nigrum</i> L.	Black nightshade, popolo	I?		0																	
<b>STERCULIACEAE</b>																					
<i>Walteria americana</i> L.	Hi'aloa, 'uhaloa	I			U																
<b>THYMELAEACEAE</b>																					
<i>Wikstroemia</i> sp.	'Akia	E																			0
<b>TILIACEAE</b>																					
<i>Elaeocarpus bifidus</i> H. & A.	Kalia	E																			0
<i>E. grandis</i> F. Muell.	Blue marble tree	X																			0
<b>ULMACEAE</b>																					
<i>Trema orientalis</i> (L.) Bl.	Gunpowder tree, charcoal tree	X		U																	
<b>UMBELLIFERAE</b>																					
<i>Centella asiatica</i> (L.) Urban	Asiatic pennywort	X		0	0	0							0								
<i>Cryptotaenia canadensis</i> (L.) DC.	Honeywort	X												R							
<b>URTICACEAE</b>																					
<i>Boehmeria grandis</i> (H. & A.) Heller	Akoka	E																			0
<b>VERBENACEAE</b>																					
<i>Citharexylum spinosum</i> L.	Fiddlewood	X						U													U
<i>Clerodendrum philippinum</i> Schau.	Fragrant clerodendrum	X																			0



## REFERENCES

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**A P P E N D I X    D**

**Comments and Responses Made During  
the Consultation Process**

GEORGE R. ARIYOSHI  
GOVERNOR OF HAWAII



STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES

DIVISION OF FORESTRY  
1151 PUNCHBOWL STREET  
HONOLULU, HAWAII 96813

DIVISIONS:  
CONVEYANCES  
FISH AND GAME  
FORESTRY  
LAND MANAGEMENT  
STATE PARKS  
WATER AND LAND DEVELOPMENT

June 17, 1977

MEMORANDUM

TO: MR. LEONARD BAUTISTA, Planning Office  
FROM: CAROLYN A. CORN, Botanist  
SUBJECT: EIS Preparation Notice

As per my letter and phone conversation with Ted Damron, Hawaiian Electric Co. concerning the EIS Preparation Notice of the two 138 KV transmission circuits from Halawa to Palolo Valley, I have reviewed the plans. Your current plan is definitely the better of the routes that have been proposed for the least impact on endangered plant species. There is, however, some possibility that the lines or poles may cross over an area or areas of a few endangered plants, especially between the Kalihi and Nuuanu Valleys when the lines traverse the native forest on the hillside. Since there may be plants that are about to be protected under federal and State law, their critical habitat should not be disturbed.

Therefore, I recommend that a botanist that is familiar with these plants be consulted when Hawaiian Electric Company has firmed up its plans--i.e. the exact location of where the poles are to be installed, how will the poles be installed, how much area around the poles will be affected, and how wide a path between poles, if any, will be made. It stands to reason that the less area affected, the less the chance of any impact on these endangered plants.

*Carolyn A. Corn*  
CAROLYN A. CORN

CAC:sna

cc: Ted Damron ✓

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Department of Land and Natural Resources  
Division of Forestry  
State of Hawaii  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

ATTENTION: Carolyn A. Corn

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of June 17, 1977 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS), has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following response is addressed specifically to your concern about the proposed 138 KV lines as expressed in your letter.

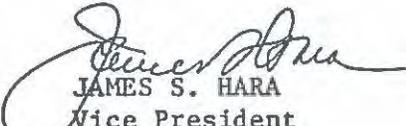
Comment: A botanist that is familiar with endangered plants should be consulted when Hawaiian Electric Company has firmed up its plans--i.e. the exact location of where the poles are to be installed, how will the poles be installed, how much area around the poles will be affected, and how wide a path between poles, if any, will be made. It stands to reason that the less area affected, the less the chance of any impact on endangered plants.

# M&E Pacific, Inc.

Department of Land and Natural Resources  
December 19, 1978  
Page 2

Response: A preliminary botanical survey for the proposed 138 KV lines has been done by The Environment Impact Study Corporation and is included in Appendix C of the EIS. Since the exact location of the pole sites has not yet been determined this survey covers a representative area indicative of vegetation through which the initially proposed route is located. Once a specific route is chosen, a more detailed botanical survey will be made of pole locations in the conservation areas, as you suggest.

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments and our responses will be included within the final revised EIS.

  
JAMES S. HARA  
Vice President

jn

Mrs. Jennifer Eckert  
2519 Myrtle Street  
Honolulu, Hawaii 96816

Mr. Lionel Low  
M&E Pacific, Inc., Suite 600  
Pacific Trade Center  
Honolulu, Hawaii 96813

October 12, 1977

Dear Mr. Low;

I am writing in regards to the "high tension" wires proposed to connect the Koolau power source with Kapiolani.

I believe that whenever possible these wires should be installed in non-residential areas. Construction then will not disrupt traffic nor damage the appearance of established neighborhoods.

When lines must be routed through residential areas, combining all wires on one set of poles will maximize maintenance efficiency and minimize detractive installations.

I hope these factors will be considered before another set of lines is installed.

Sincerely,

Jennifer Eckert

2529 A LaI Road  
Honolulu, Hawaii 96816

Mr. James S. Hara  
M&E Pacific, Inc.  
Suite 600, Pacific Trade Center  
190 South King Street  
Honolulu, Hawaii 96813

March 12, 1978

Dear Mr. Hara;                      Re: 138 KV Transmission Lines

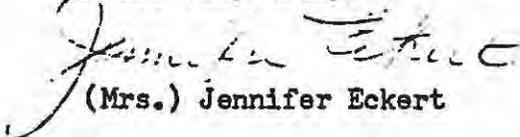
I was happy to receive your letter of March 8 in which you explained that the EIS study for the 138 KV lines had been extended.

I hope that HECO is giving further consideration to combining all lines on a single set of poles. This alternative is an appealing one from many points of view. Additional installation expense would not be exorbitant to the consumer and the visual appearance of Palolo or any residential route would be improved.

This alternative would be a viable plan using a double-L design pole. As long as sufficient space is left between sets of wires it would not pose a health hazard to maintenance men if wires were placed on extensions on the street side of the poles.

Thank you for keeping me advised.

Yours very truly,

  
(Mrs.) Jennifer Eckert

732-5762

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Mrs. Jennifer Eckert  
2529 A La-i Road  
Honolulu, Hawaii 96816

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of October 12, 1977 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS), has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to summaries of your questions and concerns about the proposed 138 KV lines as expressed in your letter.

**Comment:** Whenever possible these wires should be installed in non-residential areas.

**Response:** High voltage transmission lines (138 KV) are routed through non-residential areas whenever possible. With respect to the proposed Halawa-Pukele-Kamoku 138 KV line, several alternatives both in urban and conservation areas, have been presented in the EIS. The basic obstacles in routing 138 KV lines through conservation areas are:

1. Rough terrain requires extensive use of helicopters for construction and maintenance of the lines, resulting in higher costs and longer construction time.

# M&E Pacific, Inc.

Mrs. Jennifer Eckert  
December 19, 1978  
Page 2

2. Approval must be obtained for use of conservation districts from the Department of Land and Natural Resources.
3. Difficulty in access to the lines by maintenance crews due to rough terrain, reduces reliability of the line and increases the repair time in case of failure.

**Comment:** Construction of these lines in urban areas will disrupt traffic and damage the appearance of established neighborhoods.

**Response:** Traffic disruption due to pole construction should be minimal. Construction would be limited to five pole segments at any one time, thus confining the disruptions to small segments at a time. A minimum of one lane for traffic will always be kept open and flagmen and appropriate traffic controls will be employed, as required, to expedite traffic flow.

Admittedly, there will be a certain aesthetic impact due to the proposed 138 KV power lines. Each of the 138 KV circuits would consist of four wires on steel poles 110 to 125 feet high that, in some areas, would also support a three wire 46 KV circuit. Your opinion that these lines are incongruous within residential neighborhoods is understandable, however, certain measures would be taken to lessen the aesthetic impact of the lines. The steel poles to be used are modern, slim, and would have a neat appearance as opposed to the "jungle of wires" appearance on many existing wooden poles. Use of the steel poles would require fewer guy wires as well as fewer poles because they would be spaced at wider intervals than wooden poles. Within certain areas where existing 46 KV lines would be moved to the new steel poles, the top 10-foot portion of the wooden poles would be cut off to somewhat improve aesthetics.

**Comment:** When lines must be routed through residential areas, combining all wires on one set of poles will maximize maintenance efficiency and minimize detractive installations.

**Response:** The primary purpose for using two circuits to feed the Kamoku substation is to provide backup reliability in the event one of the circuits goes out of service. Each of the two 138 KV circuits feeding Kamoku substation will be capable of supplying 100% of the demand and thus in the event of the failure of one circuit (due to lightning, for example), the other feeder line will continue service. In any case, installation of two 138 KV circuits on one set of poles in urban areas is precluded by the overhang past the street right of way into private property if the two circuits are placed on opposite sides of the pole.

# M&E Pacific, Inc.

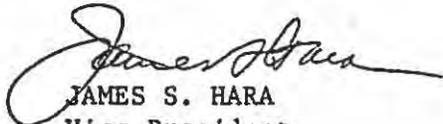
Mrs. Jennifer Eckert  
December 19, 1978  
Page 3

Placing both circuits on the street side of the pole would require much taller and larger diameter poles as well as more easements for guy wires.

Comment: I hope these factors will be considered before another set of lines is installed.

Response: A more in depth presentation of the concerns expressed in your letter is contained in the EIS.

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments and our responses will be included within the final revised EIS.

  
JAMES S. HARA  
Vice President

jn

Oct. 14, 1977

Mr. Donald Ford  
in c/o Pacific Environmental Research  
Pacific Trade Center, Ste 600  
190 S. King St.  
Honolulu, HI 96813

Dear Mr. Ford:

This letter is being written in response to  
the "High Temperature" which are submitted  
to be installed along Puhihi and Lualaba along  
Streets and along Palala Ave.

I, as a resident of Palala Valley, am  
opposed the installation of these high temperature  
lines for the reason that it is an unsightly and  
unsound practice because the lines of installation  
are left to rot. Installing these lines will  
only be adding to the already cluttered area as  
areas, suggesting the neighborhood.

Sincerely,  
Mrs. Pearl Thurston

1835 10th Ave  
Honolulu, HI 96816

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Mrs. Earl Hirakawa  
1835 10th Avenue  
Honolulu, Hawaii 96816

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of October 14, 1977 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS) has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following response is addressed specifically to your concern about the proposed 138 KV lines.

Comment: I, as a resident of Palolo Valley, am against the installation of these high tension wires for the reason that it is unsightly and would further obstruct the view of whatever is left to see. Installing these wires will only be adding to the already cluttered area or areas, suffocating the neighborhood.

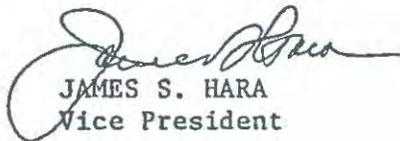
Response: Admittedly, there will be a certain aesthetic impact due to the proposed 138 KV power lines. Each of the 138 KV circuits would consist of four wires on steel poles 110 to 125 feet high that, in some areas, would also support a three-wire 46 KV circuit. Your opinion that these lines are incongruous within residential neighborhoods is understandable; however, certain measures would be taken to lessen the aesthetic impact of the lines. The steel

# M&E Pacific, Inc.

Mrs. Earl Hirakawa  
December 19, 1978  
Page 2

poles to be used are modern, slim, and would have a neat appearance as opposed to the "jungle of wires" appearance on many existing wooden poles. Use of the steel poles would require less guy wires as well as fewer poles because they would be spaced at wider intervals than wooden poles. Within certain areas where existing 46 KV lines would be moved to the new steel poles, the top 10-foot portion of the wooden poles would be cut off so as to somewhat improve the aesthetic aspect.

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments and our responses will be included within the final revised EIS.



JAMES S. HARA  
Vice President

jn

HOUSE OF REPRESENTATIVES  
THE NINTH LEGISLATURE

STATE OF HAWAII  
STATE CAPITOL  
HONOLULU, HAWAII 96813



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\*OLLIE LUNASCO  
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Twenty-Fifth District  
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\*ANN L. YUEN  
Twenty-Seventh District  
RICHARD A. KAWAKAMI  
\*TONY T. KUNIMURA  
DENNIS R. YAMADA

Oct. 13, 1977

Mr. Lionel Low  
M&E Pacific, Suite 600  
Pacific Trade Center  
190 S. King Street  
Honolulu, Hawaii 96813

Dear Mr. Low:

This letter I am addressing you concerns the plans of constructing high-powered tension lines on Palolo Avenue and Tenth Avenue.

I believe the wires will contain 138 kilovolts, which will be a detriment to the aesthetic surroundings; the land value, and human behavior.

At this time I would like to convey my negative response to the plans. The community was not given the opportunity to express their views, inputs, and ideas concerning this matter.

I would like to go on record as opposing any type of high-tension wires in Palolo which can be seen visibly.

Sincerely,

*Calvin K. Y. Say*

CALVIN K.Y. SAY  
Representative  
Ninth District

CKYS:dp

\*Assistant Majority Floor Leader  
†Minority Leader  
‡Minority Floor Leader  
§Assistant Minority Floor Leader

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Representative Calvin K.Y. Say  
House of Representatives  
State Capitol  
Honolulu, Hawaii 96813

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of October 13, 1977 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS) has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to summaries of your questions and concerns about the proposed 138 KV lines expressed in your letter.

**Comment:** I believe the wires will contain 138 kilovolts, which will be a detriment to the aesthetic surroundings, the land value, and human behavior.

**Response:** Admittedly, there will be a certain aesthetic impact due to the proposed 138 KV power lines. Each of the 138 KV circuits would consist of four wires on steel poles 110 to 125 feet high that, in some areas, would also support a three-wire 46 KV circuit. Your opinion that these lines are incongruous within residential neighborhoods is understandable; however, certain measures would be taken to lessen the aesthetic impact of the lines. The steel

# M&E Pacific, Inc.

Representative Calvin K.Y. Say

December 19, 1978

Page 2

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While future events cannot definitely be predicted with respect to property value changes, an evaluation of the effects of some existing 138 KV lines in urban Oahu areas has shown that property values have not been discernibly lowered due to the presence of 138 KV transmission lines. The approach taken within the EIS is to compare the market value of properties adjacent or near 138 KV lines with similar properties within the same tax zone. Please refer to the EIS for a more detailed discussion regarding the property value comparison analysis.

A review of available research on the biological effects due to exposure to high voltage induced electric fields showed that exposure to the fields induced by 138 KV lines will not have any effect on health. No experiment thus far has clearly established that an electric field, even 20 times as great as those encountered under a 765 KV line, can cause biological effects of significance. For a detailed presentation on the potential health effects due to high voltage transmission lines, please refer to the forthcoming EIS.

**Comment:** At this time I would like to convey my negative response to the plans. The community was not given the opportunity to express their views, inputs, and ideas concerning this matter.

**Response:** As part of the EIS process, an EIS preparation notice was published in the Environmental Quality Commission (EQC) Bulletin (Vol. III) on May 8, 1977. All those wishing to be consulted parties were given an address to send their comments and concerns. In addition, there have been numerous meetings with community groups and individuals concerning this matter. An opportunity to submit comments will be given again December 1978 through January 1979, after the forthcoming EIS is filed with the EQC. All comments and concerns received during that period will be included along with responses in the final revised EIS for this project.

# M&E Pacific, Inc.

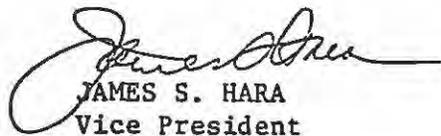
Representative Calvin K.Y. Say  
December 19, 1978  
Page 3

Comment: I would like to go on record as opposing any type of high-tension wires in Palolo which can be seen visibly.

Response: The alternative of using underground lines has been addressed in the EIS. There are certain difficulties, however, associated with this type of system. Very briefly (a more in-depth presentation is given in the EIS), the problems are as follows:

1. High costs
2. Long construction period with significant inconveniences for residents
3. Interference with existing underground utilities
4. Requirement of additional support facilities such as oil cooling and pumping stations
5. Greater and more difficult maintenance requirements

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments and our responses will be included within the final revised EIS.

  
JAMES S. HARA  
Vice President

jn

21 October, 1977

Mr. "Van" H. Beazlie  
Director, Public Information  
Hawaiian Electric Co.  
P.O. Box 2750  
Honolulu, Hawaii 96840

RE: High tension wires along Palolo Avenue.

Dear Mr. Beazlie:

First, a thanks for your quick reply. It reassures me to know that HECO is interested in what the general public thinks.

Now the bad part! HECO's request for high tension wires along Palolo Avenue has many area residents a little upset. This is due to our not knowing enough about the proposed installation. Of course we should have been at the public hearings but as is always the case, we just found out about it. Would you be so kind as to provide us with the answers to a few questions?

1. Why are these wires to be placed through Palolo if they are not of benefit to the residents of this area?
2. If the wires are indeed strung down Palolo Ave. what compensation would the property owners get for the value of their property being lowered?
3. Is it true that you cannot build under these wires?
4. To compensate for the eyesore and the additional noise would valley residents be compensated with a beautification program or something which would be of use to all valley residents?

Again, lack of information is our primary concern here and we hope that you would help us out on this. Any additional information regarding the proposed installation would also be of great help.

Hoping to hear from you I remain

Sincerely,

*Seth Whitman Rehfeldt*

Seth Whitman Rehfeldt  
P.O. Box 15245  
Honolulu, Hawaii 96815

SWR/v11

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840



November 15, 1977

Mr. S. W. Rehfeldt  
P. O. Box 15245  
Honolulu, Hawaii 96815

Dear Mr. Rehfeldt:

re: Possible 138 KV Transmission Lines Along Palolo Ave.

We are answering below the questions raised in your letter of October 21, 1977. Just in case you do not have a copy of your letter handy, or may wish to share this with others, without needing any other papers, we are listing your questions above our answers.

1. Why are these wires to be placed through Palolo if they are not of benefit to the residents of this area?
  - A. The proposed 138 KV lines to HECO's Kamoku Substation under discussion are of direct benefit to the Palolo residents. Our company's Pukele Substation presently serves the area roughly bounded by the Pacific Ocean on the south, Waialae Nui on the East, mauka to the upper ends of Manoa and Palolo Valleys, and Piikoi Street in the west. Pukele Substation is now fully developed and utilized to its complete capacity. All the land there is occupied so no additional transmission equipment can be installed. Continued growth in the areas served by Pukele Substation will result in overloading the transformation equipment at Pukele and thus impacting the HECO system reliability.

HECO's Kamoku Substation, now scheduled for 1981, will provide service to a portion of the area now served by Pukele Sub. This will take some of the load off Pukele Sub as well as provide capacity for new loads. Should any type of outages occur at Pukele Sub, Kamoku Sub will maintain reliable service to the areas served by Pukele Sub. It should also be pointed out that to provide two 138 KV transmission lines from our Kahe Power Station, near Nanakuli, to serve Pukele Substation and the residents of Palolo Valley, the transmission lines traverse the cane fields of Waipahu, through forested areas behind Pacific Palisades above Pearl City, through the Aiea State Park, over the Koolau Range to Koolau Substation in Kaneohe, then back over the Koolau Range to Pukele Substation. Although these transmission lines did not benefit them, the multitude of landowners from Kahe to Pukele negotiated easements with HECO so that residents of Palolo could enjoy the benefits of reliable electric service.

(more)

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. S. W. Rehfeldt

-2-

November 15, 1977

2. If the wires are indeed strung down Palolo Ave., what compensation would the property owners get for the value of their property being lowered?
  - A. There is no evidence to date that property values have been lowered upon installation of 138 KV transmission facilities on or near affected properties. The only type of compensation given to landowners is in areas where HECO has to obtain easements through private property for the installation of electric facilities. The landowner is then amply compensated through monetary negotiations for the use of the easements.
3. Is it true that you cannot build under these wires?
  - A. The latest revision of the Public Utilities Commission's General Order No. 6, which covers the Rules for Overhead Electric Line Construction in the State of Hawaii lists basic minimum allowable vertical clearance of wires above ground, buildings, structures, etc. for various voltages. HECO maintains a minimum of 30 feet ground clearance for 138 KV conductors. In easement negotiations with private landowners, HECO does not permit construction of buildings under the 138 KV lines. However, in certain instances, HECO has permitted restricted usage of the easement area under the 138 KV lines, provided all GO-6 requirements are met.
4. To compensate for the eyesore and the additional noise, would valley residents be compensated with a beautification program or something which would be of use to all valley residents?
  - A. We do not anticipate problems of the magnitude inferred by this question because they have not surfaced within the last few years in other suburban communities or urban areas impacted by new lines and poles of the type and general configuration of those being contemplated for your area. These previous projects not only increased the reliability of our service to the adjacent areas, but also to downtown Honolulu where, no doubt, many Palolo residents are employed. These facilities also transected much property not directly benefited by that segment of the HECO system.

We hope the above information will fill some of the major voids your letter inferred existed at the time of writing. Please let us know if there are further concerns once you have been able to give due consideration to the details we have supplied.

Sincerely,



Van H. Beazlie, APR  
Director of Public Information

VHB:dr

FOR MR. D. F. BELL

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Mr. Seth Whitman Rehfeldt  
P. O. Box 15245  
Honolulu, Hawaii 96815

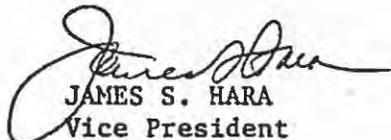
SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of October 21, 1977 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS), has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments and our responses will be included within the final revised EIS.

  
JAMES S. HARA  
Vice President

jn

2770 LA-1 ROAD  
HONOLULU 96816  
25 OCTOBER 1977

MR. LIONEL LOW  
M & E PACIFIC, ENVIRONMENTAL ENGINEERS  
PACIFIC TRADE CENTER, SUITE 600  
HONOLULU, HAWAII 96813

DEAR MR. LOW:

I WANT TO EXPRESS MY CONCERN ABOUT THE VISUAL IMPACT  
DAMAGE CERTAIN TO BE CAUSED BY THE PROPOSED HECO  
138 KV WIRES THROUGH PALOLO.

THE TOWERS PROPOSED ARE OUT OF SCALE WITH ANYTHING IN  
THE COMMUNITY. THEY WILL STICK OUT AS A VISUAL BLIGHT,  
FOREVER. PALOLO IS AN AREA WHERE ALREADY THE EXISTING  
WIRES ARE A PROBLEM, UNLIKE MANOA, WHERE LARGE TREES  
SOFTEN THE IMPACT.

THE ADDITION OF EVEN ONE LINE OF HIGH LINE OF HIGH LINES  
IN PALOLO WOULD BE A GREAT PROBLEM AND WOULD CERTAINLY  
AFFECT THE ALREADY FRAGILE BALANCE BETWEEN PRIVATE  
PROPERTY RENEWAL AND THE DECAY OF OLDER RESIDENCES.  
TO DUMP THESE WIRES IN PALOLO COULD GET MANY PROPERTY  
OWNERS WHO ARE TRYING TO IMPROVE THEIR PROPERTIES TO  
GIVE UP.

THE THOUGHT OF RUNNING TWO LINES THROUGH PALOLO IS AN  
OUTRAGE-- THE COMMUNITY PROBABLY CANNOT STAND ONE LINE,  
TWO WOULD BE ASKING FOR DISASTER. WHERE COULD ONE LOOK  
FOR AN UNOBSTRUCTED VIEW?

MAY I SUGGEST RUNNING THE WIRES DOWN THE SMALL VALLEY  
OF WAAHILA RIDGE OR THROUGH RELATIVELY UNPOPULATED  
WAIALAENUI GULCH?

IN YOUR CONSIDERATIONS, PLEASE WEIGH THE FUTURE COSTS  
TO SOCIETY OF URBAN BLIGHT IN PALOLO CAUSED BY DAMAGING  
THE VISUAL ENVIRONMENT OF THE VALLEY WITH THE TEMPORARY  
SAVINGS TO HECO. URBAN BLIGHT HAS HUGE COSTS IN PROPERTY  
VALUE LOSSES AND SOCIAL DISRUPTIONS-- THESE COSTS CAN RUN  
INTO THE HUNDREDS OF MILLIONS. IS IT WISE TO DESTROY A VIABLE  
VALLEY, CURRENTLY MAKING EFFORTS TO IMPROVE ITSELF THROUGH  
PRIVATE RENEWAL, FOR A TEMPORARY SAVINGS FOR THE ELECTRIC UTILITY?  
Sincerely,

*1-1-77 S. S. Sillman*

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Mr. Jack Gillmar  
2770 La-i Road  
Honolulu, Hawaii 96816

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of October 25, 1977 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS), has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to summaries of your questions and concerns about the proposed 138 KV lines as expressed in your letter.

**Comment:** The proposed 138 KV lines will stick out as a visual blight. Palolo is an area where the existing wires are already a problem.

**Response:** Admittedly, there will be a certain aesthetic impact due to the proposed 138 KV power lines. Each of the 138 KV circuits would consist of four wires on steel poles 110 to 125 feet high that, in some areas would also support a three wire 46 KV circuit. Your opinion that these lines are incongruous within residential neighborhoods is understandable, however, certain measures would be taken to lessen the aesthetic impact of the lines. The steel poles to be used are modern, slim, and would have a neat appearance as opposed to the "jungle of wires" appearance on many existing wooden poles. Use of the steel poles would require fewer guy wires as well as fewer poles because they would be

# M&E Pacific, Inc.

Mr. Jack Gillmar  
December 19, 1978  
Page 2

spaced at wider intervals than wooden poles. Within certain areas where existing 46 KV lines would be moved to the new steel poles, the top 10-foot portion of the wooden poles would be cut off so as to somewhat improve the aesthetic aspects.

**Comment:** The construction of the proposed lines in Palolo Valley would certainly affect the already fragile balance between private property renewal and the decay of older residences.

**Response:** While future events cannot definitely be predicted with respect to property value changes, evaluation of the effects of some existing 138 KV lines in urban Oahu areas has shown that property values have not been discernibly lowered due to the presence of 138 KV transmission lines. The approach taken within the EIS is to compare the market value of properties adjacent or near 138 KV lines with similar properties within the same tax zone. Please refer to the EIS for a more detailed discussion regarding the property value comparison analysis.

**Comment:** May I suggest running the wires down and small valley of Waahila Ridge or through relatively unpopulated Waialae-Nui Gulch?

**Response:** The Waahila Ridge alternatives have been addressed in the EIS (Lines B, C, and D and Alternative G). The primary difficulties associated with this route are as follows:

1. Rough terrain would require extensive use of helicopters for construction and maintenance, thus increasing costs and construction time.
2. Approval for use of conservation district land is required from the Department of Land and Natural Resources.
3. Detrimental aesthetic impacts on Manoa Valley and St. Louis Heights would result.
4. The lines would have to pass through Waahila Ridge State Park and require tree removal.

Although not evaluated in detail, a route through Waialae-Nui Gulch would have similar problems as any conservation area route and would still not significantly reduce the impacts on urban areas.

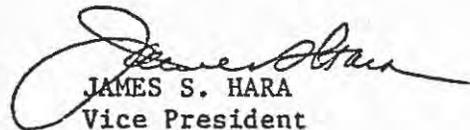
# M&E Pacific, Inc.

Mr. Jack Gillmar  
December 19, 1978  
Page 3

Comment: Is it wise to destroy a viable valley, currently making efforts to improve itself through private renewal, for a temporary savings for the electric utility?

Response: HECO does not believe that the proposed lines would "destroy" Palolo Valley, based on their experience of few or no complaints relative to existing 138 KV lines in other urban areas on Oahu.

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments along with our responses will be included within the final revised EIS.

  
JAMES S. HARA  
Vice President

jn

F.J.Boody  
2107 Tenth Ave.  
Honolulu, HI 96816  
Oct 26. 1977

Mr. Lionel Low  
M&E Pacific Environmental Engrs.  
Pacific Trade Center, Suite 600  
Honolulu, HI 96813

Dear sir:

I understand, through a Palolo Neighborhood Board communique dated Oct 25, 1977, that HECO plans to install high voltage power lines along Palolo and Tenth Avenues, to serve Waikiki.

Being an Engineer of some forty years" experience, I state flatly that this plan is unthinkable, and must be stopped.

First, adding tall poles and cables to the present unsightly mess of poles and wires will further detract from the appearance of the Valley.

Second, again from an engineering standpoint, the high voltage lines will definitely affect radio and television reception in the area. Television reception is not that good to begin with. Will HECO do anything to correct poor reception when it occurs? Certainly not!

Third, and certainly most important, is the health of all the people who live near the cables. Many studies of the effects of High Voltage power on humans have been and are being made, both here and abroad, which indicate very serious effects on the health of those exposed.

A great many people in Palolo Valley, due to the location of these high voltage cables, would live almost directly under these cables. Certainly HECO would not be willing to subject these many residents to long term questionable health conditions? Or do they care?

Sincerely,

F. J. Boody  
W. E. Boody

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Mr. F. J. Boody  
2107 Tenth Avenue  
Honolulu, Hawaii 96816

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of October 26, 1977 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS), has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to summaries of your questions and concerns about the proposed 138 KV lines as expressed in your letter.

**Comment:** Adding tall poles and cables to the present unsightly mess of poles and wires will further detract from the appearance of the Valley.

**Response:** Admittedly, there will be a certain aesthetic impact due to the proposed 138 KV power lines. Each of the 138 KV circuits would consist of four wires on steel poles 110 to 125 feet high that, in some areas would also support a three wire 46 KV circuit. Your opinion that these lines are incongruous within residential neighborhoods is understandable, however, certain measures would be taken to lessen the aesthetic impact of the lines. The steel poles to be used are modern, slim, and would have a neat appearance as opposed to the "jungle of wires" appearance on many existing wooden poles. Use of the steel poles would require

# M&E Pacific, Inc.

Mr. F. J. Boody  
December 19, 1978  
Page 2

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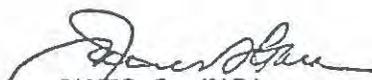
**Comment:** The high voltage lines will definitely affect radio and television reception in the area. Television reception is not that good to begin with. Will HECO do anything to correct poor reception when it occurs?

**Response:** The potential for interference with radio and television reception due to the 138 KV lines does exist under certain conditions. The primary cause of objectionable radio and television interferences (RI/TVI) is sparking due to gaps between transmission line components. The existence of spark gaps is a condition that can be corrected through maintenance efforts and is minimized by careful design and installation; regardless of the voltage transmitted. The proposed 138 KV lines should not create or significantly add to an RI/TVI situation because the possible causes of the interferences will be eliminated or minimized.

**Comment:** The most important concern is the health of all the people who live near the cables.

**Response:** A review of available research on the biological effects due to exposure to high voltage induced electric fields shows that exposure to the field induced by 138 KV lines will not have any effect on health. No experiment thus far has clearly established that an electric field, even 20 times as great as those encountered under a 765 KV line, can cause biological effects of significance. For a detailed presentation on the potential health effects due to high voltage transmission lines please refer to the forthcoming EIS.

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments and our responses will be included within the final revised EIS.

  
JAMES S. HARA  
Vice President

jn

# UNIVERSITY OF HAWAII

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~~Office of Physical Planning & Construction~~

Facilities Planning Office

October 27, 1977

M & E Pacific, Inc.  
Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813

ATTENTION: Mr. Lionel Low

Gentlemen:

SUBJECT: HECO Easement EIS

The following concerns are posed by the University of Hawaii at Manoa for the proposed 138 KV transmission lines going through Manoa Valley. We would like to see these points addressed in the draft EIS. In our discussions with HECO staff, many of these were covered but not to the extent desired. For example, where costs were involved, only relative cost relationships were given without reference to the dollar amounts. If the dollar amounts are given, it would be clearer to see the cost differential.

As the study of alternatives is always an essential part of an EIS, we would like to see each alternative discussed adequately with the reasons for its rejection. The one alternative that was considered not feasible is that along the leeward shoreline from Kahe to Waikiki, which I would like to be included.

The high voltage will require a wider easement in areas with luxurious vegetation. Will you discuss how the vegetation will be controlled, especially in Manoa Valley? Should there be a break in the line, and what preventive

M & E Pacific, Inc.  
Page Two  
October 27, 1977

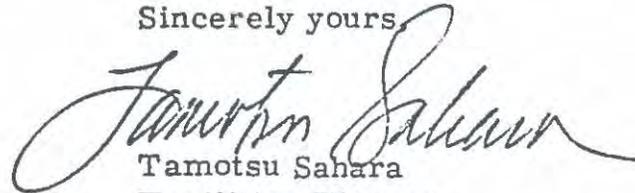
measures are used to prevent forest fires? Normally, high voltage lines generate electro-magnetic and magnetic fields. How will this affect radio, television and scientific instruments? What effect will it have on plant and animal life? There will be an adverse visual impact. Please include mitigating measures for the visual blight.

During the construction and maintenance phases for the lines, vehicles will cause the land to be disturbed. In addition to controlling erosion problems, what methods are planned to prevent the spread of noxious plants into areas not presently infested?

As a rule, easements are for an extended period of time. We would be interested in a possible replacement for the easement, if such plans are under consideration.

Thank you for this opportunity to comment on the draft EIS.

Sincerely yours,



Tamotsu Sahara  
Facilities Planner

TS:f  
cc K. Snyder  
H. McKaughan/Y. Sagawa  
M. Nishioka/W. Muraoka

# M&E Pacific, Inc.

## *Environmental Engineers*

December 19, 1978

Mr. Tamotsu Sahara  
Facilities Planning Office  
University of Hawaii  
Honolulu, Hawaii 96822

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of October 26, 1977 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS), has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to summaries of your questions and concerns about the proposed 138 KV lines as expressed in your letter.

**Comment:** The dollar amounts of the various alternatives should be given to clarify the cost differentials.

**Response:** Since the time of your earlier discussions with HECO regarding costs, more detailed expanded cost estimates have been made. These estimates are included within the EIS and should aid in making a clearer comparison between the presented alternatives.

**Comment:** We would like to see each alternative discussed adequately with the reasons for its rejection. The one alternative that was considered not feasible is that along the leeward shoreline from Kahe to Waikiki.

Pacific Trade Center, Suite 600  
190 South King Street  
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# M&E Pacific, Inc.

Mr. Tamotsu Sahara  
December 19, 1978  
Page 2

**Response:** The approach taken by the EIS is to present all of the alternatives along with the pro and con of each one. The alternative route of following the leeward shoreline from Kahe to Waikiki using a submarine cable has been addressed within the EIS. Basically, the problem of this alternative is the difficulty in maintaining the submarine cable which would require special equipment and probably take days to repair in case of a failure.

**Comment:** The high voltage will require a wider easement in areas with luxurious vegetation. Will you discuss how the vegetation will be controlled, especially in Manoa Valley?

**Response:** Most probably maintenance crews will be flown in by helicopter and trimming would be done manually or with power saws. However, the trimming requirements should not be great since the lines will be strung on poles over 100 feet tall and thus any trimming would be restricted to a few sag areas between the poles.

**Comment:** Should there be a break in the line, and what preventive measures are used to prevent forest fires?

**Response:** The proposed 138 KV lines would employ circuit breakers. In the event a line breaks, a circuit breaker would stop current flow in approximately 1/5 second after touching the ground, thereby virtually eliminating the possibility of fires.

**Comment:** High voltage lines generate electro-magnetic and magnetic fields. How will this affect radio, television, and scientific instruments? What effect will it have on plant and animal life?

**Response:** Although not an integral part of the functioning of the transmission line, the potential for interference with radio and television reception due to the 138 KV lines does exist under certain conditions. The primary cause of objectionable radio and television interferences (RI/TVI) is sparking due to gaps between transmission line components. The existence of spark gaps is a condition that can be corrected through maintenance efforts and is minimized by careful design and installation, regardless of the voltage transmitted. The proposed 138 KV lines should not create or significantly add to an RI/TVI situation because the probable causes of the interferences will be eliminated or minimized.

A review of available research on the biological effects due to exposure to high voltage induced electric fields shows that exposure to the fields induced by 138 KV lines will not have any

# M&E Pacific, Inc.

Mr. Tamotsu Sahara  
December 19, 1978  
Page 3

effect on health. No experiment thus far has clearly established that an electric field, even 20 times as great as those encountered under a 765 KV line, can cause biological effects of significance. For a detailed presentation on the potential health effects due to high voltage transmission lines please refer to the forthcoming EIS.

**Comment:** The proposed lines will have an adverse visual impact. Please include mitigating measures for the visual blight.

**Response:** Admittedly there will be some aesthetic impact due to the poles. However, to lessen the impact Hawaiian Electric will be using slim, modern, steel tubular poles as opposed to steel towers. These poles will be spaced approximately 800 to 2,000 feet apart to minimize the number of poles required. Also with the steel poles to be used, the number of guy wires will be minimized. In the conservation areas, the poles and wires will be painted to blend in with the background.

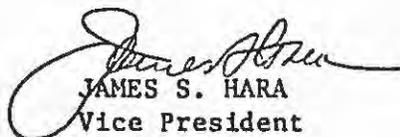
**Comment:** During the construction and maintenance phases for the lines, vehicles will cause the land to be disturbed. In addition to controlling erosion problems, what methods are planned to prevent the spread of noxious plants into areas not presently infested?

**Response:** Helicopters will be used extensively during construction to transport men and materials to the pole sites, thus disturbance of land due to vehicles will be virtually eliminated. Erosion due to disturbance of areas around the pole sites and helicopter pads will be minimized by planting of pangola grass as required as well as other applicable control measures.

**Comment:** As a rule, easements are for an extended period of time. We would be interested in a possible replacement for the easement, if such plans are under consideration.

**Response:** The question of easements cannot be addressed until a specific route for the proposed 138 KV lines is chosen.

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments and our responses will be included within the final revised EIS.

  
JAMES S. HARA  
Vice President

1590 Tamerton Ave #203  
Honolulu 96822

October 28, 1977

Mr. Lionel Low  
M&E Pacific, Environmental Engineers  
Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, HI 96813

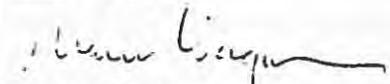
Dear Mr. Low:

I am writing to express my concern at the possibility of high-tension wires being erected in a residential area of Palolo Valley. I am employed at the Institute for Astronomy, University of Hawaii, and we have been involved in the submission of EISs for the telescopes under construction on Mauna Kea. I therefore, naturally, draw comparisons between HECO's proposed plans for erecting the high-tension wires in Palolo and the Institute's desire to run overhead powerlines along the side of Mauna Kea up to the summit area where the telescopes are located. This idea was vehemently opposed by the Big Island Mayor, City Council, and residents, as well as the Board of Land and Natural Resources who, in the recently completed Master Plan for Mauna Kea, has expressly forbidden the erection of overhead powerlines on Mauna Kea due to the visual blight that would result; we have the option of either constructing an underground line or generating power on site. Considering that Mauna Kea is uninhabited, visible from Hilo only on clear days, and that the overhead lines could be placed so that they would not be visible from the road, this provision in the Master Plan seems to reflect the current intensity of concern for environmental protection.

I understand that an alternate route for the high-tension wires would be through a non-residential area of Manoa and that the number of poles required there would be 17 less than in Palolo. Since the American government and people seem to be concerned, firstly, with the environmental impact of any action and secondarily about the cost impact (up to a point, that is), I feel it is fair to approach this situation in the same manner. The Manoa alternative is, unarguably, the less environmentally damaging of the two and, I think, enough so to warrant the additional expense (the underground powerline at Mauna Kea would cost \$7 million as opposed to about \$2 million for an overhead line).

Thank you for your sympathetic consideration of this matter.

Sincerely,

  
Marie Wagner  
Soon-to-be resident of Palolo Valley

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Marie Wagner  
1590 Thurston Avenue, #405  
Honolulu, Hawaii 96822

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of October 28, 1977 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS), has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to summaries of your questions and concerns about the proposed 138 KV lines as expressed in your letter.

**Comment:** I understand that an alternate route for the high-tension wires would be through a nonresidential area of Manoa and that the number of poles required there would be 17 less than in Palolo.

**Response:** We assume that you are referring to one or all of the several alternatives involving Waahila Ridge (Lines B, C, and D and Alternative G). These are addressed in the EIS and are being considered. The basic advantage of these routes is the reduction in the direct effect on the urban area. The basic difficulties involve increased effects on conservation area as well as higher cost, longer construction period, the requirement of additional approvals from DLNR, long repair time in case of failure, requirement of significant tree removal, and detrimental aesthetic impacts.

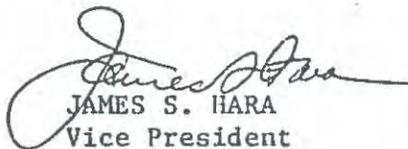
# M&E Pacific, Inc.

Ms. Marie Wagner  
December 19, 1978  
Page 2

**Comment:** The Manoa alternative is, unarguably, the less environmentally damaging of the two and, I think, enough so to warrant the additional expense.

**Response:** Although the various routes involving Waahila Ridge would have less impact on the urban area than the Palolo routes, they would have more impact on the natural environment. A breakdown of the costs of the several lines and alternatives is presented in the EIS for comparison and evaluation.

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments and our responses will be included within the final revised EIS.

  
JAMES S. HARA  
Vice President

jn

Oct. 29, 1977  
E Yamamoto  
1325 Franklin Ave, Honolulu 96816

Dear Mr. Lionel Low:

I am residing in pleasant Palolo Valley and will continue to do so for the foreseeable future. I have a definite interest in the planned high voltage ~~wires~~ that will go through Palolo Avenue and 10th Avenue since I live on Palolo Ave. To have a new set of poles and heavy wires would be an environmental detriment not only on the daily lives of the people who live here, but also to the island as a whole. This in turn reinforces the concept of an established practice of unrestrained development which this city, this island, this state, and this planet cannot afford. As far as Waikiki demands go, I say their demands have been given top priority for too long. Tourism as an industry doesn't benefit the local people; rather it is stuffing the pockets of big businessmen and corporations from the mainland and Orient. The local people 'get by' with waitress, maid, and pedicab driver jobs - and many of these get filled by haoles too.

The high voltage wires are one link in the chain of unconscionable acts that reveal the emaciated condition of the American intellect and spirit. Since there is no other worthy endeavor, we might as well make all the money we can. What happened to human character and

ideals?

It is in common decency to place the needs and the good of the residents of an area above those of the tourist transients. With public consciousness and concern awakening each day to their own needs and rights, it would be wise to get on their side early in the game. Do not put up those wires in Palolo or anywhere if possible!

Aloha,

Elise S. Yamamoto

P.S. This letter is being sent to the *Royal Hawaiian* newspaper.  
Misty Lucretia  
Mita Chang

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Ms. Elise S. Yamamoto  
1325 Palolo Avenue  
Honolulu, Hawaii 96816

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of October 29, 1977 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS), has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to summaries of your questions and concerns about the proposed 138 KV lines as expressed in your letter.

**Comment:** To have a new set of poles and heavy wires would be an environmental detriment not only on the daily lives of the people who live in Palolo Valley but also to the island as a whole.

**Response** Admittedly, there will be a certain aesthetic impact due to the proposed 138 KV power lines. Each of the 138 KV circuits would consist of four wires on steel poles 110 to 125 feet high that, in some areas would also support a three wire 46 KV circuit. Your opinion that these lines are incongruous within residential neighborhoods is understandable, however, certain measures would be taken to lessen the aesthetic impact of the lines. The steel poles to be used are modern, slim, and would have a neat appearance as opposed to the "jungle of wires" appearance on many

# M&E Pacific, Inc.

Ms. Elise S. Yamamoto  
December 19, 1978  
Page 2

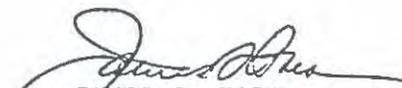
existing wooden poles. Use of the steel poles would require fewer guy wires as well as fewer poles because they would be spaced at wider intervals than wooden poles. Within certain areas where existing 46 KV lines would be moved to the new steel poles, the top 10-foot portion of the wooden poles would be cut off so as to improve aesthetics somewhat.

It should be noted that more than 145 miles of 138 KV circuits presently exist on Oahu forming the basic power transmission system. These lines pass through conservation and urban areas to serve all areas of the island, including Palolo Valley. The benefits of a reliable and efficient electric power supply system are believed to far outweigh the few detrimental environmental effects of the 138 KV lines.

Comment: It is in common decency to place the needs and the good of the residents of an area above those of the tourist transients.

Response: The proposed Kamoku substation and 138 KV lines to energize it are not only for the benefit of Waikiki as you express in your letter. Rather, it is to take some of the load off of the existing Pukele substation, which due to an increasing electric demand throughout the entire area it serves (including Palolo), is projected to be overloaded by August of 1981. Please review the EIS for further discussion of the socio-economic aspects of this project.

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments and our responses will be included within the final revised EIS.

  
JAMES S. HARA  
Vice President

jn

October 29, 1977

1729 10th Ave.

Honolulu, HI 96816

Mr. Lionel Low

M&E Pacific, Environmental Engineers

Pacific Trade Center, Suite 600

Honolulu, HI 96813

Dear Mr. Low:

I am writing to oppose most strongly, the proposed high voltage wires which are planned to run along 10th Ave. by HECO. We have lived on 10th Ave. for over 20 years and have a vital interest and investment here and would object greatly to see ugly high voltage wires suspended over our home and street. There are already enough unsightly electric wires strung along 10th Ave. as it is and we do not need any more. We strongly urge HECO to consider alternative routes to suspend their high voltage wires.

Sincerely,

  
Mary K. Manabe

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Ms. Mary K. Manabe  
1729 10th Avenue  
Honolulu, Hawaii 96816

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of October 19, 1978 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS), has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to summaries of your questions and concerns about the proposed 138 KV lines as expressed in your letter.

Comment: "Have a vital interest and investment."

Response: While future events cannot definitely be predicted with respect to property value changes, evaluation of the effects of some existing 138 KV lines in urban Oahu areas has shown that property values have not been discernibly lowered due to the presence of 138 KV transmission lines. The approach taken within the EIS is to compare the market value of properties adjacent or near 138 KV lines with similar properties within the same tax zone. Please refer to the EIS for a more detailed discussion regarding the property value comparison analysis.

# M&E Pacific, Inc.

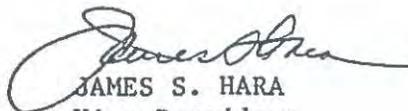
Ms. Mary K. Manabe  
December 19, 1978  
Page 2

Comment: "Would object greatly to see ugly visual high voltage wires suspended over our home and street."

Response: Admittedly, there will be a certain aesthetic impact due to the proposed 138 KV power lines. Each of the 138 KV circuits would consist of four wires on steel poles 110 to 125 feet high that, in some areas would also support a three wire 46 KV circuit. Your opinion that these lines are incongruous within residential neighborhoods is understandable; however, certain measures would be taken to lessen the aesthetic impact of the lines. The steel poles to be used are modern, slim, and would have a neat appearance as opposed to the "jungle of wires" appearance on many existing wooden poles. Use of the steel poles would require fewer guy wires as well as fewer poles because they would be spaced at wider intervals than wooden poles. Within certain areas where existing 46 KV lines would be moved to the new steel poles, the top 10-foot portion of the wooden poles would be cut off so as to improve the aesthetics somewhat.

Along city street, 138 KV overhead lines generally do not traverse private property, and no building restrictions are placed on the homeowner within his own property. When electric lines do traverse private property, an easement must be obtained from the landowner.

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments along with our responses will be included within the final revised EIS.

  
JAMES S. HARA  
Vice President

jn

1312 8th Avenue  
Honolulu, Hawaii 96816  
November 8, 1977

Mr. Lionel Low  
M&E Pacific, Environmental Engineers  
Pacific Trade Center, Suite 600  
Honolulu, Hawaii 96813

Dear Mr. Low,

I am expressing my opposition to the installation of high tension lines in Palolo Valley. My opposition is based on the fact that high tension lines can and do cause power line noise that interfere with radio communications and reception. I am a radio amateur and I have enough power line noise problems from existing power lines. People near the lines will experience interference with radio and television reception. The non-residential route through Manoa should be used to minimize interference problems to people.

If the power line is routed through Palolo Valley and does cause interference, I will complain to Hawaiian Electric Company and if necessary to the Federal Communications Commission. I will also take legal action if necessary.

There is also a question as to the effects of strong electric fields on the health of people living near high tension lines. This is a valid suspicion but as yet unproven. Since there is a non-residential route available it should be used now rather than be sorry if in the future high electric fields are proven to cause health problems.

Sincerely,

  
Ronald Fukuhara

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Mr. Ronald Fukuhara  
1312 8th Avenue  
Honolulu, Hawaii 96816

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of November 8, 1977 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS), has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to summaries of your questions and concerns about the proposed 138 KV lines as expressed in your letter.

**Comment:** My opposition is based on the fact that high tension lines can and do cause power line noise that interfere with radio communications and reception. I am a radio amateur and I have enough power line noise problems from existing power lines. People near the lines will experience interference with radio and television reception.

**Response:** Although not present under normal operation, the potential for interference with radio and television reception due to the 138 KV lines does exist under certain conditions. The primary cause of objectionable radio and television interferences (RI/TVI) is sparking due to gaps between transmission line components. The existence of spark gaps is a condition that can be corrected

# M&E Pacific, Inc.

Mr. Ronald Fukuhara  
December 19, 1978  
Page 2

through maintenance efforts and is minimized by careful design and installation; regardless of the voltage transmitted. The proposed 138 KV lines should not create or significantly add to RI/TVI because the probable causes of the interferences will be eliminated or minimized.

During the period of 1967 to 1977, HECO received seven complaints regarding RI/TVI that were directly attributed to 138 KV lines. Of the seven complaints, four were attributed to contamination.

The radio amateur is more sensitive to RI because of the low signal levels normally used. A 138 KV line, however, will not necessarily add to or create interference. With the type of line construction to be utilized, noise levels that affect the radio amateur's operation or the general public are not expected.

**Comments:** The non-residential route through Manoa should be used to minimize interference problems to people.

**Response:** Several routes through conservation lands on Waahila Ridge are discussed in the EIS (Lines B, C, and D and Alternative G). As you suggest, these lines would minimize direct effects on urban areas. However, associated with these alternative routes are the problems of increased costs and longer construction time. There would also be aesthetic impacts on those residents within sight of the lines on the ridge as well as difficulties obtaining approval from the Department of Land and Natural Resources to traverse the Conservation District on Waahila Ridge. Additionally, construction would require significant tree removal and repair of line failure would require more time than an urban route because of inaccessibility.

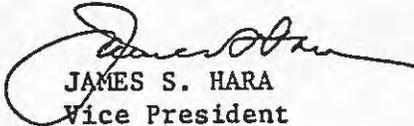
**Comments:** There is also a question as to the effects of strong electric fields on the health of the people living near high tension lines.

**Response:** A review of available research on the biological effects due to exposure to high voltage induced electric fields shows that exposure to the fields induced by 138 KV lines will not have any effect on health. No experiment thus far has clearly established that an electric field, even 20 times as great as those encountered under a 765 KV line, can cause biological effects of significance. For a detailed presentation on the potential health effects due to high voltage transmission please refer to the forthcoming EIS.

# M&E Pacific, Inc.

Mr. Ronald Fukuhara  
December 19, 1978  
Page 3

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments and our responses will be included within the final revised EIS.



JAMES S. HARA  
Vice President

jn

Mr. Frank Walker Smith, III  
2476 Waialae Homestead Rd.  
Honolulu, Hawaii 96816

November 11, 1977

Mr. Lionel Low  
MFE Pacific, Environmental Engineers  
Pacific Trade Center, Suite 600  
190 S. King St.  
Honolulu, HI 96813

Dear Mr. Low:

We are writing to voice our objections to Hawaiian Electric's plans to string high tension wires through Palolo Valley.

Our primary objection to the power lines is that they represent a very real form of pollution--visual pollution. As residents of Palolo we must suffer the effects of this pollution every time we look out of our windows. We must suffer, but at whose benefit?--probably some tourists in Waikiki.

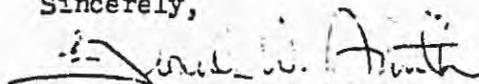
In economic terms this visual pollution caused by the power lines is a negative externality--a detrimental byproduct of HECO's business which is passed off on the public at no cost. In effect HECO is producing and selling its product at a price below its actual cost to society, and that as a result of the lower cost, the public will purchase more of the product than is appropriate. If eliminating this form of pollution means putting the power lines underground at a higher cost then that's what should be done.

As a compromise we suggest that some of the existing forest of unsightly utility poles could be eliminated in exchange for the new visual blight we will be forced to endure.

Finally we would like to express our doubts about the anticipated growth of the destination area of the power lines. Is further growth of Waikiki desirable or even likely? We suspect not.

Thank you for this opportunity to comment on this project which we feel would adversely affect the quality of our life.

Sincerely,

  
Frank and Laura Smith

# M&E Pacific, Inc.

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

## *Environmental Engineers*

December 19, 1978

Mr. Frank Walker Smith, III  
2476 Waiomao Homestead Road  
Honolulu, Hawaii 96816

**SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines**

This letter is in response to your letter of November 11, 1977 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS), has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to summaries of your questions and concerns about the proposed 138 KV lines as expressed in your letter.

**Comment:** Our primary objection to the power lines is that they represent a very real form of pollution--visual pollution. As a compromise we suggest that some of the existing forest unsightly utility poles could be eliminated in exchange for the new visual blight we will be forced to endure.

**Response:** Admittedly, there will be a certain aesthetic impact due to the proposed 138 KV power lines. Each of the 138 KV circuits would consist of four wires on steel poles 110 to 125 feet high that, in some areas would also support a three wire 46 KV circuit. Your opinion that these lines are incongruous within residential neighborhoods is understandable, however, certain measures would be taken to lessen the aesthetic impact of the lines. The steel

# M&E Pacific, Inc.

Mr. Frank Walker Smith, III

December 19, 1978

Page 2

poles to be used are modern, slim, and would have a neat appearance as opposed to the "jungle of wires" appearance on many existing wooden poles. Use of the steel poles would require fewer guy wires as well as fewer poles because they would be spaced at wider intervals than wooden poles. Within certain areas where existing 46 KV lines would be moved to the new steel poles, the top 10-foot portion of the wooden poles would be cut off so as to improve the aesthetic conditions. However, the lower portion of the wooden poles will still be required to distribute low voltage power and telephone to individual homes.

**Comment:** We must suffer, but at whose benefit?--probably some tourists in Waikiki.

**Response:** The area served by the Pukele substation can be generally described as being bounded by the Pacific Ocean on the south, Waialae-Nui on the east, mauka to the upper reaches of Palolo and Manoa Valleys, and on the west by Piikoi Street. The purpose of the new Kamoku substation is to provide load relief for the existing Pukele substation which is projected to be overloaded by August of 1981. Thus, the new Kamoku substation and the new proposed 138 KV lines to feed the Kamoku substation will ensure that reliable electric power is supplied to the entire service area as described above, including Palolo Valley.

**Comment:** In economic terms this visual pollution caused by the power lines is a negative externality--a detrimental byproduct of HECO's business which is passed off on the public at no cost. In effect HECO is producing and selling its product a price below its actual cost to society, and that as a result of the lower cost, the public will purchase more of the product than is appropriate.

**Response:** While you may be correct in saying that all of the adverse impacts that result from supplying electric power are not directly paid for, it should be noted that a utility company does not create the demand but, rather, it supplies power to meet a demand. The existing vehicle to regulate growth in demand is not and should not be the availability or price of a basic necessity of modern life such as electricity. The proper vehicle for controlling growth is through land use planning.

**Comment:** If eliminating this form of pollution means putting the power lines underground at a higher cost then that's what should be done.

**Response:** Beside the extra costs associated with both construction and maintenance of underground 138 KV lines there are other considerations such as the problem of interference with other

# M&E Pacific, Inc.

Mr. Frank Walker Smith, III

December 19, 1978

Page 3

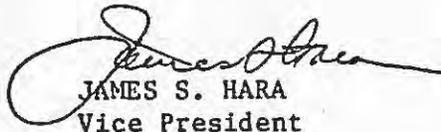
underground utilities. Using underground AC transmission at the 138 KV level would require a continuous trench approximately 16 feet wide in the street right of way. This might require extensive relocation of existing underground utilities such as gas, telephone, water, and possibly sewers.

Underground transmission of the 138 KV level would also require support facilities such as cooling and pumping stations to supply the cooling oil that must circulate around the conducting wire. These additional complexities increase the time required to repair a failure as well as increase maintenance requirements.

**Comments:** Finally we would like to express our doubts about the anticipated growth of the destination area of the power lines. Is further growth of Waikiki desirable or even likely? We suspect not.

**Response:** The "General Plan" of the City and County of Honolulu, which was the result of the work of the City Council, the Department of General Planning of the City and County of Honolulu, and the citizens of Oahu, became effective on January 18, 1977. The General Plan is "a statement of the long-range social, economic, environmental, and design objectives which the people of Oahu hope to achieve by the year 2000, for their general welfare and prosperity." The Honolulu area, which contains the Pukele Kamoku service area, is planned to grow from a population of 304,546 in 1975 to a population of 400,000 in the year 2000.

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments and our responses will be included within the final revised EIS.

  
JAMES S. HARA  
Vice President

jn

MR. LIONEL LOW  
M & E PACIFIC, INC., ENVIRONMENTAL ENGINEERS  
190 SOUTH KING STREET / SUITE 600  
HONOLULU 96813

DEAR MR. LOW:

AS AN ALTERNATIVE TO THE 138 KV LINES HECO PROPOSES TO RUN THROUGH PALOLO, MANDOA, OR OVER WAAHILA RIDGE, I SUGGEST INVESTIGATING THE EXTENT TO WHICH AN INCREASE IN USE OF SOLAR COLLECTORS IN THE TARGET SERVICE AREA MAY DIMINISH THE NEED FOR THE LINES TO THE POINT WHERE THE BENEFIT MAY BE OUT-WEIGHED BY THE ECONOMIC, SAFETY, AND ENVIRONMENTAL COSTS WHICH WOULD BE INCURRED BY THE CONSTRUCTION OF THE LINES.

AS I MENTIONED AT THE PALOLO COUNCIL MEETING ON OCTOBER 26TH, IT MAY BE REVEALING IF AN ESTIMATED RATE OF INCREASE IN NUMBERS OF INSTALLATIONS OF SOLAR COLLECTORS FOR HEATING WATER IS COMPARED WITH HECO'S PROJECTED INCREASE IN NUMBERS OF PEOPLE CONSUMING ELECTRICITY OVER THE NEXT FEW YEARS IN THE KAMOKU SUBSTATION SERVICE AREA. CONVERSELY, ONE COULD DETERMINE HOW MANY SOLAR COLLECTORS, EACH PRODUCING AN AVERAGE SAVINGS OF, SAY, 40% OF ELECTRICITY USE PER HOUSEHOLD \*, WOULD HAVE TO BE INSTALLED ANNUALLY ON EXISTING OR NEWLY-CONSTRUCTED RESIDENTIAL BUILDINGS IN ORDER TO KEEP PACE WITH THE POPULATION INCREASE IN HECO'S SERVICE AREA.

THE LIKELIHOOD THAT SUCH A RATE OF INSTALLATION OF SOLAR COLLECTORS NEEDED TO KEEP PACE WOULD ACTUALLY HAPPEN COULD BE CHECKED AGAINST A SET OF SEVERAL DIFFERENT RATES, DETERMINED INDEPENDENTLY, WHICH INCORPORATE DIFFERENT ASSUMPTIONS ABOUT FACTORS WHICH MIGHT BE MOTIVATING PEOPLE TO INSTALL SOLAR COLLECTORS IN THE NEAR FUTURE. EXAMPLES OF THESE MOTIVATING FACTORS ARE:

- A) INCREASE IN COST OF ELECTRICITY
- B) DECREASE IN COST OF COLLECTORS DUE TO HIGHER VOLUME OF MANUFACTURE AND INCREASING COMPETITION AMONG SUPPLIERS
- C) NEW FEDERAL LOANS AND TAX BREAKS FOR HOMEOWNERS INSTALLING SOLAR COLLECTORS
- D) POSSIBLE CHANGES IN THE HONOLULU BUILDING CODE REQUIRING OR ENCOURAGING WIDER USE OF COLLECTORS.

IN ADDITION, I NOTE THAT THE NEWLY-ADOPTED GENERAL PLAN FOR OAHU INCLUDES SEVERAL POINTS WHICH RELATE TO THE QUESTION OF THESE PROPOSED MASSIVE POWER LINE INSTALLATIONS. UNDER TRANSPORTATION AND UTILITIES, THE PLAN CALLS FOR THE PROMOTION OF NON-RENEWABLE SOURCES OF ENERGY, INCLUDING ENCOURAGING MORE EFFICIENT ENERGY CONSUMPTION THROUGH ECONOMIC INCENTIVES AND REGULATORY MEASURES-- AND PROMOTING THE DEVELOPMENT OF ALTERNATIVE SOURCES OF ENERGY--AS WELL AS PLANNING FOR THE TIMELY AND ORDERLY EXPANSION OF UTILITY SYSTEMS. UNDER HOUSING, THE PLAN CALLS FOR REINFORCING EXISTING COMMUNITIES THROUGH HOUSING-REHABILITATION PROGRAMS--AND 138 KV LINES ON 120' POLES MARCHING DOWN THE STREETS OF PALOLO, OR MANDOA, WOULD NOT FURTHER THIS OBJECTIVE OF THE GENERAL PLAN. NEITHER WOULD THESE POWER LINES FURTHER OTHER OBJECTIVES UNDER THE PHYSICAL DEVELOPMENT & URBAN DESIGN SECTION, INCLUDING EXCLUDING DEVELOPMENTS FROM DANGER ZONES SURROUNDING ELECTROMAGNETIC-RADIATION SOURCES (OR, PRESUMABLY, KEEPING ELECTROMAGNETIC RADIATION SOURCES AWAY FROM DEVELOPMENTS), DESIGNING PUBLIC STRUCTURES TO MEET HIGH AESTHETIC AND FUNCTIONAL STANDARDS AND TO COMPLEMENT THE

PHYSICAL CHARACTER OF THE COMMUNITIES THEY WILL SERVE.

SINCERELY YOURS,

*Janet Thebaud Gillmar*

JANET THEBAUD GILLMAR

\* (2nd paragraph, previous page)  
Average savings to be determined from  
independent data.

MR. LIONEL LOW  
M & E PACIFIC, INC., ENVIRONMENTAL ENGINEERS  
SUITE 600  
190 SOUTH KING STREET  
HONOLULU 96813

DEAR MR. LOW:

WE HAVE THE FOLLOWING FURTHER CONCERNS REGARDING THE PROPOSED 138 KV LINES ALONG PALOLO AND 10TH AVENUES CURRENTLY UNDER STUDY BY YOUR OFFICE.

WE NOTE THAT IN UNBUILT AREAS AN EASEMENT OF 50' TO 100' IS USED FOR 138 KV LINES AND THAT PROPERTY OWNERS ARE NOT ALLOWED TO BUILD DWELLINGS UNDER THE LINES. WHAT IS THE CURRENT MINIMUM DISTANCE THAT A DWELLING MAY BE FROM THE LINES? WHAT IS THE CURRENT MINIMUM DISTANCE THAT NEW DWELLINGS MAY BE CONSTRUCTED FROM THE LINES? SUPPOSE THAT IN THE FUTURE, THESE DISTANCES ARE INCREASED FOR SAFETY REASONS? IS IT POSSIBLE, WHEN EXISTING RESIDENCES ALONG PALOLO AND 10TH AVENUES ARE RE-BUILT AS THEY WEAR OUT, THAT SAFETY REQUIREMENTS NOW, OR IN THE FUTURE, IMPOSED BY THESE PROPOSED LINES MIGHT PREVENT OWNERS FROM RE-BUILDING THEIR HOUSES IN THE LOCATIONS OR IN THE SIZES THEY MIGHT OTHERWISE BUILD THEM?

IF THE ANSWER TO THE LATTER QUESTION IS 'YES' OR 'PERHAPS', THEN WE HAVE A QUESTION OF CONDEMNED LAND RIGHTS.\* DOES HECO PROPOSE TO COMPENSATE LAND OWNERS AT FAIR MARKET VALUE FOR CURRENT OR FUTURE RE-BUILDING SET-BACK PROBLEMS RESULTING FROM THEIR LINES? WOULD NOT THE SUM TOTAL OF THESE CONDEMNATION COSTS EVENTUALLY MAKE THE PALOLO ROUTE FAR MORE COSTLY THAN THE WAAHILA RIDGE ALTERNATIVE FOR BOTH LINES?

WE WOULD ALSO LIKE TO KNOW WHY IN THE HECO COST ACCOUNTING FOR THE DIFFERENT ROUTES, THE PALOLO LINE COSTS START AT THE PUKELE STATION WHEN, IN FACT, ONE LINE IS COMING FROM MANOA. SURELY IF THE MANOA LINE DIDN'T HAVE TO CROSS THE RIDGE, BUT JUST RAN DOWN MANOA, IT WOULD BE CHEAPER THAN CROSSING OVER AND RUNNING DOWN PALOLO.

SINCERELY YOURS,

*Jack Gillmar*  
JACK GILLMAR

*Janet Thebaud Gillmar*  
JANET THEBAUD GILLMAR

\* PLEASE NOTE THAT LOTS ARE VERY SMALL IN PALOLO AND SET-BACK LINES COULD MAKE RE-BUILDING IMPOSSIBLE.

# M&E Pacific, Inc.

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

## *Environmental Engineers*

December 19, 1978

Ms. Janet Gillmar and Mr. Jack Gillmar  
2770 La-i Road  
Honolulu, Hawaii 96816

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letters of November 14, 1977 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS), has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to summaries of your questions and concerns about the proposed 138 KV lines as expressed in your letter.

**Comment:** I suggest investigating the extent to which an increase in use of solar collectors in the project service area may diminish the need for the lines to the point where the benefit may be outweighed by the economic, safety, and environmental costs which would be incurred by the construction of the lines.

**Response:** Transformers, transmission lines, and other electrical facilities must be sized to accommodate the peak demand rather than the average demand, otherwise the frequency of overloads and consequent outages would make the system unworkable. Because of this consideration, certain measures such as the use of solar water heaters, which decrease the average demand but have much less effect on peak demand, would not make a significant difference in the transformer and transmission requirement. This is

# M&E Pacific, Inc.

Ms. Janet Gillmar and Mr. Jack Gillmar  
December 19, 1978  
Page 2

especially true for the next few years, when the overloaded condition at the Pukele Substation system is expected to occur. During this time, solar energy is likely to provide only a very small percentage of the supply. Because of the fact that these systems rely on electric or gas backup during cloudy periods, the peak demands would still occur and have to be accommodated.

**Comment:** In addition, I note that the newly-adopted general plan for Oahu includes several points which relate to the question of these proposed massive power line installations. Under Transportation and Utilities, the plan calls for the promotion of non-renewable sources of energy, including encouraging more efficient energy consumption through economic incentives and regulatory measures--and promoting the development of alternative sources of energy--as well as planning for the timely and orderly expansion of utility systems.

**Response:** Proposed measures to relieve the dependence on oil, such as coal, biomass, geothermal, ocean thermal, and wind, all require similar transformer and transmission systems and would not materially change the need for this project. As you note, this project is a direct response to "planning for the timely and orderly expansion of utility systems."

**Comment:** Under housing, the plan calls for reinforcing existing communities through housing-rehabilitation programs--and 138 KV lines on 120' poles marching down the streets of Palolo, or Manoa, would not further this objective of the general plan.

**Response:** In meeting their franchise obligation to supply power to satisfy the growing demand of the Pukele service area, HECO is exploring numerous alternatives. It is impossible, however, to meet these demands without placing the required transmission lines somewhere in the area to be served. The EIS outlines the advantages and disadvantages of the various alternative routes, some with greater urban effects and some with greater effects on conservation areas. The EIS process should aid in the decision process to pick the alternative with the least overall environmental effect while still taking into account economics and reliability.

**Comment:** Designing public structures to meet high aesthetic and functional standards and to complement the Physical Character of the Communities.

**Response:** Admittedly, there will be a certain aesthetic impact due to the proposed 138 KV power lines. Each of the 138 KV circuits would consist of four wires on steel poles 110 to 125 feet high that,

# M&E Pacific, Inc.

Ms. Janet Gillmar and Mr. Jack Gillmar

December 19, 1978

Page 3

in some areas would also support a three wire 46 KV circuit. Your opinion that these lines are incongruous within residential neighborhoods is understandable, however, certain measures would be taken to lessen the aesthetic impact of the lines. The steel poles to be used are modern, slim, and would have a neat appearance as opposed to the "jungle of wires" appearance on many existing wooden poles. Use of the steel poles would require fewer guy wires as well as fewer poles because they would be spaced at wider intervals than wooden poles. Within certain areas where existing 46 KV lines would be moved to the new steel poles, the top 10-foot portion of the wooden poles would be cut off so as to somewhat improve the aesthetics.

**Comment:** Neither would these power lines further other objectives under the Physical Development & Urban Design section, including developments from danger zones surrounding electromagnetic-radiation sources (or, presumably, keeping electromagnetic-radiation sources away from developments)."

**Response:** A review of available research on the biological effects due to exposure to high voltage induced electric field shows that exposure to the field induced by 138 KV lines has no known effect on human health. No experiment thus far has clearly established that an electric field, even 20 times as great as those encountered under a 765 KV line, can cause biological effects of significance. For a detailed presentation on the potential health effects due to high voltage transmission lines, please refer to the EIS.

**Comment:** In unbuilt areas an easement of 50' to 100'; is used for 138 KV lines and property owners are not allowed to build dwellings under the lines. What restrictions are placed on private property owners adjacent to the proposed lines?

**Response:** Along city streets, 138 KV overhead lines generally do not tranverse private property, and no building restrictions are placed on the homeowner within this own property. When electric lines do tranverse private property, an easement must be obtained from the landowner. Within these easements, no restrictions for small shrubbery and foliage under the lines are imposed but no dwelling construction is allowed. Along most of the proposed routes in urban areas for the two required 138 KV lines to Kamoku substation, no future restriction will be placed on the homeowner where an easement has not been obtained.

# M&E Pacific, Inc.

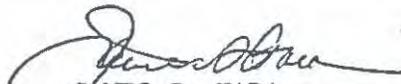
Ms. Janet Gillmar and Mr. Jack Gillmar  
December 19, 1978  
Page 4

Comment: We would also like to know why in the HECO cost accounting for the different routes, the Palolo line costs start at the Pukele Station when, in fact, one line is coming from Manoa. Surely if the Manoa line didn't have to cross the ridge, but just ran down Manoa, it would be cheaper than crossing over and running down Palolo.

Response: You are correct in stating that the Manoa line is cheaper if it just ran down Manoa from the Mt. Pua Pia junction. However, a line from this junction point to the Pukele substation is still required because one of the two lines presently feeding Pukele substation from the Koolau substation will be diverted to Kamoku and two lines are still needed to supply Pukele substation.

In the revised cost estimates (Table 4 in the EIS) the extra cost of a double circuit line above that of a single circuit line section of the line over the ridge to Palolo to which you refer has been subtracted for the cost of the Manoa lines (Alternatives A and B).

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments and our responses will be included within the final revised EIS.

  
JAMES S. HARA  
Vice President

jn

JOHN T. USHIJIMA  
PRESIDENT

DUKE T. KAWASAKI  
VICE PRESIDENT

DONALD D. H. CHING  
MAJORITY LEADER

ANSON CHONG  
STANLEY I. HARA  
GEORGE H. TOYOFUKU  
ASSISTANT MAJORITY LEADERS

ROBERT S. TAIRA  
MAJORITY FLOOR LEADER

JOHN J. HULTEN  
DENNIS O'CONNOR  
MAMORU YAMASAKI  
ASST. MAJORITY FLOOR LEADERS

FRANCIS A. WONG  
MAJORITY POLICY LEADER

FIRST DISTRICT  
STANLEY I. HARA  
RICHARD HENDERSON  
JOHN T. USHIJIMA

SECOND DISTRICT  
HENRY TAKITANI  
MAMORU YAMASAKI

THIRD DISTRICT  
D. G. ANDERSON  
MARY GEORGE  
JOHN J. HULTEN

FOURTH DISTRICT  
DONALD D. H. CHING  
JOSEPH T. KURODA  
FRANCIS A. WONG  
PATSY K. YOUNG

FIFTH DISTRICT  
DUKE T. KAWASAKI  
ROBERT S. TAIRA  
RICHARD S. H. WONG  
T. C. YIM

SIXTH DISTRICT  
ANSON CHONG  
JEAN KING  
JOHN LEOPOLD  
WAGSACHTH YEE

SEVENTH DISTRICT  
DONALD S. NISHIMURA  
DENNIS O'CONNOR  
PATRICIA SAKI  
W. BUDDY SOARES

EIGHTH DISTRICT  
GEORGE H. TOYOFUKU

SEICHI HIRAI  
CLERK

The Senate  
The Ninth Legislature  
of the  
State of Hawaii  
HONOLULU, HAWAII



Room 203  
Phone: 548-6253

December 13, 1977

Mr. Carl Williams, President  
HAWAIIAN ELECTRIC COMPANY  
900 Richards Street  
Honolulu, Hawaii 96813

SUBJ: CONCERNING THE 138 KV TRANSMISSION LINES  
AND THEIR ALTERNATIVES

Dear Mr. Williams:

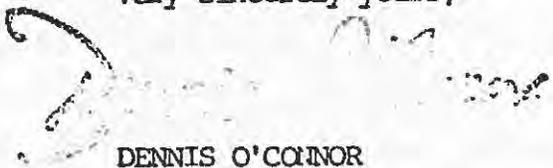
I wish to go on record as being strongly opposed to the installation of overhead power lines through the Palolo, St. Louis or Kapahulu areas.

I know you are studying the alternatives, and I would like to bring forward as one of those alternatives Kapiolani Boulevard, being fed from Iwelei, instead of Pukele. I would also like consideration to be given to the two lines running through different areas of Waikiki. My next choice would be Manoa.

Obviously, the need for the lines is there, and everyone will benefit, but the thought of overhead power lines going through residential districts is repulsive and my constituents are, naturally, upset at the unsightliness that the overhead lines will bring to their areas.

Overhead lines are not conducive to Hawaii's beautification anywhere, so I would stress that much thought be given to putting the lines underground. Extra cost notwithstanding, I believe this would solve the problem.

Very sincerely yours,

  
DENNIS O'CONNOR  
Senator  
Seventh Senatorial District

c.c: (see page 2)

# M&E Pacific, Inc.

*Environmental Engineers*

December 19, 1978

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

Senator Dennis O'Connor  
State Capitol  
Honolulu, Hawaii 96813

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of December 13, 1977 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS), has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to summaries of your questions and concerns about the proposed 138 KV lines as expressed in your letter.

**Comment:** Consider the alternative of feeding the new system from the Iwilei substation via lines along Kapiolani Boulevard.

**Response:** The alternative of directly connecting the new Kamoku substation to the Halawa substation is being considered and is discussed in the EIS. There are, however, significant difficulties associated with this alternative, including conflict with the Capital Improvement District and other special design district ordinances of the City and County of Honolulu. Feeding the new Kamoku substation from the Iwilei substation would involve new feeder lines to Iwilei, expansion of Iwilei, and two new lines through the central part of Honolulu. This is not an attractive alternative for minimizing impacts on urban areas, especially since most of the urban areas that would be impacted would not benefit from this particular system.

# M&E Pacific, Inc.

Senator Dennis O'Connor

December 19, 1978

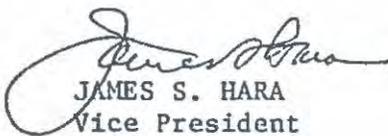
Page 2

**Comment:** Overhead power lines through residential districts are unsightly and not conducive to Hawaii's beautification anywhere so consideration should be given to placing the lines underground, extra cost notwithstanding.

**Response:** It is true that overhead lines do not improve the aesthetic conditions of urban or conservation areas. However, the lines being proposed for this project are a significant improvement aesthetically over most previous power lines in that widely spaced single steel poles are used instead of elaborate towers.

Underground lines in urban areas are being considered. As you noted, such lines are more expensive than overhead lines and they also involve a considerably longer construction period with accompanying disruptions. Initial estimates, given in the EIS, show that undergrounding is approximately three times as expensive as the conventional overhead system. Under present PUC rate regulations the difference in costs would have to be paid for by those who benefit from the underground lines. The greatest difficulty related to placing these high voltage lines underground, however, is the interference with other utilities since a 16-foot wide trench would be required.

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments and our responses will be included within the final revised EIS.

  
JAMES S. HARA  
Vice President

jn

3274 Loke Pl.  
Honolulu, HI 96816  
June 26, 1978

TMK 3-3-48-35

Mr. Ted H. Dameron, Director  
Land and Rights of Way  
Hawaiian Electric Co., Inc.  
P. O. Box 2750  
Honolulu, HI 96840

Dear Mr. Dameron:

Do you have a map of the proposed route of the two 138 KV transmission lines from the Halawa Station to the Pukele Substation and the yet-to-be-built Kamoku Substation? If you do, is there any possibility of my obtaining a copy?

I am a resident of Palolo Valley where the transmission lines might pass through.

Also, will the Kamoku Substation be located diagonally from the Iolani Court Plaza, which is under construction now?

Thank you.

Very truly yours,

*Roy E. Shigemura*

Roy E. Shigemura

July 17, 1978

ENVIRON 2-1  
H-P-K  
NV/G/NV

Mr. Roy E. Shigemura  
3274 Loke Place  
Honolulu, Hawaii 96816

Dear Mr. Shigemura:

Subject: Halawa-Pukele-Kamoku Transmission Lines

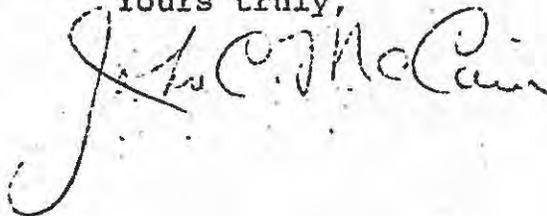
I am writing in response to your June 26 letter to Mr. Damron of Hawaiian Electric Company's Land and Rights-of-Way Department. Mr. Damron asked me to answer your letter since my department is currently preparing an Environmental Impact Statement for the proposed Halawa-Pukele-Kamoku 138 kv transmission lines.

I am enclosing a copy of a map showing the proposed routes of the two transmission lines. As you will note from the map, neither of the routes follow Loke Place; however, our proposed route of Line 1 will follow Palolo Avenue along the opposite side of the street as Loke Place.

The new Kamoku Substation is to be constructed in an enclosed building located underneath the tennis courts of the Iolani Court Plaza.

If I can assist you in any other way, please call me at 548-6880.

Yours truly,



JCMc:cm  
Enclosure

cc: F. Karimoto  
T. Damron

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Mr. Roy E. Shigemura  
3274 Loke Place  
Honolulu, Hawaii 96816

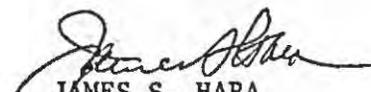
SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of June 26, 1978 with respect to the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS), has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

Thank you for your interest in this matter and should you have further comments after you review the EIS please submit them to us at the above address (Attention: HECO EIS). As part of the EIS process, your further comments and our responses will be included within the final revised EIS.

  
JAMES S. HARA  
Vice President

jn

3724 Loulu Street  
Honolulu, HI 96822  
August 23, 1978

Councilman Kekoa Kaapu  
Honolulu, Hale  
Honolulu, HI 96812

Dear Councilman Kaapu:

As concerned citizens, we want you to know that we feel most strongly that the power lines HECO is proposing through the back of Manoa Valley should not be allowed.

The prevention of the construction of such lines would help to curtail the growth of Honolulu, and would also help to preserve the natural beauty of the Valley.

If existing power lines could be placed underground, a tremendous enhancement of the great appeal of this, one of the loveliest valleys in the world, would result.

Thank you for your efforts in behalf of this urgent appeal.

Sincerely yours,

Dr. & Mrs. W. R. Wilson

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Dr. & Mrs. Wayne R. Wilson  
3724 Loulu Street  
Honolulu, Hawaii 96822

SUBJECT: Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter of August 23, 1978 to Councilman Kekoa Kaapu regarding the subject project. Our firm is preparing an Environmental Impact Statement (EIS) for this project and we have therefore been asked to respond to your letter.

Although Hawaiian Electric Company (HECO) still favors the Leeward Koolau route (which passes across the back of Manoa Valley) and the two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. All of the presently considered alternatives are discussed in the EIS being prepared by our firm. This EIS will be filed with the Environmental Quality Commission in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to your questions and concerns about the proposed 138 KV lines as expressed in your letter.

**Comment:** The prevention of the construction of such lines would help to curtail the growth of Honolulu, and would also help to preserve the natural beauty of Manoa Valley.

**Response:** The proposed project is designed to relieve the anticipated overload conditions in late 1981 at the Pukele Substation in the back of Palolo Valley which serves electrical power needs of Manoa, Palolo, Kaimuki, Waikiki, Moiliili, Makiki, Kahala, Kapahulu, Maunalani Heights, St. Louis Heights and other smaller districts and parts of districts. It appears unreasonable to seek to curtail growth in these areas by allowing a condition of unreliable electrical power and rolling blackouts to develop that would likely affect all of these areas in the future if relief is not provided for the present Pukele system. Curtailment of growth is properly done by zoning and land use control and not by providing unreliable and unacceptable utility services to all of the residents of the area.

Discussion of aesthetic and other environmental impacts as well as mitigating measures are given in the EIS.

# M&E Pacific, Inc.

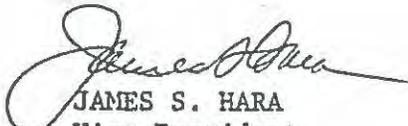
Dr. & Mrs. Wayne R. Wilson  
December 19, 1978  
Page 2

**Comment:** If existing power lines could be placed underground, a tremendous enhancement of the great appeal of this, one of the loveliest valleys in the world, would result.

**Response:** It is our understanding that local power lines can be placed underground if proper arrangements are made with HECO and other affected agencies and the cost is borne by the local landowner's residents or some other local group. This financial arrangement is necessary because, according to PUC regulations, HECO rates are based only on overhead lines and the extra cost of underground lines must be paid by someone else.

The alternative of placing the proposed 138 KV lines underground in urban areas is discussed in the EIS. Undergrounding is not being considered for conservation areas, such as the back of Manoa Valley, because the 16-foot wide trench required would have considerably greater environmental affect than an overhead system.

Thank you for your interest in this matter and should you have further comments after you review the EIS, please submit them to us. As part of the EIS progress, your further comments and our responses will be included in the final revised EIS.

  
JAMES S. HARA  
Vice President

HJK/jn

REPRESENTATIVE TED T. MORIOKA

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2618 Gardenia Street · Honolulu, HI. 96816

June 1, 1977

Mr. Ted Damron, Director  
Land & Rights of Way  
Hawaiian Electric Co. Inc.  
P. O. Box 2750  
Honolulu, HI 96840

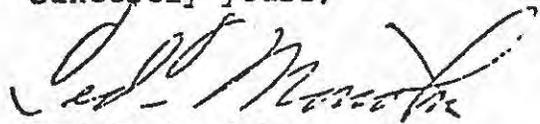
Dear Mr. Damron:

In response to your EIS Preparation Notice regarding the "Construction of Two 138 KV Transmission Circuits, Halawa to Palolo Valley, Oahu", we request that the following be allowed to serve as consultants representing the Palolo Community:

Rev. Charles C. Luttrell, President  
Palolo Community Council  
2165 10th Avenue  
Honolulu, HI 96816

Ted T. Morioka  
Representative, 9th District  
2618 Gardenia St.  
Honolulu, HI 96816

Sincerely yours,



Ted T. Morioka

cc: Palolo Community Council  
Waiomao Community Ass'n  
Carlos Long Community Ass'n  
Members of the Palolo Comm. Council

ENVIRONMENTAL  
2-1 EIS, Preparation  
Halawa-Pukele 138 KV  
NV/G/NV

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96803

June 2, 1977



RICHARD E. BELL  
MANAGER, ENVIRONMENTAL DEPARTMENT

The Honorable Ted T. Morioka  
Representative, 9th District  
2618 Gardenia Street  
Honolulu, Hawaii 96816

Dear Representative Morioka:

In response to your request of June 1, 1977, please be advised that your name and that of Reverend Charles C. Luttrell have been added to the list of organizations and individuals wishing to be consulted on this project. I have enclosed with this letter a copy of the EIS Preparation Notice which you may find of interest.

Sincerely yours,

A handwritten signature in dark ink, appearing to be 'Richard E. Bell'.

REB:cm  
Enclosures

cc: Sunn, Low, Tom & Hara, Inc. (Krock)

November 11, 1977

Mr. Lionel Low  
M&E Pacific  
Environmental Engineers  
Pacific Trade Center  
190 S. King St., Suite 600  
Honolulu, HI 96813

Dear Mr. Low:

The attached is a list of concerns voiced by the residents of Palolo Valley at the meeting called by the Palolo Community Council on November 9, 1977 at the Jarrett Intermediate School Cafetorium.

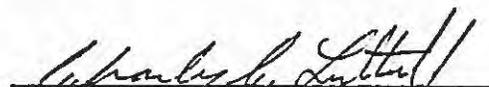
We are submitting these concerns as agreed upon at the Council's previous meeting with you on October 26. It is our understanding that the undersigned, on behalf of the Palolo Council, will receive a copy of your responses to these concerns.

Sincerely,

PALOLO COMMUNITY COUNCIL



Ted T. Morioka  
Representative, 9th District  
2618 Gardenia St.  
Honolulu, HI 96816



Rev. Charles C. Luttrell  
Palolo Valley Church of Christ  
2165 10th Avenue  
Honolulu, HI 96816

1. What is the distance and cost of the Palolo Avenue line if measurement was taken from the junction where the Manoa alternate connects to the line from Waiau. Line 1 & Alt. A junction.
2. HECO has claimed that DLNR will not permit the lines to go over Waahila Ridge because it is conservation land. If so, how did HECO get lines through all the conservation land from Waiau to Pukele?
3. What is the total distance that the power line travels through conservation land to get to Pukele?
4. What is the distance through conservation land if the Waahila Ridge alternate is used? (Alt. D)
5. What is the environmental effect on vegetation and fauna of the line from Waiau to Pukele as compared to the line from Pukele to Dole St.?
6. Does the proposed line from Waiau to Pukele to Kamoku substation enter into the Pukele Substation system?
7. Is the electromagnetic field generated between the two 138 KV lines in Palolo harmful to humans? If not, how close must the lines be before the electromagnetic force is harmful to humans?
8. How severe will the radio and TV interference be and how can it be corrected?
9. Will arcing and electromagnetic field cause constant radio and TV interference.
10. Will arcing intensify during rainstorms?
11. What is the noise intensity of the humming of the wires?
12. How much of the sidewalk area will the poles occupy?
13. How many lines besides the 138 KV will the poles carry?
14. If other lines are to be carried by the 138 KV poles, will it eliminate any of the poles now in use?
15. When the power lines traverse conservation land, how wide an area is cleared or condemned under the power lines?
16. Why is the area under the line condemned? Is it for line maintenance or for safety reasons?
17. Is a draft of the EIS available?

18. If so, why hasn't it been made available to the intervenors namely, Ted Morioka and Rev. Luttrell?
19. Has HECO requested permission from DLNR to run the 138 KV lines over Waahila Ridge? If so, we would like a copy of the reply from DLNR.
20. Can there be 2 lines running parallel over Waahila Ridge?
21. Is there a danger to kite-users--especially children?
22. What effect will the construction of the high tension power lines have on the property values of landowners in the valley?
23. General residential safety is of great concern to the community - lines might fall on homes. How valid is this concern?
24. Do the poles create a traffic hazard?
25. How much pressure is needed to knock a pole or wire (by wind or man-made) down?
26. What effect on the aesthetic values of the valley does the construction of power lines have?
27. Up to what distance can the noise be heard?
28. Why was Palolo Valley, a residential community, selected since it is densely populated -- have other areas been equally evaluated -- for instance, other valleys like Manoa are a shorter distance than Palolo.
29. What is the true cost of the routes through Palolo? We believe Hawaiian Electric's comparisons of alternate routes and their respective costs do not reflect the true distances which must be traversed to transmit power through alternate lines 1 and 2.
30. Why couldn't there be a Manoa substation to feed the 46 KV using existing lines?
31. Why can't we go underground?
32. Is the height of the poles in accordance with the zoning?
33. If a home is destroyed by fire, condemned, etc., would the owner be permitted to rebuild his home under the high tension wires?
34. What effects would the electromagnetic fields generated by the power lines have on homes with metal roofs?
35. What precautionary devices will be installed to insure that the flow of electricity will stop if the pole should fall or if a wire should break.

36. Has new technologies relating to underground wiring currently being used in Europe been considered? e.g., using refrigerated and inert gases as insulation.
37. Did PUC order additional transmission capacity to support the Waikiki area?
38. What is meant by "support a growing electrical load in Waikiki area" as noted in the HECO EIS Preparation Notice?

December 15, 1977

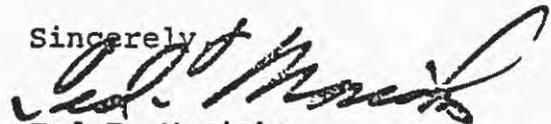
Dr. Hans Krock  
M&E Pacific  
Suite 600, Pacific Trade Center  
Honolulu, Hawaii 96813

Dear Dr. Krock:

The attached list of questions is being submitted to you by the Palolo Community Council. These questions were raised at our meeting last evening at the Jarrett Intermediate School Cafetorium.

Reverend Charles Luttrell and I will be expecting M&E's response to these questions as well as to the original set of questions submitted.

Sincerely,



Ted T. Morioka  
Representative, 9th District  
2618 Gardenia Street  
Honolulu, Hawaii 96816

Questions Raised at Palolo Community Council Meeting December 14, 1977:

1. Is there a possibility of placing one set of wires on either side of Waahila Ridge?
2. Can the Kamoku project be delayed until there is sufficient technology to consider an underground route?
3. Isn't the layout presented by Hawaiian Electric Company with regard to existing transmission lines inaccurate?
4. What setback limit is there for the wires? (How far away from dwellings must the wires be placed?)
5. If a home under or near the wires is destroyed, can the owner rebuild his home? Are there any restrictions to prevent such rebuilding?
6. Can the breakdown of the costs for all alternate routes be presented to the Palolo residents?
7. In most situations that deal with subjects of such magnitude, there are several professionals or experts who do research-- why is it that there is only one scientist who is doing this research?
8. If there hasn't been much research done on the effects of the 138 kv lines, how can there be a conclusive statement that there is little effect on human beings?
9. Can the need for two power lines be demonstrated by Hawaiian Electric Company? What statistics are being used as the basis for such projections?

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Mr. Ted T. Morioka  
Representative, 9th District  
2618 Gardenia Street  
Honolulu, Hawaii 96816

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to two letters from the Palolo Community Council dated November 11, 1977 and December 15, 1977 regarding the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS) has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to your questions and concerns about the proposed 138 KV lines as expressed in your letter of November 11, 1977.

**Comment:** What is the distance and cost of the Palolo Avenue line if measurement was taken from the junction where the Manoa alternate connects to the line from Waiiau. Line 1 and Alt. A junction.

**Response:** The Palolo Avenue line (Line 1) is about 3.8 miles long from Pukele to Kamoku and is estimated to cost about \$3.32 million. Selection of Line A through Manoa Valley would still require the

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 2

construction of a line to Pukele from the junction with the line from Halawa (not Waiiau). The junction to the Pukele line, however, would be single circuit rather than double circuit and therefore less expensive. Line A would be about 4.3 miles long from the junction with the Halawa-Pukele line to Kamoku. The total cost of Line A is estimated by HECO to be about \$4.16 million, which includes a credit of \$0.23 million for the single circuit portion from the junction to Pukele and \$0.72 million for cancellation charges for the poles HECO has ordered for Line 1. The cost of Line A without the cancellation charges would be about \$3.44 million. The EIS contains a further breakdown of these estimated costs.

**Comment:** HECO has claimed that DLNR will not permit the lines to go over Waahila Ridge because it is conservation land. If so, how did HECO get lines through all the conservation land from Waiiau to Pukele?

**Response:** The Department of Land and Natural Resources evaluates requests for use of conservation land on an individual basis. HECO has had preliminary discussions with DLNR concerning a 138 KV line over Waahila Ridge but has made no formal request for approval of such a route (Line D or Alternatives G and I). At these preliminary discussions, DLNR has indicated to HECO that there is a strong possibility that the route over Waahila Ridge would not be approved.

**Comment:** What is the total distance that the power line travels through conservation land to get to Pukele?

**Response:** The leeward Koolau route from Halawa to Pukele would be about 10.17 miles long, of which about 9.1 miles would be in conservation land.

**Comment:** What is the distance through conservation land if the Waahila Ridge alternate is used (Alternate D)?

**Response:** Line D is about 3.7 miles long, of which about 1.4 miles would be in conservation land and about 0.7 miles would be in open land on the lower portion of Waahila Ridge owned by the University of Hawaii and zoned urban.

**Comment:** What is the environmental effect on vegetation and fauna of the line from Waiiau to Pukele as compared to the line from Pukele to Dole Street?

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 3

**Response:** The Halawa to Pukele line would have longer average spans than the Pukele to Dole Street portion of Line D since the former generally goes from ridge top to ridge top while the latter generally goes down Waahila Ridge. Pole and tower construction impacts for both lines would be similar and minimal with respect to vegetation and fauna. Line D, however, would require a significant amount of tree removal in the park area above St. Louis Heights, while the Halawa to Pukele line would require only minimal tree trimming in a few sag areas between poles. Neither line would have a significant effect on fauna. Further discussion of conservation area effects is given in the EIS.

**Comment:** Does the proposed line from Waiiau to Pukele to Kamoku substation enter into the Pukele Substation system?

**Response:** Yes, one of the two circuits from Halawa (not Waiiau) will go to Pukele (to replace the circuit from Koolau that is being diverted to Kamoku); the other will go to Kamoku.

**Comment:** Is the electromagnetic field generated between the two 138 KV lines in Palolo harmful to humans? If not, how close must the lines be before the electromagnetic force is harmful to humans?

**Response:** A review of available research on the biological effects of electrical fields indicates that exposure to the field strength produced by 138 KV lines has no discernible effects on human health or the health of any other living organisms. No experiment has clearly established a danger threshold for human exposure to electrical fields. The results of Russian experiments, which form the basis for Soviet exposure standards, could not be reproduced in the USA or in Western Europe. In any case, the electrical field associated with 138 KV lines is several times weaker than the "unlimited" exposure duration level of the Russian standards. No American standards exist.

**Comment:** How severe will the radio and TV interference be and how can it be corrected?

**Response:** Radio interference (RI) and TV interference (TVI) are not associated with properly functioning transmission lines. The potential for RI/TVI, however, does exist and is generally due to arcing, which is the result of small gaps between transmission line components. The existence of these gaps is minimized by good design and construction, high tension, and by line maintenance. It should be noted that RI/TVI is not dependent on voltage and can occur with 46 KV and local distribution lines. From 1967 to 1977, HECO has received only seven complaints of

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 4

RI/TVI attributable to 138 KV lines. In all cases, corrective action alleviated the problem to the satisfaction of the complainant.

**Comment:** Will arcing and electromagnetic field cause constant radio and TV interference?

**Response:** No, since arcing with 138 KV lines can be considered a rare occurrence and the electrical field of the 138 KV line is not strong enough to cause a significant corona discharge (partial ionization of air), which can cause RI in the lower radio frequencies with much higher voltage transmission lines.

**Comment:** Will arcing intensify during rain storms?

**Response:** Rain will not cause arcing. It should be noted that there is a possibility that high wind can cause loose hardware and result in arcing. This is no more likely, however, with 138 KV lines than with the existing lines in Palolo.

**Comment:** What is the noise intensity of the humming of the wires?

**Response:** Noise can be caused by arcing or by corona discharge. Arcing is rare and can be remedied by maintenance. Corona discharge can be controlled by good design and has not been a significant factor in the 138 KV system on Oahu. No significantly audible noise is anticipated from the proposed lines.

**Comment:** How much of the sidewalk area will the poles occupy?

**Response:** In the urban area, the pole diameter will be about two feet at the base and will generally occupy the area between the face of the curb and the sidewalk. The face of the curb is generally 6 to 8 feet from the property line.

**Comment:** How many lines besides the 138 KV will the poles carry?

**Response:** In urban areas the single 138 KV circuit will consist of three conductors (about 1-1/2 inch diameter aluminum) and one shield wire at the top of the pole. Where reasonably possible, the poles will also carry the three conductors of a 46 KV circuit.

**Comment:** If other lines are to be carried by the 138 KV poles, will it eliminate any of the poles now in use?

**Response:** In those urban areas where the 46 KV lines are transferred from the wooden poles to the 138 KV poles, approximately the top

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 5

10 feet of the wooden poles will be removed. Almost no wooden poles will be eliminated, however, because they would still be needed to carry the local distribution lines and transformers as well as telephone lines.

**Comment:** When the power lines traverse conservation land, how wide an area is cleared or condemned under the power lines?

**Response:** Easements in conservation lands for the 138 KV lines are generally 100 feet wide. This width is selected to accommodate conductor swing for the typically long span in conservation land (some spans are 2,000 feet). It should be emphasized that clearing is confined to a small radius around each pole site and to a few helicopter pads, with some tree trimming in a few sag areas. Except for these locations, the easement area is not cleared.

**Comment:** Why is the area under the line condemned? Is it for line maintenance or for safety reasons?

**Response:** The easement area is not condemned. After HECO obtains an easement from the landowner to allow passage of the lines over the land, the owner retains ownership and is able to use the land for most purposes as described in the easement grant.

**Comment:** Is a draft of the EIS available?

**Response:** A draft of the EIS will be available in January 1979 and will be subject to public review after it is filed with the Environmental Quality Commission (EQC).

**Comment:** If so, why hasn't it been made available to the intervenors namely, Ted Morioka and Rev. Luttrell?

**Response:** When filed with the EQC, the EIS will be available for public review and copies will be sent to Representative Ted Morioka and Rev. Luttrell.

**Comment:** Has HECO requested permission from DLNR to run the 138 KV lines over Waahila Ridge? If so, we would like a copy of the reply from DLNR.

**Response:** HECO has not made a formal request to DLNR for 138 KV lines over Waahila Ridge. HECO has met with DLNR concerning the 138 KV lines as well as concerning a 46 KV line on the Waahila Ridge alignment. Indications from this meeting were that there is a strong possibility that DLNR would not approve the Waahila Ridge alignment if there were reasonable alternatives available.

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 6

Comment: Can there be two lines running parallel over Waahila Ridge?

Response: It is possible, though not an optimum design, to construct parallel pole lines over Waahila Ridge. Such an alternative would be very costly, require a considerably greater amount of tree removal from the park, and would not constitute a large improvement in reliability over a double circuit on a single pole line (this is already being considered in the EIS as Alternative G).

Comment: Is there a danger to kite users--especially children?

Response: The proposed 138 KV lines are not any more dangerous to kite users than are the existing 46 KV lines or many of the local distribution lines. In any case, kite flying should be done only in open areas away from any kind of utility lines.

Comment: What effect will the construction of the high tension power lines have on the property values of landowners in the valley?

Response: While future conditions cannot be definitely predicted regarding effects on property values, a limited comparison study of the selling prices of homes near existing 138 KV lines with similar properties elsewhere in the same tax zone shows no discernible detrimental effect on property values. It is also significant to note that there have been no complaints to HECO regarding any lowering of property values resulting from the construction of many miles of 138 KV lines in urban areas on Oahu.

Comment: General residential safety is of great concern to the community--lines might fall on homes. How valid is this concern?

Response: The poles for the 138 KV lines would generally be located between the curb face and the sidewalk. The conductors would be hung above the street right of way on insulator arms extending 5 to 10 feet from the pole. Since the private property line is generally located about 6 to 8 feet from the curb face, the conductors would be located 11 to 18 feet horizontally from the property line. Consequently, it is very unlikely that a broken conductor could fall on a home. Additionally, it is highly unlikely that a conductor would break since they will be designed with a factor of safety greatly exceeding the minimum factor of safety of 2.0. In any case, the current in the conductor would be stopped in a fraction of a second by protective relays in the event of line interruption.

Comment: Do the poles create a traffic hazard?

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 7

**Response:** The poles for the 138 KV lines would not constitute any more of a traffic hazard than the existing wooden poles. It is true, however, that more poles would be added and thereby add to the objects that an out-of-control vehicle can collide with.

**Comment:** How much pressure is needed to knock a pole or wire (by wind or man-made) down?

**Response:** The force required to shear the steel poles is calculated to be 860,000 pounds. Assuming several reasonable conditions, a 24-ton truck traveling at 60 mph will not shear a pole. The wires will withstand a wind of 60 mph at 50°F with a factor of safety of 2.93.

**Comment:** What effect on the aesthetic values of the valley does the construction of power lines have?

**Response:** There will be a certain aesthetic impact from the 138 KV lines, and it is understandable that many people consider such lines to be incongruous with residential neighborhoods. The design of these lines, however, is an improvement over the elaborate towers previously used. The proposed slim, steel poles present a modern, neat appearance that is in contrast to the "jungle of wires" effect of many of the wooden pole lines already existing in these neighborhoods.

**Comment:** Up to what distance can the noise be heard?

**Response:** As noted in the response to a previous comment, no significantly audible noise is anticipated from the proposed lines.

**Comment:** Why was Palolo Valley, a residential community, selected since it is densely populated--have other areas been equally evaluated--for instance, other valleys like Manoa are a shorter distance than Palolo.

**Response:** No final selection has been made among the alternatives that have been evaluated. HECO, however, prefers the two overhead lines through Palolo Valley, primarily because of lower costs and greater ease of construction and maintenance. Evaluations of all the alternatives are presented in the EIS.

**Comment:** What is the true cost of the routes through Palolo? We believe Hawaiian Electric's comparisons of alternate routes and their respective costs do not reflect the true distances which must be traversed to transmit power through alternate lines 1 and 2.

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 8

**Response:** The cost estimates of the various alternatives have been updated, and a breakdown and comparison are given in the EIS. As noted in the response to the first comment, the lengths of the lines, the double and single circuit changes, and the costs have all been evaluated and are presented in the EIS.

**Comment:** Why couldn't there be a Manoa substation to feed the 46 KV using existing lines?

**Response:** There could be a substation like Pukele in the upper end of Manoa Valley. This would still require the construction of 138 KV lines from Halawa. The upper end of Manoa Valley is a very poor location because there are very few 46 KV lines in Manoa Valley. It would not be possible to export full power because of the scarcity of existing 46 KV lines in Manoa. Eight 46 KV lines are needed to transport the power to the load center. It is very difficult to build new lines down Manoa Valley because of the narrow, winding streets and the trees.

**Comment:** Why can't we go underground?

**Response:** It is possible to go underground in urban areas, and this would alleviate the aesthetic objections. There are, however, several significant drawbacks to the underground alternative. These include higher construction costs (by approximately a factor of three), much longer construction time, significant interference with existing and planned utilities (since a 16-foot wide trench would be required), greater maintenance requirements, longer down time in case of failure, and additional property requirements for housing the line cooling facilities. It should also be noted that there are no PUC regulations indicating how the extra costs of undergrounding major transmission lines would be paid.

**Comment:** Is the height of the poles in accordance with the zoning?

**Response:** The Comprehensive Zoning Code does not place restrictions on the height of overhead lines. The proposed lines, however, would meet all required clearances and comply with all applicable codes and rules.

**Comment:** If a home is destroyed by fire, condemned, etc., would the owner be permitted to rebuild his home under the high tension wires?

**Response:** Along city streets, 138 KV overhead lines generally do not traverse private property, and no building restrictions are placed on the homeowner within his own property. When electric

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 9

lines do traverse private property, an easement must be obtained from the landowner. No restrictions for small shrubbery and foliage under the lines are imposed, but no dwelling construction is allowed. Along most of the proposed routes in urban areas for the two required 138 KV lines to Kamoku Substation, no building restrictions, no minimum distances from the line, and no future restrictions will be placed on the homeowner where an easement has not been obtained.

**Comment:** What effects would the electromagnetic fields generated by the power lines have on homes with metal roofs?

**Response:** The electric field is greatest directly under the line for the line configuration HECO will be using for the Kamoku 138 KV lines. The electric field strength then decreases at a rapid rate as distance from the line increases. As homes are located some distance away from the line, it is not expected that there will be any effects on homes with metal roofs or otherwise.

**Comment:** What precautionary devices will be installed to insure that the flow of electricity will stop if the pole should fall or if a wire should break?

**Response:** The flow of current through the lines would be constantly monitored by protective relays. Should a pole fall down or should a wire break, these devices will sense the flow of fault current and cause circuit breakers to open and disconnect the line within a fraction of a second.

**Comment:** Has new technologies relating to underground wiring currently being used in Europe been considered; e.g., using refrigerated and inert gases as insulation?

**Response:** The "superconductors" that are referred to are largely experimental. Their purpose is to provide a large capacity to transmit electric power. HECO keeps abreast of current industry developments in cable technology and other areas to insure that system expansion is accomplished in the most economical and efficient means.

**Comment:** Did PUC order additional transmission capacity to support the Waikiki area?

**Response:** The PUC does not directly order additional transmission capacity. PUC General Order 7 states (V.5.1) "the electric plant of the utility shall be constructed, installed, removed, maintained, and operated in accordance with accepted good engineering

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 10

practice in the electric utility industry to insure, as far as reasonably possible, continuity of service, uniformity in the quality of service furnished, and the safety of persons and property."

Hawaiian Electric is responsible for planning, designing, and installing facilities to provide adequate, reliable service at the least cost to the consumers. It must be pointed out that the purpose of the Kamoku Substation is not to serve just the Waikiki area. Rather, it is required so that load may be shifted away from Pukele Substation so that the Pukele Substation may continue to reliably supply its service area, which includes Palolo Valley.

Comment: What is meant by "support a growing electrical load in Waikiki area" as noted in the HECO EIS preparation notice?

Response: The statement is incomplete and evidently misleading since the Kamoku Substation and connecting transmission lines are required to relieve the anticipated overloaded condition of the Pukele Substation. The Pukele Substation serves Palolo, Manoa, Kaimuki, and several other districts besides Waikiki.

The following responses are to comments from your December 15, 1977 letter.

Comment: Is there a possibility of placing one set of wires on either side of Waahila Ridge?

Response: Yes, Line B on the Manoa side of Waahila Ridge and Line C on the Palolo side are addressed in the EIS.

Comment: Can the Kamoku project be delayed until there is sufficient technology to consider an underground route?

Response: The underground route is being considered but would be very costly and disruptive to residents and other underground utilities. Since it is anticipated that this project will be needed by 1981, there is not enough time for any kind of realistic hope of reductions in cost or complexity of the underground system to alleviate its major drawbacks.

Comment: Isn't the layout presented by Hawaiian Electric Company with regard to existing transmission lines inaccurate?

Response: It is not clear what layout is being referred to; however, the facts and figures presented in the EIS are believed to be accurate.

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 11

**Comment:** What setback limit is there for the wires? (How far away from dwellings must the wires be placed?)

**Response:** According to the Public Utility Commission General Order No. 6, the minimum horizontal clearance from a building is 6 feet and the minimum vertical clearance is 12 feet.

**Comment:** If a home under or near the wires is destroyed, can the owner rebuild his home? Are there any restrictions to prevent such rebuilding?

**Response:** As noted in the response to a previous comment, no future restrictions will be placed on the homeowner where an easement has not been obtained.

**Comment:** Can the breakdown of the costs for all alternate routes be presented to the Palolo residents?

**Response:** The cost estimates for the various alternatives have been updated and a breakdown is presented in the EIS.

**Comment:** In most situations that deal with subjects of such magnitude, there are several professionals or experts who do research--why it is that there is only one scientist who is doing this research?

**Response:** Studies related to the EIS have been conducted by the staffs of M&E Pacific, Inc. and HECO as well as by specialists in the areas of botany, ornithology, and archaeology. In addition, the results of published research of numerous scientists on possible health effects and other subjects have been summarized and included in the EIS.

**Comment:** If there hasn't been much research done on the effects of the 138 KV lines, how can there be a conclusive statement that there is little effect on human beings?

**Response:** There has been a considerable amount of research done on the effect of electrical fields on biological systems, and there is no evidence that the electrical field strength associated with 138 KV transmission lines has any discernible effect on human beings.

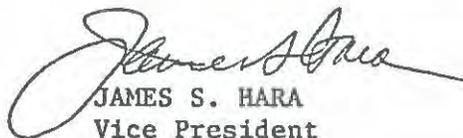
**Comment:** Can the need for two power lines be demonstrated by Hawaiian Electric Company? What statistics are being used as the basis for such projections?

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 12

Response: Two circuits are needed to allow the required periodic maintenance of each circuit, involving shutdown of that circuit, without a blackout of the service area. In addition, a second circuit is required as backup in case of failure. Without such an arrangement, the level of service would be unacceptable to most consumers.

Thank you for your interest in this matter and should you have further comments after you review the EIS, please submit them to us. As part of the EIS process, your further comments and our responses will be included within the final revised EIS.



JAMES S. HARA  
Vice President

HJK/jn

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

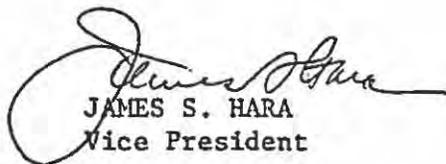
December 28, 1978

Mr. Ted T. Morioka  
Representative, 9th District  
2618 Gardenia Street  
Honolulu, Hawaii 96816

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is a follow up to our response letter of December 19, 1978. Since the time of our response to your questions, HECO has updated the cost estimates for the various alternative 138 KV lines to Kamoku substation so as to reflect costs as of December 1978. Thus the updated costs applicable to your first comment are as follows:

Palolo Avenue Line (Line 1)	\$5.25 million
Manoa Valley Line (Line A)	\$6.15 million (with cancellation charges)
	\$5.43 million (without cancellation charges)

  
JAMES S. HARA  
Vice President



# Moiliili-McCully Community Council

2535 South King Street • Honolulu, Hawaii 96826 • Telephone (808) 955-1555

September 11, 1978



Hawaiian Electric Company  
ATTN: Mr. John C. McCain  
Box 2750  
Honolulu, HI 96840

Dear Sir,

We have received the fact sheet regarding the proposed 276,000 volt transmission lines and Kamoku Street substation. We thank you for having it available to the public upon request. However, we find that it does not adequately address the concerns in our letter of August 1, 1978.

a. Need for the transmission lines. The magnitude and location of need within the service area; population that will be served; types of users; electrical consumption; effect of energy-saving devices and programs.

b. Public safety considerations for residential areas. Measures that will safeguard the public against hazards of electric shock and electro-magnetic radiation.

c. Community impacts during and after construction. Right of way requirements for routes; effects of construction activity on business; aesthetic considerations both at street level and with an overall urban design viewpoint.

d. Advantages/disadvantages of routes. In addition to costs, criteria for selection and rationale for two routes rather than a single route; the purpose of the dual use, condominium building and electric substation, of the Kamoku Street site; costs and methods of financing for above-ground and below-ground routes.

With this initial information, we will more fully understand and will be interested in detailed discussions regarding the proposal.

Sincerely,

*Pat Akamine*  
Patricia Akamine  
President

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96803

September 27, 1978

ENV 2-1  
H-P-K  
NV/G/NV

Ms. Patricia Akamine, President  
Moiliili-McCully Community Council  
2535 South King Street  
Honolulu, Hawaii 96826

Dear Ms. Akamine:

Subject: Halawa-Pukele-Kamoku Transmission Line Project

Please forgive the delay in answering your letter of September 11, 1978 which requested further information on our proposed Halawa-Pukele-Kamoku transmission line project. I agree that the fact sheet which was recently sent to you may not answer all of your concern; however, the Environmental Impact Statement (EIS) we are currently preparing will address the concerns you list. ~~The draft EIS should be available in about 4 months.~~ Rather than cover material which will be contained in the EIS, it seems appropriate that you review the draft EIS when it appears. As you know, you have an opportunity to review and comment on the draft EIS when it is issued.

Yours truly,

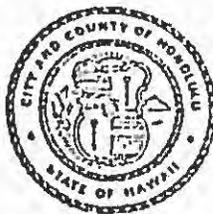
*John P. McCully*

JCMc:cm

cc: Dr. Hans Krock/

MCCULLY/MOILIILI NEIGHBORHOOD BOARD NO. 8  
c/o MCCULLY/MOILIILI COMMUNITY CENTER  
2535 SOUTH KING STREET  
HONOLULU, HAWAII 96814

Jul 1978



July 20, 1978

Hawaiian Electric Co.,  
900 Richards Street  
Honolulu, Hawaii

Attention - Public Relations

Gentlemen:

In behalf of the McCully-Moiliili Neighborhood Board we are hereby making the following request with reference to the power line to be installed from Palolo to the Date - Kamoku - Kapiolani sub-station.

- 1--Data substantiating present and future need for the sub-station.
- 2--Immediate and future anticipated power capacity.
- 3--Present and projected resident and commercial consumer power requirements
- 4--Whatever other information you may desire to supply that would benefit us in giving advise to our community and gathering neighborhood reaction.

Thank you for your attention and courtesy.

Sincerely,

*Eugene Montoya*  
Eugene Montoya #3  
Chairman

cc-Members of N.B. #8

Jean King - Sen - 6th

Anson Chong " - 6th

Carl Takamura Hsc - 12th

Cliff Uwaine " - 11th

K. Kamalji " - 11th

John Carroll " - 11th

3-M Community Council

Marilyn Bornhorst - Com. Council

K. Kaapu

Dennis Callan *2535 South King Street, Honolulu, Hawaii (64-1111)*

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

December 19, 1978

Mr. Eugene Montoya  
Chairman  
McCully/Moiliili Neighborhood Board No. 8  
2535 South King Street  
Honolulu, Hawaii 96826

SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines

This letter is in response to your letter to Hawaiian Electric Company (HECO) dated July 20, 1978 regarding the subject project.

Please excuse the delay in responding to your comments and concerns, but more time was required by HECO and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer the Leeward Koolau route and placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS) has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to your questions and concerns about the proposed 138 KV lines as expressed in your letter.

Comment: We request information regarding the following items:

1. Data substantiating present and future need for the Kamoku Substation.
2. Immediate and future anticipated power capacity.
3. Present and projected resident and commercial consumer power requirements.
4. Whatever other information you may desire to supply that would benefit us in giving advice to our community and gathering neighborhood reaction.

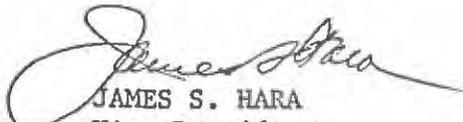
# M&E Pacific, Inc.

Mr. Eugene Montoya  
December 19, 1978  
Page 2

Response: Regarding the last item, the EIS that has been prepared for this project should contain all the necessary information for your review of the project. After being filed with the Environmental Quality Commission, the EIS will be available for public review. A copy will be sent to your Board.

Items 1, 2 and 3 dealing with justification of the proposed project are answered in the project description section of the EIS. The 1977 peak load of the Pukele Substation service area was 253.5 MVA. With a projected compound annual increase in demand of 3.9 percent the 1981 peak is expected to be 295.6 MVA. At that time the Pukele Substation system is expected to be overloaded and the Kamoku Substation along with the required 138 KV transmission lines are designed to relieve that overload.

Thank you for your interest in this matter and should you have further comments after you review the EIS, please submit them to us. As part of the EIS process, your further comments and our responses will be included in the final revised EIS.

  
JAMES S. HARA  
Vice President

HJK/jn

# EQC Bulletin

Environmental Quality Commission,  
550 Halekua Street Room 301 Honolulu, Hawaii 96813 - Phone: 548-695

Vol. III

May 8, 1977

## REGISTER OF CHAPTER 343 DOCUMENTS

\*\*\*\*\*  
\*EIS PREPARATION NOTICES\*  
\*\*\*\*\*

*EIS Preparation Notices are available from the respective proposing agency or applicant. Please request copies from the listed contacts. A 30 day period is allowed for requests to be a consulted party.*

CONSTRUCTION OF TWO 138 KV TRANSMISSION CIRCUITS, HALAWA TO PALOLO VALLEY, OAHU. Hawaiian Electric Co./ State Dept. of Land and Natural Resources.

Hawaiian Electric Company proposes to construct two 138 kv transmission circuits (10 to 20 conductors supported by approximately 175 steel and wooden structures) to connect the Halawa Substation to the substation planned for construction at the corner of Date and Kamoku Streets, via the Pukele Substation located in upper Palolo Valley. Most of the transmission line route from Halawa to Pukele is planned for location in the Conservation District which will traverse the remote forested areas along the southwestern flank of the Koolau Range. Approximately half of the line will be located in existing utility corridors. Those segments of lines running through the urban areas of Palolo, Moiliili, and Kaimuki are on City streets and along State highway thoroughfares. The line will enter

populated areas as it crosses the major valleys and as it descends from Pukele to Kamoku it will enter urban Honolulu.

Contact: Ted M. Damron, Director  
Land and Rights of Way  
Hawaiian Electric Co., Inc.  
P.O. Box 2750  
Honolulu, Hawaii 96840

Deadline: June 7, 1977

HALEIWA RD. DRAINAGE IMPROVEMENT PROJECT, WAIALUA, OAHU. Dept. of Public Works, C&C of Honolulu

The proposed action involves the study, design, and construction of a storm drainage system for Haleiwa Town to reduce or alleviate local flooding resulting from the inadequate capacity of the existing drainage facilities to handle runoff created during major rainstorms that occur over the Haleiwa Rd. Basin itself.

The project will include: 1) widening and dredging the existing 15 ft. ditch that drains the basin; 2) upgrading the Paalaa Rd. box culvert and 3) constructing a new box culvert at the Cane Haul Rd. Additional work will consist of adjustments to irrigation pipes crossing the ditch, and a new sluice gate.

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840



May 20, 1977

REF: OA-4/2/75-657

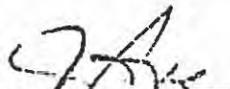
The Honorable Christopher Cobb  
Chairman and Member  
Board of Land and Natural Resources  
P. O. Box 621  
Honolulu, Hawaii 96809

Dear Mr. Cobb:

This is written with reference to your letter of May 6, 1977 to Hawaiian Electric Company, Inc., in which you reiterate the position of the Board of Land and Natural Resources regarding the Company's Conservation District Use application OA-4/2/75-657.

The Company concurs in the position of the Board of Land and Natural Resources regarding the above Conservation District Use application that no work within the State's Conservation District may proceed until such time as the Board of Land and Natural Resources has accepted an environmental impact statement in connection with the above application and has approved the above Conservation District Use Application.

Yours very truly,

  
Charles T. Ane  
Right of Way Agent

cc: Mr. Roger Evans

bc: Peter Lewis  
Buddy Soares, Dick Bell  
V. E. Cronkhite ✓  
Bob Ladd  
Meade Wildrick  
Kenneth Ching  
File 73-281-X #2 (1977)

May 27, 1977

Dr. Douglas S. Yamamura  
Chancellor  
University of Hawaii  
2444 Dole Street  
Honolulu, Hawaii 96822

Dear Dr. Yamamura:

Halawa-Pukele 138Kv Transmission Line  
Lyon Arboretum

We appreciate your staff's willingness to meet with us to resolve our easement request through the Lyon Arboretum. As requested at our meeting of May 17, 1977, the following are our reasons for the route selected and the alternatives considered.

At the outset, two overall routes for the Halawa-Pukele 138Kv transmission line were considered. The selected route (leeward) runs from the Halawa Substation to Pukele Substation via Kalihi, Nuuanu and Manoa Valleys. The other route (windward) traverses Kalihi Valley over the Koolau Range to the Koolau Substation on the windward side of Oahu, running south parallel to the Pali and then back to Pukele over the Koolaus. The windward route was felt to have more of an adverse impact because of the construction of the Kaneohe Reservoir Park Project (Kamooalii Flood Control) and of its location in front and below the Pali Highway Lookout. The Department of Transportation and the Public Utilities Commission were queried by the Department of Land and Natural Resources and both recommended the leeward route. The Board of Land and Natural Resources then approved the leeward route in the Conservation District.

May 27, 1977

The leeward route as presently aligned will utilize as much of the existing 46Kv right-of-way as possible. With green painted poles and non-specular conductors (see attached photographs), the lines, as routed deep in the valleys, will be effectively out of the line of sight of the general public.

At the Lyon Arboretum, it was felt that a route along the rear of the Arboretum would be less visible and have the least impact on the general public and the environment. The proposed alignment would place the lines behind Puu Pia, a natural high spot in the valley, thereby concealing the conductors. In addition, we could then relinquish a significant portion of our existing easements through the Lyon Arboretum.

The route HECO is now proposing (Alternate A) in Lyon Arboretum is actually a compromise alignment developed in coordination with University of Hawaii personnel. It is shown on the attached sketch.

Several other alternatives were considered in regard to the Arboretum property. One proposal was to utilize all of the existing easements in the Arboretum property. This would require more poles and would also add more conductors for the 138Kv circuits. It was felt that the combination of more poles and conductors would greatly impact on the Arboretum. In addition, this alignment would take the lines across Paradise Park and on to Puu Pia. At Puu Pia a taller structure would have to be installed to accommodate the new 138Kv circuits. The added conductors and structure would be clearly visible from most of Manoa Valley as a result of being on the high spot.

Another alternate discussed with the Arboretum staff located the line at the rear of the Arboretum as proposed but entirely into the Board of Water Supply property. This alternate would require considerable trimming of a eucalyptus grove located in the BWS property than that now planned. We have been informed by your Mr. T. Sahara that the Division of Forestry of DLNR is adamantly opposed to this alignment. They take the position that the alignment as shown on the attached sketch should be selected since Forestry and Lyon Arboretum would both be giving a little.

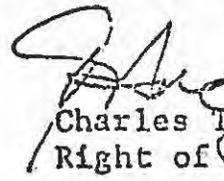
May 27, 1977

Subsequent to our meeting, a third alternative was suggested by your staff and discussed with the undersigned in the field. The alignment suggested comes from the top of the ridge to the front of the Arboretum property (along the Ewa boundary) and then along the front of the property to our existing easement. We feel this route would have more impact on the Arboretum in terms of visibility of the lines. In addition, extensive tree trimming would be required and the line may pass over a few homes within the Arboretum area. It has been HECO's policy not to have homes beneath 138Kv lines.

As Dr. Sagawa pointed out, he was opposed to the alignment shown on the sketch since it would deny the Arboretum the last relatively flat area on which tree development and experiments could be conducted. We would like to point out, however, that HECO would be relinquishing 111,050 square feet of easement property and removing its 46Kv facilities in the front of the Arboretum, which also is relatively flat, where the same tree development and experiments could be conducted. We believe this to be a reasonable trade-off, all things considered.

We trust the foregoing will be helpful to the University in making an expedited decision on this matter. Should you have any additional questions, please contact us. Thank you for your understanding and cooperation.

Yours very truly,

  
Charles T. Ane  
Right of Way Agent

CA:RI:sg

bc: V. E. Cronkhite  
M. Wildrick  
R. Imai ✓  
S. Takamine  
K. Ching

File 73-281  
73-281-X-4

RECEIVED  
 JUN 1 1977  
 Environmental  
 Department

# University of Hawaii at Manoa

Office of the Chancellor  
 Hawaii Hall 105 • 2500 Campus Road  
 Honolulu, Hawaii 96822

May 25, 1977

HECO / L & R/W	DATE
Damron, T. M.	5/31/77
Fernandez, J.	5/31
Ane, C.	5/31
Fernie, J.	
Gould, S.	
Dist: R. Pull, VEC	
File(s): 72-241-72-2124	

Mr. Ted M. Damron, Director  
 Land and Rights of Way  
 Hawaiian Electric Co., Inc.  
 P.O. Box 2750  
 Honolulu, Hawaii 96840

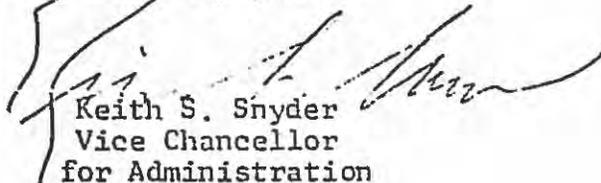
Dear Mr. Damron:

Subject: EIS Preparation Notice

This is to inform you that the University of Hawaii at Manoa wishes to be consulted in the preparation of the EIS for the construction of the 138 KV transmission lines. A portion of the lines is proposed to cross over lands under our control.

Please transmit all notices to Mr. Tamotsu Sahara, Facilities Planning Office, 2002 East West Road.

Sincerely yours,

  
 Keith S. Snyder  
 Vice Chancellor  
 for Administration

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96803

June 2, 1977



RICHARD E. BELL  
MANAGER, ENVIRONMENTAL DEPARTMENT

Mr. Tamotsu Sahara  
Facilities Planning Office  
University of Hawaii  
2002 East West Road  
Honolulu, Hawaii 96822

Dear Mr. Sahara:

In response to Dr. Snyder's request, enclosed please find a copy of the EIS Preparation Notice for the Halawa-Pukele-Kamoku Transmission Line. The University has been added to the list of organizations wishing to be consulted on this project.

Sincerely yours,

REB:cm  
Enclosure

cc: Sunn, Low, Tom & Hara, Inc. (Krock)

# University of Hawaii at Manoa

Office of the Chancellor  
Hawaii Hall 105 • 2500 Campus Road  
Honolulu, Hawaii 96822

June 27, 1977

Mr. Charles Ane  
Right of Way Agent  
Hawaiian Electric Co., Inc.  
P.O. Box 2750  
Honolulu, Hawaii 96840

Dear Mr. Ane:

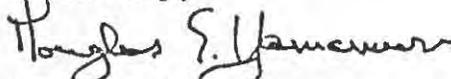
This is in reply to your letter of May 27, 1977 and pursuant to your earlier meeting with members of the University staff on the subject of an easement through the Lyon Arboretum for a proposed 138 KV transmission line.

We regret that we cannot accede to your company's request for this easement, and we will suggest an alternate route.

The deed transferring the Arboretum property to the University of Hawaii mandates that the University maintain and preserve the premises as an arboretum and botanical garden only. The granting of such an easement would place a material restriction upon the efforts of the University to comply with the terms of the deed. As you know, trees are essential components of an arboretum, and the placement of a power line within the boundaries of land dedicated to such use will markedly reduce the amount of land which can be dedicated to the growing of trees without restriction. We must also make note of the fact that the area upon which you seek an easement is one of the last remaining areas suitable for trees within the Arboretum.

My staff suggests that you look to the State lands adjoining the Arboretum as a preferred route, with the transmission line placed above the eucalyptus plantings in order to minimize the adverse visual impact. We believe that alternative will best serve the interests of the State and the public.

Sincerely,



Douglas S. Yamamura  
Chancellor

cc: A. Kay  
W. Muraoka  
Y. Sagawa  
T. Sahara  
K. Snyder

DECLARATORY RULING #77-01: CONCERNING AGENCY/APPLICANT ACTIONS

The Environmental Quality Commission has on its own motion ruled upon a recurring question that has lent itself to conflicting interpretations. This ruling was made at the Commission meeting of November 30, 1977.

The instant case generating this ruling involves a project covered by conservation district use application OA-4/2/75-657 on file with the Department of Land and Natural Resources. This project is proposed by the Hawaiian Electric Company, Inc., and entails installation of 138 KV transmission lines from Halawa to Pukele. The transmission lines would cross conservation district lands, portions of which are owned by the State. Chapter 343, HRS, is therefore applicable on two counts. The use of conservation district lands by HECO would constitute an applicant action under HRS Section 343-4(c); the entitlement to State lands by DLNR would constitute an agency action under HRS Section 343-4(b). At issue is, who is responsible for meeting Chapter 343 requirements: HECO as the applicant, or DLNR as a proposing agency?

In order to remove uncertainties regarding the applicable law in this matter, the Environmental Quality Commission declares as follows:

1. The HECO proposal is comprised of two distinct aspects in terms of Chapter 343, HRS. The first involves land use by HECO; the second, land disposition by DLNR. Applicable requirements under Chapter 343 are different for the two aspects, such that satisfactory completion of requirements for the one will not lay to rest requirements for the other.
2. The land use aspect involves HECO's proposal to install transmission lines within the conservation district. DLNR has assessed this proposal and required an EIS from HECO under HRS Section 343-4(c). DLNR will, as the approving agency, determine the acceptability of this EIS.
3. The land disposition aspect arises if DLNR regards the proposed land use as appropriate. Prior to granting entitlement to State lands for that use, DLNR shall satisfy the requirements of HRS Section 343-4(b).
4. DLNR may satisfy any need for an EIS as determined under item 3 above by incorporating in whole or in part the EIS required and accepted under item 2. This option is available through HRS Section 343-4(e), which states:

Whenever an agency proposes to implement an action..., the agency may consider and, where applicable and appropriate, incorporate by reference in whole or in part...previously accepted statements.

EIS Regulation 1:32 provides the following criteria for incorporating previously accepted statements:

- a. The information in the referenced EIS must be "pertinent to the decision at hand" and must have "logical relevancy and bearing to the action being considered."
- b. The referenced EIS must be for an action "substantially similar to and relevant to" the action being considered.

Because the State lands in question are part of the transmission line corridor covered by the HECO EIS, these criteria are met, and DLNR may incorporate the HECO EIS as necessary.

5. In the event the HECO EIS suffices in whole or in part to entirely cover DLNR's land disposition action, an EIS preparation notice need not be filed, nor need consultation and public review again be undertaken. Two sets of the incorporated EIS and a cover letter should be filed with the Governor for acceptance, along with twenty copies with the Environmental Quality Commission for distribution to public depositories.

A P P E N D I X    E

Comments and Responses Made During the  
Public Review of the EIS

GEORGE R. ARIYOSHI  
GOVERNOR OF HAWAII



STATE OF HAWAII  
DEPARTMENT OF HEALTH  
P.O. Box 3378  
HONOLULU, HAWAII 96801  
January 11, 1979



GEORGE A. L. YUEN  
DIRECTOR OF HEALTH

Audrey W. Mertz, M.D., M.P.H.  
Deputy Director of Health

Henry N. Thompson, M.A.  
Deputy Director of Health

James S. Kumagai, Ph.D., P.E.  
Deputy Director of Health

In reply, please refer to:  
File: EPHS - SS

MEMORANDUM

To: Hawaiian Electric Company

From: Deputy Director for Environmental Health

Subject: Environmental Impact Statement (EIS) for Proposed Halawa  
to Kamoku 138 KV Transmission Line, Honolulu

Thank you for allowing us to review and comment on the subject EIS. On the basis that the project will comply with all applicable Public Health Regulations, please be informed that we have no objections to this project.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

*for Brian J. J. Choy*  
\_\_\_\_\_  
JAMES S. KUMAGAI, Ph.D.

cc: Office of Environmental Quality Control  
Board of Land & Natural Resources

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

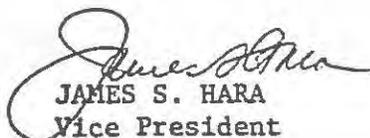
February 13, 1979

State of Hawaii  
Department of Health  
P.O. Box 3378  
Honolulu, Hawaii 96801

ATTENTION: James S. Kumagai, Ph.D.

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.

  
JAMES S. HARA  
Vice President

WW/ep

GEORGE R. ARIYOSHI  
GOVERNOR



STATE OF HAWAII  
DEPARTMENT OF DEFENSE  
OFFICE OF THE ADJUTANT GENERAL  
~~FORT RUGER, HONOLULU, HAWAII 96816~~  
3949 DIAMOND HEAD ROAD, HONOLULU, HAWAII 96816

HIENG

11 JAN 1979

Office of Environmental Quality Control  
550 Halekauwila Street, Room 301  
Honolulu, Hawaii 96813

Gentlemen:

Proposed Halawa to Kamoku  
138 KV Transmission Line  
Honolulu, Oahu

Thank you for sending us a copy of the "Proposed Halawa to Kamoku 138 KV Transmission Line, Honolulu, Oahu" Environmental Impact Statement. We have no comments to offer at this time. The attached document is returned for your use.

Yours truly,

A handwritten signature in cursive script, appearing to read "Wayne R. Tomoyasu".

WAYNE R. TOMOYASU  
Captain, CE, HARNG  
Contr & Engr Officer

Enclosure

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

February 13, 1979

Department of Defense  
Office of Adjutant General  
State of Hawaii  
3949 Diamond Head Road  
Honolulu, Hawaii 96816

ATTENTION: Captain Wayne R. Tomoyasu

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.

  
JAMES S. HARA  
Vice President

WW/ep

GEORGE R. ARIYOSHI  
GOVERNOR



JOHN FARIAS, JR.  
CHAIRMAN, BOARD OF AGRICULTURE

YUKIO KITAGAWA  
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII

DEPARTMENT OF AGRICULTURE

1428 SO. KING STREET  
HONOLULU, HAWAII 96814

January 12, 1979

MEMORANDUM

To: Board of Land and Natural Resources

Subject: EIS for Proposed Halawa to Kamoku 133 KV  
Transmission Line, Honolulu, Hawaii

The Department of Agriculture has no comments to offer  
on the environmental impact statement for the subject  
project.

We appreciate the opportunity to review the report  
which is being returned, herewith.

JOHN FARIAS, JR.  
Chairman, Board of Agriculture

cc: Hawaiian Electric Company, Inc.

HECO / L & R/W	DATE
Damron, T. M.	1/15/79
Fernandez, J.	
Ane, C.	
Fernie, J.	
Gould, S.	
Dist. FCL, CDP, REB, VEC, J. Mc. Coim ✓	
File(s): 73-281 X 4	

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

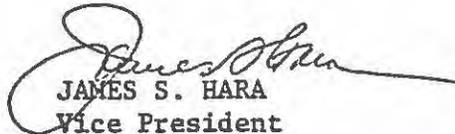
February 13, 1979

State of Hawaii  
Department of Agriculture  
1428 South King Street  
Honolulu, Hawaii 96814

ATTENTION: Mr. John Farias, Jr.

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.

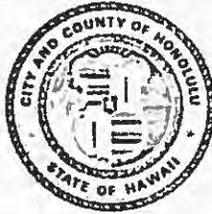
  
JAMES S. HARA  
Vice President

WW/ep

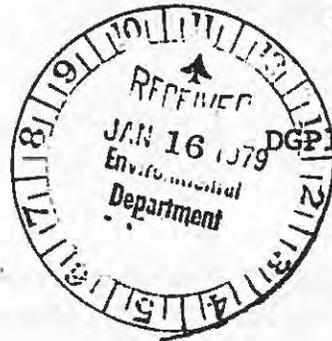
DEPARTMENT OF GENERAL PLANNING  
**CITY AND COUNTY OF HONOLULU**

650 SOUTH KING STREET  
HONOLULU, HAWAII 96813

FRANK F. FASI  
MAYOR



GEORGE S. MORIGUCHI  
CHIEF PLANNING OFFICER



DGP1/79-68 (CT)

January 15, 1979

Board of Land and Natural Resources  
State of Hawaii  
1151 Punchbowl Street  
Honolulu, Hawaii

Gentlemen:

Environmental Impact Statement for Proposed  
Halawa to Kamoku 138 KV Transmission Line  
Comments Requested

We have no comments.

Thank you for affording us the opportunity of reviewing  
the impact statement.

Sincerely,

A handwritten signature in cursive script, reading "George S. Moriguchi".

GEORGE S. MORIGUCHI  
Chief Planning Officer

GSM:fmt

cc: Hawaiian Electric Co.

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

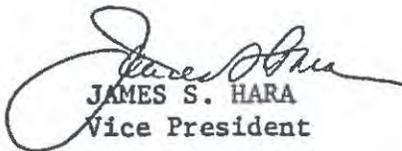
February 13, 1979

Department of General Planning  
City & County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

ATTENTION: Mr. George S. Moriguchi

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.

  
JAMES S. HARA  
Vice President

WW/ep



(P)1027.9

Board of Land and Natural  
Resources  
State of Hawaii  
Honolulu, Hawaii

Gentlemen:

Subject: Proposed Halawa to Kamoku 138 KV  
Transmission Line, Honolulu, Oahu

The subject proposed action will not have any adverse  
environmental impact on any existing or planned facilities  
serviced by our department.

Thank you for this opportunity to review and comment.

Very truly yours,

HIDEO MURAKAMI  
State Comptroller

LT:jnt 5-2  
cc: Hawaiian Electric Company  
P. O. Box 2750  
Honolulu 96803

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

February 13, 1979

Dept. of Accounting and General Services  
State of Hawaii  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

ATTENTION: Mr. Hideo Murakami  
Comptroller

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.

  
JAMES S. HARA  
Vice President

WW/ep

GEORGE R. ARIYOSHI  
GOVERNOR



FRANKLIN Y. K. SUNN  
EXECUTIVE DIRECTOR

WILLIAM A. HALL  
ASSISTANT EXEC. DIRECTOR

STATE OF HAWAII  
DEPARTMENT OF SOCIAL SERVICES AND HOUSING  
HAWAII HOUSING AUTHORITY

P. O. BOX 17907  
HONOLULU, HAWAII 96817

January 17, 1979

IN REPLY REFER

TO:

MEMORANDUM

TO: Board of Land & Natural Resources

FROM: Franklin Y. K. Sunn, Executive Director

SUBJECT: Environmental Impact Statement  
Title: Proposed Halawa to Kamoku 138 KV Transmission  
Line  
Location: Honolulu, Oahu  
Classification: Applicant Action

The Hawaii Housing Authority has reviewed the subject Environmental Impact Statement and has no comments to offer.

Thank you for allowing us the opportunity to review the EIS.

FRANKLIN Y. K. SUNN  
Original Signed

---

Executive Director

cc: Hawaiian Electric Company/  
EQC  
DSSH

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

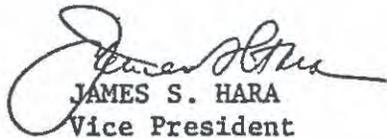
February 13, 1979

State of Hawaii  
Hawaii Housing Authority  
P. O. Box 17097  
Honolulu, Hawaii 96817

ATTENTION: Mr. Franklin Y. K. Sunn

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.

  
JAMES S. HARA  
Vice President

WW/ep

DEPARTMENT OF PUBLIC WORKS  
**CITY AND COUNTY OF HONOLULU**

650 SOUTH KING STREET  
HONOLULU, HAWAII 96813

FRANK F. FASI  
MAYOR



WALLACE MIYAHIRA  
DIRECTOR AND CHIEF ENGINEER

ENV 79-13

January 18, 1979

Board of Land and Natural Resources  
State of Hawaii  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

Gentlemen:

Subject: Environmental Impact Statement for the  
Proposed Halawa to Kamoku 138 KV  
Transmission Line, Honolulu, Oahu, Hawaii

We have reviewed the subject EIS and have the following comments.

1. Construction plans for the selected alternatives within the urban areas should be coordinated with our Divisions of Engineering and Wastewater Management.
2. If poles are placed outside of the utility strip within the street right-of-way, the Division of Engineering should be consulted as part of the approval process.
3. Underground transmission lines placed within the street right-of-ways either in the horizontal or vertical configurations would probably have a major impact on the existing water, sewer and drainage systems. Within subdivision streets, underground placement may not be feasible even with the relocation of existing lines or with dual systems.
4. Overhead systems are potentially hazardous especially to both vehicles and pedestrians in addition to being extremely unsightly. From our limited observation, we have not seen large overhead transmission lines within large metropolitan areas. The EIS should discuss current transmission practices in metropolitan areas in the U.S. and Europe.

Very truly yours,

WALLACE MIYAHIRA  
Director and Chief Engineer

7 cc: Hawaiian Electric Company

# M&E Pacific, Inc.

*Environmental Engineers*

February 16, 1979

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

Department of Public Works  
City and County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

**ATTENTION:** Mr. Wallace Miyahira  
Director and Chief Engineer

**SUBJECT:** Environmental Impact Statement (EIS) for the  
Proposed Halawa to Kamoku 138 KV Transmission Lines

We received your letter dated January 18, 1979 concerning the subject EIS.  
The following responses are offered to your comments:

**Comment:** Construction plans for the selected alternatives within the urban areas should be coordinated with our Divisions of Engineering and Wastewater Management. If poles are placed outside of the utility strip within the street right-of-way, the Division of Engineering should be consulted as part of the approval process.

**Response:** Hawaiian Electric Company (HECO) will coordinate its facilities and will submit its construction plans, as appropriate, to the governmental agencies during the course of obtaining all necessary permits prior to starting actual construction.

**Comment:** Overhead systems are potentially hazardous, especially to both vehicles and pedestrians, in addition to being extremely unsightly. From our limited observation, we have not seen large overhead transmission lines within large metropolitan areas. The EIS should discuss current transmission practices in metropolitan areas in the U.S. and Europe.

**Response:** It is HECO's belief that its current design philosophy of installing overhead lines in urban residential areas closely approximates those of other U.S. utilities. In a 1978 survey covering 1977 actual and planned transmission (69 KV to 765 KV) construction, it was shown that 8,140 circuit miles of overhead lines had been built in 1977, while underground transmission construction consisted of only

# M&E Pacific, Inc.

Department of Public Works

February 16, 1979

Page 2

75 circuit miles. The survey also noted that the 8,140 circuit miles of overhead construction was an increase of almost 8 percent from 1976, while the 75 circuit miles of underground construction was a decrease of almost 28 percent from 1976. Review of the actual transmission circuit miles constructed during the period 1973 to 1977 also revealed that overhead construction has fluctuated from a low of 7,542 circuit miles (1975) to a high of 9,116 circuit miles (1974), whereas underground construction has shown a steady decrease from a high of 226 circuit miles in 1973 to the 75 circuit miles in 1977. Whether or not the trends in Europe follow those in the U.S. cannot be substantiated.

While it is presumed that most of the overhead transmission circuit miles are constructed through the open areas available on the mainland, it can also be assumed that a significant amount of the circuit miles are built in or near residential urban areas. It might also be noted that underground transmission lines are generally limited to use in central urban areas. This latter assumption is borne out by the fact that only a very small percentage of the total transmission lines constructed is underground. Although the use of underground lines is presently decreasing, HECO is following the development of different cable types and the "state of the art" inasmuch as there will come a day when underground lines will be an attractive alternative from the economic and operations standpoint.

We appreciate your interest and concern in this matter. Your comments, together with our responses, will be included in the Revised EIS and will be submitted to the Department of Land and Natural Resources and to the Governor for acceptance and approval.

  
JAMES S. HARA  
Vice President



DEPARTMENT OF THE ARMY  
U. S. ARMY ENGINEER DISTRICT, HONOLULU  
BUILDING 230  
FT. SHAFTER, HAWAII 96858

PODED-PV

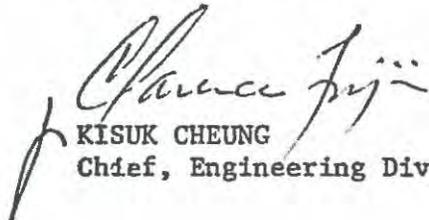


Dr. John McCain, Manager  
Environmental Department  
Hawaiian Electric Company, Inc.  
P.O. Box 2750  
Honolulu, Hawaii 96803

Dear Dr. McCain:

We have reviewed the Environmental Impact Statement for the Proposed Halawa to Kamoku 138 KV Transmission Line that was forwarded to us on January 1979 by the Office of Environmental Quality Control. The project does not affect any ongoing U.S. Army Corps of Engineers projects or areas of responsibilities.

Sincerely yours,

  
KISUK CHEUNG  
Chief, Engineering Division

CF:

Mr. W.Y. Thompson, Director  
Department of Land and Natural  
Resources  
State of Hawaii  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

Mr. Richard O'Connell, Director  
Office of Environmental Quality  
Control  
State of Hawaii  
550 Halekauwila Street, Room 301  
Honolulu, Hawaii 96813

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

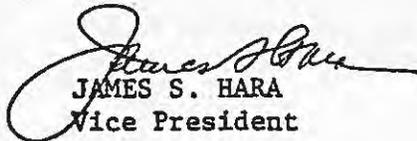
February 13, 1979

Department of the Army  
U. S. Army Engineers District, Honolulu  
Building 230  
Fort Shafter, Hawaii 96858

ATTENTION: Mr. Kisuk Cheung

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

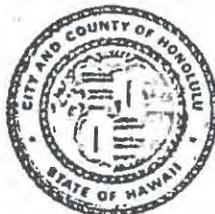
Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.

  
JAMES S. HARA  
Vice President

WW/ep

DEPARTMENT OF HOUSING AND COMMUNITY DEVELOPMENT  
**CITY AND COUNTY OF HONOLULU**

650 SOUTH KING STREET  
HONOLULU, HAWAII 96813  
PHONE 823-4101



FRANK F. FASI  
MAYOR

EDWARD Y. HIRATA  
MANAGING DIRECTOR

BARRY CHUNG  
DIRECTOR

MYRA M. TAKASAK  
DEPUTY DIRECTOR

January 19, 1979

Environmental Quality Commission  
State of Hawaii  
550 Halekauwila Street, Room 301  
Honolulu, Hawaii 96813

Gentlemen:

Subject: Proposed Halawa to Kamoku  
138 KV Transmission Line

We have reviewed the Environmental Impact Statement for the Proposed Halawa to Kamoku 138 KV Transmission Line prepared for Hawaiian Electric by M&E Pacific, Inc. and have no comments.

Thank you for allowing us the opportunity of reviewing the statement.

Very truly yours,

*Richard Nagasawa*

Richard Nagasawa

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

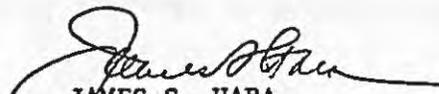
February 13, 1979

Department of Housing and Community Development  
City & County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

ATTENTION: Mr. Richard Nagasawa

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.

  
JAMES S. HARA  
Vice President

WW/ep

P2



DEPARTMENT OF PLANNING AND ECONOMIC DEVELOPMENT

Kamamalu Building, 250 South King St., Honolulu, Hawaii • Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

RECEIVED GEORGE R. ARIYOSHI Governor

HIDETO KONO Director

79 JAN 28 A 9:40 FRANK SKRIVANEK Deputy Director

DEPT. (Ref) No. 8085 NATURAL RESOURCES STATE OF HAWAII

JAN 30 1979

January 24, 1979

Rec'd Ping. Ofc \_\_\_\_\_  
 By Ep \_\_\_\_\_  
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 Return to \_\_\_\_\_

The Honorable Susumu Ono  
Chairman  
Department of Land and  
Natural Resources  
State of Hawaii  
Honolulu, Hawaii

Dear Mr. Ono:

Subject: Environmental Impact Statement for the Proposed  
Halawa to Kamoku 138 KV Transmission Line

Thank you for providing us the opportunity to review the subject EIS.

The statement appears adequate in its consideration of probable impacts associated with the proposed action.

Sincerely,

*Frank Skrivaneck*  
for HIDETO KONO

cc: Hawaiian Electric Company, Inc.

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

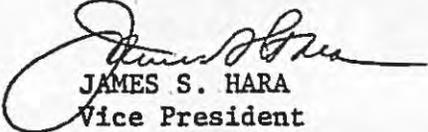
February 13, 1979

Department of Planning and Economic Development  
P. O. Box 2539  
Honolulu, Hawaii 96804

ATTENTION: Mr. Frank Skrivanek

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.

  
JAMES S. HARA  
Vice President

WW/ep

DEPARTMENT OF LAND UTILIZATION  
**CITY AND COUNTY OF HONOLULU**

650 SOUTH KING STREET  
HONOLULU HAWAII 96813

FRANK F. FASI  
MAYOR



TYRONE T. KUSAO  
DIRECTOR

79/EC-9 (JW)  
LU1/79-112

January 24, 1979

Mr. Susumo Ono, Chairman  
Department of Land  
and Natural Resources  
State of Hawaii  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

Dear Mr. Ono:

Environmental Impact Statement  
Proposed Halawa to Kamoku 138 KV Transmission Line  
Oahu

As a general observation, the above Statement prepared by M & E Pacific is well-balanced and thorough. Our principal concern is with its peculiar timing.

We note that there was considerable delay between HECO's first briefing of DLNR on this project (i.e., 1972) and the issuance of the EIS Preparation Notice (1977). We further note that the Board of Land and Natural Resources approved this project in April, 1975, and the DLNR approved the construction plans in November, 1975. In view of this, we question the value and even the legality of this EIS. The intent of the EIS system is to provide public review of information related to environmental impacts as an aid to agency decision-making. Chapter 343, HRS, requires assessment of applicant actions within thirty days from the submission of the request for approval. There is much popular misunderstanding of the purpose and intent of Chapter 343. We would find it regrettable if a public agency were to abet this confusion by requiring an after-the-fact EIS as a ploy to assuage vehement public opposition to an approved project.

Because the time horizon for planning these facilities is now quite short and construction costs have been rising steadily,

the viability of alternative routings and undergrounding is seriously prejudiced. If the Board had acted in a timely and responsible manner, these may have been realistic options with relatively smaller costs to the energy consumer.

As for the information provided in the EIS, the only point which we question is the seeming inconsistency between the findings of the "Bird and Mammal Study" and the "Botanical Survey". Consultant Berger concludes that "the vast majority of all plant life now consists of introduced species" and that "native ecosystems were devastated more than 100 years ago". Yet, the Environmental Impact Study Corporation identifies only 70% of the proposed alignment as "previously disturbed areas". The remainder is described as Ohia-Koa native forest.

The EIS seems to lead to the conclusion that the principal impact is visual. In this respect, we have the following comments and questions:

1. The single pole configuration is an improvement over the tower structure. However, we note that several such towers are proposed at various points along the route through the Conservation District. Will any of these be visible from existing or proposed hiking trails?
2. In cases where the proposed routing through urban areas approximates the alignment of wooden poles, would it be possible to eliminate the need for wooden poles by moving all the lines to the new poles? Responses to comments during the consultation phase seem to indicate that only the top 10-foot portion of the wooden poles would be removed.
3. No existing City ordinances, including the McCully-Moiliili Interim Control District, would require the undergrounding of any of the alternative routes from Pukele to Kamoku substations. However, small portions of the makai sides of Mooheau and Date Streets lie within the Diamond Head District, which may affect two of the possible alignments. The Iwilei-Kamoku route would require undergrounding. From an urban design point of view, undergrounding is definitely preferable.
4. With the proposed redevelopment of Kakaako and the likelihood of increased energy needs in that area, the undergrounding of transmission lines through this area may

Mr. Susumo Ono, Chairman  
Page 3

have some benefits to offset high costs. Many of the streets and underground utilities will probably be reconstructed and the installation of transmission lines could be coordinated with this effort.

Should you have any questions on this matter, please call Mr. John Whalen of our staff at 523-4077.

Very truly yours,



TYRONE T. KUSAO  
Director of Land Utilization

TTK:sl

cc: M & E Pacific, Inc.  
HECO ✓  
OEQC

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840

February 20, 1979



JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

ENV 2-1  
H-P-K  
NV/G/NV

Mr. Tyrone T. Kusao  
Department of Land Utilization  
City and County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

Dear Mr. Kusao:

Subject: EIS for the Proposed Halawa-Pukele-Kamoku 138 kv  
Transmission Lines

This is in response to your letter of January 24, 1979 regarding the Environmental Impact Statement for the proposed Halawa-Pukele-Kamoku 138 kv transmission lines. The following responses are addressed specifically to the concerns and questions you discussed in your letter:

COMMENT: We question the seeming inconsistency between the findings of the "Bird & Mammal Study" and the "Botanical Survey." Consultant Berger concludes that "the vast majority of all plant life now consist of introduced species" and that "native ecosystems were devastated more than 100 years ago." Yet, the Environmental Impact Study Corporation identifies only 70 percent of the proposed alignment as "previously disturbed." The remainder is described as Ohia-Koa native forest.

RESPONSE: It is our understanding that Dr. Berger (Appendix B) is referring to complete native ecosystems and that the "native forest" designation by E.I.S. Corp. (Appendix C) is for areas that contain significant quantities of native flora but do not constitute self sufficient native ecosystems. Although there is a difference in emphasis between the findings of the two consultants, there is no basic conflict. The questions of whether there will be any interference with endangered species and what mitigating measures will be taken will be adequately answered by the detailed surveys that will be done at each pole site.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Tyrone T. Kusao  
Department of Land Utilization  
February 20, 1979  
Page 2

- COMMENT: The single pole configuration is an improvement over the tower structure. However, we note that several such towers are proposed at various points along the route through the Conservation District. Will any of these be visible from existing or proposed hiking trails?
- RESPONSE: The visibility of the steel tower structures from hiking trails will depend upon the background against which the hiker views the structure. Viewed against the background of the blue sky, the structure will probably be silhouetted as would be steel poles or any solid object. However, when viewed against a background of vegetation, the structures may not be readily visible since it is HECO's standard practice to paint metal poles/structures in Conservation Districts to blend with the surrounding vegetation. Further, HECO will continue to coordinate the location and appearance of its facilities in Conservation Districts with the DLNR, particularly its Divisions of State Parks and Forestry.
- COMMENT: In cases where the proposed routing through urban areas approximates the alignment of wooden poles, would it be possible to eliminate the need for wooden poles by moving all the lines to the new poles? Responses to comments during the consultation phase seem to indicate that only the top 10-foot portion of the wooden poles would be removed.
- RESPONSE: Although it would be technically feasible to combine all lines on the steel poles, the following points must be considered:
1. The existing wood poles are "joint poles" which are owned by three agencies -- Hawaiian Electric Co., (HECO), Hawaiian Telephone (HTCO), and the City. To eliminate the wood poles, the consent of all three parties is required, especially since additional relocation costs are involved. While the City has indicated its willingness, HTCO has indicated a preference for maintaining the existing wood pole line.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Tyrone T. Kusao  
Department of Land Utilization  
February 20, 1979  
Page 3

2. The combination of all lines on the steel poles would not necessarily eliminate the need for the wood poles. Wood poles, spaced 150-200 feet apart, would still be required to support lower voltage facilities (transformers), telephone facilities (splices), and street light facilities (luminaires) which serve the individual customers along the alignment.
3. Combining all facilities on a single pole line (assuming the willingness of others) would require taller steel poles to obtain adequate vertical clearance between the 138/46 kv conductors and the intermediate wood poles.

COMMENT: No existing City ordinances, including the McCully-Moiliili Interim Control District, would require the undergrounding of any of the alternative routes from Pukele to Kamoku substations. However, small portions of the makai sides of Mooheau and Date Streets lie within the Diamond Head District, which may affect two of the possible alignments. The Iwilei-Kamoku route would require undergrounding. From an urban design point of view, underground is definitely preferable.

RESPONSE: The alignments of Line #2 and one circuit of Alternative G are definitely within the limits of the Diamond Head District along the makai side of Date Street. However, a legal opinion rendered by the City Corporation Counsel's office has determined that the underground provisions do not apply since the applicable ordinances were enacted subsequent to HECO's approved plans for overhead construction.

With reference to undergrounding in general, the merits are discussed in the EIS wherein statements are made regarding:

1. High costs and the allocation of costs.
2. Long construction periods with significant inconveniences for residents.
3. Interference with existing underground utilities.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Tyrone T. Kusao  
Department of Land Utilization  
February 20, 1979  
Page 4

4. Requirements for additional support facilities such as oil cooling and pumping stations.
5. Greater and more difficult maintenance requirements.

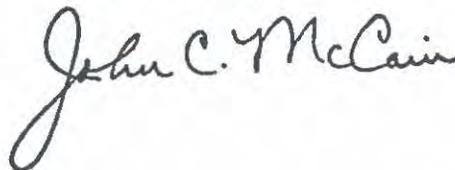
COMMENT: With the proposed redevelopment of Kakaako and the likelihood of increased energy needs in that area, the undergrounding of transmission lines through this area may have some benefits to offset high costs. Many of the streets and underground utilities will probably be reconstructed and the installation of transmission lines could be coordinated with this effort.

RESPONSE: HECO has long made it a practice to coordinate its future installations with those of the various governmental agencies. These joint efforts have many times resulted in benefits to both parties. As such, we will continue this practice.

In the specific case of the planned redevelopment of Kakaako and the possibility of coordinating the installation of 138 kv underground circuits to Kamoku Substation with this redevelopment, it should be noted that the City's redevelopment plans for the Kakaako area are still in the development stage. They have not yet reached the final detailed engineering stage at which utility-government coordination could result in any benefits. It is not anticipated that they will reach this stage in the time frame necessary for HECO to meet its requirement date for Kamoku Substation.

We appreciate your interest and concerns in this matter. Your comments along with our responses will be included within the revised EIS which will be submitted to the Department of Natural Resources and the Governor for acceptance and approval.

Yours truly,



JCMc:cm

DEPARTMENT OF TRANSPORTATION SERVICES  
**CITY AND COUNTY OF HONOLULU**

HONOLULU MUNICIPAL BUILDING  
650 SOUTH KING STREET  
HONOLULU, HAWAII 96813

FRANK F. FASI  
MAYOR



JAN 25 1979

TELEPHONE  
NUMBER



Environmental Quality Commission  
550 Halekauwila St., Room 301  
Honolulu, Hawaii 96813

Gentlemen:

Subject: Environmental Impact Statement for the  
Proposed Halawa to Kamoku 138 KV Transmission  
Line

We have reviewed the Environmental Impact Statement for the project and are satisfied with its assessment of traffic impact during the construction phase.

Thank you for providing us this opportunity to review the report.

Very truly yours,

A handwritten signature in cursive script, appearing to read "Akira Fujita".

AKIRA FUJITA  
Acting Director

cc: Board of Land & Natural Resources  
Hawaiian Electric Company, Inc.  
OEQC

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

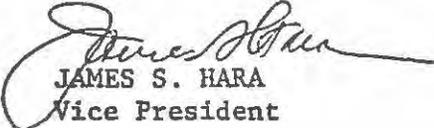
February 13, 1979

Department of Transportation Services  
City & County of Honolulu  
650 South King Street  
Honolulu, Hawaii 96813

ATTENTION: Mr. Akira Fujita

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.

  
JAMES S. HARA  
Vice President

WW/ep

DEPARTMENT OF THE AIR FORCE  
HEADQUARTERS 15TH AIR BASE WING (PACAF)  
HICKAM AIR FORCE BASE, HAWAII 96853



25 JAN 1979

REPLY TO: DEEV (Mr Nakashima, 449-1831)  
ATTN OF:

SUBJECT: Environmental Impact Statement (EIS) for the Proposed Halawa to Kamoku  
138 KV Transmission Line, Honolulu, Oahu, Hawaii

TO: Board of Land and Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

1. This office has reviewed the subject EIS and has no comment to render relative to the proposed project.

2. We greatly appreciate your cooperative efforts in keeping the Air Force apprised of your project and thank you for the opportunity to review the document.

Original signed by

GEN D. KOSA  
Dep Dir of Civil Engineering

Cy to: Hawaiian Electric Co, Inc  
PO Box 2750  
Honolulu, Hawaii 96803

*Recd ELD  
29 Jan 1979*

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

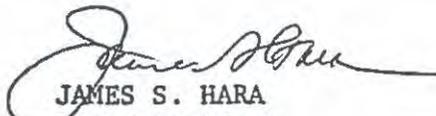
February 13, 1979

Department of the Air Force  
Headquarters 15th Air Base Wing (PCAF)  
Hickam Air Force Base, Hawaii 96853

ATTENTION: Ben P. Kosa  
Dep. Dir. of Civil Engineering

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.

  
JAMES S. HARA  
Vice President

WW/ep

GEORGE R. ARIYOSHI  
GOVERNOR



RYOKICHI HIGASHIONNA, PH D  
DIRECTOR

DEPUTY DIRECTORS  
WALLACE AOKI  
DOUGLAS S. SAKAMOTO  
CHARLES O. SWANSON

STATE OF HAWAII  
DEPARTMENT OF TRANSPORTATION  
869 PUNCHBOWL STREET  
HONOLULU, HAWAII 96813

IN REPLY REFER TO:

January 29, 1979

STP 8.5289

Mr. Donald Bremner  
Chairman  
Environmental Quality Commission  
550 Halekauwila Street, Rm. 301  
Honolulu, Hawaii 96813

Dear Mr. Bremner:

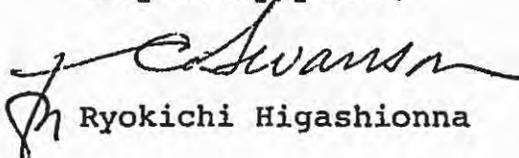
Subject: Environmental Impact Statement  
Proposed Halawa to Kamoku 138  
KV Transmission Line,  
Honolulu, Oahu

Thank you for giving us the opportunity to review and comment on the above-captioned document.

Please be informed that the Kapiolani Interchange On-Ramp Project is anticipated to be under construction this year. This project is within the Kamoku Substation Service Area. We suggest that HECO consider this highway project in its alternative route studies.

The applicant is advised that impacts affecting the State Highway System should be coordinated with the State Department of Transportation, Land Transportation Facilities Division. In addition, construction plans for work within or adjacent to State rights-of-way must be submitted to that Division for its review and approval.

Very truly yours,

  
Ryokichi Higashionna

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

February 14, 1979

State of Hawaii  
Department of Transportation  
869 Punchbowl Street  
Honolulu, Hawaii 96813

ATTENTION: Mr. Ryokichi Higashionna

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138 KV Transmission Lines

In response to your January 29, 1979 letter on the subject EIS, the Hawaiian Electric Co. (HECO) is informed of the Kapiolani Interchange On-Ramp project. HECO, the applicant, will coordinate with the State Department of Transportation, Land Transportation Facilities Division for impacts affecting the State Highway System by proposed actions.

We appreciate your review and comments. Thank you for your interest in this matter. The revised EIS now being prepared will be submitted to the Department of Natural Resources and the Governor for acceptance and approval.

  
JAMES S. HARA  
Vice President

jn



# United States Department of the Interior

## FISH AND WILDLIFE SERVICE

300 ALA MOANA BOULEVARD  
P. O. BOX 50167  
HONOLULU, HAWAII 96850

January 29, 1979

IN REPLY REFER TO:  
ES  
Room 6307

Office of Environmental Quality Control  
550 Halekauwila Street, Room 301  
Honolulu, Hawaii 96813



Re: Environmental Impact  
Statement for  
Proposed Halawa to  
Kamoku 138 KV  
Transmission Line  
Honolulu, Oahu,  
Hawaii

Dear Sir:

We have reviewed the referenced document received from your office 8 January 1979.

The terrestrial biological impacts presented in this document appear to have been based primarily on the findings of Berger (avifauna and their habitat associations) and a one time plant survey by Environment Impact Study Corporation included in the draft statement as Appendix B and C, respectively. We understand that more detailed surveys will be performed when a route has been selected.

The Service has determined that fish and wildlife impacts will be minimal along the proposed transmission routes in urbanized areas. However, as stated on pages 74 and 75, transmission line installation along the proposed Halawa to Pukele substation routes could result in adverse impacts to endangered and proposed endangered species. If a federal presence is involved through project funding and/or licensing, that agency must determine whether or not endangered species will be affected. If that determination is positive, the agency must then initiate a Section 7 Consultation with the Service's Regional Director in Portland, Oregon, as prescribed under the Endangered Species Act of 1973.



*Save Energy and You Serve America!*

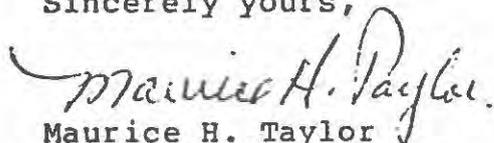
We are concerned that pole construction in the native forest areas, both virgin and revegetated, may result in adverse impacts to federally proposed endangered plants. An erroneous theme pervades the ecological evaluation portion of this document i.e. that once an area has been disturbed, it has lost its habitat value for native species for all time. However, federally proposed endangered plants have been found in areas previously disturbed. Endangered forest bird utilization of regenerated forest areas also has been demonstrated. Therefore it is imperative that this project be coordinated with the Service's Office of Endangered Species.

On page 46, grass planting around the newly erected poles in Conservation Districts is proposed for erosion control. Introduction of exotic grasses and other plants into native forest ecosystems could result in the loss through competition of native vegetation in the adjoining areas. To limit this impact, we recommend that considerable care be taken in the selection of the ground cover, perhaps a minimally aggressive, shade intolerant grass would be best.

Although endemic tree snails have not been proposed for federal endangered species status, considerable concern has been expressed for these unique animals and the continued destruction of their limited habitat. The range of given species may be restricted to a single ridge. The range of these tree snails on Oahu has decreased to approximately less than 25 percent of the already decreasing habitat available at the turn of the century.

Thank you for the opportunity to comment on this project.

Sincerely yours,



Maurice H. Taylor  
Field Supervisor  
Division of Ecological  
Services

cc: HA  
SE, Honolulu  
Hawaiian Electric Company, Inc.  
Board of Land and Natural Resources

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

February 14, 1979

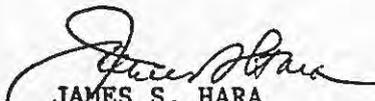
U.S. Department of the Interior  
Fish and Wildlife Service  
P. O. Box 50167  
Honolulu, Hawaii 96850

ATTENTION: Mr. Maurice H. Taylor

SUBJECT: Environmental Impact Statement (EIS) for the  
Proposed Halawa to Kamoku 138 KV Transmission Lines

Thank you for your review of the subject EIS. The following response to your comment is offered.

Your understanding that more detailed plant and wildlife surveys will be performed when a specific route is chosen is correct. Should the results of the surveys identify any endangered species, all applicable federal and local regulations would be complied with and close coordination between the applicant and the Fish and Wildlife Service maintained. Your recommendations regarding grass planting for erosion control will be considered and your information about the endemic tree snails will be forwarded to the consultant performing future surveys for the applicant.

  
JAMES S. HARA  
Vice President



COPY

January 30, 1979

Mr. Susumu Ono  
Chairman of the Board  
Board of Land and Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

Dear Mr. Ono:

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT FOR THE  
PROPOSED HALAWA TO KAMOKU 138KV TRANSMISSION  
LINE, HONOLULU, OAHU, HAWAII

The proposed project to install the 138KV transmission line is acceptable to us. We do not anticipate any adverse effects to potable groundwater resources along the several proposed alternative routes.

If you have any questions on this matter, please call Lawrence Whang at 548-5221.

Very truly yours,

KAZU HAYASHIDA  
Manager and Chief Engineer

cc: Hawaiian Electric Co., Inc.

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

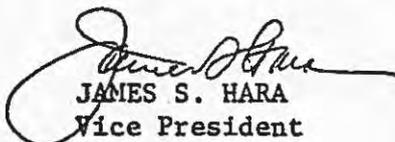
February 13, 1979

Board of Water Supply  
City & County of Honolulu  
630 South Beretania Street  
Honolulu, Hawaii 96813

ATTENTION: Mr. Kazu Hayashida

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.

  
JAMES S. HARA  
Vice President

WW/ep

615

RECEIVED

HEADQUARTERS  
FOURTEENTH NAVAL DISTRICT  
BOX 110  
PEARL HARBOR, HAWAII 96860

IN REPLY REFER TO:  
002:09F:SH:mm  
Ser 206

79 JAN 31 P 1:27

30 JAN 1979

DEPT OF LAND  
& NATURAL RESOURCES  
Mr. Sumner Ono  
Chairman  
Board of Land and Natural  
Resources  
State of Hawaii  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

Dear Mr. Ono:

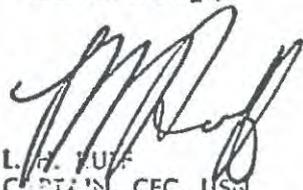
Environmental Impact Statement (EIS)  
For The Proposed Halawa to Kamoku  
138 KV Transmission Line

The subject EIS has been forwarded (undated) by the State Environmental Quality Commission requesting review comments and response by 7 February 1979 to your Board and to the Hawaiian Electric Company, Inc. The following comments are submitted:

- a. The U. S. Navy was not involved in the Consultation Process, as indicated in Appendix D.
- b. Review of the EIS indicates there is no discussion of soil erosion or runoff, and it would be appropriate to make a positive or negative statement in this regard. If there is a problem, then steps to minimize such erosion should be indicated.
- c. If there is any aspect of this project which merits further attention of the U. S. Navy, please advise further.

Thank you for the opportunity to review this EIS and to submit these comments for your consideration.

Sincerely,



L. G. HUFF  
CAPTAIN, CEC, USN  
DISTRICT CIVIL ENGINEER  
BY DIRECTION OF THE COMMANDANT

Copy to:  
Hawaiian Electric Company, Inc.  
P. O. Box 2750  
Honolulu, Hawaii 96803

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

February 14, 1979

Headquarters  
District Civil Engineer  
Fourteenth Naval District  
Box 110  
Pearl Harbor, Hawaii 96860

ATTENTION: L.H. Ruff, Captain, CEC, USN

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138 KV Transmission Lines

Thank you for your review of the subject EIS. The following responses are offered to your comments:

Comment: The U.S. Navy was not involved in the Consultation Process, as indicated in Appendix D.

Response: The U.S. Navy did not respond to the preparation notice for the subject EIS and consequently was not involved in the consultation process.

Comment: Review of the EIS indicates there is no discussion of soil erosion or runoff, and it would be appropriate to make a positive or negative statement in this regard. If there is a problem, then steps to minimize such erosion should be indicated.

Response: The possibility of short-term soil erosion related to excavation and the absence of vegetative cover at pole sites in conservation areas is noted in the description of probable impacts of the proposed project. The mitigating measure proposed to minimize this impact is the planting of appropriate grass or other control measure as required. In any case, the small area involved at each site precludes the occurrence of any really significant erosion.

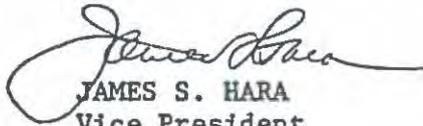
Comment: If there is any aspect of this project which merits further attention of the U.S. Navy, please advise further.

Response: The Navy will be notified if any aspect of the proposed project requires its further attention.

# M&E Pacific, Inc.

Headquarters  
February 14, 1979  
Page 2

Your comments along with our responses will be included within the revised EIS, which will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.



JAMES S. HARA  
Vice President

HJK/jn

# UNIVERSITY OF HAWAII

---

Water Resources Research Center

February 1, 1979

Board of Land and Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

Dear Sir:

SUBJECT: Review of the EIS of Halawa to Kamoku  
138 KV Transmission Line,  
Honolulu, Hawaii

Thank you for sending the subject EIS for our review and comment. This EIS is well organized and we have no comments on items related to water resources. We would like to keep this EIS for future reference.

Sincerely,



Yu-Si Fok, Professor  
Faculty EIS Review Coordinator

YF:jm

cc: Hawaiian Electric Co., Inc.  
Dr. Moncur  
Dr. Saxena  
Mr. Murabayashi

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable MEPAC

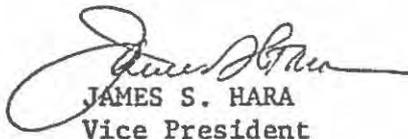
February 13, 1979

University of Hawaii  
Water Resources Research Center  
2540 Dole Street  
Honolulu, Hawaii 96822

ATTENTION: Prof. Yu-Si Fok

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.



JAMES S. HARA  
Vice President

WW/ep

LYON ARBORETUM ASSOCIATION  
3860 Manoa Road  
Honolulu, Hawaii 96822  
Ph: 988-7378

Board of Land & Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

Dear Chairman Thompson:

Subject: Environmental Impact Statement  
Proposed Halawa to Kamoku 138 KV Transmission Line  
Honolulu, Hawaii

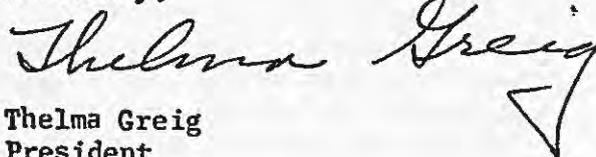
Please be informed that the Lyon Arboretum Association does not support any of the alternative routes for the subject transmission line which either goes through Lyon Arboretum and/or the unmarred, "amphitheater-like", rear portion of Manoa Valley.

We concur with the covenant of the Lyon Arboretum deed which mandates that the arboretum lands be maintained and preserved as an arboretum and botanical garden only.

In addition, we are strongly opposed to the intrusion of overhead power lines into the unmarred beauty of the arboretum grounds and the surrounding rear Manoa Valley. This natural beauty is a unique resource because of its accessibility by urban Honolulu residents and visitors, and the fact that it will be further enhanced as the Lyon Arboretum programs develop.

We would appreciate your continuing support of Lyon Arboretum by your concurrence with our position that the subject proposed transmission lines not go through Lyon Arboretum and the rear portion of Manoa Valley.

Sincerely,

  
Thelma Greig  
President

cc: Environmental Quality Commission  
Hawaiian Electric Company, Inc.

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable MEPAC

February 16, 1979

Lyon Arboretum Association  
3860 Manoa Road  
Honolulu, Hawaii 96822

ATTENTION: Ms. Thelma Greig

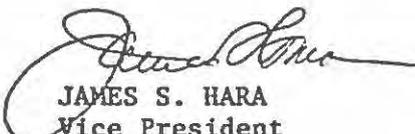
SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138 KV Transmission Lines

The following is in response to your comments to the Board of Land and Natural Resources on the subject EIS.

HECO concurs that the grounds of the Lyon Arboretum and the "amphitheater-like" rear portion of Manoa Valley are beautiful. It should be noted, however, that a 46 KV line presently exists in the Arboretum grounds and through other forested areas of Manoa. The fact that the existing 46 KV line is compatible with the beauty of the areas through which it passes demonstrates that mitigating measures (painting of poles and wires) can be taken to reduce the aesthetic impact of the proposed alternative.

The deed through which the University of Hawaii obtained the Arboretum lands from the Hawaiian Sugar Planters Association was subject to a grant of easement to HECO. This easement, on which the existing 46 KV line is located, contains approximately 147,800 square feet. In its preliminary negotiations with UHM and Lyon Arboretum officials, HECO has proposed that 111,050 square feet be cancelled and 36,750 square feet be retained. In addition, however, HECO has requested 51,750 square feet of easement area adjacent to that portion of easement to be retained. The total easement requirement for the proposed lines would therefore be 88,500 square feet or 60% of the easement area presently occupied.

We appreciate your comments and your interest in this project.



JAMES S. HARA  
Vice President

jn

RICHARD S. H. WONG  
PRESIDENT

DUKE T. KAWASAKI  
VICE PRESIDENT

JOSEPH T. KURODA  
MAJORITY LEADER

ANSON CHONG  
GEORGE H. TOYOFUKU  
ASSISTANT MAJORITY LEADERS

NORMAN MIZUGUCHI  
MAJORITY FLOOR LEADER

DANTE K. CARPENTER  
MAMORU YAMASAKI  
PATSY K. YOUNG  
ASST. MAJORITY FLOOR LEADERS

CHARLES M. CAMPBELL  
MAJORITY POLICY LEADER

JOHN T. USHIJIMA  
CHAIRMAN EMERITUS

FIRST DISTRICT  
DANTE K. CARPENTER  
STANLEY I. HARA  
JOHN T. USHIJIMA

SECOND DISTRICT  
HENRY TAKITANI  
MAMORU YAMASAKI

THIRD DISTRICT  
RALPH K. AJIFU  
D. G. ANDERSON  
MARY GEORGE

FOURTH DISTRICT  
BENJAMIN J. CAYETANO  
JOSEPH T. KURODA  
NORMAN MIZUGUCHI  
PATSY K. YOUNG

FIFTH DISTRICT  
CHARLES M. CAMPBELL  
DUKE T. KAWASAKI  
RICHARD S. H. WONG  
T. C. YIM

SIXTH DISTRICT  
NEIL AHLERCHOWIE  
JOHN S. CARROLL  
ANSON CHONG  
WADSWORTH YEE

SEVENTH DISTRICT  
STEVE COBB  
DENNIS O'CONNOR  
PATRICIA SAIKI  
W. BUDDY SOARES

EIGHTH DISTRICT  
GEORGE H. TOYOFUKU

The Senate  
The Tenth Legislature  
of the  
State of Hawaii

HONOLULU, HAWAII



February 4, 1979

Mr. Susumu Ono, Chairman  
Department of Land & Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

Dear Mr. Ono,

Proposed Halawa to Kamoku 138 KV Transmission  
Line, Oahu, Hawaiian Electric Company/Depart-  
ment of Land and Natural Resources.

1. I have reviewed the Environmental Impact Statement for the proposed Halawa to Kamoku 138 KV Transmission Line proposed by M&E Pacific Inc., Environmental Engineers for the Hawaiian Electric Co, January, 1979.

2. I wish to go on record as being opposed to the various lines described and proposed in the Category II section of the Statement for construction thru Palolo Valley (pages 24-37), with the exception of Line "D" (page 29).

3. Line "D" would parallel existing double circuits of 46 KV lines up Waahila Ridge at the State Recreation Area, then along the ridge in the conservation area between St. Louis Heights and the University of Hawaii Campus, thence across Dole Street, along Koali Road and Old Waiialae Road to King Street, then ewa side of University Avenue to Date Street, to the intersection of Kapiolani Boulevard and Kamoku Street (Kamoku Substation.)

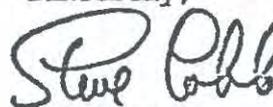
4. The above route would minimize urban area disturbances by running thru a rural area rather than thru built-up residential areas. It will also avoid the necessity of running two 138 KV lines thru Palolo Valley. Other distinct advantages are the shorter distance involved, 3.7 miles; and the cost of \$6,118,100.

5. The disadvantages or requiring additional right-of-ways and governmental agency approvals, more difficult maintenance, removal of trees, detrimental aesthetic affect and a potential foundation problem near Manoa Stream do not appear to offset the advantages set forth above.

6. It is requested that you consider approval of Line "D" as the most feasible and economical way of achieving the project to provide load relief for the existing Pukele Substation and to energize the new Kamoku Substation. Whenever a line intersects or disrupts a residential neighborhood, it it should be constructed underground even tho costs are greater.

Ltr: To Susumo Ono, Dept of Land & Natural Resources, Subj:  
Proposed Halawa to Kamoku 138 KV Transmission Line, Oahu,  
Hawaiian Electric Company/Department of Land and Natural Re-  
sources, February 4, 1979

Sincerely,

A handwritten signature in cursive script that reads "Steve Cobb". The signature is written in dark ink and is positioned above the printed name and title.

STEVE COBB  
Senator

cc to: Hawaiian Electric Co.  
Atten: Dr. John McCain  
Palolo Community Assn  
Neighborhood Board No 4.  
Neighborhood Board No 5.  
Neighborhood Board No 6.

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

February 16, 1979

The Senate  
The Tenth Legislature of the  
State of Hawaii  
Honolulu, Hawaii

ATTENTION: Senator Steve Cobb

SUBJECT: Environmental Impact Statement (EIS) for the  
Proposed Halawa to Kamoku 138 KV Transmission Lines

The following is in response to your letter dated February 4, 1979 to the Department of Land and Natural Resources on the subject EIS.

We acknowledge that you are opposed to all the alternate routes described in Category II, except for Alternate Route "D", which you request be considered for approval. Your description of the route is accurate, but it should be noted that (1) in order to achieve the objectives of the project, two 138 KV lines must be routed from the Pukele Substation to the Kamoku Substation and (2) the advantages and disadvantages you refer to do not compare favorably to Alternatives 1 and 2.

Thank you for your comments, which, along with our responses, will be included within the revised EIS.

  
JAMES S. HARA  
Vice President

RSN/bs



# University of Hawaii at Manoa

Department of General Science  
Dean Hall 2 • 2450 Campus Road  
Honolulu, Hawaii 96822  
February 5, 1979

## MEMORANDUM

TO: Department of Land and Natural Resources

✓Hawaiian Electric Company  
M&E Pacific Inc.  
Environmental Center, UHM  
Environmental Quality Commission

FROM: Sheila Conant, Ph. D. *Sheila Conant*  
Assistant Professor

RE: Commentary on Draft Environmental Impact Statement  
Proposed Hālawā to Kāmoku 138 KV Transmission Line

Comments are primarily on the sections dealing with avifauna and vegetation.

There are some minor discrepancies between Appendix B (Bird and Mammal Study) and the description of the avifauna in the body of the draft (pp. 55-59). For example, the Red-whiskered Bulbul and the Java Sparrow are said to be common in Manoa (pp. B-18, b-19), but neither species is listed on page 58. In regard to Manoa Valley, where I live, the Red-vented Bulbul is also a common species, and there have been recent reports of 'Amakihi and 'Apapane at relatively low elevations on the Woodlawn trail and ('Amakihi) in the residential Woodlawn area adjacent to conservation lands (e.g., Pyle, R. L. 1978. 'Elepaio 38:85-89).

Since this report was completed, Shallenberger (1978. Avifaunal Survey of the Central Ko'olau Range, O'ahu. Ahuimanu Productions.) has reported recent sightings of the endangered O'ahu Creeper (Loxops maculatus maculatus) in Moanalua Valley, Upper North Hālawā Valley and on Mānana Trail. Based on data gathered in his extensive survey, as well as what he considered reliable sightings in the literature, Shallenberger also listed this bird as "probably" occurring in South Hālawā Valley and on Hālawā Trail. These areas are near proposed power lines routes.

I concur with Berger that the proposed project is unlikely to seriously adversely affect any native bird species, including the endangered O'ahu Creeper. However, proposed routes pass through several areas with substantial native vegetation, including a good diversity of plant species. In these areas, the specific location of each power pole should be surveyed for rare plants. Of course, precautions should be taken to avoid introducing noxious weeds into such areas.

While I am unable to suggest the proposed action will have a significant negative affect on native birds, I am wholeheartedly opposed to routing a power line through upper Manoa or Palolo Valleys. I have resided in Manoa for over 23 years and am offended by the unpleasant appearance of present power lines. Of course, this comment is made as a concerned citizen and involved resident.

AN EQUAL OPPORTUNITY EMPLOYER

February 5, 1979  
page 2

As a concerned citizen and scientist I would like to comment that sooner or later the people of Hawai'i will have to reduce their energy consumption by a substantial percentage. I question the short-sightedness of continued expansion of electrical supply systems. However, this is a rather basic philosophical question not properly considered at this stage of the EIS process.

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable MEPAC

February 15, 1979

University of Hawaii at Manoa  
Department of General Science  
Dean Hall 2, 2450 Campus Road  
Honolulu, Hawaii 96822

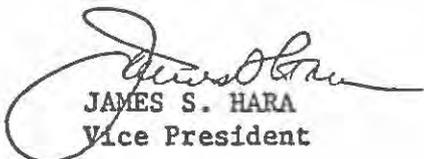
ATTENTION: Sheila Conant, Ph. D.

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138 KV Transmission Lines

We appreciate your review of the subject EIS. The following response to your comments is offered.

With reference to the avifauna and vegetation studies in the EIS, HECO is committed to more detailed investigations of the plant and animal life at each pole site once a specific route is chosen. Should any interference with endangered species be discovered, acceptable mitigating measures will be formulated and employed where applicable, including precautions to avoid introducing noxious weeds into such area.

Your comments together with our responses will be included in the revised EIS which will be submitted to the Department of Natural Resources and the Governor for acceptance and approval.

  
JAMES S. HARA  
Vice President

jn

UNITED STATES DEPARTMENT OF AGRICULTURE

SOIL CONSERVATION SERVICE

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P. O. Box 50004, Honolulu, HI 96850

February 5, 1979

Hawaiian Electric Company, Inc.  
P. O. Box 2750  
Honolulu, HI 96803

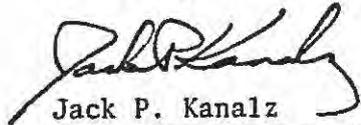
Gentlemen:

Subject: Proposed Halawa to Kamoku 138 KV Transmission Line  
Honolulu, Oahu

We have reviewed the subject environmental impact statement and have no comments to offer.

Thank you for the opportunity to review this document.

Sincerely,



Jack P. Kanalz  
State Conservationist

cc:  
Board of Land & Natural Resources  
Environmental Quality Commission



# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

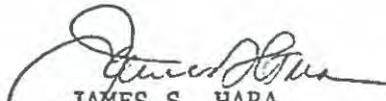
February 13, 1979

United States Department of Agriculture  
Soil Conservation Service  
P. O. Box 50004  
Honolulu, Hawaii 96850

ATTENTION: Mr. Jack P. Kanalz

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.



JAMES S. HARA  
Vice President

WW/ep

GEORGE R. ARIYOSHI  
GOVERNOR



RICHARD L. O'CONNELL  
DIRECTOR  
TELEPHONE NO.  
548-6915

STATE OF HAWAII  
OFFICE OF ENVIRONMENTAL QUALITY CONTROL  
OFFICE OF THE GOVERNOR  
550 HALEKAUWILA ST.  
ROOM 301  
HONOLULU, HAWAII 96813

February 5, 1979



MEMORANDUM

TO: Susumu Ono, Director  
Department of Land and Natural Resources

FROM: Richard L. O'Connell, Director  
Office of Environmental Quality Control

SUBJECT: Environmental Impact Statement for the Proposed  
Halawa to Kamoku 138 KV Transmission Line

We have reviewed the subject statement and offer the following comments for your consideration:

Page 1 - Background

The EIS does not indicate that a Conservation District Use Application (CDUA) for this action was filed in 1975, approved and subsequently voided in 1977. It is not clear when or if the CDUA was refiled. A discussion of this matter is recommended to clarify the present status of the CDUA.

Page 18

The EIS states, "...almost all easements have been obtained from various landowners who would be affected, including the Department of Land and Natural Resources (DLNR)." However, the EIS is not clear whether the route will pass through Lyon's Aboretum. If an easement is not granted, then it is possible that State lands may have to be used. Has an easement for State lands in that area been already granted?

Page 35

An explanation should be given as to why steel poles were ordered for certain alternative routes prior to completion of the environmental analysis of the alternatives.

Page 46

The operating cost for helicopter use is quoted as \$1000 per hour, however, most helicopter companies charge approximately \$300-\$400 per hour.

Page 59

The biological survey indicates that the Hawaiian Bat (Lasiurus cinereus semotus) exists within the project area. It should also be noted that the Hawaiian Bat is on the federal list of endangered species. What mitigation measures will be implemented to assure protection of these mammals?

KAMOKU SUBSTATION

The EIS does not include discussion on the Kamoku Substation which is part of the project. Section 1:22 b. of the EIS Regulations states,

"A group of proposed action shall be treated as a single action when: (1) the component actions are phases or increments of a larger undertaking; (2) an individual project is a necessary precedent for a larger project; (3) an individual project represents a commitment to a larger project; or (4) the actions in question are essentially identical and a single Statement will adequately address the impacts of each individual action and those of the group of actions as a whole."

Accordingly, the entire undertaking including the Kamoku Substation should be discussed in the EIS.

It is our understanding that construction of the Kamoku substation has been initiated. According to a letter dated May 6, 1977 to Hawaiian Electric, the Chairman of the BLNR stated, "It is my understanding that the EIS will encompass lands outside the Conservation District. As a consequence, our position is that no work be initiated on any land which will be within the scope of the required EIS." A discussion is recommended to clarify this matter.

UPGRADING PUKELE SUBSTATION

HECO states that there is no room for upgrading the existing substation. Could HECO use its powers of condemnation to permit expansion of this substation?

Page 3

## OIL PUMPING STATIONS

The EIS mentions that there will be oil pumping stations. There should be further descriptions of these stations giving size, location, and environmental impacts on the surrounding area.

## HELIPADS

The EIS also mentions that helipads will be constructed in conjunction with the transmission towers. A description of the helipads, including size, location, and environmental impacts should be included in the EIS. In addition, it should be noted that construction of helipads within native forest areas will have an impact on native flora.

## POPULATION PROJECTIONS

The need for the proposed project is based on the anticipated overload condition of the Pukele Substation. However, the EIS does not identify the present and future population served by the project. Does the proposed service area population reflect the State's revised population figures, Series II-2?

## OTHER ALTERNATIVES

The EIS should discuss the feasibility of energy conservation, off-peak pricing systems and other approaches as alternatives to the proposed action.

We trust that these comments will be helpful to you in preparing the revised EIS. An attached sheet lists the commenting agencies and/or organizations.

We thank you for the opportunity to review the subject EIS. We look forward to the revised statement.

Attachment

cc: Hawaiian Electric Co.  
w/attachments  
(Attn: John McCain)

LIST OF COMMENTING AGENCIES AND/OR ORGANIZATIONS

FEDERAL

\*Corps of Engineers January 19, 1979

STATE

Department of Defense January 11, 1979

+Department of Health January 11, 1979

CITY AND COUNTY OF HONOLULU

\*Department of Land Utilization January 24, 1979

\*Department of Transportation Services January 25, 1979

\*Comments forwarded to DLNR and HECO by reviewers

+Comment forwarded only to DLNR

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840

February 20, 1979



JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

ENV 2-1  
H-P-K  
NV/G/NV

Mr. Richard L. O'Connell, Director  
Office of Environmental Quality Control  
550 Halekauwila Street, Room 301  
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

Subject: EIS for the Proposed Halawa-Pukele-Kamoku 138 kv  
Transmission Lines

This is in response to your letter of February 5, 1979 regarding the Environmental Impact Statement for the proposed Halawa-Pukele-Kamoku 138 kv transmission lines. The following responses are addressed specifically to the concerns and questions you discussed in your letter:

COMMENT: The EIS does not indicate that a Conservation District Use Application (CDUA) for this action was filed in 1975, approved, and subsequently voided in 1977. It is not clear when or if the CDUA was refiled. A discussion of this matter is recommended to clarify the present status of the CDUA.

RESPONSE: Attached is a letter (Ref: OA-4/2/75-657) dated May 6, 1977 from Mr. Christopher Cobb, Chairman of the Board of Land and Natural Resources, to HECO on the CDUA. The second and last paragraphs indicate that the original CDUA is still in effect and only the past Board action is null and void. Future action will depend on the acceptance of the EIS rather than on reapplication of a CDUA.

COMMENT: The EIS states "...almost all easements have been obtained from various landowners who would be affected, including the Department of Land and Natural Resources (DLNR)." However, the EIS is not clear whether the route will pass through Lyon Arboretum. If an easement is not granted, then it is possible that State lands may have to be used. Has an easement for State lands in that area been already granted?

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Richard L. O'Connell, Director  
Office of Environmental Quality Control  
February 20, 1979  
Page 2

**RESPONSE:** The preferred route does pass through the Lyon Arboretum property, and easements have not been finalized. It should be noted that a proposal has been submitted with an alignment encompassing 59,300 square feet less land than presently leased by HECO. Although we feel that a final alignment and easement acceptable to all parties will be negotiated, we agree that, if the easement is not granted and if we find it impractical to use the existing easement, then other lands may be used. Agreements have been reached on easements for other State lands, but execution is pending the acceptance of the EIS and approval of the Cдуа.

**COMMENT:** An explanation should be given as to why steel poles were ordered for certain alternative routes prior to completion of the environmental analysis of the alternatives.

**RESPONSE:** Purchase orders for the Lines 1 and 2 steel poles were placed with the manufacturers in 1975. At that time, HECO was in compliance with all applicable State of Hawaii Laws and City and County ordinances and was not required to submit an EIS and/or cost comparisons. Subsequent to the placing of the orders, however, various State of Hawaii and City and County ordinances were enacted that resulted in various public and governmental information meetings.

At that time, the purchase orders were placed in suspension and negotiations with the steel pole manufacture were undertaken to determine the cost of cancelling the purchase orders. These negotiations resulted in a dollar figure being placed on any order cancellation to compensate the manufacturer for expenses incurred. A true cost comparison must therefore include the cancellation costs for all urban alternatives other than Lines 1 and 2 since they had proceeded with the necessary engineering and material ordering in good faith and in compliance with all applicable laws during the initial stages of the project.

**COMMENT:** The operating cost for helicopter use is quoted as \$1,000 per hour; however, most helicopter companies charge approximately \$300 to \$400 per hour.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Richard L. O'Connell  
Office of Environmental Quality Control  
February 20, 1979  
Page 3

RESPONSE: The lifting capacity of the commercial helicopters based in Hawaii is limited to approximately 1,800 pounds. These helicopters are primarily used by HECO for ferrying crews at the referenced rate of \$300 to \$400 per hour. The 3,500-pound capacity helicopter referenced in the EIS was utilized in 1977 on a wood pole project. The contract cost for this helicopter was \$20,000 and included shipping the helicopter to Hawaii from the mainland and a specified number of lifts. If the number of lifts was exceeded, the charge for the flight time (in 1977) was \$850 per hour, therefore, escalated to 1981 dollars the cost would be approximately \$1,000 per hour.

To further clarify the helicopter charges, it should be noted that, subsequent to the EIS submittal, HECO completed the installation of steel poles/structures on another project by utilizing a helicopter with a lifting capacity of approximately 9,000 pounds. The contract cost of using this helicopter included \$181,000 for shipping to Hawaii for a specified number of lifts and a \$1,800 per hour charge for additional work.

COMMENT: The biological survey indicates that the Hawaiian Bat (Lasiurus cinereus semotus) exists within the project area. It should also be noted that the Hawaiian Bat is on the Federal list of endangered species. What mitigation measures will be implemented to assure protection of these mammals?

RESPONSE: The referenced statement has been corrected to note that the Hawaiian Bat is probably the only indigenous land mammal in the Hawaiian Islands but is not located in the project area. This coincides with the Bird and Mammal Study by Andrew J. Burger that is included as Appendix B of the EIS.

COMMENT: The EIS does not include discussion on the Kamoku Substation which is part of the project. Accordingly, the entire undertaking including the Kamoku Substation should be discussed in the EIS. It is our understanding that construction of the Kamoku Substation has been initiated. According to a letter dated May 6, 1977 to Hawaiian Electric, the Chairman of the DLNR stated, "It is my understanding that the EIS will encompass lands outside the Conservation District. As a consequence, our position is that no work be initiated on any land which will be within the scope of the required EIS." A discussion is recommended to clarify this matter.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Richard L. O'Connell  
Office of Environmental Quality Control  
February 20, 1979  
Page 4

RESPONSE: The regulatory approvals for the Kamoku Substation predate the effective date of the EIS regulation, June 2, 1975. On February 9, 1973, the Public Utilities Commission (PUC) approved the purchase of the Kamoku Substation site. After receiving PUC approval for the purchase of the site, we entered into an agreement to purchase the site on February 15, 1973 and with the condominium developer, Business Investments, Ltd., on August 22, 1974. An agreement for engineering services was signed with Westinghouse on February 21, 1975. Since that time, there has been a substantial commitment of funds to the Kamoku Substation.

We view the project as bringing power to an existing, approved substation site. In any case, Section 1:21 of the EIS Regulation specifically exempts the substation site from consideration even if it is considered a component action of a larger project. To quote the applicable portion of Section 1:21, "For any action for which the applicant has not obtained all necessary approvals and for which an EIS was not previously required, the applicant may be subject to Chapter 343, Hawaii Revised Statutes, provided, however, that any subsequent EIS that is required is limited to that component of the action for which approval is necessary."

COMMENT: HECO states that there is no room for upgrading the existing substation. Could HECO use its powers of condemnation to permit expansion of this substation?

RESPONSE: The present Pukele Substation size is approximately 260 feet by 250 feet for a total of approximately 65,000 square feet. Although the lot size is larger, much of the land is unusable due to the hillside and adjacent stream. During the initial development of the substation site, the lot was graded and the hillside terraced to obtain the desired level area upon which the substation is situated.

It is reasonable to assume that at least 65,000 square feet of level land would be required to duplicate the Kamoku Substation in its entirety adjacent to the Pukele Substation. HECO would attempt to negotiate the fee purchase of this land from the neighboring landowners prior to utilizing any condemnation powers. It should further be noted that, although HECO has the power of condemnation, HECO cannot exercise that power unless HECO can demonstrate that no other viable alternatives exist.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Richard L. O'Connell  
Office of Environmental Quality Control  
February 20, 1979  
Page 5

The expansion of the Pukele Substation area would not eliminate the need for new 138 kv lines to the Pukele Substation area since the duplicate substation would require power and backup capabilities. Finally, to export the power out of the new substation would require eight new 46 kv lines to the load areas. These eight 46 kv lines would require considerably more material and rights-of-way, thereby increasing the overall cost of the project, especially if overhead routes were not available and undergrounding of the 46 kv lines were required. Please note that the eight new 46 kv lines will be in addition to the eight 46 kv lines presently emanating from the Pukele Substation.

COMMENT: The EIS mentions that there will be oil pumping stations. There should be further descriptions of these stations giving size, location, and environmental impacts on the surrounding area.

RESPONSE: Oil pumping stations will be required for underground and submarine transmission lines. Attached is a sketch showing a typical plan view of a transition substation, an oil pumping substation, and a typical plan view of an alternate oil pumping substation. As depicted, approximately 14,000 square feet of land is required for each of the substations. The bus support structures will be no higher than 32 feet, and the entire property will be enclosed with a fence and a planting strip in front of the substation.

No sites have been selected for these substations, but, if the underground system is selected, HECO will proceed with the acquisition. Although an assessment as to the environmental impact cannot be provided at this time, based on its similarity with a distribution substation, we anticipate minimal long-range impact and temporary, short-range impact associated with the construction activities.

COMMENT: The EIS also mentions that helipads will be constructed in conjunction with the transmission towers. A description of the helipads, including size, location, and environmental impacts should be included in the EIS. In addition, it should be noted that construction of helipads within native forest areas will have an impact on native flora.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Richard L. O'Connell  
Office of Environmental Quality Control  
February 20, 1979  
Page 6

RESPONSE: Existing and proposed helicopter landing areas (helipads) are shown on Figure 13 of the EIS. These helipads are primarily used by HECO to ferry crew members to those sites that are not within reasonable walking distance from existing roads and trails. In most cases, extensive clearing is not required since a relatively open site is usually chosen for the helipads, with minimal clearing of the adjacent area done to prevent tree contact with the helicopter rotor blades. For example, on a ridgeline, any trimming would be limited to an area of the width of the ridge (4 to 8 feet) by the length of the rotor blades (40 to 50 feet). Each of the sites has been reviewed and approved by the DLNR Forestry staff, who also indicated an interest in utilizing the helipads for fire-fighting and rescue purposes.

COMMENT: The need for the proposed project is based on the anticipated overload condition of the Pukele Substation. However, the EIS does not identify the present and future population served by the project. Does the proposed service area population reflect the State's revised population figures, Series II-2?

RESPONSE: The EIS identifies the geographical area served by the Pukele and Kamoku Substations. As indicated in the third paragraph on page 11, the load projections were made on the basis of known requests for service and not directly on population projections. Many other factors influence the peak load projections. The inclusion of a population forecast in the EIS therefore seems inappropriate. For your information, many statistical data from the DPED are utilized in the projections.

In inquiries of a similar nature, we have added the following response: "HECO is legally required to provide service on demand and does not have the option of restricting or jeopardizing service to curtail growth."

COMMENT: The EIS should discuss the feasibility of energy conservation, off-peak pricing systems, and other approaches as alternatives to the proposed action.

HAWAIIAN ELECTRIC COMPANY, INC.

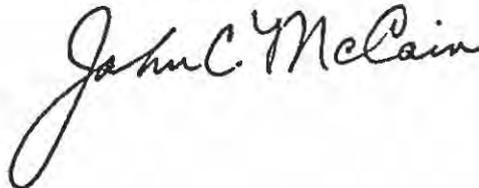
Mr. Richard L. O'Connell  
Office of Environmental Quality Control  
February 20, 1979  
Page 7

RESPONSE: On page 13 of the EIS, we discuss why your suggested alternatives will not meet the needs of this project. Questions concerning energy efficient appliances, time-of-day pricing, and other devices to reduce peak demand are thoroughly discussed in PUC Docket 2793, Investigation of Rate Schedules. No decision has been rendered by the PUC on this docket.

Even if a decision were now in hand, such measures could do little to reduce demands by heating, and other energy reducing measures do not necessarily reduce peak demand. Consider as one example solar water heaters. These devices do reduce energy consumption. However, as soon as the weather turns bad for several days, as it has in recent months, the solar heater becomes ineffective and energy and peak demand are no longer affected by solar heaters. The weather is usually the worst in the winter months, which further compounds the problem because this is when our peak occurs.

We trust we have satisfactorily responded to your comments and thank you for your interest and concern for this project.

Yours truly,

A handwritten signature in cursive script that reads "John C. McCain". The signature is written in dark ink and is positioned below the typed name "John C. McCain".

JCMc:cm  
Enclosures



May 6, 1977

REF: OA-4/2/75-657

Mr. Charles Ane  
Hawaiian Electric Company, Inc.  
900 Richards Street  
Honolulu, HI 96840

Dear Mr. Ane:

This is to reiterate the position of the Board of Land and Natural Resources regarding your Conservation District Use Application OA-4/2/75-657.

Insofar as the satisfaction of Chapter 343, Hawaii Revised Statutes, as it related to Chapter 183-41, HRS is concerned; an Environmental Impact Statement has been required in this project, no work within the State's Conservation District may proceed until such time as the BLNR has accepted this EIS, and approved your Cдуа.

However, insofar as the satisfaction of Chapter 343, HRS by itself is concerned, Section 1:72 of EIS Regulations pertaining to applicant actions reads in pertinent part:

Acceptance of the required EIS will be a condition precedent to approval of the request and commencement of the proposed action.

It is my understanding that the EIS will encompass lands outside the Conservation District. As a consequence, our position is that no work be initiated on any land which will fall within the scope of the required EIS. In this manner, you will remain in compliance with Chapter 343, HRS and EIS Rules and Regulations.

Inasmuch as the required EIS is an integral part of Cдуа OA-4/2/75-657, and, was initiated at your request, any past Board action on this Cдуа is null and void.

ENCLOSURE

Mr. Charles Ana  
Page 2  
May 6, 1977

As a consequence, should the EIS be deemed non-acceptable, the effect will be to deny your application. Should the EIS be deemed acceptable, then the Board may modify the CDUA to whatever degree the Board feels necessary to insure whatever concerns articulated are alleviated.

Inasmuch as this EIS, although a departmental decision, was initiated at the request of Hawaiian Electric, I would appreciate your written concurrence to the above understanding by May 20, 1977.

If I may be of any further service, please feel free to contact Mr. Roger Evans of my Planning Office at 548-7837.

Very truly yours,

  
CHRISTOPHER COBB  
Chairman of the Board

RCE:eyo

# UNIVERSITY OF HAWAII

---

Harold L. Lyon Arboretum

5 February 1979

Department of Land and Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

Gentlemen,

Attached is comments as prepared by our staff on "Proposed Halawa to Kamoku 138 KV Transmission Line" which we wish to submit for considerations.

Thank you for giving us the opportunity to review the Environmental Impact Statement.

Sincerely yours,

Yoneo Sagawa, Director  
Lyon Arboretum

cc: T. Sahara  
✓ Hawaiian Electric Co., Inc.

COMMENTS PERTAINING TO EIS FOR THE PROPOSED HALAWA TO KAMOKU  
138 KV TRANSMISSION LINE

The proposed project is based on the projected increase of electric power requirements of the area presently being served by the Pukele Station. A new substation at Kamoku is proposed to provide load relief for the Pukele Station which presently supplies power to the area from Waialae Nui to Piikoi Street, including Waikiki. Apparently, the increase in power requirements is based on the City & County of Honolulu General Plan which calls for a 30% increase in Honolulu's population during the last quarter of this century. This projection should be critically re-assessed in view of the State administration's policy of decentralization of population and controlled growth. It seems incongruous that a new substation should be constructed that could supply enough power that would, in turn, justify yet more construction and greater population growth in areas that are already overburdened. Surely this would not be justified under the policy of controlled growth. The EIS does not adequately address this problem.

It is evident (Figure 3) that the proposed routing of power and establishment of new Kamoku Substation is related to the availability of land of Kapiolani Boulevard and Date Street.

If, as indicated in the report, there has been increased demands for power by developments such as Kahala Mall, would it not be more reasonable to build a substation in the eastern boundaries of this service area? Or, is this the first of several substations?

The State of Hawaii has appropriated funds for the development of upper Manoa Valley as a recreational area. Some work has begun on the development of additional hiking trails. Is destruction of one of the few unmarred valleys so close to the city compatible with accomodation of our future clientele?

The following comments refer to the portion of the proposed transmission line that pass through the Lyon Arboretum:

1. The proposed alignment will directly affect the plantings in the following ways:
  - a. The construction of the steel poles will greatly disturb the surrounding plantings. Accessioned material may need to be severely pruned or removed or their roots may be damaged by construction activities.
  - b. Although the pole heights are proposed to be 105'-125', the actual heights of the transmission lines (including sag) are not specified. Because the proposed alignment traverses much of our last available planting sites, the lines and the required 30' clearance poses an unacceptable restriction on the use of this area and the growth of our collections.

2. If the proposed alignment is accepted a portion of the present 46 Kv easement through the Arboretum will be relinquished. Although this amounts to 111,050 square feet, most of the accessible flat areas are already planted and cannot be used for experimentation. In fact, a portion of this easement was cut through an area that was planted in the 1930's. Thus, many trees were directly affected and to this date, they have not been allowed to develop to their natural size.

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840



February 20, 1979

JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

ENV 2-1  
H-P-K  
NV/G/NV

Mr. Yoneo Sagawa, Director  
Lyon Arboretum  
3860 Manoa Road  
Honolulu, Hawaii 96822

Dear Mr. Sagawa:

Subject: EIS for the Proposed Halawa-Pukele-Kamoku 138 kv  
Transmission Lines

This is in response to your letter dated February 5, 1979 to the Department of Land and Natural Resources regarding the Environmental Impact Statement for the proposed Halawa-Pukele-Kamoku 138 kv transmission lines. The following responses are addressed specifically to the concerns and questions you discussed in your letter:

COMMENT: The conflict in population projections between the City and County of Honolulu General Plan and the State administration policies should be critically reassessed. It seems incongruous that a new substation should be constructed that could supply enough power that would, in turn, justify yet more construction and greater population growth in areas that are already overburdened.

RESPONSE: The load projections for the Pukele service area were made on the basis of known new requests for service and not directly on population projections. There are factors other than population that have a great influence on load projections.

In view of the above and the fact that HECO is legally required to supply service on demand and does not have the option to restrict or jeopardize service to curtail growth, we feel that any differences in population projections or policies need not be addressed in the EIS.

COMMENT: It is evident (Figure 3) that the proposed routing of power and establishment of a new Kamoku Substation are related to the availability of land on Kapiolani Boulevard

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Yoneo Sagawa  
February 20, 1979  
Page 2

and Date Street. If, as indicated in the report, there has been increased demands for power by developments such as Kahala Mall, would it not be more reasonable to build a substation in the eastern boundaries of this service area? Or, is this the first of several substations?

RESPONSE: We concur that the establishment of the new Kamoku Substation is related to availability of land. It should also be noted that the ideal location of a transmission substation is at the heart of the load center because the 46 kv lines emanating from the substation would not have to be extended very far to reach the service area.

The Kahala Mall that you mention is only one example of the recent increases in demand. Other notable examples are the expansion of the Manoa Shopping Center and the recent addition of several commercial establishments along Waialae Avenue. These indicate a pattern of growth for the present Pukele Substation service area which by 1981 will require the addition of Kamoku Substation. At present, there are no plans for another transmission substation on the leeward side of the Koolaus between Kaimuki and Kokohead.

COMMENT: The State of Hawaii has appropriated funds for the development of upper Manoa Valley as a recreational area. Some work has begun on the development of additional hiking trails. Is destruction of one of the few unmarred valleys so close to the city compatible with accommodation of our future clientele?

RESPONSE: Manoa Valley is a beautiful valley. It should be noted, however, that a 46 kv line presently exists in the rear of the valley and through other forested areas of Manoa. The fact that the existing 46 kv line is compatible with the beauty of the areas through which it passes demonstrates that mitigating measures (painting of poles and wires) can be taken to reduce the aesthetic impact of the proposed alternative.

COMMENT: The proposed alignment will directly affect the plantings in the following ways: (a) construction of steel poles

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Yoneo Sagawa  
February 20, 1979  
Page 3

will greatly disturb the surrounding plantings and (b) although the pole heights are proposed to be 105 to 125 feet, the actual heights of the transmission lines (including sag) are not specified.

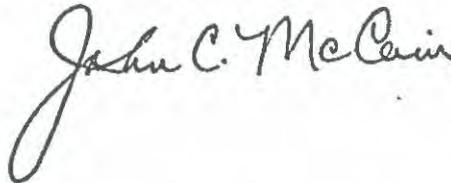
If the proposed alignment is accepted, a portion of the present 46 kv easement through the Arboretum will be relinquished. Although this amounts to 111,050 square feet, most of the accessible flat areas are already planted and cannot be used for experimentation. In fact, a portion of this easement was cut through an area that was planted in the 1930's. Thus, many trees were directly affected and, to this date, have not been allowed to develop to their natural size.

RESPONSE: The easement through the Arboretum for the 138 kv line has not yet been obtained. HECO has submitted a proposal specifying an alignment that meets their requirements, minimizes costs, and reduces the easement area in Lyon Arboretum by 59,300 square feet.

Your comments on the effect the proposed alignment will have on the plantings, the trees, and the experimentation area are greatly appreciated. This information will facilitate the negotiations toward an alignment and easement that will be acceptable to all parties and still have a minimal impact on the environment.

We appreciate your comments and would like to extend our thanks to you and your staff for your assistance.

Yours truly,



JCMc:cal

S H. WAKATSUKI  
or  
EL J. KIHANO  
Leader  
Y HAALILIO PETERS  
Minor Leader  
UYA YAMADA

HOUSE OF REPRESENTATIVES  
THE TENTH LEGISLATURE

STATE OF HAWAII  
STATE CAPITOL  
HONOLULU, HAWAII 96813



February 6, 1979

Mr. Susumu Ono, Chairman  
Board of Land and Natural Resources  
State of Hawaii  
Honolulu, Hawaii 96813

SUBJECT: Environmental Impact Statement for the Proposed  
Halawa to Kamoku 138 KV Transmission Line

Dear Mr. Ono:

The following comments are offered for your consideration:

1. Kamoku Substation

In discussing the proposed action, Kamoku Substation is not included as part of the project. Section 1:22 b. of the EIS Regulations mandates,

"A group of proposed actions shall be treated as a single action when: (1) the component actions are phases or increments of larger total undertaking; (2) an individual project is a necessary precedent for a larger project; (3) an individual project represents a commitment to a larger project; or (4) the actions in question are essentially identical and a single statement will adequately address the impacts of each individual action and those of the group of actions as a whole."

In other words, the entire project should be adequately discussed including the Kamoku Substation. Therefore, a description of the substation, its environmental impacts, and its status should be given.

2. Pukele Substation

The alternative of expanding the Pukele Substation must be thoroughly examined. Because Hawaiian Electric does have powers of condemnation, expansion of the existing site is not only feasible but less costly than the 138 KV overhead transmission lines to Kamoku and the Kamoku Substation.

ct  
K. SUWA  
istrict  
BERT A. SEGAWA  
SUYA YAMADA  
istrict  
HITO TAKAMINE  
istrict  
ORU INABA  
istrict  
ISTOPHER A. CROZIER  
ALD K. MACHIDA  
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BERT J. HONDA  
HONY P. TAKITANI  
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ERT D. DODS  
INA R. IKEDA  
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K. LARSEN  
IBARA MARUMOTO  
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T. MORIOKA  
VIN K. Y. SAY  
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Y KUYABU  
STRAND KOBAYASHI  
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IAU BOYD KAMALII  
JL L. LACY, JR.  
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VID M. HAGINO  
IFFORD T. UWAINA  
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RALD de HEER  
ROL FUKUNAGA  
ARLES T. USHIJIMA  
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SSELL BLAIR  
THLEEN STANLEY  
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HARD IKE SUTTON  
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LTON HOLT  
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HARD GARCIA  
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ARSHALL K. IGE  
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HITNEY T. ANDERSON  
OHN J. MEDEIROS  
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USSALL J. SAKAMOTO  
istrict  
RICHARD A. KAWAKAMI  
IGNY T. KUNIMURA  
DENNIS R. YAMADA

Minority Leader  
Minority Floor Leader

February 6, 1979  
Mr. Susumu Ono  
Page Two

3. Diamond Head Historic, Scenic, and Cultural District

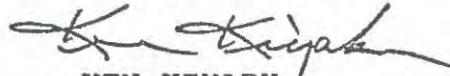
Line 2 appears to be within the Diamond Head Historic, Scenic, and Cultural District. However, no reference to the district has been made. It is important to note that the steel poles will not be permitted within the Diamond Head district. The transmission lines will have to be underground. Has the cost of underground lines been included on page 36?

In addition, the section on the alternative for line 2 should be revised to reflect the impact on the Diamond Head district.

In light of the Diamond Head district, I do not support any proposed transmission lines that affects this area. Therefore, I do not support lines 2, E and F.

I thank you for the opportunity to comment on the subject EIS.

Sincerely,



KEN KIYABU  
Representative  
Tenth District

cc: Hawaiian Electric

KK:gh

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840



February 20, 1979

JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

ENV 2-1  
H-P-K  
NV/G/NV

Representative Ken Kiyabu  
House of Representatives  
The Tenth Legislature  
State of Hawaii  
State Capitol  
Honolulu, Hawaii 96813

Dear Representative Kiyabu:

Subject: EIS for the Proposed Halawa-Pukele-Kamoku 138 kv  
Transmission Lines

This is in response to your letter of February 6, 1979 regarding the Environmental Impact Statement for the proposed Halawa-Pukele-Kamoku 138 kv transmission lines. The following responses are addressed specifically to the concerns and questions you discussed in your letter:

COMMENT: The EIS should include in it the Kamoku Substation. EIS Regulations (sec. 1:22-b) require the inclusion of the Kamoku Substation in the EIS. Paragraph 2, page 14 inadequately justifies the exclusion of the Kamoku Substation in the EIS. Also, HECO has stated that construction on the substation has begun, but in a letter dated May 6, 1977 to HECO, BLNR Chairman wrote: "...no work can be initiated on any land which will be within the scope of the required EIS." Discussion on these points should be included.

RESPONSE: The regulatory approvals for the Kamoku Substation predate the effective date of the EIS regulation June 2, 1975. On February 9, 1973, the Public Utilities Commission (PUC) approved the purchase of the Kamoku Substation site. After receiving PUC approval for the purchase of the site, we entered into an agreement to purchase the site on February 15, 1973 and with the condominium developer, Business Investments, Ltd., on August 22, 1974. An agreement for engineering services was signed with Westinghouse on February 21, 1975. Since that time there has been a substantial commitment of funds to the Kamoku Substation.

We view the project as bringing power to an existing, approved substation site. In any case, Section 1:21 of

HAWAIIAN ELECTRIC COMPANY, INC.

Representative Ken Kiyabu  
February 20, 1979  
Page 2

the EIS Regulation specifically exempts the substation site from consideration even if it is considered a component action of a larger project. To quote the applicable portion of Section 1:21 -

"For any action for which the applicant has not obtained all necessary approvals and for which an EIS was not previously required, the applicant may be subject to Chapter 343, Hawaii Revised Statutes, provided, however, that any subsequent EIS that is required is limited to that component of the action for which approval is necessary."

COMMENT: The alternative of expanding Pukele Substation must be thoroughly examined. Because Hawaiian Electric does have powers of condemnation, expansion of the existing site is not only feasible but less costly than the 138 kv overhead transmission lines to Kamoku and the Kamoku Substation.

RESPONSE: The present Pukele Substation size is approximately 260 feet by 250 feet for a total of approximately 65,000 square feet. Although the lot size is larger, much of the land is unusable due to the hillside and adjacent stream. During the initial development of the substation site, the lot was graded and the hillside terraced to obtain the desired level area upon which the substation is situated.

It is reasonable to assume that at least 65,000 square feet of level land would be required to duplicate the Kamoku Substation in its entirety adjacent to Pukele Substation. HECO would attempt to negotiate the fee purchase of this land from the neighboring landowners prior to utilizing any condemnation powers. It should be noted further that, although HECO has the power of condemnation, HECO cannot exercise these powers unless they can demonstrate that no other viable alternatives exist.

The expansion of the Pukele Substation area would not eliminate the need for new 138 kv lines to the Pukele Substation area since the duplicate substation would require power and backup capabilities. Finally, to export the power out of the new substation would require eight new 46 kv lines to the load areas. These eight

HAWAIIAN ELECTRIC COMPANY, INC.

Representative Ken Kiyabu  
February 20, 1979  
Page 3

46 kv lines would require considerably more materials and rights-of-way thereby increasing the overall cost of the project, especially if overhead routes were not available and undergrounding of the 46 kv lines were required. Please note that the eight new 46 kv lines will be in addition to the eight 46 kv lines presently emanating from Pukele Substation.

COMMENT: Line 2 appears to be within the Diamond Head Historic, Scenic, and Cultural District. However, no reference to the district has been made. It is important to note that the steel poles will not be permitted within the Diamond Head district. The transmission lines will have to be underground. Has the cost of underground lines been included on page 36?

RESPONSE: The alignment of Line 2 is definitely within the limits of the Diamond Head District along the makai side of Date Street. However, a legal opinion rendered by the City Corporation Counsel's office has determined that the City's underground provisions do not apply because the applicable ordinances were enacted subsequent to HECO's approved plans for overhead construction.

With reference to undergrounding in general, the merits are discussed in the EIS wherein statements are made regarding:

1. High costs and the allocation of costs.
2. Long construction periods with significant inconveniences for residents.
3. Interference with existing underground utilities.
4. Requirements for additional support facilities such as oil cooling and pumping stations.
5. Greater and more difficult maintenance requirements.

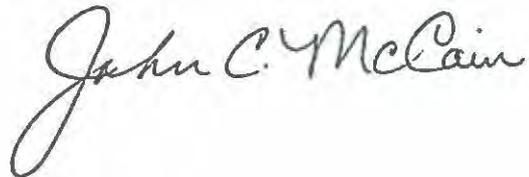
We appreciate your interest and concern on this subject project. Your comments and our responses will be included in the revised

HAWAIIAN ELECTRIC COMPANY, INC.

Representative Ken Kiyabu  
February 20, 1979  
Page 4

EIS, which will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.

Yours truly,

A handwritten signature in cursive script that reads "John C. McCain". The signature is written in dark ink and is positioned to the right of the typed name "John C. McCain".

JCMc:cal

FEB 8 1979

HOUSE OF REPRESENTATIVES  
THE TENTH LEGISLATURE

STATE OF HAWAII  
STATE CAPITOL  
HONOLULU, HAWAII 96813



H WAKATSUKI  
L J KIHANO  
Y HAALILIO PETERS  
UYA YAMADA

February 6, 1979



K. SUWA  
BERT A. SEGAWA  
UYA YAMADA  
HITO TAKAMINE  
JRU INABA  
STEPHER A. CROZIER  
ALD K. MACHIDA  
BERT J. HONDA  
HONY P. TAKITANI  
ERT D. DODS  
NA R. IKEDA  
K. LARSEN  
BARA MARUMOTO  
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ARLES T. USHJIMA  
SSELL BLAIR  
THLEEN STANLEY  
RON BAKER  
HARD IKE SUTTON  
LTON HOLT  
INY NARVAES  
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ITSUO UECHI  
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ATH J. EVANS  
HITNEY T. ANDERSON  
OHN J. MEDEIROS  
USSELL J. SAKAMOTO  
RICHARD A. KAWAKAMI  
TONY T. KUNIMURA  
DENNIS R. YAMADA

Mr. Carl H. Williams, President  
Hawaiian Electric Company  
P. O. Box 2750  
Honolulu, HI 96840

Dear Mr. Williams:

The attached is a copy of my comments  
on the Environmental Impact Statement for  
the proposed Halawa to Kamoku 138KV trans-  
mission line and its attendant facilities.

Sincerely,  
*Ted T. Morioka*  
Ted T. Morioka

cc: PCL  
JMV  
CDF, REB

Minority Leader  
Minority Floor Leader

HOUSE OF REPRESENTATIVES  
THE TENTH LEGISLATURE

STATE OF HAWAII  
STATE CAPITOL  
HONOLULU, HAWAII 96813



February 6, 1979

Speaker  
ANIEL J. KIHANO  
Deputy Speaker  
HENRY HAALILIO PETERS  
Floor Leader  
ATSUYA YAMADA

District  
ACK K. SUWA  
1st District  
HERBERT A. SEGAWA  
ATSUYA YAMADA  
2nd District  
OSHIRO TAKAMINE  
3rd District  
MINORU INABA  
4th District  
CHRISTOPHER A. CROZIER  
GERALD K. MACHIDA  
5th District  
HERBERT J. HONDA  
ANTHONY P. TAKITANI  
6th District  
ROBERT D. DODS  
MONNA R. IKEDA  
7th District  
ACK LARSEN  
BARBARA MARUMOTO  
8th District  
TED T. MORIOKA  
CALVIN K. Y. SAY  
9th District  
KEN KIJABU  
BERTRAND KOBAYASHI  
10th District  
KINAU BOYD KAMALII  
PAUL L. LACY, JR.  
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DAVID M. HAGINO  
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OLLIE LUNASCO  
YOSHIRO NAKAMURA  
22nd District  
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WHITNEY T. ANDERSON  
JOHN J. MEDEIROS  
25th District  
RUSSELL J. SAKAMOTO  
26th District  
RICHARD A. KAWAKAMI  
TONY T. KUNIMURA  
DENNIS R. YAMADA

Mr. Susumu Ono  
Chairman  
Board of Land and  
Natural Resources  
Department of Land  
and Natural Resources  
P. O. Box 621  
Honolulu, Hawaii 96809

Dear Mr. Ono:

I have completed my review of the Environmental Impact Statement for the proposed Halawa to Kamoku 138 KV transmission line and its attendant facilities and it appears to be deficient in the following areas:

- A. EIS regulations require that a group of proposed actions be treated as a single action and as a whole. The document, however does not address the impacts of the construction of the Kamoku Substation which is an integral part of the proposed action. Has construction already proceeded in this area? It also fails to describe other facilities and their impacts such as the proposed helipads and oil pumping stations.
- B. The document states a need to increase its capacities due to growing demand. Population data and forecasts are, however, lacking in the statement and there is some question as to the need of this project. Which populations and at what densities will this project serve? Could it also serve other neighboring areas through a re-routing of lines such as Kakaako which is planned for intensive development? Would energy conservation measures taken by the serviced area alleviate the need for this project?

Minority Leader  
Minority Floor Leader

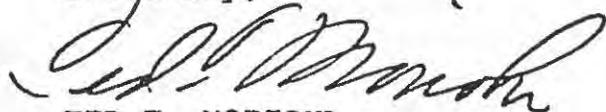
Mr. Susumu Ono  
February 6, 1979  
Page Two

- C. The document states that the project is needed because there is no space to expand the Pukele Station. However, the HECO has condemnation powers. Why hasn't this been considered as an alternative?
- ✓ D. In computing the costs and benefits for the alternatives, the statement appears deficient in calculating costs for the impacts on the various neighborhoods' aesthetic appearance which would probably affect marketability and land values. These are not adequately stated in terms of underground as compared to overhead wiring.
- E. Some of the amounts used in calculating costs appear to be inaccurate such as those used for computing helicopter service costs.
- Ch  
ant  
F. In addition, it is not clear as to the legality of preparing an EIS after decision-making (the CDUA) has already been made. Could clarification be provided on this matter?

✓ In addition to these concerns, we would like to point out to the Board of Land and Natural Resources that pages 11 and 13 of the document indicate this project's non-compliance with the State's objectives. The Land Board and other State agencies, however, are required to conform to the State Plan as mandated by Act 100, SLH 1978.

There also appears to be no one authority in charge of ensuring that the project has minimum adverse impacts on areas outside of the conservation district and I recommend that the Board of Land and Natural Resources, and Public Utilities Commission assume this responsibility in making their decisions on the project. It is further suggested that the Board of Land and Natural Resources, Public Utilities Division, and Public Utilities Commission also review all cost estimates presented in the document.

Sincerely,



TED T. MORIOKA  
State Representative  
Ninth District

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840



JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

February 20, 1979

Representative Ted T. Morioka  
House of Representatives  
The Tenth Legislature  
State of Hawaii  
State Capitol  
Honolulu, Hawaii 96813

Dear Representative Morioka:

**SUBJECT:** Environmental Impact Statement for the  
Proposed Halawa-Pukele-Kamoku 138 KV  
Transmission Lines

This is in response to your letter dated February 6, 1979, to the Board of Land & Natural Resources on the Environmental Impact Statement for the proposed Halawa-Pukele-Kamoku 138 KV transmission lines. The following responses are addressed specifically to questions and concerns expressed in your letter.

**COMMENT:** EIS regulations require that a group of proposed actions be treated as a single action and as a whole. The document, however does not address the impacts of the construction of the Kamoku Substation which is an integral part of the proposed action. Has construction already proceeded in this area? It also fails to describe other facilities and their impacts such as the proposed helipads and oil pumping stations.

**RESPONSE:** The regulatory approvals for the Kamoku Substation predate the effective date of the EIS regulation, June 2, 1975. On February 9, 1973, the Public Utilities Commission (PUC) approved the purchase of the Kamoku Substation site. After receiving PUC approval for the purchase of the site, we entered into an agreement to purchase the site on February 15, 1973 and with the condominium developer, Business Investments, Ltd., on August 22, 1974. An agreement for engineering services was signed with Westinghouse on February 21, 1975. Since that time there has been a substantial commitment of funds to the Kamoku Substation. Construction at the site is in progress.

We view the project as bringing power to an existing, approved substation site. In any case, Section 1:21

HAWAIIAN ELECTRIC COMPANY, INC.

Representative Ted T. Morioka  
February 20, 1979  
Page 2

of the EIS Regulation specifically exempts the substation site from consideration even if it is considered a component action of a larger project. To quote the applicable portion of Section 1:21 "For any action for which the applicant has not obtained all necessary approvals and for which an EIS was not previously required, the applicant may be subject to Chapter 343, Hawaii Revised Statutes, provided, however, that any subsequent EIS that is required is limited to that component of the action for which approval is necessary."

Existing and proposed helicopter landing areas (helipads) are shown on Figure 13 of the EIS. These helipads are to be used to ferry company crew members to those sites that are not within reasonable walking distance from existing roads and trails. In most cases, extensive clearing was not required since a relatively open site was chosen for the helipads. Each of the sites has been reviewed and approved by the DLNR forestry staff, who also indicated interest in utilizing the helipads for firefighting and rescue purposes.

The oil pumping stations will be required by underground lines. Attached is a sketch showing a typical plan view of a transition, an oil pumping substation, and a typical plan view of an alternate oil pumping substation. As depicted, approximately 14,000 square feet of land is required for each of the substations. The bus support structure will be no higher than 32 feet, and the entire property will be enclosed with a fence, and a planting strip will be located in front of the substation.

No sites have been selected for these substations but if an underground system is utilized, HECO would proceed with any acquisition. Based on its similarity with a distribution substation, we anticipate minimal long-range impact and a temporary short range impact associated with the construction activities.

**COMMENT:** The document states a need to increase its capacities due to growing demand. Population data and forecasts are, however, lacking in the statement and there is some question as to the need of this project. Which populations and at what densities will this project serve? Could it also serve other neighboring areas through a re-routing of lines such as Kakaako which is planned for intensive development? Would energy

HAWAIIAN ELECTRIC COMPANY, INC.

Representative Ted T. Morioka

February 20, 1979

Page 3

conservation measures taken by the serviced area alleviate the need for this project?

RESPONSE: The load projections for the Pukele service area were made on the basis of known requests for service and not on population projections. The inclusion of a population forecast in the EIS is, therefore, inappropriate.

The proposed Halawa to Kamoku 138 KV transmission lines are to supply power to the Kamoku Substation service area. The Kakaako District will not be supplied by the Kamoku Substation and thus is not related to the subject 138 KV lines.

On page 13 of the EIS, we discuss why energy conservation measures taken by the service area will not alleviate the need for this project. As noted, energy reducing measures do not necessarily reduce peak demand. Consider as one example solar water heaters. These devices do reduce energy consumption. However, as soon as the weather turns bad for several days, as it has in recent months, the solar heater becomes ineffective and energy and peak demand are no longer affected by solar heaters. The weather is usually the worst in the winter months, which further compounds the problem because this is when the system peak occurs.

COMMENT: The document states that the project is needed because there is no space to expand the Pukele Station. However, the HECO has condemnation powers. Why hasn't this been considered as an alternative?

RESPONSE: The present Pukele Substation size is approximately 260 feet by 250 feet for a total of approximately 65,000 square feet. Although the lot size is larger, much of the land is unusable due to the hillside and adjacent stream. During the initial development of the substation site, the lot was graded and the hillside terraced to obtain the desired level area upon which the substation is situated.

It is reasonable to assume that at least 65,000 square feet of level land would be required to duplicate the Kamoku Substation in its entirety adjacent to the Pukele Substation. The company would attempt to negotiate the fee purchase of this land from the neighboring landowners prior to utilizing any condemnation powers. It should further be noted that,

HAWAIIAN ELECTRIC COMPANY, INC.

Representative Ted T. Morioka  
February 20, 1979  
Page 4

although the company has the power of condemnation, this power cannot be exercised unless it can be demonstrated that no other viable alternatives exist.

The expansion of the Pukele Substation area would not eliminate the need for new 138 KV lines to the Pukele Substation area since the duplicate substation would require power and backup capabilities. Finally, to export the power out of the new substation would require eight new 46 KV lines to the load areas. These eight 46 KV lines would require considerably more material and rights-of-way, thereby increasing the overall cost of the project, especially if overhead routes were not available and undergrounding of the 46 KV lines were required. Please note that the eight new 46 KV lines will be in addition to the eight 46 KV lines presently emanating from the Pukele Substation.

COMMENT: In computing the costs and benefits for the alternatives, the statement appears deficient in calculating costs for the impact on the various neighborhoods' aesthetic appearance which would probably affect marketability and land values. These are not adequately stated in terms of underground as compared to overhead wiring.

RESPONSE: The potential effects on property values due to overhead lines are addressed on pages 89-90 of the EIS. Based on this analysis, we have concluded that 138 KV overhead lines will not have any effects on property values in the area. Similarly, 138 KV underground lines will not have any effects on property values.

COMMENT: Some of the amounts used in calculating costs appear to be inaccurate such as those used for computing helicopter service costs.

RESPONSE: The lifting capacity of the commercial helicopters based in Hawaii is limited to approximately 1,800 pounds. These helicopters are primarily used by HECO for ferrying crews at the referenced rate of \$300 to \$400 per hours. The 3,500-pound capacity helicopter referenced in the EIS was utilized in 1977 on a wood pole project. The contract cost for this helicopter was \$20,000 and included shipping the helicopter to Hawaii from the mainland and a specified number of lifts. If the number of lifts was exceeded, the charge for the flight time (in 1977) was \$850 per hour. Therefore, when escalated to 1981 dollars the cost is approximately \$1,000 per hour.

HAWAIIAN ELECTRIC COMPANY, INC.

Representative Ted T. Morioka  
February 20, 1979  
Page 5

To further clarify the helicopter charges, it should be noted that, subsequent to the EIS submittal, HECO completed the installation of steel poles/structures on another project by utilizing a helicopter with a lifting capacity of approximately 9,000 pounds. The contract cost of using this helicopter included \$181,000 for shipping to Hawaii for a specified number of lifts and a \$1,800 per hour charge for additional work.

COMMENT: In addition, it is not clear as to the legality of preparing an EIS after decision-making (the CDDA) has already been made. Could clarification be provided on this matter?

RESPONSE: Attached is a May 6, 1977 letter (Ref: OA-4/2/75-657) from Mr. Christopher Cobb, Chairman of the Board of Land and Natural Resources to HECO on the Conservation District Use Application (CDDA). Paragraphs 5 and 6 rescind past Board action on the CDDA and indicates that the original CDDA is still in effect.

COMMENT: In addition to these concerns, we would like to point out to the Board of Land and Natural Resources that pages 11 and 13 of the document indicate this project's non-compliance with the State's objectives. The Land Board and other State agencies, however, are required to conform to the State Plan as mandated by Act 100, SLH 1978.

There also appears to be no one authority in charge of ensuring that the project has minimum adverse impacts on areas outside of the conservation district and I recommend that the Board of Land and Natural Resources, and Public Utilities Commission assume this responsibility in making their decisions on the project. It is further suggested that the Board of Land and Natural Resources, Public Utilities Division, and Public Utilities Commission also review all cost estimates presented in the document.

RESPONSE: Inasmuch as these paragraphs are directed to the Board of Land and Natural Resources, PUC, PUD and other state agencies, we shall limit our response by pointing out that the company is required by law to provide service upon demand and does not have the option to restrict or jeopardize electrical service to curtail growth. Therefore, we must continue to plan and

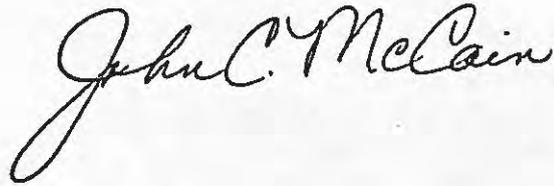
HAWAIIAN ELECTRIC COMPANY, INC.

Representative Ted T. Morioka  
February 20, 1979  
Page 6

construct facilities in a reasonable and prudent  
manner to meet the projected demand for service.

Thank you for your comments and we appreciate your interest and  
concern for this project.

Yours truly,

A handwritten signature in cursive script that reads "John C. McCain". The signature is written in dark ink and is positioned to the right of the typed name "John C. McCain".

JCMc:kh

May 6, 1977

REF: OA-4/2/75-657

Mr. Charles Ane  
Hawaiian Electric Company, Inc.  
900 Richards Street  
Honolulu, HI 96840

Dear Mr. Ane:

This is to reiterate the position of the Board of Land and Natural Resources regarding your Conservation District Use Application OA-4/2/75-657.

Insofar as the satisfaction of Chapter 343, Hawaii Revised Statutes, as it related to Chapter 183-41, HRS is concerned; an Environmental Impact Statement has been required in this project, no work within the State's Conservation District may proceed until such time as the BLNR has accepted this EIS, and approved your CDUA.

However, insofar as the satisfaction of Chapter 343, HRS by itself is concerned, Section 1:72 of EIS Regulations pertaining to applicant actions reads in pertinent part:

Acceptance of the required EIS will be a condition precedent to approval of the request and commencement of the proposed action.

It is my understanding that the EIS will encompass lands outside the Conservation District. As a consequence, our position is that no work be initiated on any land which will fall within the scope of the required EIS. In this manner, you will remain in compliance with Chapter 343, HRS and EIS Rules and Regulations.

Inasmuch as the required EIS is an integral part of CDUA OA-4/2/75-657, and, was initiated at your request, any past Board action on this CDUA is null and void.

ENCLOSURE

Mr. Charles Ana  
Page 2  
May 6, 1977

As a consequence, should the EIS be deemed non-acceptable, the effect will be to deny your application. Should the EIS be deemed acceptable, then the Board may modify the CDUA to whatever degree the Board feels necessary to insure whatever concerns articulated are alleviated.

Inasmuch as this EIS, although a departmental decision, was initiated at the request of Hawaiian Electric, I would appreciate your written concurrence to the above understanding by May 20, 1977.

If I may be of any further service, please feel free to contact Mr. Roger Evans of my Planning Office at 548-7837.

Very truly yours,

  
for CHRISTOPHER COEB  
Chairman of the Board

RCE:eyo

AFZV-EH-EE



6 FEB 1979

Office of Environmental Quality Commission  
550 Halekaiwila Street, Room 301  
Honolulu, Hawaii 96813

Gentlemen:

The Environmental Impact Statement (EIS) for the Proposed Halawa to Kamoku 138 KV Transmission Line, Honolulu, Oahu, has been reviewed and it appears that areas of concern to the US Army Support Command, Hawaii, have been adequately addressed. The proposed 138 KV transmission line will affect both Tripler Army Medical Center and Fort Shafter. However, the route will be generally along the present transmission lines for which Hawaiian Electric Company, Inc., has long term easements.

The opportunity to review the EIS is appreciated. The document is returned in accordance with your request.

Sincerely,

1 Incl  
As stated

CARL P. RODOLPH  
Colonel, CE  
Director of Engineering and Housing

Copies furnished:

Board of Land & Natural  
Resources  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

JOHN E. PEARSON, JR.  
LTC, Corps of Engineers

✓ Hawaiian Electric Company, Inc.  
P. O. Box 2750  
Honolulu, Hawaii 96803

# M&E Pacific, Inc.

*Environmental Engineers*

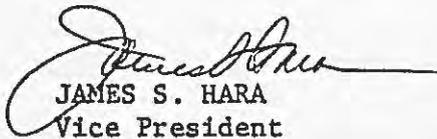
Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

February 13, 1979

Colonel Carl P. Rodolph  
Director of Engineering and Housing  
U. S. Army Support Command, Hawaii  
Fort Shafter, Hawaii 96858

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138KV Transmission Lines

Your review of the subject EIS is appreciated. The revised EIS is now being prepared and will be submitted to the Department of Land and Natural Resources and the Governor for acceptance and approval.



JAMES S. HARA  
Vice President

WW/ep



6 February 1979

Department of Land and Natural Resources  
1151 Punchbowl Street  
Honolulu, HI 96813

RE: Proposed Halawa to Kamoku 138 KV Transmission Line

Gentlemen:

As a future resident of Palolo Valley, I wish to make one comment on the Environmental Impact Statement for the referenced power line project.

While I can appreciate the long range need for increased electrical energy supply to the area served by the new Kamoku substation, I feel strongly that installing a high voltage line on steel towers in a residential neighborhood is the wrong way to go about it. I have seen installations of such lines on the 105 and 125 foot steel poles which you propose to use, and they absolutely devastate the scale and appearance of the neighborhoods. While the poles are of course less objectionable to the standard steel towers which they replace, they totally overwhelm the trees, houses and anything and everything else in the area.

Their "modern, slim" appearance is only relative, and the aesthetic impact cannot be satisfactorily assured, as claimed in M&E Pacific's 19 December 78 letter to Mr. Jack Gillmar.

Further, the photograph you provide to illustrate such an installation (Figure 14, page 78) clearly shows a much shorter and smaller diameter pole than the one proposed for this system. The poles shown appear to be around 50 feet in height and 1-1/2 feet in diameter, or less than half the dimensions of the proposed installation. Had you shown the true appearance of such a system, with the new steel poles dwarfing the trees, the reaction of readers of the EIS might be different.

MERCHANDISE MART BUILDING 1100 ALAKEA STREET ROOM 432  
HONOLULU HAWAII 96813 PHONE 808-524-6502

Department of Land and Natural Resources  
6 February 1979  
Page 2

I recommend that when the EIS is revised or when public hearings are held, a photograph of a comparable system be obtained and made available to reviewers for an accurate assessment of the visual impact of the proposed system.

Sincerely yours,

Cliff Terry, A.I.A.

CT/so

xc: Hawaiian Electric; Mr. Leigh Wai Doo

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable MEPAC

February 15, 1979

Pearson & Terry  
Merchandise Mart Building  
1100 Alakea Street, Room 432  
Honolulu, Hawaii 96813

ATTENTION: Mr. Cliff Terry, AIA  
SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138 KV Transmission Lines

The following is in response to your letter dated February 6, 1979 to the Department of Land and Natural Resources on the subject EIS.

We appreciate your suggestion of showing the true appearance of the steel poles, which are being proposed for use on the subject project and we enclose a copy of a photograph of HECO's existing 138 KV steel poles on School Street. This photograph will be used on page 78 of the revised EIS.

Although there will be a certain aesthetic impact due to the steel poles, this impact is greatly minimized by their slim and neat appearance and their wide spacing. This wide spacing and height prevents these poles from overwhelming the trees, houses and other things in the area as you suggest.

Thank you for your comments and your interest and concern for this project.

  
JAMES S. HARA  
Vice President

RSN/jn

Encl.



# Moiliili-McCully Community Council

2535 South King Street • Honolulu, Hawaii 96826 • Telephone (808) 955-1555



February 7, 1979

Department of Land and Natural Resources  
State of Hawaii  
1151 Punchbowl St  
Honolulu, HI 96813

and

Hawaiian Electric Company  
P. O. Box 2750  
Honolulu, HI 96803

Dear Sir,

We appreciate the opportunity to comment on the Environmental Impact Statement (EIS) for the Proposed Halawa to Kamoku 138 KV Transmission Lines by Hawaiian Electric Company (HECO).

We would appreciate further information regarding questions that were raised in our letter of September 11, 1978 but not fully addressed in the EIS.

a. Although Table 3 of your EIS gives recorded and projected peak loads, further detail would clarify the assumptions and scope of the forecast. Although a forecast has been made for the Pukele service area, it has not been made clear that servicing the Kamoku area is the best alternative to relieve the demand on the Pukele substation. Further questions related to the need of the transmission lines include: What other substations supply the Kamoku service area, and if any, what improvements can be made to the present system? What are the future population demands associated with the Kamoku service area as indicated in the forecasts, ie, where will future population growth occur within the Pukele area? How will the City Development Planning process and the planning that neighborhoods are undertaking affect future demand and services? How much will implementation of the project contribute to the servicing of the Pukele area peak load in 1981 and beyond?

b. In regard to the electro-magnetic radiation, please compare the safety standard of 10 milliwatts per square centimeter as stated in Newsweek magazine in their issue of July 17, 1978 and your Figure 15, Electro-static Field Gradient.

✓ c. What are the impacts of construction activity on businesses? We are especially concerned about the interruption of commercial activity on King Street and the consequences of such disturbance on those businesses that operate on a marginal basis.

d. Inclusion of a schematic diagram of a typical underground system and available methods to finance it would be helpful for a better understanding of the underground alternative. There has also been a previous indication by HECO that endorsed a route to Waikiki substation. What are the proposed routes and service areas of the 46 KV feeder circuits initially proposed for construction for the Kamoku system?

✓ e. What is the procedure and approvals required after completion of the EIS process?

We thank you for the opportunity to participate in the EIS process. Please keep us informed on the status of the proposal, during and after completion of the EIS.

Sincerely,

*Patricia Akamine* ~~est~~

Patricia Akamine  
President

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840



February 20, 1979

JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

ENV 2-1  
H-P-K  
NV/G/NV

Ms. Patricia Akamine, President  
Moiliili-McCully Community Council  
2535 South King Street  
Honolulu, Hawaii 96826

Dear Ms. Akamine:

Subject: EIS for the Proposed Halawa-Pukele-Kamoku 138 kv  
Transmission Lines

This is in response to your letter dated February 7, 1979 regarding the Environmental Impact Statement for the proposed Halawa-Pukele-Kamoku 138 kv transmission lines. The following responses are addressed specifically to the concerns and questions you discussed in your letter:

- COMMENT: Although Table 3 of your EIS gives recorded and projected peak loads, further detail will clarify the assumptions and scope of forecast.
- RESPONSE: The forecast is primarily based upon known, definite requests for service. Other parameters such as past trends, marketing analysis, economic forecasts, etc. are also used. Projections for Pukele service area peak loads were developed through the analysis of these parameters independent of the peak demand projection for Oahu.
- COMMENT: Although a forecast has been made for the Pukele service area, it has not been made clear that servicing the Kamoku area is the best alternative to relieve the demand on the Pukele Substation.
- RESPONSE: By dividing the Pukele service area into two parts and establishing the Kamoku Substation to serve one of these service areas, the anticipated overload condition of the Pukele Substation will be relieved. This is the best alternative as justified on page 6 of the EIS especially when compared with the other alternatives of doing nothing or expanding the existing Pukele Substation.

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Patricia Akamine  
February 20, 1979  
Page 2

COMMENT: What other substations supply the Kamoku service area, and if any, what improvements can be made to the present system?

RESPONSE: No other transmission substations serve the present Pukele service area.

COMMENT: What are the future population demands associated with the Kamoku service area as indicated in the forecast, i.e., where will the population growth occur within the Pukele area?

RESPONSE: As stated in response to your first comment, the forecast is based primarily on known, definite requests for service and not on population projections.

COMMENT: How will the City Development Planning process and the planning that the neighborhoods are undertaking affect future demand and services?

RESPONSE: All known requests for service in the future are reflected in the projections of demand and service. We would not know specifically how a planning process or the neighborhood planning effort may affect the future until these result in relatively concrete plans.

COMMENT: How much will the implementation of the project contribute to the servicing of the Pukele area peakload in 1981 and beyond?

RESPONSE: Approximately 20 percent of the Pukele area peakload will be serviced by Kamoku Substation in 1981. Beyond 1981, this percentage will increase as there are no plans for another transmission substation on the leeward side of the Koolaus between Kaimuki and Koko Head.

COMMENT: In regard to the electro-magnetic radiation, please compare the safety standard of 10 milliwatts per square centimeter as stated in Newsweek magazine in their issue of July 17, 1978 and your Figure 15, Electro-static Field Gradient.

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Patricia Akamine  
February 20, 1979  
Page 3

RESPONSE: In comparison to the standard level of 10 milliwatt per square centimeter, the calculated energy value for a person standing beneath a typical 138 kV line whose electrostatic field gradient is 0.65 kv/m would be 0.00006 milliwatt per square centimeter which is less than one one-hundred-thousandth of the safety level.

COMMENT: What are the impacts of construction activity on businesses? We are especially concerned about the interruption of commercial activity on King Street and the consequences of such disturbance on those businesses that operate on a marginal basis.

RESPONSE: If the proposed overhead route is approved, construction will be limited to a few pole sites at any one time and at least one lane will always be open for traffic. The impact of construction on an area will be only a few days at a time. Other probable impacts and their mitigating measures are summarized on page viii of the EIS.

In the area of King Street, one of the four traffic lanes may be closed with overhead construction and most of the parking spaces will be available. In the commercial area, between University Avenue and Old Waiialae Road, only four steel poles are planned. During the brief period of construction, we anticipate very minimal impact on the businesses and every effort will be made to accommodate the businesses affected.

With underground construction the impact during construction will be similar in nature but much more extensive both in duration and in area affected (see enclosed schematic diagram of a typical underground system). Two lanes of traffic will have to be closed along the entire route. While the closings may be done in sections of a few blocks at a time, the duration of each of these will be significantly longer than for overhead. In addition, the trenching required for underground could have an adverse impact on the businesses along the route.

COMMENT: Inclusion of a schematic diagram of a typical underground system and available methods to finance it would be helpful for a better understanding of the

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Patricia Akamine  
February 20, 1979  
Page 4

underground alternative. There has also been a previous indication by HECO that endorsed a route to Waikiki Substation. What are the proposed routes and service areas of the 56 kv feeder circuits initially proposed for construction for the Kamoku system?

**RESPONSE:** The attached drawing shows a typical 138 kv high pressure oil filled pipe type cable underground system. The typical plan view of the overhead to underground transition station would be required at Pukele and Kamoku Substations for Alternative H. One or more oil pumping stations (two alternates are shown depending on lot configuration) will be required between Pukele and Kamoku. Also shown is a cross sectional view of the underground cable and pipe installation.

As for methods of financing such an underground system, the customers in the area where the undergrounding is requested would have to contribute the difference between the underground installation and the equivalent overhead installation.

As for the 46 kv feeder circuits initially proposed for construction for the Kamoku system, two 46 kv circuits will be connected to two of the 46 kv circuits coming from Pukele Substation along Kapiolani and Date Streets. These 46 kv circuits will pick up load in the McCully and Waikiki areas.

**COMMENT:** What is the procedure and approvals required after completion of the EIS process?

**RESPONSE:** After the completion of the EIS process and the acceptance of the EIS, the Department of Land and Natural Resources must decide whether to approve, disapprove or modify the Conservation District Use Application. Subsequently, the PUC order to cease all work must be rescinded.

Plans must then be finalized; additional right-of-ways obtained if required; and appropriate construction permits approved. The determination of the approving

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Patricia Akamine  
February 20, 1979  
Page 5

agencies will depend on the selected route, the method of construction, and any modifications to present plans.

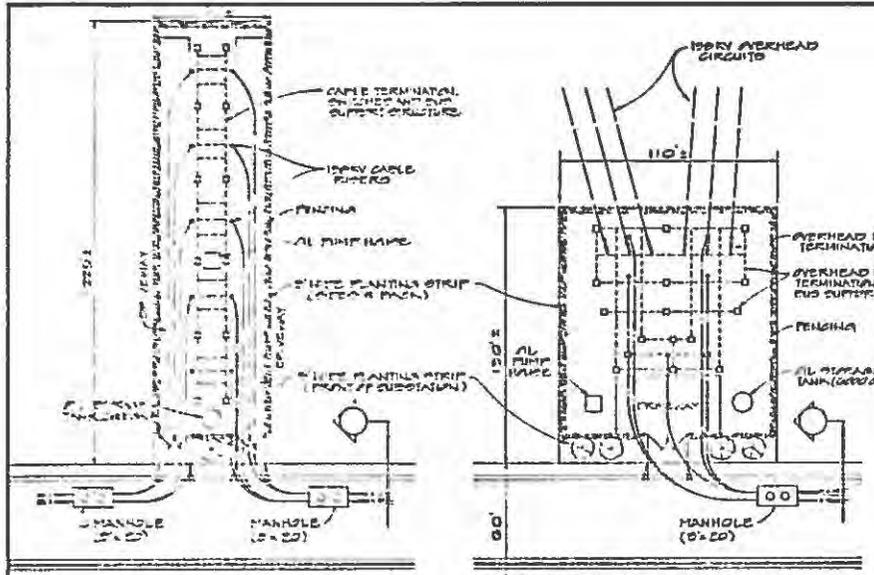
We hope the information provided is satisfactory and we appreciate your comments and your interest on this project.

Yours truly,

*John C. McCain*

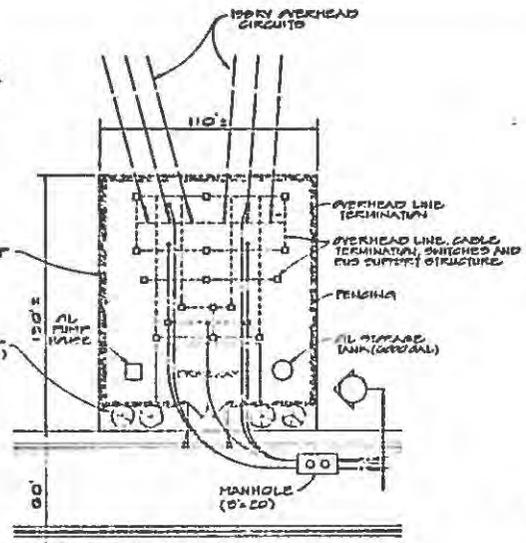
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Enclosure

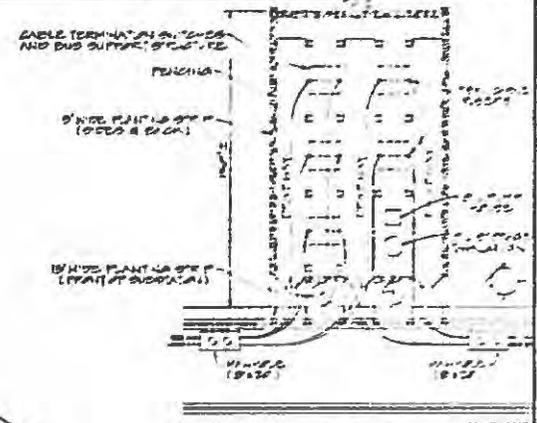


LATEREGROUND MID-SPAN OIL PUMP AND SUBSTATION (SEE ALTERNATE PLAN)

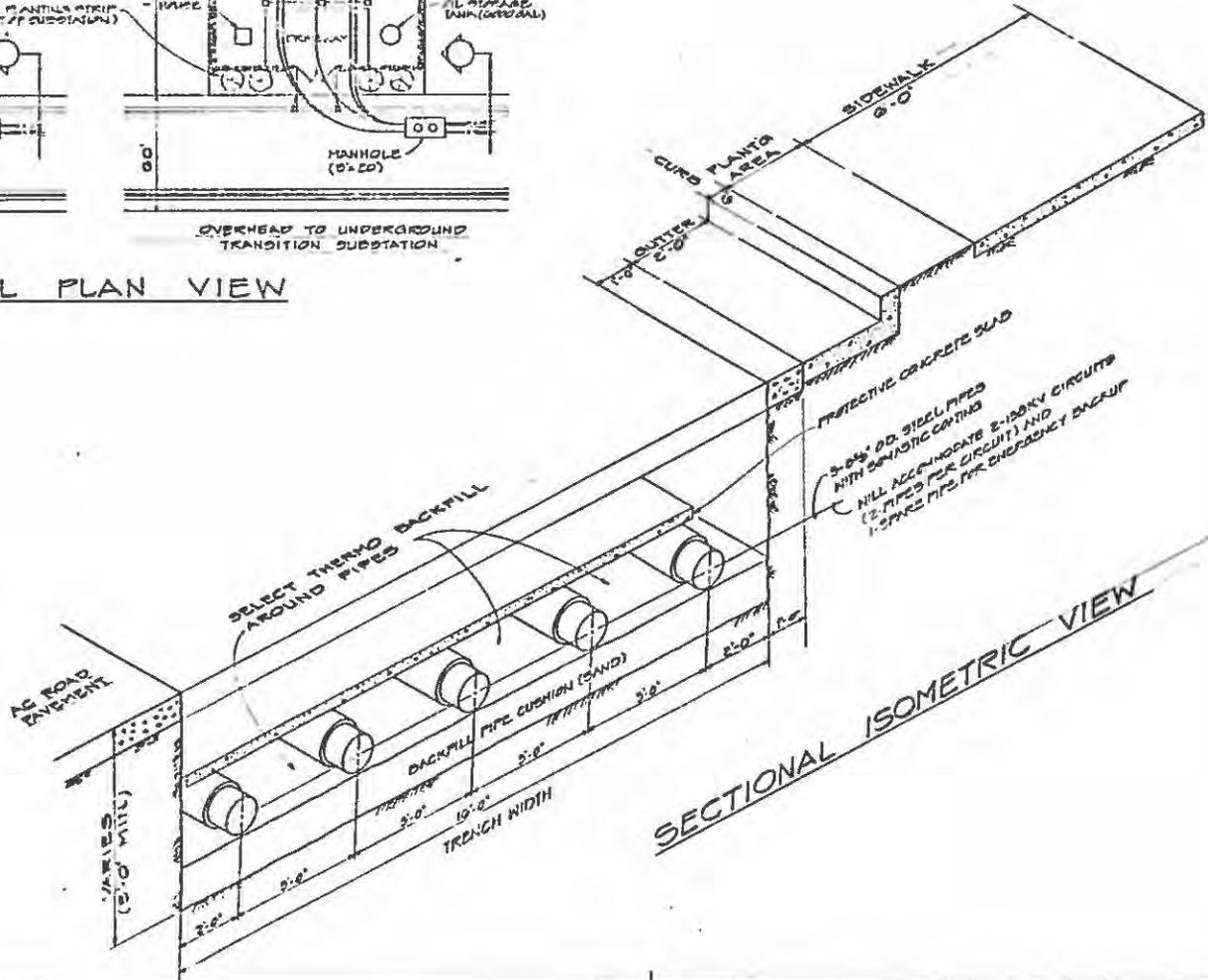
TYPICAL PLAN VIEW



OVERHEAD TO UNDERGROUND TRANSITION SUBSTATION



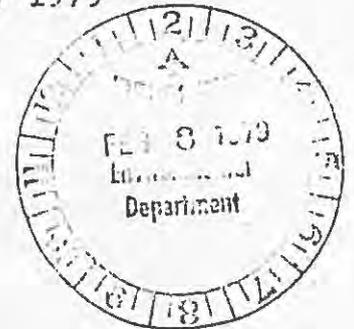
TYPICAL PLAN VIEW



SECTIONAL ISOMETRIC VIEW

110KV - 0- PRESSURE OIL FILLED PIPE TYPE CABLE INSTALLATION	
DATE	BY
DESIGNED BY	CHECKED BY
APPROVED BY	DATE

2660 C Waiomao Homestead Rd.  
Honolulu, Hawaii 96816  
7 February 1979



Board of Land and Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

Reference: Environmental Impact Statement  
for the Proposed Halawa to Kamoku  
138KV Transmission Line

Dear Sirs:

This letter is to provide my comments that the above-referenced Environmental Impact Statement prepared for Hawaiian Electric Company is inadequate in content and procedures in at least the following respects:

1. The archeological reconnaissance of the proposed 138KV transmission line to Pukele substation is inadequate. Only three sentences describe the reconnaissance in Palolo Valley. It noted: "The right of way was not surveyed because of the difficulty of access to the area ... the possibility of their presence should not be discounted", page 83.

2. The baseline study of birds and mammals along the proposed HECO 138KV transmission line is inadequate. The investigator did not go into areas where the KV line would most likely encounter birds and mammals but rather went only to that section which he could reach by automobile on a paved road. See page b-21, wherein it states: "I made only one field trip to Palolo Valley going as far as the HECO substation (elevation approximately 500 feet) at the end of Myrtle Street."

3. There is inadequate discussion of the alternative of no action. The need for the two transmission line is stated because "overload conditions could occur at

the Pukele substation if a major component failed or was shut down during peak demand periods." See page IX. There is no statistical notation of failure or shutdown during peak demand periods, how often unlikely either occurs, how such failure or shutdown is handled presently, what can be done to mitigate such failure or shutdown and the affects of them, specific examples and effects of failure and shutdown historically, and numerous other matters to completely discuss the environmental impact of no action.

4. There is no discussion as to why the transmission lines should go to the Pukele substation. There is strong indication that the Pukele substation lends no assistance to the transmission of the power from Halawa to Kamoku. It is noted that the line could go directly from Halawa to Kamoku by underground or sea cable or other overhead routes, as an indication that the Pukele substation does not assist the transmission.

5. There is no discussion for provision of an emergency power generation unit to provide load relief when major components of the existing station failed or had shut down during peak demand periods. The submitted EIS speaks only of the development of an entirely new generation plant; that alternative exaggerates the environmental impact since a new power plant would be in excess of the needs.

6. There is an inadequate showing that the consequences of not implementing the proposed project are substantially more undesirable than the adverse impacts associated with the project. See page 6.

7. There is inadequate justification and statistical evidence of need to "support a growing electrical load in Waikiki area" as noted in the HECO EIS preparation notice and to relieve the anticipated overload conditions of the Pukele substation. It is noted in the report that the population of Palolo has decreased and that the population of Waikiki is anticipated to increase; there is no mention of the effects of the Waikiki general plan or the Waikiki special design ordinance and whether such ordinances came into effect after the projected Waikiki population figures were made.

8. There is no discussion at all of the state's as well as the county's general plans, land use plans, policies and controls for Palolo and the alternative areas and how that is affected by the proposed transmission line.

9. There is no specific reference to related projects, public and private, existing or planned in the region of Palolo and other areas proposed for the routes for purposes of examining the possible overall cumulative impact of the transmission line through Palolo and other alternative routes.

10. There is inadequate discussion, and no data, with respect to increasing electrical per capita demand, as well as commercial and light industry demand in Palolo and other alternative routes. There is no discussion of an alternative to the main way of increasing the reliability by providing redundancy of components. Page 16 bottom says two lines from different sources are required. There is no discussion of an alternative to the main way of increasing reliability. Or why redundancy of components is the main way.

11. There is inadequate discussion of the environmental impact and disadvantages of all proposed routes, particularly lines l, 2, c, e, f. The LIS primarily states without quantification, without statistical notation and without other support that "the major disadvantages (of the above routes) are 1) detrimental aesthetic effects, 2) added potential traffic hazards and 3) objections by residents along the route." Said objections, disadvantages, major as well as minor in the perspective should be addressed in detail. It was not.

12. There is inadequate discussion of alternatives g, h and i, proposals with the least urban impact. There is also no data on the simultaneous failure per year per mile of double circuit lines; this data is needed to discuss alternatives.

13. There was no discussion, figures or statistics with respect to the difference in costs of maintenance on the different routes alternatives. Cost of maintenance has been stated as one of the reasons for HECO's preference. Said costs should be statistically justified and discussed.

14. There is no justification or evidence to support the statement that the underground alternative would interfere with other utilities making that alternative technically infeasible. Page 34 notes only "it may be found with further study that the interference with other utilities would make this alternative technically infeasible". The EIS is incomplete dismissing alternative proposals with speculative conclusionary remarks as the above statement.

15. The EIS submitted January, 1979 is biased in its entirety as a document and affects each and every portion of the statement indirectly as well as directly.

16. The cost breakouts for the line alternatives is misleading by inclusion of the cancellation charges. The cancellation charges is a figure on how much HECO expects to lose in cancelling the order for steel poles specifically designed for lines 1 and 2. See page 35. The bias is evidenced by the addition of this cancellation charge unto all line alternatives but for lines 1 and 2. There is no justification for the cancellation of charges to be included in the EIS; by its inclusion persons directly affected by lines 1 and 2 in Palolo Valley are prejudiced adversely. Further there is no specification or evidence that the cancellation charges are accurate. Even the EIS notes "perhaps the most fair cost comparison would be the subtotal without the cancellation charges".

17. There is inadequate discussion of the feasibility, costs and legal difficulty of obtaining routes along the freeway and underground.

18. There is inadequate discussion of the construction costs in conservation and urban areas with precise costs breakouts. For example there is no discussion in the difference in costs for a pole to come from a marshalling

area as opposed to being assembled on the site and where and in which routes the marshalling or assembly would be required. See page 44, EIS.

19. There is inadequate discussion of the effects on the beautification of the community through which the lines run and the costs and value of real estate and homes through which the lines run. There is no discussion for example of the poles taking up three feet of a sidewalk through Palolo Valley, thus making electric line poles taking up three feet of sidewalk along both sides of the street at Palolo Avenue and 10th Avenue.

20. There is inadequate discussion of the nausea, lassitude, loss of appetite, and reduced sex drive of USSR and Spanish workers due to exposure to electrical fields under extra high-voltage power lines. There is no discussion of Minnesota experiments conducted in recent years and reported in the Environmental Law Reporter. There is no research given and provided as to the effects of the lines when a person lives directly under or within 200 feet of the line for that person's entire life as would be the case in urban areas if the lines were to run through urban areas. There is inadequate discussion of the harm the 133 KV lines may have on people.

21. The few studies referred to in the references on the effects of the power line on humans and animal behavior are very old, being studies made in 1966, 1967, 1974 and 1972. No study has evidenced that exposure to the electrical fields is harmless. There is inadequate study of the effects of the photochemical oxidants produced by corona discharge from electrical apparatus and transmission lines.

22. There is no study, research or evidence that the low frequency noises due to corona discharge is not harmful to humans in the course of their lifetime. It is noted that this low frequency noise due to corona discharge may be audible to some persons, see page 95. It is further noted that it is only anticipated that little noise will be audible. Such anticipation is speculation and the EIS is inadequate.

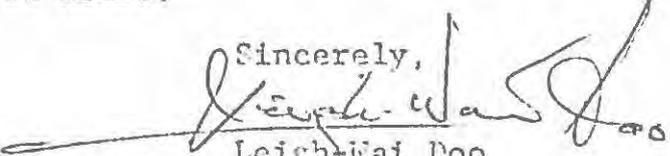
Board of Land and Natural Resources  
Page Six  
7 February 1979

23. The discussion of alternatives to the proposed action, page 102-103, is entirely conclusionary, biased, and unsupportive by specific evidence and research. The final paragraph on page 103 provides no justification and provides only speculation. It states: "Since there is no convincing reason to believe that the peak demand in the Pukele service area will decrease in the foreseeable future, the no-action alternative would only delay the project, perhaps with the result that future action is taken hastily under semi-emergency conditions, resulting in greater construction-related impacts."

24. The interests and considerations of governmental policy thought to offset the adverse environmental affects of the proposed action is inadequate. See page 109. There is no discussion of having customers (principally those utilizing the increase in demand in Waikiki and Moilili) contribute the difference in cost between overhead and underground lines. When this occurs, this alternative can be done according to HECO's rules. There is no discussion of this in the EIS statement.

25. The botanical study for the FIS is inadequate in that the study site was only that area immediately adjacent to the Pukele station, see page C13, and not the proposed route through Palolo's conservation as well as urban land. There has not been in fact any identification of the exact location of pole sites.

26. The responses to comments prior to the EIS filing were inadequate and affects the inadequacy of the EIS. For example, in the response to Representative Morioka on page 9, it is noted "As homes are located some distance away from the line, it is not expected that there will be effects on homes with metal roofs or otherwise." Homes will be as close as 200 feet away from the lines in Palolo. The EIS does not clarify the "expectations" that there will be no effect on homes with metal roofs because it does not at any time address metal roofed homes.

Sincerely,  
  
Leigh-Wai Doo

cc: Hawaiian Electric Company

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840



JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

February 20, 1979

Mr. Leigh-Wai Doo  
2660 C Waiomao Homestead Road  
Honolulu, Hawaii 96816

Dear Mr. Doo:

SUBJECT: Environmental Impact Statement for the  
Proposed Halawa-Pukele-Kamoku 138 KV  
Transmission Line

This is in response to your letter of February 7, 1979 to the Board of Land and Natural Resources concerning the Environmental Impact Statement for the proposed Halawa-Pukele-Kamoku 138 KV transmission lines. The following responses address the specific concerns discussed in your letter.

COMMENT: 1. The archeological reconnaissance of the proposed 138KV transmission line to Pukele substation is inadequate. Only three sentences describe the reconnaissance in Palolo Valley. It noted: "The right of way was not surveyed because of the difficulty of access to the area...the possibility of their presence should not be discounted", page 83.

RESPONSE: In the introduction to the archaeological report, the investigator states that he did not survey areas where the likelihood of finding archaeological remains was low. He also cautions that the report provides only an indication of what should be expected. On page A-3, as you mention, he states that, "The extreme inland portion of this part of the proposed powerline right of way was not surveyed because of the difficulty of access to the area."

Based on the entire archaeological study and the contents of the total report, we feel that the section of powerline route not surveyed is not critical and the report is adequate. We plan to follow the recommendations of the archaeological report and will have each pole location inspected prior to disturbance. If anything of archaeological value is found, one of the three mitigating measures outlined in the report will be implemented.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 2

COMMENT: 2. The baseline study of birds and mammals along the proposed HECO 138KV transmission line is inadequate. The investigator did not go into areas where the KV line would most likely encounter birds and mammals but rather went only to that section which he could reach by automobile on a paved road. See page b-21, wherein it states: "I made only one field trip to Palolo Valley going as far as the HECO substation (elevation approximately 500 feet) at the end of Myrtle Street."

RESPONSE: As indicated in response to your comment number 1, we plan to have an archaeologist and biologist accompany field crews during the surveys of each pole site. Should any rare or endangered species be found at the pole site, mitigation measures will be implemented. The large expense of a pre-survey study of each pole site prior to approval of the routing is not justified since environmental values will be retained with our mitigation measures.

COMMENT: 3. There is inadequate discussion of the alternative of no action. The need for the two transmission line is stated because "overload conditions could occur at the Pukele substation if a major component failed or was shut down during peak demand periods." See page IX. There is no statistical notation of failure or shutdown during peak demand periods, how often unlikely either occurs, how such failure or shutdown is handled presently, what can be done to mitigate such failure or shutdown and the affects of them, specific examples and effects of failure and shutdown historically, and numerous other matters to completely discuss the environmental impact of no action.

RESPONSE: The alternative of no action or postponing the project would mean that consumers will incur increasingly more severe outages with time. We do not view this as a viable alternative to the project since it means that we cannot meet our responsibility for planning, designing, and installing facilities to provide adequate, reliable service at the least cost to the consumers. The EIS Regulations require the consideration of "Any known alternatives for the action which could feasibly attain the objectives of the action...". No action or postponement of the project would not attain the objectives of the project nor fulfill our responsibilities.

The probability of failure of each component of the 138 KV transmission system and 46 KV transmission

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 3

system was not used in the single failure analysis. A full probabilistic analysis of failure modes including mean time to failure, mean time to repair and effect on consumers is, at this time, computationally infeasible. The problem is further compounded by the "cascade" effect when a failure causes other components to fail producing events which are not independent of each other. The Electric Power Research Institute is conducting research into algorithms and computational methods to attempt to make a probabilistic analysis of a complex electrical system feasible with modern computational equipment.

It is the policy of the company that no single failure in the 138 KV transmission system, the 138 to 46 KV transmission substations, or the 46 KV subtransmission system will cause failure of other equipment due to overload or will cause major extended outages to the consumers.

COMMENT: 4. There is no discussion as to why the transmission lines should go to the Pukele substation. There is strong indication that the Pukele substation lends no assistance to the transmission of the power from Halawa to Kamoku. It is noted that the line could go directly from Halawa to Kamoku by underground or sea cable or other overhead routes, as an indication that the Pukele substation does not assist the transmission.

RESPONSE: The combination of either Alternative I-A (Leeward Koolau Route) or Alternative I-B (Trans-Koolau Route) with Alternative G (Double Circuit on Waahila Ridge) would result in two circuits to Kamoku from Halawa without any reconnections required at Pukele Substation. However, utilization of this arrangement would make the system more susceptible to the possibility of a total outage at Kamoku since both circuits to Kamoku would be supported on the same structure.

COMMENT: 5. There is no discussion for provision of an emergency power generation unit to provide load relief when major components of the existing station failed or had shut down during peak demand periods. The submitted EIS speaks only of the development of an entirely new generation plant; that alternative exaggerates the environmental impact since a new power plant would be in excess of the needs.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 4

RESPONSE: The question of installing an emergency generator must properly be addressed from the standpoint of where the emergency generator would do the most good. For example, should the generator be located at Pukele, the 46 KV lines would not be relieved of any overloads caused by loads being transferred among the lines because of failure or maintenance of various major components. In this respect, the capacity of the 46 KV line is the constraint rather than the power capability at Pukele. Further, as mentioned in the EIS, Pukele Substation cannot be expanded to accommodate the generator.

It is therefore reasonable to suggest that the generator be located in those areas where the load exists (e.g. at the distribution substations). In this situation, should any major components be out of service due to maintenance or failure, any overloads on the 46 KV lines could be relieved by the emergency generators located at the distribution substations. However, it should be noted that an emergency generator sized at 3 megawatts (3 million watts, one percent of the projected load at Pukele Substation) would require the installation of a generating facility about the size and weight of a railroad locomotive. The noise, smoke, and fuel delivery associated with this type of facility makes this type of installation unattractive. Further, space limitations at the distribution substation would severely restrict our ability to install such facilities.

COMMENT: 6. There is an inadequate showing that the consequences of not implementing the proposed project are substantially more undesirable than the adverse impacts associated with the project. See page 6.

RESPONSE: The consequences of not implementing the project are stated on the first paragraph on page 11 of the EIS: "This means that, as the population and power demands grow, there will be an increase in frequency and duration of power outages, unless the transmission and transformer capacity is increased." The impact of outages is discussed on page 102. Another important adverse impact of no action is that the company would be derelict in its responsibility since we are required by law to provide adequate, reliable electrical service to our consumers. Based on the above, we feel that the EIS adequately shows the consequences of not implementing the proposed project.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 5

COMMENT: 7. There is inadequate justification and statistical evidence of need to "support a growing electrical load in Waikiki area" as noted in the HECO EIS preparation notice and to relieve the anticipated overload conditions of the Pukele substation. It is noted in the report that the population of Palolo has decreased and that the population of Waikiki is anticipated to increase; there is no mention of the effects of the Waikiki general plan or the Waikiki special design ordinance and whether such ordinances came into effect after the projected Waikiki population figures were made.

RESPONSE: The need to relieve load on the Pukele Substation is based on known service requests from customers in Waikiki as well as the other areas within the existing Pukele Substation service area. These service requests are considered to be privileged information between the customer and the company.

It is assumed that these service requests reflect compliance with all applicable Waikiki general plan and the Waikiki Design District ordinances and further reflect any anticipated population increases in the Waikiki area.

COMMENT: 8. There is no discussion at all of the state's as well as the county's general plans, land use plans, policies and controls for Palolo and the alternative areas and how that is affected by the proposed transmission line.

RESPONSE: Pages 69 through 72 of the EIS, "The Relationship of the Proposed Action to Land Use Plans, Policies, and Controls for the Affected Areas," contains a discussion which specifically addresses your concerns. In addition, the consultation procedures during the preparation of the EIS and the dissemination, review, comment, and response procedures after the draft EIS was completed, assures that the plans and projects, existing or planned, are discussed in the EIS.

COMMENT: 9. There is no specific reference to related projects, public and private, existing or planned in the region of Palolo and other areas proposed for the routes for purposes of examining the possible overall cumulative impact of the transmission line through Palolo and other alternative routes.

RESPONSE: The company is in constant contact with the various departments of the City and State and with the other

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 6

utilities. The company is a member of the Utilities Coordinating Committee which meets monthly under the direction of the City and County Department of Public Works, Division of Engineering. Projects currently being coordinated include East Kakaako Major Drain, Piikoi Street Widening, Kuhio Avenue Sewer Project, etc. The company also attends monthly utilities committee meetings with the State Department of Transportation, Land Transportation Facilities Division, and is a member of the Hawaii Joint Pole Committee. As such, construction activities among governmental agencies and other utilities are well planned in advance to minimize the overall impact on the community through which any project is planned. Projects planned by private enterprises are also coordinated well in advance as service requests are normally received early along with preliminary plans for review and comments.

COMMENT: 10. There is inadequate discussion, and no data, with respect to increasing electrical per capita demand, as well as commercial and light industry demand in Palolo and other alternative routes. There is no discussion of an alternative to the main way of increasing the reliability by providing redundancy of components. Page 16 bottom says two lines from different sources are required. There is no discussion of an alternative to the main way of increasing reliability. Or why redundancy of components is the main way.

RESPONSE: The company is required by law to provide adequate, reliable electric power to meet the demands within its service area. Definite, known requests for service have been received for various types of customers within the Pukele Substation service area. As such, the total demand for the service area and not the demands of individual classes of consumers is the justification of the need for additional capacity.

Redundancy of major components is the primary method of maintaining reliability within the 138 KV transmission system. Within the subtransmission system, reliability can be maintained not only by redundancy of components but also by transfer of loads by switching and interties between two or more lines. However for the transmission system, Hawaii is unlike the mainland where one utility can tie its transmission system into that of surrounding utilities as well as incorporate redundancy of components to maintain reliability to its consumers. Hence due to Hawaii's geographic isolation, the company does not have the option of tying into adjacent

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 7

transmission systems and must therefore rely on redundancy of components as the main way of maintaining reliability within its 138 KV transmission system.

COMMENT: 11. There is inadequate discussion of the environmental impact and disadvantages of all proposed routes, particularly lines 1, 2, c, e, f. The EIS primarily states without quantification, without statistical notation and without other support that "the major disadvantages (of the above routes) are 1) detrimental aesthetic effects, 2) added potential traffic hazards and 3) objections by residents along the route." Said objections, disadvantages, major as well as minor in the perspective should be addressed in detail. It was not.

RESPONSE: Pages 75 through 92 of the EIS are devoted to the environmental impact of routes between Pukele and Kamoku. The quantification and statistical notation on aesthetic effects, potential traffic hazards, and resident objections are generally difficult to do in a manner satisfactory to reviewers, and many attempts to quantify these effects in an EIS have been labeled speculative or inappropriate.

COMMENT: 12. There is inadequate discussion of alternatives g, h and i, proposals with the least urban impact. There is also no data on the simultaneous failure per year per mile of double circuit lines; this data is needed to discuss alternatives.

RESPONSE: In reference to Figure 1 of the existing 138 KV circuits on Oahu, there are approximately 31 miles of double circuit lines presently in existence. With three 138 KV double circuit failures in the last nine years, this amounts to 0.0106 failures per mile per year. With 2.1 miles of double circuit lines on Waahila Ridge, as indicated in alternatives g, h, and i, this translates to 0.0223 failures per year, or about one failure in 45 years. Although this does not appear to be of much concern, it should be noted that failure of any one of the existing double circuit lines shown on Figure 1 would not result in an outage to a substation as no two lines to any substation are on the same double circuit structure. In the case of Kamoku, however, the entire substation would sustain an outage should a failure occur on the portion of double circuit line on Waahila Ridge.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 8

COMMENT: 13. There was no discussion, figures or statistics with respect to the difference in costs of maintenance on the different routes alternatives. Cost of maintenance has been stated as one of the reasons for HECO's preference. Said costs should be statistically justified and discussed.

RESPONSE: In each description of the alternative routes, only relative ease or difficulty of maintenance is mentioned and not maintenance costs. For example, maintenance in urban areas would be relatively easy as line trucks with extendable booms can be driven to each pole site. Maintenance in mountainous areas would be relatively difficult as access to pole sites would be restricted to hiking or by helicopter and pole maintenance must be performed by climbing the poles. As for underground or submarine cables, not much regular maintenance can be performed. The difficulties of maintenance of underground lines in urban areas and of submarine cables are discussed on pages 95-98 of the EIS.

COMMENT: 14. There is no justification or evidence to support the statement that the underground alternative would interfere with other utilities making that alternative technically infeasible. Page 34 notes only "it may be found with further study that the interference with other utilities would make this alternative technically infeasible". The EIS is incomplete dismissing alternative proposals with speculative conclusionary remarks as the above statement.

RESPONSE: The conclusionary remarks are based on our past experience with 12 and 46 KV ductlines. Interference with existing utilities has been encountered which resulted in the rerouting of the ductline onto another alignment or required relocation of the other utilities at our expense. Also, preliminary studies along the underground routes indicated the presence of sewer lines, storm drains, and obstacles such as bridges crossing Palolo Stream. Considering the magnitude of 138 KV underground construction, it is highly probable that interference with existing utilities would occur which would make the underground alternative infeasible.

COMMENT: 15. The EIS submitted January, 1979 is biased in its entirety as a document and affects each and every portion of the statement indirectly as well as directly.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 9

RESPONSE: One of our objectives is to eliminate in the EIS the biases to which you refer, therefore, we appreciate your specific comments which aid us in meeting this objective.

COMMENT: 16. The cost breakouts for the line alternatives is misleading by inclusion of the cancellation charges. The cancellation charges is a figure on how much HECO expects to lose in cancelling the order for steel poles specifically designed for lines 1 and 2. See page 35. The bias is evidenced by the addition of this cancellation charge unto all line alternatives but for lines 1 and 2. There is no justification for the cancellation of charges to be included in the EIS; by its inclusion persons directly affected by lines 1 and 2 in Palolo Valley are prejudiced adversely. Further there is no specification or evidence that the cancellation charges are accurate. Even the EIS notes "perhaps the most fair cost comparison would be the subtotal without the cancellation charges".

RESPONSE: Purchase orders for the line 1 and 2 steel poles were placed with the manufacturers in 1975. At that time, we were in compliance with all applicable State of Hawaii laws and City and County ordinances and were not required to submit an EIS and/or cost comparisons. Subsequent to the placing of the orders, however, various State of Hawaii and City and County ordinances were enacted that resulted in various public and governmental informational meetings.

At that time, the purchase orders were placed in suspension and negotiations with the steel pole manufacturer were undertaken to determine the cost of cancelling the purchase orders. These negotiations resulted in a dollar figure being placed on any order cancellation to compensate the manufacturer for expenses incurred. Therefore, a true cost comparison must include the cancellation costs for all urban alternatives other than lines 1 and 2 since we had proceeded with the necessary engineering and material ordering in good faith and in compliance with all applicable laws during the initial stages of the project.

COMMENT: 17. There is inadequate discussion of the feasibility, costs and legal difficulty of obtaining routes along the freeway and underground.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 10

RESPONSE: The "Rules and Regulations Relating to the Accommodation and Installation of Utilities on State Highways and Federal Aid Secondary County Highways" which are promulgated under the authority of Sections 264-23 and 264-24 and Chapter 91, Hawaii Revised Statutes, specifically states:

VI. Requirements-Freeways

This provision will also apply to ramps of freeways.

- A. A utility will not be permitted to be installed longitudinally within the control of access lines of a freeway and any utilities located outside the control of access lines cannot be serviced by access from the through-traffic roadways or ramps.

Based on the above regulation, a double circuit overhead line along the freeway (no matter at what voltage) will not be permitted by the State Department of Transportation. Therefore, no further discussion of this route is required since it is not a viable alternative to the proposed project.

As for underground routes, the EIS thoroughly describes construction of 138 KV transmission lines on pages 47-49, and the costs are addressed in Tables 6 and 7. As for legal difficulty, the underground routes are located within city streets and, as such, require only city approval.

COMMENT: 18. There is inadequate discussion of the construction costs in conservation and urban areas with precise costs breakouts. For example there is no discussion in the difference in costs for a pole to come from a marshalling area as opposed to being assembled on the site and where and in which routes the marshalling or assembly would be required. See page 44, EIS.

RESPONSE: Marshalling areas will be required for any alternative route chosen. These marshalling areas are open areas where the pole segments can be received (after unloading off the ship from the mainland), inspected, and prepared for installation. Ideally, these marshalling areas are located in the midst of the project area to minimize excess traveling time. Further, these open areas are usually leased for the short term from the landowner with proper precautions (fences) taken to protect the public safety as well as HECO's equipment and materials.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 11

Regarding construction costs, for the specific example cited (i.e., assembly at the marshalling area versus assembly at the pole site), the cost differential is not substantial since the heavy equipment to be utilized would be the same in both cases.

With reference to construction costs in conservation areas, HECO recently completed a similar type of pole installation using a helicopter capable of lifting 9,000 pounds. Since there were no helicopters in Hawaii with this capacity, HECO contracted for the use of the helicopter at a base cost of \$181,000 to ship the helicopter to Hawaii for a specified number of lifts. Any work done outside of the base contract was quoted at \$1,800 per hour.

As noted in the EIS, the helicopter would take the place of cranes and transportation equipment as the helicopter would transport the bottom section of the pole from the marshalling area to the site and lower this section onto the anchor bolts in the foundation. The next section would then be picked up at the marshalling yard, transported to the pole site, and lowered onto the bottom section. This process is continued until all sections are slipped into place. Note that each section of pole transported to the site is considered as one lift. Therefore, exact costs cannot be determined until final drawings are received from the steel pole manufacturer. The number of pole sections shown on these drawings would then determine how many lifts would be required. A contract would then be negotiated with a helicopter company.

COMMENT: 19. There is inadequate discussion of the effects on the beautification of the community through which the lines run and the costs and value of real estate and homes through which the lines run. There is no discussion for example of the poles taking up three feet of a sidewalk through Palolo Valley, thus making electric line poles taking up three feet of sidewalk along both sides of the street at Palolo Avenue and 10th Avenue.

RESPONSE: The long-term negative impacts to aesthetics and property values are discussed on pages 76 and 89 respectively. The restrictions on private property and along city streets are discussed on pages 90 and 92.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 12

In general, the steel poles will be located on one side of the street and will occupy the planting area allocated for utility use between the curb and the concrete sidewalk. At these locations the intrusion of the poles into the concrete sidewalk area utilized by pedestrians will be minimal. Likewise, the existing wood poles on the opposite side of the street are also located in the planting area. It should be noted that the diameters of these wood poles are much smaller than the steel poles. An attempt has been made to assess the effect of the proposed project by comparing average sales of properties adjacent to 138 KV overhead lines with the average sales of the applicable tax division.

COMMENT: 20. There is inadequate discussion of the nausea, lassitude, loss of appetite, and reduced sex drive of USSR and Spanish workers due to exposure to electrical fields under extra high-voltage power lines. There is no discussion of Minnesota experiments conducted in recent years and reported in the Environmental Law Reporter. There is no research given and provided as to the effects of the lines when a person lives directly under or within 200 feet of the line for that person's entire life as would be the case in urban areas if the lines were to run through urban areas. There is inadequate discussion of the harm the 138 KV lines may have on people.

RESPONSE: Pages 81 to 87 of the EIS discuss the potential health effects of 138 KV lines. Further discussion on the effects of exposure to electrical fields is in referenced documents at the end of the EIS. We agree that no research is given and provided on lifetime (greater than two decades) exposure to electric fields and low frequency noises due to corona discharge. Photochemical oxidants are discussed on page 86, and a summary of research on the biological effects due to electrostatic fields is provided on page 84.

No reputable scientist would state that any action is harmless, rather, the threshold of measurable response is usually presented. A recent article in the January 4, 1979 issue of Public Utilities Fortnightly reviews the health effects associated with high voltage lines; most studies on extra-high voltage (345 - 765 KV) field effects fail to document any adverse field effects.

Dr. Harry Kornberg, a specialist on biological effects research at EPRI, says that under a typical 765-kilovolt

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 13

line, at its closest proximity to the ground, which is usually near midspan, the field is about eight to ten kilovolts per meter (0.65 for 138 KV) at a measurement point about 1.5 meters (five feet) above the ground. "A person standing on the ground in this field would have about 120 microamperes flowing through him, about 1/10,000 of the current flowing through a 100-watt light bulb. Leakage currents from metallic household appliances cause 200 to 300 microamperes of current flow in grounded persons holding them," states Dr. Kornberg. He further notes that the American National Standards Institute's maximum leakage current is 500 microamperes for portable appliances and 750 microamperes for stationary appliances. (Currents greater than 500 microamperes are normally required for a person to receive a small shock.)

The predicted electrostatic field of 0.65 KV/m directly under our proposed overhead lines is far below the level of measurable physiological response. In general, our reasonably extensive review of the literature failed to locate any report of adverse health impact due to fields of this low intensity.

COMMENT: 21. The few studies referred to in the references on the effects of the power line on humans and animal behavior are very old, being studies made in 1966, 1967, 1974 and 1972. No study has evidenced that exposure to the electrical fields is harmless. There is inadequate study of the effects of the photochemical oxidants produced by corona discharge from electrical apparatus and transmission lines.

RESPONSE: Refer to response to your comment number 20.

COMMENT: 22. There is no study, research or evidence that the low frequency noises due to corona discharge is not harmful to humans in the course of their lifetime. It is noted that this low frequency noise due to corona discharge may be audible to some persons, see page 93. It is further noted that it is only anticipated that little noise will be audible. Such anticipation is speculation and the EIS is inadequate.

RESPONSE: Corona is usually a concern at voltage levels of 345 KV and above. Corona can be fairly well predicted and controlled for 138 KV lines as stated in the EIS.

As mentioned on page 86 of the EIS, corona discharge can be caused by the conductor surface gradient

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 14

exceeding a critical value. The calculation of the conductor surface gradient is dependent on the conductor size, line configuration, and the voltage. The critical value can also be calculated given the conductor size, condition of the surface, and the weather conditions.

Based on the above parameters, it can be shown that the determination of whether or not corona will be present is dependent on the proximity of 138 KV lines and the weather conditions. In general, it can be demonstrated that the probability of corona increases during rainy weather. However, it has been the company's experience that corona related problems have not been observed on any single and double circuit 138 KV lines presently in service.

COMMENT: 23. The discussion of alternatives to the proposed action, page 102-103, is entirely conclusionary, biased, and unsupportive by specific evidence and research. The final paragraph on page 103 provides no justification and provides only speculation. It states: "Since there is no convincing reason to believe that the peak demand in the Pukele service area will decrease in the foreseeable future, the no-action alternative would only delay the project, perhaps with the result that future action is taken hastily under semi-emergency conditions, resulting in greater construction-related impacts."

RESPONSE: The discussion on pages 102 and 103 of alternatives to the proposed action was abbreviated because the alternatives were thoroughly discussed throughout the body of the EIS. The conclusion on alternatives is also supported with evidence and research discussed throughout the report.

The word "perhaps," which you have underlined, was inserted to allow for the impossibility of predicting future events with certainty.

The no action or postponement alternatives were discussed in response to your comment number 3.

COMMENT: 24. The interests and considerations of governmental policy thought to offset the adverse environmental affects of the proposed action is inadequate. See page 109. There is no discussion of having customers (principally those utilizing the increase in demand in

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 15

and Moiliili) contribute the difference in cost between overhead and underground lines. When this occurs, this alternative can be done according to HECO's rules. There is no discussion of this in the EIS statement.

RESPONSE: The lines to energize Kamoku Substation are not being constructed to satisfy only the increase in demand in Waikiki and Moiliili but to satisfy the increasing demand in the existing Pukele Substation service area. (See EIS pgs. 1-13) The installation of Kamoku Substation will transfer some of the load from Pukele thereby increasing the availability of power to the new Pukele Substation service. Inasmuch as the entire Pukele/Kamoku Substation service area will then benefit, the allocation of cost to the Kamoku Substation service area customers cannot be justified. Instead, the customers in the area where the undergrounding is requested would have to contribute the difference between the underground installation and the equivalent overhead installation.

COMMENT: 25. The botanical study for the EIS is inadequate in that the study site was only that area immediately adjacent to the Pukele station, see page C13, and not the proposed route through Palolo's conservation as well as urban land. There has not been in fact any identification of the exact location of pole sites.

RESPONSE: Similar to our response to your comments 1 and 2, the botanical survey covers a representative area indicative of vegetation through which the proposed route is located. Rare and endangered plants were not found during this preliminary survey; however, we plan to make additional surveys of each pole site when stakeouts are completed and to take adequate mitigating measures as required. We feel that the botanical survey, in total, is adequate for the EIS, although the specific area around each pole site was not surveyed.

COMMENT: 26. The responses to comments prior to the EIS filing were inadequate and affects the inadequacy of the EIS. For example, in the response to Representative Morioka on page 9, it is noted "As homes are located some distance away from the line, it is not expected that there will be effects on homes with metal roofs or otherwise." Homes will be as close as 200 feet away from the lines in Palolo. The EIS does not clarify

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Leigh-Wai Doo  
February 20, 1979  
Page 16

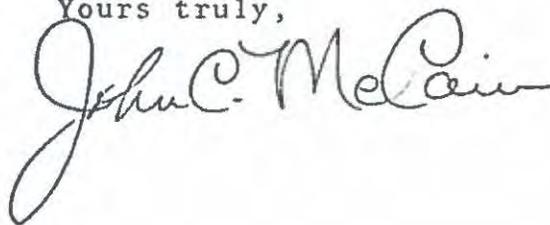
the "expectations" that there will be no effect on homes with metal roofs because it does not at any time address metal roofed homes.

RESPONSE: Our responses to general questions are, by their very nature, broad and we try to provide specific responses to specific questions. As a case in point, the original response you cite was in answer to the question "What effects would the electromagnetic fields generated by the power lines have on homes with metal roofs?" Hence, the general nature of the response.

With respect to your specific comment regarding homes 200 feet away from the lines, there will be no perceptible effects on any metal roofs.

Your questions and concerns regarding this project are appreciated.

Yours truly,

A handwritten signature in cursive script that reads "John C. McCain". The signature is written in dark ink and is positioned to the right of the typed name "John C. McCain".

JCMc:kh

HOUSE OF REPRESENTATIVES  
THE TENTH LEGISLATURE



STATE OF HAWAII  
STATE CAPITOL  
HONOLULU, HAWAII 96813

Representative David M. Hagino

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TONY T. KUNIMURA  
DENNIS R. YAMADA

February 7, 1979

Dr. John McCain  
Hawaiian Electric Company, Inc.  
900 Richards St.  
Honolulu, HI 96813

Dear Dr. McCain:

Thank you for the opportunity to comment on this environmental impact statement.

My comments are:

1. Projected Increases in Demand. At page 11, your EIS states: "Electrical demands increase not only with population increases but also on a per capita basis because of business growth and higher living standards." In a time when the costs of energy are dramatically increasing, the conservation of non-renewable resources ought to be encouraged. The report does not consider what effects energy conservation practices would have on demand through the increased use of energy-efficient appliances, time of day, pricing and other devices to reduce peak demand and total energy consumption.

To the extent that excess peak capacity is built, it must be paid for whether used or not. Last year, San Francisco experienced a water shortage. The people of San Francisco became so thrifty in their use of water that the total amount of water fees paid dropped. But because of its high overhead (in HECO's case excess capacity), the Board of Water Supply asked for an increase in rates. Should the demand for electrical energy decrease or fail to increase by as much as HECO predicts, the people of Honolulu would be in the same straits as the people of San Francisco - of paying more for less because they were thrifty and cost-conscious.

†Minority Leader  
††Minority Floor Leader

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In addition, the EIS fails to consider the likelihood of decreased growth in the study area. The City & County Department of General Planning is working with Neighborhood Boards to prepare new development plans for Oahu. A consensus against high rise development seems to be emerging.

In addition, the City Council has recently begun consideration of a General Plan amendment on energy use. The revised EIS should address any such anticipated changes in policy.

2. Social and Economic Impact. In addition, the EIS fails to consider the sound and economic results of additional electrical capacity in an already developed area. The availability of electrical power would allow further intensive development. The increased crowding will lead to increased costs for government and other sound services.

3. Aesthetics. 'Honolulu is an island.'

Bob Wenkam

Honolulu is an island on which one can observe both the mountains and the sea. Looking mauka up into Manoa Valley along University Avenue is one of the last scenic vistas in urban Honolulu. That view is threatened by the specter of steel poles marching into the valley. Something must be done to preserve that view. The lines should not destroy that view. If necessary, the lines should be placed underground.

Very truly yours,

David M. Hagino  
Representative  
Twelfth District

DMH/jet

# M & E Pacific, Inc.

Environmental Engineers

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

February 16, 1979

House of Representatives  
The Tenth Legislature  
State of Hawaii  
State Capitol  
Honolulu, Hawaii 96813

ATTENTION: Representative David Hagino

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138 KV Transmission Lines

The following is in response to your comments dated February 7, 1979 on the subject EIS. We have paired our responses to each of your comments which are summarized before each response.

1. Projected Increases in Demand

Comment: The projection for peak demand and the total energy consumption in the report does not consider energy conservation practices, thrifty use of energy during shortages, likelihood of decreased growth due to existing planning efforts, and reduction in energy use due to a possible general plan amendment.

Response: The load projections for the Pukele Service area was made on the basis of known new requests for service as stated at the end of the third paragraph, page 11 of the report. It is difficult to predict the long term effects of the factors you mention on energy consumption but HECO feels that the impact to short term peakload projections will be relatively negligible.

2. Social and Economic Impact. In addition, the EIS fails to consider the sound and economic results of additional electrical capacity in an already developed area. The availability of electrical power would allow further intensive development. The increased crowding will lead to increased costs for government and other sound services.

Response: HECO is legally required to supply service on demand. HECO is not in a position to restrict or jeopardize electrical service in order to curtail growth. Therefore, HECO must continue to plan and construct facilities in a reasonable and prudent manner to meet the projected demand for service.

# M&E Pacific, Inc.

House of Representatives  
February 16, 1979  
Page 2

### 3. Aesthetics

**Comments:** Honolulu is an island on which one can observe both the mountains and the sea. Looking mauka up into Manoa Valley along University Avenue is one of the last scenic vistas in urban Honolulu. That view is threatened by the spector of steel poles marching into the valley. Something must be done to preserve that view. The lines should not destroy that view. If necessary, the lines should be placed underground.

**Response:** We agree that the view suggested is scenic. We feel that everything reasonable must be done to preserve that particular view and other scenic vistas.

Although the route for the tansmission lines have not as yet been selected, several of the alternatives being considered do involve Manoa Valley. We admit that there will be a certain aesthetic impact due to the poles. However, their neat, modern and slim appearance plus their wide spacing and lesser need of guy wires will greatly minimize their adverse impact especially when compared to existing wooden poles.

The visual impact of transmission lines in the rear of Manoa Valley will be similar to those currently in existance.

We appreciate your comments and your interest and concern for this project.

  
JAMES S. HARA  
Vice President

RSN:jn

Palolo Community Council  
Palolo Valley  
Honolulu, Hawaii

February 7, 1979



Mr. Susumu Ono  
Chairman, Board of Land and  
Natural Resources  
Department of Land and  
Natural Resources  
P. O. Box 621  
Honolulu, Hawaii 96809

Dear Mr. Ono,

I have reviewed the "Environmental Impact Statement for the Proposed Halawa to Kamoku 138 KV Transmission Line" and find that it does not meet the content requirements as required in section 1:42 of Environmental Impact Statement Regulations.

In addition, I find that the questions submitted by the Palolo Community Council to the applicant during the consultation process prior to filing of the EIS were inadequately answered by the applicant. I have attached a copy of those questions and answers.

On behalf of the Palolo Community Council, all comments submitted by Palolo Valley residents regarding the Halawa to Kamoku EIS are hereby incorporated by reference.

It is the Palolo Community Council's understanding that our request to extend the EIS review period has been granted. It is also our understanding that the review period will terminate at 12 noon February 16, 1979. I have attached a copy of the letter from Mr. John C. McCain notifying me of the extension.

I will be forwarding further comments to you prior to February 16.

Very sincerely yours,

A handwritten signature in cursive script that reads "Les S. Ihara, Jr.".

Les S. Ihara, Jr.  
Treasurer, Palolo Community Council

cc: Hawaiian Electric Company

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840

February 2, 1979



JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

ENV 2-1  
H-P-K  
NV/G/NV

Mr. Les S. Ihara  
3284 Loke Place  
Honolulu, Hawaii 96816

Dear Mr. Ihara:

Subject: Extension of Public Comment Period, Halawa-Pukele-  
Kamoku 138 kv Transmission Line Environmental  
Impact Statement

As you discussed with representatives of Hawaiian Electric Company (HECO), we are pleased to accept and respond to public comments on the above mentioned environmental impact statement (EIS) which are received by me prior to noon on February 16, 1979, rather than limit comments to those submitted on or before the February 7, 1979 deadline specified in the EQC Bulletin. HECO will respond to comments received during this additional period in order to assure the public adequate review time and to allow the EIS the maximum exposure possible.

HECO explored the possibility of extending the review-response-decision process period beyond the 60-day period specified in the EIS regulation; however, EQC has advised the company that the Deputy Attorney General, Mr. Lau, has stated that such an extension is not allowed under the EIS regulation.

Because the additional review time severely limits HECO's response time, it would be appreciated if all comments could be submitted as early as possible in order to assure adequate consideration.

Yours truly,

JCMc:cm

# M&E Pacific, Inc.

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

## *Environmental Engineers*

December 19, 1978

Mr. Ted T. Morioka  
Representative, 9th District  
2618 Gardenia Street  
Honolulu, Hawaii 96816

**SUBJECT: EIS for the Proposed Halawa-Pukele-Kamoku  
138 KV Transmission Lines**

This letter is in response to two letters from the Palolo Community Council dated November 11, 1977 and December 15, 1977 regarding the 138 KV Halawa-Pukele-Kamoku transmission lines proposed by Hawaiian Electric Company.

Please excuse the delay in responding to your comments and concerns, but more time was required by Hawaiian Electric Company and M&E Pacific, Inc. to evaluate all of the alternative routes and answer the specific questions related to the proposed project.

While Hawaiian Electric Company continues to prefer placing two overhead circuits through Palolo Valley as originally proposed, no final selection of routes has yet been made. An Environmental Impact Statement (EIS) has been prepared by our firm, which will present all of the presently considered alternative routes for the 138 KV lines as well as the related issues. This EIS will be filed with the Environmental Quality Commission (EQC) in January and should be available for public review shortly thereafter.

The following responses are addressed specifically to your questions and concerns about the proposed 138 KV lines as expressed in your letter of November 11, 1977.

**Comment:** What is the distance and cost of the Palolo Avenue line if measurement was taken from the junction where the Manoa alternate connects to the line from Waiiau. Line 1 and Alt. A junction.

**Response:** The Palolo Avenue line (Line 1) is about 3.8 miles long from Pukele to Kamoku and is estimated to cost about \$3.32 million. Selection of Line A through Manoa Valley would still require the

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 2

construction of a line to Pukele from the junction with the line from Halawa (not Waiau). The junction to the Pukele line, however, would be single circuit rather than double circuit and therefore less expensive. Line A would be about 4.3 miles long from the junction with the Halawa-Pukele line to Kamoku. The total cost of Line A is estimated by HECO to be about \$4.16 million, which includes a credit of \$0.23 million for the single circuit portion from the junction to Pukele and \$0.72 million for cancellation charges for the poles HECO has ordered for Line 1. The cost of Line A without the cancellation charges would be about \$3.44 million. The EIS contains a further breakdown of these estimated costs.

**Comment:** HECO has claimed that DLNR will not permit the lines to go over Waahila Ridge because it is conservation land. If so, how did HECO get lines through all the conservation land from Waiau to Pukele?

**Response:** The Department of Land and Natural Resources evaluates requests for use of conservation land on an individual basis. HECO has had preliminary discussions with DLNR concerning a 138 KV line over Waahila Ridge but has made no formal request for approval of such a route (Line D or Alternatives G and I). At these preliminary discussions, DLNR has indicated to HECO that there is a strong possibility that the route over Waahila Ridge would not be approved.

**Comment:** What is the total distance that the power line travels through conservation land to get to Pukele?

**Response:** The leeward Koolau route from Halawa to Pukele would be about 10.17 miles long, of which about 9.1 miles would be in conservation land.

**Comment:** What is the distance through conservation land if the Waahila Ridge alternate is used (Alternate D)?

**Response:** Line D is about 3.7 miles long, of which about 1.4 miles would be in conservation land and about 0.7 miles would be in open land on the lower portion of Waahila Ridge owned by the University of Hawaii and zoned urban.

**Comment:** What is the environmental effect on vegetation and fauna of the line from Waiau to Pukele as compared to the line from Pukele to Dole Street?

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 3

**Response:** The Halawa to Pukele line would have longer average spans than the Pukele to Dole Street portion of Line D since the former generally goes from ridge top to ridge top while the latter generally goes down Waahila Ridge. Pole and tower construction impacts for both lines would be similar and minimal with respect to vegetation and fauna. Line D, however, would require a significant amount of tree removal in the park area above St. Louis Heights, while the Halawa to Pukele line would require only minimal tree trimming in a few sag areas between poles. Neither line would have a significant effect on fauna. Further discussion of conservation area effects is given in the EIS.

**Comment:** Does the proposed line from Waiiau to Pukele to Kamoku substation enter into the Pukele Substation system?

**Response:** Yes, one of the two circuits from Halawa (not Waiiau) will go to Pukele (to replace the circuit from Koolau that is being diverted to Kamoku); the other will go to Kamoku.

**Comment:** Is the electromagnetic field generated between the two 138 KV lines in Palolo harmful to humans? If not, how close must the lines be before the electromagnetic force is harmful to humans?

**Response:** A review of available research on the biological effects of electrical fields indicates that exposure to the field strength produced by 138 KV lines has no discernible effects on human health or the health of any other living organisms. No experiment has clearly established a danger threshold for human exposure to electrical fields. The results of Russian experiments, which form the basis for Soviet exposure standards, could not be reproduced in the USA or in Western Europe. In any case, the electrical field associated with 138 KV lines is several times weaker than the "unlimited" exposure duration level of the Russian standards. No American standards exist.

**Comment:** How severe will the radio and TV interference be and how can it be corrected?

**Response:** Radio interference (RI) and TV interference (TVI) are not associated with properly functioning transmission lines. The potential for RI/TVI, however, does exist and is generally due to arcing, which is the result of small gaps between transmission line components. The existence of these gaps is minimized by good design and construction, high tension, and by line maintenance. It should be noted that RI/TVI is not dependent on voltage and can occur with 46 KV and local distribution lines. From 1967 to 1977, HECO has received only seven complaints of

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 4

RI/TVI attributable to 138 KV lines. In all cases, corrective action alleviated the problem to the satisfaction of the complainant.

**Comment:** Will arcing and electromagnetic field cause constant radio and TV interference?

**Response:** No, since arcing with 138 KV lines can be considered a rare occurrence and the electrical field of the 138 KV line is not strong enough to cause a significant corona discharge (partial ionization of air), which can cause RI in the lower radio frequencies with much higher voltage transmission lines.

**Comment:** Will arcing intensify during rain storms?

**Response:** Rain will not cause arcing. It should be noted that there is a possibility that high wind can cause loose hardware and result in arcing. This is no more likely, however, with 138 KV lines than with the existing lines in Palolo.

**Comment:** What is the noise intensity of the humming of the wires?

**Response:** Noise can be caused by arcing or by corona discharge. Arcing is rare and can be remedied by maintenance. Corona discharge can be controlled by good design and has not been a significant factor in the 138 KV system on Oahu. No significantly audible noise is anticipated from the proposed lines.

**Comment:** How much of the sidewalk area will the poles occupy?

**Response:** In the urban area, the pole diameter will be about two feet at the base and will generally occupy the area between the face of the curb and the sidewalk. The face of the curb is generally 6 to 8 feet from the property line.

**Comment:** How many lines besides the 138 KV will the poles carry?

**Response:** In urban areas the single 138 KV circuit will consist of three conductors (about 1-1/2 inch diameter aluminum) and one shield wire at the top of the pole. Where reasonably possible, the poles will also carry the three conductors of a 46 KV circuit.

**Comment:** If other lines are to be carried by the 138 KV poles, will it eliminate any of the poles now in use?

**Response:** In those urban areas where the 46 KV lines are transferred from the wooden poles to the 138 KV poles, approximately the top

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 5

10 feet of the wooden poles will be removed. Almost no wooden poles will be eliminated, however, because they would still be needed to carry the local distribution lines and transformers as well as telephone lines.

**Comment:** When the power lines traverse conservation land, how wide an area is cleared or condemned under the power lines?

**Response:** Easements in conservation lands for the 138 KV lines are generally 100 feet wide. This width is selected to accommodate conductor swing for the typically long span in conservation land (some spans are 2,000 feet). It should be emphasized that clearing is confined to a small radius around each pole site and to a few helicopter pads, with some tree trimming in a few sag areas. Except for these locations, the easement area is not cleared.

**Comment:** Why is the area under the line condemned? Is it for line maintenance or for safety reasons?

**Response:** The easement area is not condemned. After HECO obtains an easement from the landowner to allow passage of the lines over the land, the owner retains ownership and is able to use the land for most purposes as described in the easement grant.

**Comment:** Is a draft of the EIS available?

**Response:** A draft of the EIS will be available in January 1979 and will be subject to public review after it is filed with the Environmental Quality Commission (EQC).

**Comment:** If so, why hasn't it been made available to the intervenors namely, Ted Morioka and Rev. Luttrell?

**Response:** When filed with the EQC, the EIS will be available for public review and copies will be sent to Representative Ted Morioka and Rev. Luttrell.

**Comment:** Has HECO requested permission from DLNR to run the 138 KV lines over Waahila Ridge? If so, we would like a copy of the reply from DLNR.

**Response:** HECO has not made a formal request to DLNR for 138 KV lines over Waahila Ridge. HECO has met with DLNR concerning the 138 KV lines as well as concerning a 46 KV line on the Waahila Ridge alignment. Indications from this meeting were that there is a strong possibility that DLNR would not approve the Waahila Ridge alignment if there were reasonable alternatives available.

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 6

**Comment:** Can there be two lines running parallel over Waahila Ridge?

**Response:** It is possible, though not an optimum design, to construct parallel pole lines over Waahila Ridge. Such an alternative would be very costly, require a considerably greater amount of tree removal from the park, and would not constitute a large improvement in reliability over a double circuit on a single pole line (this is already being considered in the EIS as Alternative G).

**Comment:** Is there a danger to kite users—especially children?

**Response:** The proposed 138 KV lines are not any more dangerous to kite users than are the existing 46 KV lines or many of the local distribution lines. In any case, kite flying should be done only in open areas away from any kind of utility lines.

**Comment:** What effect will the construction of the high tension power lines have on the property values of landowners in the valley?

**Response:** While future conditions cannot be definitely predicted regarding effects on property values, a limited comparison study of the selling prices of homes near existing 138 KV lines with similar properties elsewhere in the same tax zone shows no discernible detrimental effect on property values. It is also significant to note that there have been no complaints to HECO regarding any lowering of property values resulting from the construction of many miles of 138 KV lines in urban areas on Oahu.

**Comment:** General residential safety is of great concern to the community—lines might fall on homes. How valid is this concern?

**Response:** The poles for the 138 KV lines would generally be located between the curb face and the sidewalk. The conductors would be hung above the street right of way on insulator arms extending 5 to 10 feet from the pole. Since the private property line is generally located about 6 to 8 feet from the curb face, the conductors would be located 11 to 18 feet horizontally from the property line. Consequently, it is very unlikely that a broken conductor could fall on a home. Additionally, it is highly unlikely that a conductor would break since they will be designed with a factor of safety greatly exceeding the minimum factor of safety of 2.0. In any case, the current in the conductor would be stopped in a fraction of a second by protective relays in the event of line interruption.

**Comment:** Do the poles create a traffic hazard?

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 7

**Response:** The poles for the 138 KV lines would not constitute any more of a traffic hazard than the existing wooden poles. It is true, however, that more poles would be added and thereby add to the objects that an out-of-control vehicle can collide with.

**Comment:** How much pressure is needed to knock a pole or wire (by wind or man-made) down?

**Response:** The force required to shear the steel poles is calculated to be 860,000 pounds. Assuming several reasonable conditions, a 24-ton truck traveling at 60 mph will not shear a pole. The wires will withstand a wind of 60 mph at 50°F with a factor of safety of 2.93.

**Comment:** What effect on the aesthetic values of the valley does the construction of power lines have?

**Response:** There will be a certain aesthetic impact from the 138 KV lines, and it is understandable that many people consider such lines to be incongruous with residential neighborhoods. The design of these lines, however, is an improvement over the elaborate towers previously used. The proposed slim, steel poles present a modern, neat appearance that is in contrast to the "jungle of wires" effect of many of the wooden pole lines already existing in these neighborhoods.

**Comment:** Up to what distance can the noise be heard?

**Response:** As noted in the response to a previous comment, no significantly audible noise is anticipated from the proposed lines.

**Comment:** Why was Palolo Valley, a residential community, selected since it is densely populated—have other areas been equally evaluated—for instance, other valleys like Manoa are a shorter distance than Palolo.

**Response:** No final selection has been made among the alternatives that have been evaluated. HECO, however, prefers the two overhead lines through Palolo Valley, primarily because of lower costs and greater ease of construction and maintenance. Evaluations of all the alternatives are presented in the EIS.

**Comment:** What is the true cost of the routes through Palolo? We believe Hawaiian Electric's comparisons of alternate routes and their respective costs do not reflect the true distances which must be traversed to transmit power through alternate lines 1 and 2.

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 8

**Response:** The cost estimates of the various alternatives have been updated, and a breakdown and comparison are given in the EIS. As noted in the response to the first comment, the lengths of the lines, the double and single circuit changes, and the costs have all been evaluated and are presented in the EIS.

**Comment:** Why couldn't there be a Manoa substation to feed the 46 KV using existing lines?

**Response:** There could be a substation like Pukele in the upper end of Manoa Valley. This would still require the construction of 138 KV lines from Halawa. The upper end of Manoa Valley is a very poor location because there are very few 46 KV lines in Manoa Valley. It would not be possible to export full power because of the scarcity of existing 46 KV lines in Manoa. Eight 46 KV lines are needed to transport the power to the load center. It is very difficult to build new lines down Manoa Valley because of the narrow, winding streets and the trees.

**Comment:** Why can't we go underground?

**Response:** It is possible to go underground in urban areas, and this would alleviate the aesthetic objections. There are, however, several significant drawbacks to the underground alternative. These include higher construction costs (by approximately a factor of three), much longer construction time, significant interference with existing and planned utilities (since a 16-foot wide trench would be required), greater maintenance requirements, longer down time in case of failure, and additional property requirements for housing the line cooling facilities. It should also be noted that there are no PUC regulations indicating how the extra costs of undergrounding major transmission lines would be paid.

**Comment:** Is the height of the poles in accordance with the zoning?

**Response:** The Comprehensive Zoning Code does not place restrictions on the height of overhead lines. The proposed lines, however, would meet all required clearances and comply with all applicable codes and rules.

**Comment:** If a home is destroyed by fire, condemned, etc., would the owner be permitted to rebuild his home under the high tension wires?

**Response:** Along city streets, 138 KV overhead lines generally do not traverse private property, and no building restrictions are placed on the homeowner within his own property. When electric

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 9

lines do traverse private property, an easement must be obtained from the landowner. No restrictions for small shrubbery and foliage under the lines are imposed, but no dwelling construction is allowed. Along most of the proposed routes in urban areas for the two required 138 KV lines to Kamoku Substation, no building restrictions, no minimum distances from the line, and no future restrictions will be placed on the homeowner where an easement has not been obtained.

**Comment:** What effects would the electromagnetic fields generated by the power lines have on homes with metal roofs?

**Response:** The electric field is greatest directly under the line for the line configuration HECO will be using for the Kamoku 138 KV lines. The electric field strength then decreases at a rapid rate as distance from the line increases. As homes are located some distance away from the line, it is not expected that there will be any effects on homes with metal roofs or otherwise.

**Comment:** What precautionary devices will be installed to insure that the flow of electricity will stop if the pole should fall or if a wire should break?

**Response:** The flow of current through the lines would be constantly monitored by protective relays. Should a pole fall down or should a wire break, these devices will sense the flow of fault current and cause circuit breakers to open and disconnect the line within a fraction of a second.

**Comment:** Has new technologies relating to underground wiring currently being used in Europe been considered; e.g., using refrigerated and inert gases as insulation?

**Response:** The "superconductors" that are referred to are largely experimental. Their purpose is to provide a large capacity to transmit electric power. HECO keeps abreast of current industry developments in cable technology and other areas to insure that system expansion is accomplished in the most economical and efficient means.

**Comment:** Did PUC order additional transmission capacity to support the Waikiki area?

**Response:** The PUC does not directly order additional transmission capacity. PUC General Order 7 states (V.5.1) "the electric plant of the utility shall be constructed, installed, removed, maintained, and operated in accordance with accepted good engineering

# M&E Pacific, Inc.

Mr. Ted Morioka  
December 19, 1978  
Page 10

practice in the electric utility industry to insure, as far as reasonably possible, continuity of service, uniformity in the quality of service furnished, and the safety of persons and property."

Hawaiian Electric is responsible for planning, designing, and installing facilities to provide adequate, reliable service at the least cost to the consumers. It must be pointed out that the purpose of the Kamoku Substation is not to serve just the Waikiki area. Rather, it is required so that load may be shifted away from Pukele Substation so that the Pukele Substation may continue to reliably supply its service area, which includes Palolo Valley.

**Comment:** What is meant by "support a growing electrical load in Waikiki area" as noted in the HECO EIS preparation notice?

**Response:** The statement is incomplete and evidently misleading since the Kamoku Substation and connecting transmission lines are required to relieve the anticipated overloaded condition of the Pukele Substation. The Pukele Substation serves Palolo, Manoa, Kaimuki, and several other districts besides Waikiki.

The following responses are to comments from your December 15, 1977 letter.

**Comment:** Is there a possibility of placing one set of wires on either side of Waahila Ridge?

**Response:** Yes, Line B on the Manoa side of Waahila Ridge and Line C on the Palolo side are addressed in the EIS.

**Comment:** Can the Kamoku project be delayed until there is sufficient technology to consider an underground route?

**Response:** The underground route is being considered but would be very costly and disruptive to residents and other underground utilities. Since it is anticipated that this project will be needed by 1981, there is not enough time for any kind of realistic hope of reductions in cost or complexity of the underground system to alleviate its major drawbacks.

**Comment:** Isn't the layout presented by Hawaiian Electric Company with regard to existing transmission lines inaccurate?

**Response:** It is not clear what layout is being referred to; however, the facts and figures presented in the EIS are believed to be accurate.

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

February 13, 1979

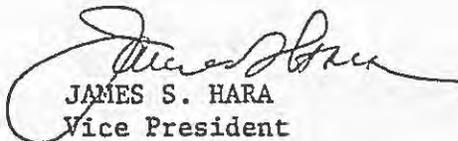
Mr. Les S. Ihara  
3284 Loke Place  
Honolulu, Hawaii 96816

SUBJECT: EIS for Halawa-Kamoku 138KV Transmission Lines

We have received your letter dated February 7, 1979 on subject EIS and appreciate your interest in the matter. We also acknowledge that Hawaiian Electric Company will accept and respond to the comments which you intend to submit prior to noon of February 16, 1979.

We are not able to respond to your general comments on the inadequacy of the EIS content and of the answers provided to your previous questions because no specific areas were identified. We hope that your next submittal will help us.

Thank you,

  
JAMES S. HARA  
Vice President

JSH/ep

PALOLO COMMUNITY COUNCIL  
c/o 2165 10th Avenue  
Honolulu, Hawaii

RECEIVED  
RECEIVED

79 FEB 7 P 2: 46  
79 FEB 7 P 2: 46

February 7, 1979

DEPT. OF LAND  
& NATURAL RESOURCES  
& STATE OF HAWAII

STAMP: Susumu Ono, Director  
Department of Land and  
Natural Resources  
State Office Building  
Honolulu, Hawaii 96813

Dear Mr. Ono:

The following comments on the environmental impact statement regarding the high-voltage power line project proposed by Hawaiian Electric Company are hereby forwarded to you on behalf of the Palolo Community Council and concerned residents of Palolo Valley. The Palolo Community Council is comprised of organizations within the Valley and includes members of the Palolo Neighborhood Board.

Very truly yours,

Charles L. Fentrell  
Paul M. ...

Palolo Community Council

## COMMENTS ON ENVIRONMENTAL IMPACT STATEMENTS

1. The justification for the location of the Kamoku Substation is not adequately addressed. We question why that specific location was chosen as the end point for the 138kv lines.
2. Little or no consideration of the effects of these lines on the inconvenience, aesthetic values, noise, or health impact on human lives has been given in the company's response to initial comments made by residents of Palolo Valley.
3. The long-term ramifications have not even been hinted at in the EIS. This project has received a long-term overview only in terms of the utilization of the facilities constructed; however, the same application of the long-term view is not given to the cost factors. For example, if these lines are supposed to last for 20 or 30 years, shouldn't the ultimate cost be viewed in such a time frame also? Is underground wiring so inconceivable in the next 20 or 30 years that putting more money in now could save us undoing a big mistake over the next decade?
4. Impacts on real estate values have not been discussed sufficiently. We believe more reliable and valid information of the impact of such high tension lines would have on property values should be obtained for a better decision on alternate routes and technological procedures.
5. Health effects have been discussed in relationship to higher voltages than proposed by HECO. However, like asbestos, which took nearly 30 years to be discovered as a health hazard, high voltage lines may have similar long-term health effects.
6. It appears to us that the alternate routes have not been given as serious consideration as the lines preferred by HECO. Cost factors presented back in 1975, 1977 and thereafter only change in magnitude, not in the proportional relationship of one alternative to another.
7. A cost-benefit study is not part of the environmental impact study. We believe that it is incumbent upon the applicant to tell us what they think trade-offs would be and are. It appears that the people who would be directly affected by the poles and unsightly power lines would be getting only "cost" instead of benefits. Why is it that the 138kv lines should traverse urban areas versus conservation. Why is it necessary that people or human lives must take a secondary position to birds, flowers, and trees? What is the human life worth to the State and to Hawaiian Electric.

8. A concept of social justice is lacking in the consideration of this project. It is the feeling of some residents that Palolo is a convenient "scapegoat" for Hawaiian Electric because they (HECO) do not anticipate as vocal or heated a controversy arising from Palolo as it might expect from Manoa Valley. It may be easy for HECO executives and planners to sanctimoniously sit around and talk about how nice steel poles are but no one would volunteer to have it in his front or back yard. The same arguments we bring forth might be mentioned by these same people who advocate putting these lines through our Valley. Many of us don't care how modern or "slim" these steel poles are--they are not mitigating measures on our aesthetic senses. The visual impact of these poles on our Valley would change drastically the nature of the Valley--instead of one set of poles we would have two--how can this make it more aesthetically pleasing? How can planners call the creation of an uneven archway of power lines pleasing to the eyes?
  
9. In M&E Pacific's response to the comments regarding the choice of Palolo Valley as the preferred route via two lines, it is stated that HECO prefers the overhead lines because of lower costs and greater ease of construction and maintenance. We challenge these contentions and would further add that even if it were true, these are not the right questions to be asking when making the choice of routes. The response again shows little or no consideration for the detrimental effects of the power lines on the human beings living in Palolo Valley. The lives of several generations will be affected by the decision. There will be more homes that are remodelled or rebuilt in the Valley during the next 20 to 30 years. It will not look the way it does now, with predominantly older homes. Do the residents both present and future have to be sentenced to living under power lines and having to face the visual blight overhead everyday of their lives? These questions should be faced by an agency determining whether or not a utility has met its requirements.

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840



February 20, 1979

JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

ENV 2-1  
H-P-K  
NV/G/NV

Representative Ted Morioka and  
Mr. Charles Luttrell  
Palolo Community Council  
c/o 2165 Tenth Avenue  
Honolulu, Hawaii

Gentlemen:

Subject: Environmental Impact Statement for the Proposed  
Halawa-Pukele-Kamoku 138 kv Transmission Lines

This is in response to your letter of February 7, 1979 to the Department of Land and Natural Resources regarding the EIS for the proposed Halawa-Pukele-Kamoku 138 kv transmission lines. The following responses are specifically addressed to the concerns and questions you discussed in your letter:

- COMMENT: The justification for the location of the Kamoku Substation is not adequately addressed. We question why that specific location was chosen as the end point for the 138 kv lines.
- RESPONSE: The ideal location of a transmission substation is at the heart of the load center since the 46 kv lines emanating from the substation would not have to be extended very far to reach the customers requiring power. The Kamoku Substation site is an adequately sized property which was available within a reasonable distance from the theoretic ideal location; therefore, it was selected as an end point for the 138 kv lines. We feel that combining the substation with a condominium is an ecologically and economically sound action and that the acquisition of a parcel of land of suitable size was fortunate.
- COMMENT: Little or no consideration of the effects of these lines on the inconvenience, aesthetic values, noise, or health impact on human lives has been given in the company's response to initial comments made by residents of Palolo Valley.

HAWAIIAN ELECTRIC COMPANY, INC.

Representative Ted Morioka and  
Mr. Charles Luttrell  
February 20, 1979  
Page 2

RESPONSE: The revised EIS, pages 75 to 93 addresses the effects of the 138 kv lines on the inconvenience, aesthetic values, noise, and health impact on human lives. Many of these were expanded in detail in response to many of your previous comments.

COMMENT: The long-term ramifications have not even been hinted at in the EIS. This project has received a long-term overview only in terms of the utilization of the facilities constructed; however, the same application of the long-term view is not given to the cost factors. For example, if these lines are supposed to last for 20 or 30 years, shouldn't the ultimate cost be viewed in such a time frame also? Is underground wiring so inconceivable in the next 20 or 30 years that putting more money in now could save us undoing a big mistake over the next decade?

RESPONSE: The environmental impacts are separated into short and long term, negative and positive impacts and included in the EIS. The ultimate or long term costs are essentially addressed in the total costs presented for each alternative. Maintenance and operational costs are not reflected in these costs but their relative impact is addressed in the EIS.

The EIS presents several underground alternatives and, therefore, underground wiring is not inconceivable. However, the need for the transmission line will be acute in 1981. We must meet the demand which we forecast based upon known requests for service in the Pukele service area and in meeting this need, we must plan in the most economical manner possible.

COMMENT: Impacts on real estate values have not been discussed sufficiently. We believe more reliable and valid information of the impact of such high tension lines would have on property values should be obtained for a better decision on alternate routes and technological procedures.

RESPONSE: The potential effects on property values are discussed in pages 89 to 91 of the EIS. We believe that the information presented are reliable and valid but will be glad to review them if specific areas of doubt are identified.

HAWAIIAN ELECTRIC COMPANY, INC.

Representative Ted Morioka and  
Mr. Charles Luttrell  
February 20, 1979  
Page 3

COMMENT: Health effects have been discussed in relationship to higher voltages than proposed by HECO. However, like asbestos, which took nearly 30 years to be discovered as a health hazard, high voltage lines may have similar long-term health effects.

RESPONSE: We agree that health effect on transmission lines for 30 years or a life time are not included in the EIS and that a health hazard may be discovered in the future. We believe that the EIS presents a reasonably thorough investigation and research of available information which indicate a negligible impact of the proposed 138 kv lines to human health. The need for the project as presented in the EIS, does not allow the many years of research and experimentation to discover a health hazard which is not presently indicated, particularly when all available data indicates that the electrostatic field gradient which will be produced by the lines as well below the threshold of any measurable physiological response.

COMMENT: It appears to us that the alternate routes have not been given as serious consideration as the lines preferred by HECO. Cost factors presented back in 1975, 1977 and thereafter only change in magnitude, not in the proportional relationship of one alternative to another.

RESPONSE: All costs originally presented at informational hearings were based on applicable unit costs for material, labor, and contract work at the time the estimates were prepared. All alternate routes utilized the same unit costs as the preferred routes wherever similar situations were encountered. All costs presented in successive informational meetings as well as those costs included in the EIS reflect the original quantities of material, labor, and contract work utilizing up-to-date unit costs which take into account the effects of inflation, and these costs are escalated further to account for construction in future years. However, certain costs are fixed costs such as charges associated with the cancellation of the steel pole

HAWAIIAN ELECTRIC COMPANY, INC.

Representative Ted Morioka and  
Mr. Charles Luttrell  
February 20, 1979  
Page 4

order for lines 1 and 2 and therefore have not been escalated. Consequently, cost factors may change in magnitude due to the effects of inflation but may not necessarily change in the proportional relationship of one alternative to another.

COMMENT: A cost-benefit study is not part of the environmental impact study. We believe that it is incumbent upon the applicant to tell us what they think trade-offs would be and are. It appears that the people who would be directly affected by the poles and unsightly power lines would be getting only "cost" instead of benefits. Why is it that the 138 KV lines should traverse urban areas versus conservation? Why is it necessary that people or human lives must take a secondary position to birds, flowers, and trees? What is the human life worth to the State and to Hawaiian Electric?

RESPONSE: The costs and benefits that can realistically be converted into dollars are presented in the EIS. The EIS presents the impact of many alternatives and HECO has presented the advantages and disadvantages of these alternatives as related to their preferred routes which traverse both urban and conservation land.

The people directly affected by the proposed transmission lines would benefit. They would gain by having reliable, lowest cost electrical power. Other alternatives presented in the EIS require longer construction periods and reliability will suffer and these alternatives are more expensive.

The Kamoku Substation is located in the heart of an urban area. Obviously, it would not be possible to reach the heart of an urban area without traversing some of the area. We have presented alternatives, such as Alternative D, which utilizes conservation land as much as possible.

Human life does not take a secondary position to the birds, flowers, and trees as you suggest. The governmental regulatory agencies require consideration of the natural ecosystem including rare or endangered organisms. To overlook the natural ecosystem would be

HAWAIIAN ELECTRIC COMPANY, INC.

Representative Ted Morioka and  
Mr. Charles Luttrell  
February 20, 1979  
Page 5

contrary to man's general desire for a high quality of life including a clean environment.

I can assure you that Hawaiian Electric Company and I assume the State, value human life extremely high. We are seeking an economically and environmentally sound means of bringing electrical energy to our customers.

COMMENT: A concept of social justice is lacking in the consideration of this project. It is the feeling of some residents that Palolo is a convenient "scapegoat" for Hawaiian Electric because the (HECO) do not anticipate as vocal or heated a controversy arising from Palolo as it might expect from Manoa Valley. It may be easy for HECO executives and planners to sanctimoniously sit around and talk about how nice steel poles are but no one would volunteer to have it in his front or back yard. The same arguments we bring forth might be mentioned by these same people who advocate putting these lines through our Valley. Many of us don't care how modern or "slim" these steel poles are--they are not mitigating measures on our aesthetic senses. The visual impact of these poles on our Valley would change drastically the nature of the Valley--instead of one set of poles we would have two--how can this make it more aesthetically pleasing? How can planners call the creation of an uneven archway of power lines pleasing to the eyes?

RESPONSE: The advantages and disadvantages of each of the alternative routes in Category II are presented in pages 28 to 39 of the EIS. The disadvantages of both the Palolo and Manoa routes include objections by residents along the route. Therefore, the preference of the company for the Palolo routes is based on the facts mentioned: lower cost, greater ease of construction, less right-of-way acquisitions and agency approvals, and ease of maintenance and not on lesser objections by residents.

COMMENT: In M&E Pacific's response to the comments regarding the choice of Palolo Valley as the preferred route via two

HAWAIIAN ELECTRIC COMPANY, INC.

Representative Ted Morioka and  
Mr. Charles Luttrell  
February 20, 1979  
Page 6

lines, it is stated that HECO prefers the overhead lines because of lower costs and greater ease of construction and maintenance. We challenge these contentions and would further add that even if it were true, these are not the right questions to be asking when making the choice of routes. The response again shows little or no consideration for the detrimental effects of the power lines on the human beings living in Palolo Valley. The lives of several generations will be affected by the decision. There will be more homes that are remodelled or rebuilt in the Valley during the next 20 to 30 years.

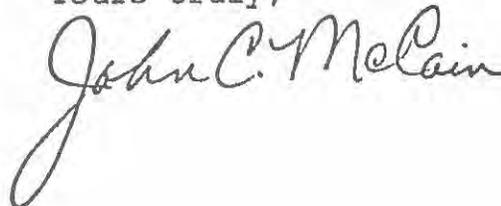
It will not look the way it does now, with predominantly older homes. Do the residents both present and future have to be sentenced to living under power lines and having to face the visual blight overhead everyday of their lives? These questions should be faced by an agency determining whether or not a utility has met its requirements.

RESPONSE: Double sets of poles, slim poles, or an uneven archway of power lines are not purported in the EIS to be aesthetically pleasing. Their aesthetic and visual impacts are lessened or minimized by the characteristics of the poles or the mitigating measures taken.

Commitment to the overhead route we propose is a long-term commitment. However, the proposed project is necessary to relieve load on the Pukele Substation in the near future, before the need becomes acute, and the project is the most economical solution.

Thank you for your comments and your interest and concern for this project.

Yours truly,



JCMc:cal



DIVISIONS:  
CONSERVATION AND  
RESOURCES ENFORCEMENT  
CONVEYANCES  
FISH AND GAME  
FORESTRY  
LAND MANAGEMENT  
STATE PARKS  
WATER AND LAND DEVELOPMENT

STATE OF HAWAII  
DEPARTMENT OF LAND AND NATURAL RESOURCES  
P. O. BOX 621  
HONOLULU, HAWAII 96809

February 7, 1979

REF NO.: CPO-117

Mr. Charles Ane  
Hawaiian Electric Co., Inc.  
P. O. Box 2750  
Honolulu, HI 96840

Dear Mr. Ane:

We have reviewed your EIS for the proposed Halawa to Kamoku 138 KV transmission line and have the following comments to offer.

- A. Two of the alternate routes affect existing State Parks. No other State Park development interests are directly affected. The affected existing parks are:
1. Nuuanu Pali Lookout - Category I-B Trans-Koolau Route appears to go very close to the lookout and could have a negative impact on the view. Part of the park development completed a few years ago included the relocation of an existing 46 KV powerline to minimize its impact on the view.
  2. Waahila Ridge - Category II Pukele area to Kamoku has Line D and Alternate G (same route) going through the park. This could be very disruptive to the park since it would involve tree removal as well as a negative impact on the view into Manoa.

No details were given in the EIS so the extent of the impact of these proposals to the parks cannot be given. None of the routes affecting parks was proposed by HECO and the impact on parks was recognized.



Mr. Charles Ane  
Page 2  
February 7, 1979

Previous archaeological reconnaissance survey of the project route by Barrera (his report attached as App. A of EIS) confirms the presence of archaeological remains. The proposed mitigation measure of the applicant to avoid interference with archaeological sites (p. vii of EIS) appear adequate but should be coordinated with the Historic Sites archaeologist at an early stage as possible.

- B. Of the four major categories of alternatives presented, only Category I (Halawa SS Pukele SS) has the potential for affecting stream resources. As described in the EIS, extensive use of the helicopter transport for construction and maintenance (with resultant reduction in need for land access routes), should minimize terrain disturbances and associated detrimental effects on streams. Also, the effects of construction activities for the erection of poles and towers and stringing of transmission lines should be relatively minor and transitory. The main detrimental effect would be esthetic intrusion on scenic values.

From the marine fisheries standpoint, the EIS adequately address most of the concerns relating to category III-B (underwater route). We fully concur with the view that this alternative should have a low priority because of the high cost involved, maintenance and repair difficulties, and adverse impact upon the marine environment due to trenching requirements. We however disagree with the statement that an advantage of this alternative is minimization of impact upon conservation area (pg. 42). It should be clarified that State conservation areas are not solely fast-lands but include all submerged marine lands within territorial limits.

The description of the birdlife of the Halawa-Pukele Station route is meagre. A few species are overlooked, such as the grassquit, swiftlet and the pueo (an endangered species on Oahu) but mention of these species may not alter the conclusion that there should be no significant effect on the birds or bird habitats in the path of the recommended route for the powerline.

Mr. Charles Ane  
Page 3  
February 7, 1979

The Oahu creeper has been reported from the higher elevations of both Halawa and Moanalua Valleys and the iiwi most likely strays into the very upper portions of these valleys; however, the upper valleys should not be affected by the powerline. The conclusion in the EIS that there is very little native forest involved (Dr. Berger's discussion) does not appear consistent with the botanical report which states (on page 14, C-15) that 30% of the vegetation consists of 'ohia and koa, both native species. With these reservations, the EIS appears adequate in its disclosure of impacts on wildlife.

- C. Category I. (Halawa Substation to Pukele Substation)
1. Leeward Koolau Route - A double circuit overhead 138 KV line through conservation areas on northern outskirts of Honolulu.
  2. Trans-Koolau Rouge - A double circuit overhead 138 KV line through conservation areas across the Koolau Mountains to Pukele Substation via the Koolau Substation.

The Leeward Koolau route was approved by the Board on April 11, 1975 primarily because of the amount of work done prior to application, although the Trans-Koolau route was presented to the Board.

Category III (Halawa Substation directly to Kamoku Substation) and Category IV (Separate Power Plant) are both outside of the CD lands and would therefore, be preferred from the Forestry standpoint.

The Division of Forestry points out the following:

1. The Windward route is less obtrusive than the Leeward route in terms to safeguard aesthetic and environmental values, since there exists an existing electrical corridor. Whereas the Leeward Koolau route traverses a new and virgin forested area where there are presently no transmission lines.

Mr. Charles Ane  
Page 4  
February 7, 1979

2. Systems reliability is still maintained by the Trans-Koolau route.
3. In time the Windward area would require 138 KV lines for the contemplated ongoing residential development in the Windward areas. Therefore, it appears that serious consideration should be given to upgrading of existing lower voltage transmission circuits on the existing right-of-way.

Of those 11 alternatives presented in Category II (Pukele Substation to Kamoku Substation) 3 lines involve crossing over Waahila Ridge primarily because of its present open space status and therefore, easement of least resistance.

The Division of Forestry points out the following:

1. The Pukele Substation is in Palolo Valley this should be considered rather than via by-pass lines through Manoa Valley.
2. A Pukele-Kamoku route would most appropriately follow Palolo Valley either via the Urban route or via CD lands on the lower slopes of Kalaepohaku Ridge.
3. The Waahila Ridge or any ridge line route has greater aesthetic impact as compared to a lower slope alignment where land utilization is limited by topography. The Waahila Ridge lands may be presently open space, but future land utilization potentials are very high for this area because of topography.

Should either of the CD routes be selected (Category I), the Division of Forestry would require a plan for every pole site construction, plus a current on-site inspection, in order to assure the minimal amount of environmental impact to the forested areas. A preliminary pole site inspection was made in 1973 by helicopter.

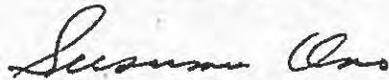
Mr. Charles Ane  
Page 5  
February 7, 1979

No mention is made of the costs and physical requirements of providing underground service from the Pukele Substation for alterantive routes G. and H. to the Kamoku Substation (page 32). We are particularly interested in the costs as they pertain to underground service in the Conservation District. More elaboration on this aspect should be forthcoming.

In addition, I have attached copies of all correspondence received to date on this matter.

Thank you for allowing us to comment. If we may be of any further service, please feel free to contat Mr. Roger C. Evans of my Planning Office at 548-7837.

Very truly yours,



SUSUMU ONO, Chairman  
Board of Land and Natural Resources

cc: Division of State Parks  
Division of Fish & Game  
Division of Forestry

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840

ENV 2-1  
H-P-K  
NV/G/NV



February 20, 1979

JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

Mr. Susumu Ono, Chairman  
Board of Land and Natural Resources  
State of Hawaii  
Department of Land and Natural Resources  
P.O. Box 621  
Honolulu, Hawaii 96809

Dear Mr. Ono:

Subject: EIS for the Proposed Halawa-Pukele-  
Kamoku 138 KV Transmission Lines

I am writing in response to your letter of February 7, 1979, to Mr. Charles Ane regarding the Environmental Impact Statement for the proposed Halawa-Pukele-Kamoku 138 kv transmission lines. The following responses are addressed specifically to the concerns and questions you discussed in your letter:

COMMENT: Nuuanu Pali Lookout - Category I-B Trans-Koolau Route appears to go very close to the lookout and could have a negative impact on the view. Part of the park development completed a few years ago included the relocation of an existing 46 kv powerline to minimize its impact on the view.

Waahila Ridge - Category II Pukele area to Kamoku has Line D and Alternate G (same route) going through the park. This could be very disruptive to the park since it would involve tree removal as well as a negative impact on the view into Manoa.

No details were given in the EIS so the extent of the impact of these proposals to the parks cannot be given. None of the routes affecting parks was proposed by HECO and the impact on parks was recognized.

RESPONSE: As indicated in the EIS, the Trans-Koolau route will parallel the existing 138 kv transmission lines on the windward side of the Nuuanu Pali lookout. Additional aesthetic impact of the order of magnitude of the existing lines could therefore be expected. We concur with your conclusion that Line D and Alternative G, which pass through the State park on Waahila Ridge, could be

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Susumu Ono, Chairman

February 20, 1979

-2-

disruptive to the park. A detailed description of the extent of impact of these routes is not possible to make at this time since actual pole sites have not been surveyed.

COMMENT: Previous archaeological reconnaissance survey of the project route by Barrera (his report attached as App. A of EIS) confirms the presence of archaeological remains. The proposed mitigation measure of the applicant to avoid interference with archaeological sites (p. vii of EIS) appears adequate but should be coordinated with the Historic Sites archaeologist at an early stage as possible.

RESPONSE: During the surveying of the actual pole sites, a consulting archaeologist will investigate the areas for archaeological remains. This archaeologist will contact the Historic Sites archaeologist well in advance of beginning such investigations.

COMMENT: From the marine fisheries standpoint, the EIS adequately address most of the concerns relating to category III-B (underwater route). We fully concur with the view that this alternative should have a low priority because of the high cost involved, maintenance and repair difficulties, and adverse impact upon the marine environment due to trenching requirements. We however disagree with the statement that an advantage of this alternative is minimization of impact upon conservation area (pg. 42). It should be clarified that State conservation areas are not solely fast-lands but include all submerged marine lands within territorial limits.

RESPONSE: The revised EIS has been altered to reflect the fact that all submerged marine lands within territorial limits is a State conservation area.

COMMENT: The description of the birdlife of the Halawa-Pukele Station route is meagre. A few species are overlooked, such as the grassquit, swiftlet and the pueo (an endangered species on Oahu) but mention of these species may not alter the conclusion that there should be no significant effect on the birds or bird habitats in the path of the recommended route for the powerline.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Susumu Ono, Chairman

February 20, 1979

-3-

The Oahu creeper has been reported from the higher elevations of both Halawa and Moanalua Valleys and the iiwi most likely strays into the very upper portions of these valleys; however, the upper valleys should not be affected by the powerline. The conclusion in the EIS that there is very little native forest involved (Dr. Berger's discussion) does not appear consistent with the botanical report which states (on page 14, C-15) that 30% of the vegetation consists of 'ohia and koa, both native species. With these reservations, the EIS appears adequate in its disclosure of impacts on wildlife.

RESPONSE: It is our understanding that Dr. Berger (Appendix B) is referring to complete native ecosystems and that the "native forest" designation by E.I.S. Corp. (Appendix C) is for areas that contain significant quantities of native flora but do not constitute self-sufficient native ecosystems. Although there is a difference in emphasis between the findings of the two consultants there is no basic conflict. The questions of whether there will be any interference with endangered species and what mitigating measures will be taken will be adequately answered by the detailed surveys that will be done at each pole site.

COMMENT: The Windward route is less obtrusive than the Leeward route in terms to safeguard aesthetic and environmental values, since there exists an existing electrical corridor. Whereas the Leeward Koolau route traverses a new and virgin forested area where there are presently no transmission lines.

RESPONSE: The Leeward Koolau route will traverse some new and virgin forested areas; however, along portions of the route existing rights-of-way will be utilized. The use of existing rights-of-way as much as possible should mitigate somewhat the impact of these lines in the conservation district. Every effort will be made to reduce or mitigate impact in new or virgin forested areas by the use of helicopters and minimal clearing.

COMMENT: In time the Windward area would require 138 KV lines for the contemplated ongoing residential development in the Windward areas. Therefore, it appears that serious consideration should be given to upgrading of existing lower voltage transmission circuits on the existing right-of-way.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Susumu Ono, Chairman

February 20, 1979

-4-

RESPONSE: The windward area will, in time, require additional 138 kv transmission lines. There are now three 138 kv lines crossing the Koolaus to the windward side of the island, as shown on FIGURE 1 of the EIS. There are no 46 kv transmission circuits crossing the Koolaus; rather, the 46 kv circuits that cross the Koolaus feed distribution substations. If these 46 kv circuits are upgraded, actually removal of 46 kv and installation of 138 kv, then the distribution substations would have to be converted to 138 kv substations at an extremely large expense in money and land.

Routing the Pukele lines to the windward side of the island will mean that additional rights-of-way would be required when additional capacity is needed on the windward side because the existing rights-of-way would have been filled to get power to the Kamoku Substation.

COMMENT: Of those 11 alternatives presented in Category II (Pukele Substation to Kamoku Substation) 3 lines involve crossing over Waahila Ridge primarily because of its present open space status and therefore, easement of least resistance.

RESPONSE: The Waahila Ridge alternatives were investigated due to suggestions from concerned individuals and community groups. While these alternatives may represent the "easements of least resistance," they also represent possible alternatives and were thus presented. We agree that "future land utilization potentials are very high for this area..." and are, therefore, proposing the urban routes.

COMMENT: Should either of the CD routes be selected (Category I), the Division of Forestry would require a plan for every pole site construction, plus a current on-site inspection, in order to assure the minimal amount of environmental impact to the forested areas. A preliminary pole site inspection was made in 1973 by helicopter.

RESPONSE: Hawaiian Electric Company will supply a plan for each pali site and will be glad to cooperate in an on-site inspection.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Susumu Ono, Chairman

February 20, 1979

-5-

COMMENT: No mention is made of the costs and physical requirements of providing underground service from the Pukele Substation for alternative route G. and H. to the Kamoku Substation (page 32). We are particularly interested in the costs as they pertain to underground service in the Conservation District. More elaboration on this aspect should be forthcoming.

RESPONSE: We have prepared cost estimates for undergrounding two 138 kv lines along Waahila Ridge for comparison with Alternatives G and H. As described in the EIS, Alternative "G" is the double circuited 138 kv overhead line along Waahila Ridge from Pukele Substation to Dole Street. At Dole Street, the double circuit line separates into two single circuit lines that continue to Kamoku substation along different routes via city streets. The estimated cost for Alternative "G" of \$10.9 million can be compared to an estimated cost of \$47.0 million for undergrounding through the Conservation District. The latter estimate is based on undergrounding two 138 kv lines from Pukele Substation up to and through the Waahila State Park. From the makai boundary of the Conservation District, double-circuited overhead 138 kv lines would continue to Dole Street where the two lines would separate to follow two separate routes to Kamoku Substation.

Alternate "H", which is the undergrounding of two 138 kv lines along city streets between Pukele and Kamoku, is presently estimated at \$51.3 million. A comparable double circuit 138 kv completely undergrounded lines from Pukele Substation up to and through the Waahila State Park, down Waahila Ridge to Dole Street, and along city streets to Kamoku Substation is presently estimated at \$75.5 million.

The comparison of costs, however, does not complete the analysis. Included in this analysis must be the conditions under which the proposed undergrounding would be considered feasible. Among the factors to be considered are the following:

1. Although the overhead lines can span the great difference in elevation (from Pukele Substation at the bottom of Palolo Valley to the top of Waahila Ridge) quite easily and in a straight line, the underground alignment would be more circuitous to obtain a reasonably sloping alignment through which the pipes and cables could be installed.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Susumu Ono, Chairman

February 20, 1979

-6-

2. To obtain the required slope, a 24 foot wide road would be constructed to follow the contours of the Palolo face of Waahila Ridge. Although the trench width would only be 10 feet, the extra width would be required to facilitate construction (i.e. movement of earth moving equipment, trenching equipment, trucks, cranes, etc.).
3. This 24-foot wide road would be approximately 5,300 feet long with an average of 16% slope. The earth-work necessary to build this road would require the clearing and grubbing of approximately 25 acres of hillside. Further, approximately 300,000 cubic yards of material would be removed to a sanitary disposal site in accordance with DLNR's standard procedure.
4. Adequate drainage provisions (box culverts, concrete ditches, etc.) would be installed to control erosion and water runoff. Further, inasmuch as Palolo Valley has a history of landslides, safety measures such as retaining walls would be considered at certain locations. Other measures to prevent erosion (replanting and periodic maintenance) would also be considered for the hillside cut during road construction.
5. Although the roadway would open a new trail for hikes to reach Waahila Ridge Park, adequate measures would also be taken to prevent unauthorized motor vehicles from traversing the route.
6. Within the park area itself, the 24' wide road would still be required. Since the park is presently forested with large Norfolk pine trees, this 24-foot wide swath would necessitate the complete removal of a great number of trees.
7. It is further HECO's intent to replant selected areas within the 24-foot swath with suitable ground cover once construction is completed. However, replanting of these areas would present two possible problems. First, the ground cover selected must be able to withstand any heat generated by the cable system. Second, the ground cover selected as well as the adjacent trees must have root systems which will not affect the pipes. In the latter regard, we are particularly concerned that large roots may cause an uplift in the pipes thereby causing leaks and damage.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Susumu Ono, Chairman

February 20, 1979

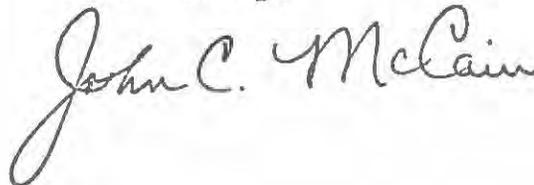
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8. It must be again emphasized that only selected areas will be replanted. This is especially true for that portion of the route from Pukele Substation to the top of the ridge. HECO cannot agree to any ground cover over the pipes since maintenance vehicles will be required to patrol and/or work on the road. Because of the steepness of the terrain and the possibility of a vehicle sliding on a vegetation type ground cover, it is our intent to install a gravel topping for all hazardous areas.
9. Included in the cost estimate comparable to Alternative "G" is an underground to overhead transition station located near the makai boundary of the Waahila State Park. This transition station would require an open area, approximately 130 feet by 110 feet, where the underground lines would tie into the double-circuited 138 kv overhead lines.

As you can see by the discussion, we expect undergrounding through Conservation Districts to be difficult with much construction resulting in an unfavorable impact on the forest area. Whereas on the mainland, undergrounding of transmission lines in the forested areas may be less complex, the terrain in Hawaii (because of its volcanic origin) becomes a formidable obstacle. The description presented above regarding only a short section of line typifies the type of problems we expect to encounter whenever undergrounding in Conservation Districts is discussed.

Hawaiian Electric Company appreciates your interest in this project.

Yours truly,

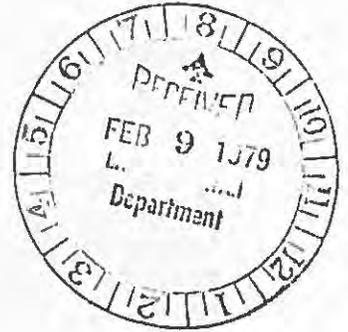


JCMc:ri

# UNIVERSITY OF HAWAII

Office of Physical Planning & Construction

February 7, 1979



Department of Land and Natural  
Resources  
P. O. Box 621  
Honolulu, Hawaii 96809

Gentlemen:

SUBJECT: Comments on EIS for  
Halawa-Kamoku 138 KV  
Transmission Line

The EIS for the proposed Halawa-Kamoku transmission line discusses several alternative routes with the Manoa and Palolo routes appearing to be the favored ones. As there is no specific route decided on in this EIS, it would appear that the preparation of a supplemental statement be necessary when a route is selected. In the statement, detailed descriptions and locations of the rights of way should be addressed.

Sincerely yours,

*Tamotsu Sahara*  
Tamotsu Sahara  
Planner

TS:lp  
cc: ✓ H.E.Co.

# M&E Pacific, Inc.

*Environmental Engineers*

Pacific Trade Center, Suite 600  
190 South King Street  
Honolulu, Hawaii 96813  
(808) 521-3051 Cable: MEPAC

February 15, 1979

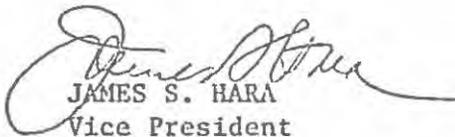
Mr. Tamotsu Sahara, Planner  
University of Hawaii  
Office of Physical Planning & Construction  
2002 East-West Road  
Honolulu, Hawaii 96822

SUBJECT: Environmental Impact Statement (EIS) for  
Proposed Halawa to Kamoku 138 KV Transmission Lines

In response to your February 7, 1979 letter on the subject EIS, we do not anticipate the preparation of a supplemental statement. The EIS addresses the impact to the environment of many alternative routes thereby precluding the need of a separate supplemental statement.

We also do not anticipate including in the EIS the detailed descriptions and locations of the rights of way for the alternative routes, but the information is available for your review at the Engineering Design Department of Hawaiian Electric Company.

We appreciate your comments and thank you for your interest in this matter.

  
JAMES S. HARA  
Vice President

RSN/jn



# University of Hawaii at Manoa

Environmental Center  
Crawford 317 • 2550 Campus Road  
Honolulu, Hawaii 96822  
Telephone (808) 948-7361

Office of the Director

February 9, 1979

RE:0269

Department of Land and  
Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

Dear Sir:

## Review of Draft Environmental Impact Statement Halawa to Kamoku 138 KV Transmission Line

The Environmental Center has reviewed the above cited EIS with the assistance of Sheila Conant, General Science; Charles Lamoureux, Botany; Bertil Granborg, Electrical Engineering; and Jacquelin Miller, Barbara Vogt, and Caryn Woodhouse of the Environmental Center.

The EIS presents a careful and extensive discussion of most of the potential environmental impacts associated with the overhead emplacement of 138 KV transmission lines. Less information is provided for the underground and submarine alternatives. The specific areas in which our reviewers have expressed concern are as follows.

The discussion of impacts on flora and fauna is good. We agree that the proposed project is unlikely to seriously affect any native bird species. The proposed overhead routes do pass through several areas with substantial native vegetation, including a good diversity of plant species. We are pleased to note (p. VII) that the specific location of each power pole will be surveyed for archeological sites and endangered species prior to clearing and pole emplacement. Of course, precautions should be taken to avoid introducing noxious weeds into such areas. We suggest that HECO confer with the State Botanist for advice on the choice of grass species planted to control erosion at pole sites.

The EIS states that corona discharge is not a factor at 138 KV (p. 87). Does it become a factor when two 138 KV lines are in close proximity? The EIS does not discuss corona discharge as it relates to ambient weather conditions (especially wet weather). Is our humid weather a significant factor in this phenomena?

The EIS presents so many alternate routes that it becomes difficult to adequately access in depth, the impacts of any specific route. This problem is particularly evident when assessing the impact of proposed lines on property values, and visual aesthetics (pp. 89-90). For example, sight lines apparently were not considered. Transmission lines at different heights above ground may well impact on an entirely different set of

properties, both in detached houses and in apartment areas. It is inappropriate to compare the sale prices of a few adjacent properties with the average sale prices for as large and diverse a group as is found in Tax Map Zone 9. An attempt should be made to compare sale prices or appraisals of properties where transmission lines are highly visible or audible with nearby properties not so influenced in order to evaluate the economic impact of overhead lines. What mitigating measures will be taken if the proposed project is shown to have a negative impact on real property values?

The section on noise related problems (pp. 92-93) discusses noise caused by sparking and corona discharge. It has been brought to our attention that in addition to these types of noise, residents near 138 KV lines have complained of a nearly constant hum apparently due to wind vibration of the lines. Has consideration been given to the impact of noise related to wind vibration of the lines and the number of residences that will be affected along the different routes?

The generally expressed concern of the affected neighborhoods, over the potential biological, economic and aesthetic, impacts of the construction of overhead 138 KV lines should require a detailed analysis of the underground and submarine alternatives. The discussion on pp. 37-42 of Alternatives III-A (3) (Urban Honolulu Route Underground) and III-B (Underwater Route) should be expanded and alternative routes and construction methods within the suggested routes need to be considered. For example, could a combination of the underground and submarine route be devised? Are there any existing conduits such as sewers or storm drains that could be used for submarine type cables? We recognize that capacities of existing systems may not accommodate the pipe conduit required for the electrical lines, however, is it possible that some of the undergrounding could be accommodated in this way and thereby minimize street excavation and traffic disruption? Furthermore by using the larger sewers or storm drains access could be achieved for repair and maintenance.

Has consideration been given in relation to the submarine route to the use of the existing abandoned sewer outfalls between Honolulu Harbor and Kewalo basin as routes for the auxiliary cooling oil line? We recognize that cooling oil is necessary in underground installations, however, is such cooling oil necessary in the case of submarine cables where cooling is provided by the sea? With respect to the use of the Ala Wai Canal, could the submarine cables be attached to the mauka wall of the Ala Wai Canal and covered as necessary for protection, thus facilitating access for maintenance and eliminating excavation? Similarly could the existing storm drain channel through Ala Moana Park (perhaps with some additional excavation), accommodate the necessary cables? Has consideration been given to a route consisting of undergrounding, with excavation or use of storm drains or sewers, from Iwilei Substation to Keawe Street, then up the storm drain channel at Ala Moana Park, across to the Ala Wai Canal and from there mauka to the Kamoku substation?

Several statements are made in connection with the discussion of the submarine route which require further explanation. The statement is made that no expertise or equipment is available locally to install undersea power cables. We seriously question the validity of this statement. It is our understanding that there are at least three major dredging and construction companies in the State that either have, or can provide, the necessary expertise and equipment for undersea cable laying. The necessary ships are available locally both for installation and repair. The 100 foot suggested depth of installation

February 9, 1979

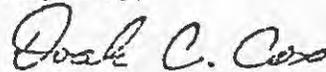
is within the working depth of divers from locally available, highly skilled, and experienced technical and scientific diving companies. The environmental effects of trenching requirements should be short term and minimal.

Because of the significance to the communities involved and the long term permanent impact of an overhead route decision, it seems imperative that full and precise analysis be made of each of the alternatives presented in the DEIS. The economic analysis of the undergrounding and submarine routes, (both the AC and DC systems) should be more fully detailed to permit a more informed evaluation of these alternatives.

We recognize that in-depth assessment of the impacts of all possible routes would be extremely time consuming and costly, and would not be justified by the decision making needs. However, the assessment of several of the routes that should not at this point be discarded should be expanded in order to assure that the final EIS will provide adequate information to fulfill its purpose as a decision making document. We suggest that when the choice of routes has been narrowed to one or a very few on the basis of the combination of monetary and environmental considerations, a supplemental EIS be prepared to assure adequate evaluation of all impacts on those areas that would be affected by construction and use of power lines on those routes.

We appreciate the opportunity to comment on this EIS and your consideration of our comments.

Very truly,



Doak C. Cox  
Director

DCC/ck

cc: OEQC  
Sheila Conant  
Charles Lamoureux  
Bertil Granborg  
Jacquelin Miller  
Barbara Vogt  
Caryn Woodhouse  
Tamotsu Sahara  
*John McLain ✓*

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840



February 20, 1979

JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

ENV 2-1  
H-P-K  
NV/G/NV

Mr. Doak C. Cox, Director  
University of Hawaii at Manoa  
Environmental Center  
Crawford 317, 2550 Campus Road  
Honolulu, Hawaii 96822

Dear Mr. Cox:

Subject: EIS for the Proposed Halawa-Pukele-Kamoku 138 kv  
Transmission Lines

This is in response to your letter dated February 9, 1979 to the Department of Land and Natural Resources regarding the Environmental Impact Statement for the proposed Halawa-Pukele-Kamoku 138 kv transmission lines. The following responses are addressed specifically to the concerns and questions you discussed in your letter:

- COMMENT: We suggest that HECO confer with the State Botanist for advice on the choice of grass species planted to control erosion at the poles.
- RESPONSE: A detailed botanical survey will be made of pole locations as you suggested and advice will be sought to prevent the introduction of noxious weeds and to control erosion at the pole sites.
- COMMENT: The EIS states that corona discharge is not a factor at 138 kv (page 87). Does it become a factor when two 138 kv lines are in close proximity? The EIS does not discuss corona discharge as it relates to ambient weather conditions (especially wet weather). Is our humid weather a significant factor in this phenomena?
- RESPONSE: As mentioned on page 86 of the EIS, corona discharge can be caused by the conductor surface gradient exceeding a critical value. The calculation of the conductor surface gradient is dependent on the conductor size, line configuration, and the voltage. The critical value can also be calculated given the conductor size, condition of the surface, and the weather conditions.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Doak C. Cox  
February 20, 1979  
Page 2

Based on the above parameters, it can be shown that the determination of whether or not corona will be present is dependent on the proximity of 138 kv lines and the weather conditions. In general, it can be demonstrated that the probability of corona increases during rainy weather. However, it has been HECO's experience that corona related problems have not been observed on any single and double circuit 138 kv lines presently in service.

COMMENT: The EIS presents so many alternate routes that it becomes difficult to adequately access in depth, the impacts of any specific route. This problem is particularly evident when assessing the impact of proposed lines on property values, and visual aesthetics (pp. 89-90). For example, sight lines apparently were not considered. Transmission lines at different heights above ground may well impact on an entirely different set of properties, both in detached houses and in apartment areas. It is inappropriate to compare the sale prices of a few adjacent properties with the average sale prices for as large and diverse a group as is found in Tax Map Zone 9. An attempt should be made to compare sale prices or appraisals of properties where transmission lines are highly visible or audible with nearby properties not so influenced in order to evaluate the economic impact of overhead lines. What mitigating measures will be taken if the proposed project is shown to have a negative impact on real property values?

RESPONSE: We agree that an unusual number of alternative routes are presented in our attempt to include all suggested possible routes between two points. Normally we reduce the number of alternatives based on our experience and judgment on pertinent information that are economically available.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Doak C. Cox  
February 20, 1979  
Page 3

We agree that transmission lines at different heights above ground may present a different impact than those at the same height, but, because of the height and wide spacing interval of the poles proposed, the break in sight lines due to differing heights is not readily discernible (see page 78 of EIS) thereby minimizing their visual impact.

In assessing the potential effect of the 138 kv line project to property values, we compared the market values of properties near 138 kv lines with the average values for properties in the tax division as a base.

We felt that this base did reflect nearby properties not influenced by the visual and possibly audible impact of the 138 kv transmission lines. We also felt that this base will dampen the variation in market values caused by many factors other than the impact of transmission lines.

No measure is planned at this time to mitigate the negative impact this project may have on property values because we feel it will not be required. As stated in the EIS, owners will be adequately compensated if the lines cross their property.

COMMENT: The section on noise related problems (pp. 92-93) discusses noise caused by sparking and corona discharge. It has been brought to our attention that, in addition to these types of noise, residents near 138 kv lines have complained of a nearly constant hum apparently due to wind vibration of the lines. Has consideration been given to the impact of noise related to wind vibration of the lines and the number of residences that will be affected along the different routes?

RESPONSE: It is possible for a humming noise to be produced by wind flowing past conductors. The factors contributing to this noise are wind velocity, terrain, route of the conductor in relation to wind direction, and the number of conductors impacted upon by the wind. It is usually a combination of these factors which produce wind noise discernible to the public.

The velocity of the wind is a key factor. In normal cases of little or no wind, there is no noise. However,

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Doak C. Cox  
February 20, 1979  
Page 4

in times of high wind, the wind will produce noise as it flows past any object in its path. This includes trees and buildings as well as transmission lines.

Terrain is a major contributing factor. In certain locations on the island the features of the land present a narrow opening to the wind causing a funneling effect. As the wind forces its way through this narrow opening a noise is produced. This feature exists at the location of one complaint received from Palolo.

The orientation of the conductors in relation to the wind direction is also important. If the route of the conductors is perpendicular to the wind direction, they present an obstacle to the wind and noise is produced at times of high wind. If the route is parallel to the wind direction, little or no noise is produced.

The configuration of the conductors is also a factor. If a large number of conductors are placed in a vertical configuration across the path of a high wind, the wind impacting on the conductors could create noise.

Several mitigating measures are available to HECO in solving problems of this nature. Among these are changing the line configuration or installing vibration dampers. It is HECO's policy upon receiving these complaints to investigate and take the appropriate mitigating measures.

**COMMENT:** The generally expressed concern of the affected neighborhoods over the potential biological, economic, and aesthetic impacts of the construction of overhead 138 kv lines should require a detailed analysis of the underground and submarine alternatives. The discussion on pp. 37-42 of Alternatives III-A(3) (Urban Honolulu Route Underground) and III-B (Underwater Route) should be expanded and alternative routes and construction methods within the suggested routes need to be considered. For example, could a combination of the underground and submarine route be devised?

**RESPONSE:** Discussed on pages 47 through 49 is the Company's position on its proposed 138 kv underground transmission system. HECO's proposal to utilize the pipe-type system for its high voltage 138 kv underground system is based on the system's proven performance of lower maintenance and higher reliability as compared to other types of 138 kv underground systems. The pipe-type system currently dominates the high voltage underground field in the

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Doak C. Cox  
February 20, 1979  
Page 5

United States. Although there may be other systems currently being utilized, the number of such installations are minimal and they do not have the proven record of experience that pipe-type systems have attained.

We did not expand on alternate underground and underwater routes because we felt that the potential problems and difficulties associated with this type of cable installations in the area to be traversed will basically be the same, whichever route is chosen. Our basic concern is to minimize the economical, environmental, sociological, etc., impact on our community.

The underwater route is actually a combination of underground and submarine systems. The route will utilize submarine cables through Honolulu Harbor, out in the ocean, and in Ala Wai Canal. Underground cables (pipe-type) will be utilized from Iwilei Substation to Honolulu Harbor, and from Ala Wai Canal near Ala Wai School to Kamoku Substation.

COMMENT: Are there any existing conduits such as sewers or storm drains that could be used for submarine type cables? We recognize that capacities of existing systems may not accommodate the pipe conduit required for the electrical lines, however, is it possible that some of the undergrounding could be accommodated in this way and thereby minimize street excavation and traffic disruption? Furthermore, by using the larger sewers or storm drains access could be achieved for repair and maintenance.

RESPONSE: Sewer or storm drains will not be a viable solution for use as conduits for submarine cables. The presence of highly toxic and explosion gases such as methane in sewer systems makes it totally unacceptable for use as underground electric ducts at any voltage, least of all, 138 kv. Unlike HECO's electric ductline system, where separate conduits are provided for individual circuits for reliability reasons and ductline runs are normally straight, with bends that follow smooth uninterrupted radii, most storm drains, regardless of size, are completely different. Usually, only one pipe (conduit) is available between drain manholes. Bends in drain pipes do not follow a smooth radius; rather, they are normally abrupt, either in the vertical or horizontal direction. Except for straight runs of drain pipe, cable pulling between drain manholes would be extremely difficult, if not impossible. Submarine

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Doak C. Cox  
February 20, 1979  
Page 6

cables are constructed with a metallic protection armor making the cable highly inflexible to small radius bends. They are designed to be installed by being laid directly into the ocean or into an open trench, where bending radii requirements are quite large. Use of small size and lower voltage cables would be difficult enough; use of submarine cables would compound the difficulties. Electric manholes are normally built large enough to accommodate splicing operations, requiring space for the splice, workmen, tools, materials, and equipment. Most storm drain manholes would be too small to accommodate this operation. As mentioned above, most drains have only one pipe between manholes. Utilizing one pipe to install all of HECO's cables would present a system reliability problem.

Another very important question that has to be considered is would the City allow such use of their sewer and drain pipes? These pipes are sized to accommodate a certain drain or sewer flow capacity. Utilizing part of these pipes by cables would reduce the pipe's capacity. Submarine cables are oil-filled. Failure of this cable would introduce oil into the City's drain system. Should the pipes be filled with water, maintenance cannot be performed on the cables.

**COMMENT:** Has consideration been given in relation to the submarine route to the use of the existing abandoned sewer outfalls between Honolulu Harbor and Kewalo Basin as routes for the auxiliary cooling oil line? We recognize that cooling oil is necessary in underground installations, however, is such cooling oil necessary in the case of submarine cables where cooling is provided by the sea?

**RESPONSE:** Upon reevaluation of the underwater route, it has been determined that the oil pumping station originally located on HECO's property on Cooke Street between King Street and Kapiolani Boulevard could be replaced by two pumping stations, one at each end of the underwater route. This method would then eliminate any construction activity in the Kakaako area for the underwater alternative.

The term "cooling" is also somewhat misleading. The primary purpose of the oil pumping station is to maintain a high oil pressure in both the land underground cables and the submarine cables. A constant high oil pressure is then maintained to eliminate gaseous ionization that may damage cable insulation,

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Doak C. Cox  
February 20, 1979  
Page 7

rather than for cooling purposes. However, should the need to increase cable capacity be necessary, the pump station could be used to circulate and cool the oil for this purpose. In addition, should the cable be damaged, the pump will maintain a positive pressure in the cable, keeping water out, limiting cable damage to the immediate area of the cable fault. Intrusion of moisture could result in the entire length being damaged.

COMMENT: With respect to the use of the Ala Wai Canal, could the submarine cables be attached to the mauka wall of the Ala Wai Canal and covered as necessary for protection, thus facilitating access for maintenance and eliminating excavation?

RESPONSE: Attaching the submarine cables to the mauka wall of the Ala Wai Canal would present some very difficult problems. We are proposing to utilize seven cables for this installation. These cables must be properly spaced apart to eliminate thermal and maintenance problems. If we separated these cables by a minimum of one foot, we would need wall space of at least six feet below the lowest waterline. It is our understanding that the canal wall is constructed on a coral ledge with an average water depth of two to three feet. Attaching the cables to the wall would therefore require dredging adjacent to the wall to clear a minimum of six feet wall space. Reinforcing or rebuilding portions of the wall may be necessary should it not be adequate to support the weight of the cables or not be deep enough to clear six feet. There are at least two drain streams that enter the Ala Wai Canal through the mauka wall along the cable route. At these points, trenches will have to be dredged across the entrance to allow crossing of the cables.

We agree with you that the cables must be covered for public protection. We believe minimum protection for high voltage underground lines is six inches of reinforced concrete. Therefore, a concrete box must be constructed around the conductors the entire length of its cable run. For maintenance purposes, the top of the concrete box must be removable slabs. We see no advantage in this proposal.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Doak C. Cox  
February 20, 1979  
Page 8

COMMENT: Similarly, could the existing storm drain channel through Ala Moana Park (perhaps with some additional excavation) accommodate the necessary cables?

RESPONSE: No, for the same reasons given above. In addition, the City has plans of eliminating part of the drain channel to provide more park space.

COMMENT: Has consideration been given to a route consisting of undergrounding with excavation or use of storm drains or sewers from Iwilei Substation to Keawe Street, then up the storm drain channel at Ala Moana Park, across to the Ala Wai Canal, and from there mauka to the Kamoku Substation?

RESPONSE: No, consideration was not given to this route; however, for reasons given above regarding use of sewer and storm drains and the City's plans to eliminate part of the Ala Moana drain channel, we do not consider this viable.

COMMENT: Several statements are made in connection with the discussion of the submarine route which require further explanation. The statement is made that no expertise or equipment is available locally to install undersea power cables. We seriously question the validity of this statement. It is our understanding that there are at least three major dredging and construction companies in the State that either have, or can provide, the necessary expertise and equipment for undersea cable laying.

RESPONSE: Yes, we agree that there may be some expertise in the islands, however, no submarine cable project of this magnitude has ever been attempted before in the islands. Therefore, the number of qualified personnel and equipment may be limited. To accomplish this project we would probably follow the lead of many utilities and execute a "turn key" contract with the cable manufacturer to do the complete work. They may hire local craftsmen and equipment for assistance in the installation of the cables.

COMMENT: The economic analysis of the undergrounding and submarine routes, should be more fully detailed to permit a more informed evaluation of these alternatives.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Doak C. Cox  
February 20, 1979  
Page 9

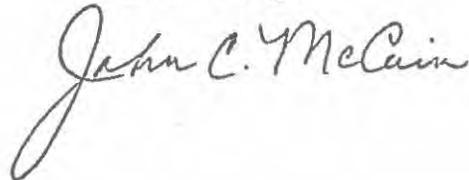
RESPONSE: Comparable cost estimates listed in Table 7 incorporates latest unit wage and material prices as of December, 1978, which have been further escalated to account for construction in future years. Further discussion on detailed costs can be arranged at your convenience.

COMMENT: Assessment of several routes should be expanded and a supplemental EIS should be prepared on routes selected during a "choice narrowing" procedure.

RESPONSE: We feel that each alternative in the final EIS has been sufficiently described and its impact sufficiently addressed that a supplemental EIS is not required.

We trust that we have satisfactorily responded to your comments and thank you for your interest and concern for this project.

Yours truly,



JCMc:cal

2801 Ia-1 Road  
Honolulu, Hawaii 96816  
February 12, 1979

Mr. Susumo Ono, Chairman  
Board of Land and Natural Resources  
1151 Punchbowl Street  
Honolulu, Hawaii 96813

Dear Mr. Ono:

The Environmental Impact Statement for the Proposed Halawa to Kawoku 138kv Transmission Lines is inadequate in many respects including the following:

1. The EIS is biased in favor of Hawaiian Electric Company and totally misrepresents and misinterprets the future situation of power shortage which the proposed project is intended to address. The EIS is entirely based on the unsupported assumption that a need for more electricity will exist, when, in fact, a need for additional energy supply, which could be provided through a variety of forms, may be anticipated. The alternatives of increased reliance on gas, solar, geothermal, and other forms of energy, individually and in different combinations, and the impacts of these alternatives are fully neglected. The EIS is therefore misleading and inadequate in its entirety.

2. The EIS fails to examine the short and long-term economic, environmental, and social impacts of increased reliance on oil-based electricity production in comparison with reliance on alternative forms of energy. This is of particular importance in light of uncertain future availability and cost of oil.

3. The EIS is inadequate in that it does not disclose, for each alternative means of meeting the anticipated need for power: 1) the number of years for which the equipment used could reasonably be expected to function and remain in place; 2) the amortization schedule for the project; 3) the manner in which costs of the project will be passed on to various consumer groups over time; 4) the projected level of energy demand throughout the expected life of the project. In addition to a comparison of all alternatives with respect to these four points, a presentation of all assumptions, data, data sources, and methods used in determining the above is needed in order to disclose the cumulative environmental, economic, and social impacts of the project.

4. The EIS inadequately describes the impacts of each alternative means of meeting energy demands on residential property values. The method used in the EIS to suggest that overhead 138kv lines in residential areas will have no significant effect on property values is thoroughly unrealistic and inappropriate. A competent research of this problem should be undertaken to disclose the economic impacts of the project.

5. A study on file at the Public Utilities Division, entitled, "Kakaloa-McCully-Kapiolani-Kaimuki-Aina Koa Load Study," the stated purpose of which was, "to determine whether another 138 kv transmission substation in addition to Pukele is required in the area from Kakaloa to Aina Koa" (Load Study, page 1) states that: "a new 138 kv transmission substation is required by 1976 to meet the system load requirements for this area" (Load Study, page 3). Clearly, load requirement projections are not always correct. The assumptions, methodology, data, and data sources used in projecting peak loads for the Pukele substation are not presented in the EIS. Therefore, the EIS is inadequate. The alternative assumptions, methodologies, data, and data sources which might have been used, in addition to an explanation of why those which were used were chosen, and a

comparison of those which were used in arriving at the (incorrect) 1976 date with those used in arriving at the 1981 date cited in the EIS (pages 6 through 13) are needed to fully describe the alternative of no action or delayed action.

6. In referring to a single failure analysis which was done in order to substantiate the need for the proposed project (EIS pages 8 through 12), the EIS fails to adequately disclose: 1) the probability of failure for each line and each transformer; 2) the probability that such a failure would occur at a peak demand period; 3) the impacts and probable duration of outages caused by such failures; 4) the alternative methods of providing emergency systems in case of failure. Therefore, the claim of need for the project is unsubstantiated and unqualified.

7. On page 33 of the EIS, the statement is made that, "If the probability of a simultaneous failure per year per mile of double circuit line were known with reasonable accuracy, a direct evaluation of the tradeoffs could be made." Calculation of this probability is essential to decision making. The EIS is inadequate in that it does not disclose the probability of such a failure.

8. The cost estimates presented in the EIS for each of the alternatives discussed are unsubstantiated, inaccurate, and reflect poor investigation of cost-saving alternatives. Savings could be realized through coordinating the proposed alternatives with other projects scheduled to be undertaken in a similar time frame by public and semi-public agencies. For example, the Board of Water Supply has tentatively scheduled reconstruction of water mains in Palolo Valley for 1981 and 1983. Putting electric lines underground at the same time could considerably reduce costs and inconvenience to the public. On page 34 of the EIS, it is stated that, "accommodation of such a large use of right of way (as would be required for two 138kv underground lines) would have had to have been planned for when the streets and other utilities were first laid out." Redevelopment of the Kakaako area in the near future should provide such an opportunity for planning and installation of underground utilities at reduced cost.

9. The alternative of connecting the Kamoku substation to the Halawa substation via the Iwilei substation, overhead and underground, is inadequately covered in the EIS.

10. The Honolulu generating plant, mentioned on page 1 of the EIS, is not included on the map entitled, "Figure 1", which is supposed to present "the generation facilities of Hawaiian Electric Company on Oahu" (EIS, page 1). The EIS is inadequate because it does not include discussion of how the Honolulu plant could be utilized in meeting the projected need for power in the nearby area.

11. In discussion of the alternative routes through urban areas, the impacts of the project on the health of people living near the transmission lines is given inadequate consideration. No study is presented which indicates that 138kv lines are not harmful to health to people living near the lines.

12. The impacts of line noise in high winds are not thoroughly studied and considered in the EIS. Contrary to the claims of Hawaiian Electric Company, line noise does occur in periods of high winds, and such noise has been a source of great distress to residents of Palolo Valley residing in close proximity to existing lines. Consideration in this regard should be given to the fact that the elderly residents of Palolo Chinese Home may be adversely effected if the route passing over the Home is utilized.

13. In discussion of the "Potential Danger from Electric Power Lines and Poles", on page 77 of the EIS, reference is made to "normal conditions(80 deg.F, no wind)." These are not normal conditions in Palolo Valley, where strong winds are often channeled down the routes of alternative lines 1 and 2. The design criteria noted in the EIS page 77, refer to maximum tension at 50 degrees F and 60 mile per hour winds. In view of the high winds and freak gusts which have hit the islands this past year, design criteria for more severe condition should be presented. The EIS is inadequate in this and other respects with regard to impacts of the project on health and safety.

14. The statement that, "The proposed poles could actually be considered to be less of a traffic hazard than the existing poles," (EIS, page 80), is biased and misleading. The proposed poles will be an additional traffic hazard, beyond that posed by the existing poles which, under current plans, would remain in place.

15. The EIS does not fully describe the limitation on construction and other future uses of private property under or adjacent to the overhead lines. Therefore, the EIS is misleading, biased, and inadequately discloses negative impacts of the proposed project.

16. The statement made in response to many letters expressing concern for the visual impact of the proposed overhead wires that, "the steel poles to be used are modern, slim, and would have a neat appearance as opposed to the 'jungle of wires' appearance on many existing wooden poles," is biased in favor of Hawaiian Electric. These steel poles could just as truthfully be described as, "outdated, bulky, fat, obsolete eyesores in addition to the 'jungle of wires' on existing wooden poles." The EIS is filled with such judgemental and misleading statements.

17. The EIS is inadequate in that it makes no reference to or attempt to document and measure the impact of the proposed overhead lines on views from residential structures at street level and above.

18. The "Typical View" of the proposed steel poles along an urban street, which is presented in Figure 14, page 78 of the EIS, is a misrepresentation. If the existing wooden poles are 60 to 65 feet tall, as stated on page 60 of the EIS, and the steel poles for the proposed project are to be 105 to 125 feet tall, as stated in the EIS on page 76 and elsewhere, then the steel poles should be approximately twice as tall as the existing wooden poles. The picture in Figure 14 is extremely misleading, making the steel poles appear to be approximately the same height or only slightly taller than the existing poles. Also, the picture conveniently leaves out any of the service lines which cross the streets from the existing wooden poles which further detract from the view.

19. Discussion of mitigation measures in the EIS is inadequate in that it does not include the option of removing all the existing wooden poles and transferring all the existing wires to the proposed steel poles. The mitigation measures also fail to address the issue of compensation to property owners for reduced property values in those communities in which the lines would be installed. There are also many other mitigating measures which are not included in the EIS, but which are possible ways of reducing negative impacts of the proposed project.

20. The EIS is inadequate because it contains conflicting, yet supposedly factual, information. For example, on page B-29 is written:

...There is no virgin or near virgin native ecosystem at any place along the proposed power line. The entire route passes through areas whose native ecosystems were devastated more than 100 years ago, with the result that the vast majority of all plant life now consists of introduced species.

while on page c-13 the EIS states:

Study Site 7: Waahila Ridge.

.... This was the least disturbed site and consisted of a large number of native species. Many of the weedy species such as... were confined to the trailsides. A large colony of the native white hibiscus, Hibiscus ornottianus, was seen on the slopes facing Palolo Valley. The lichen, Usnea, was very common on the branches and twigs of trees in the study site. Large, pale green tussocks of the moss Leucobryum were frequently found on the ground near the base of the trees.

Uluhe covers much of the open steeper slopes and ridges. Trees such as chia, koa, 'akaha, and kalia (Elaeocarpus bifidus) were scattered throughout the uluhe and accounted for 25% of the cover. Large groves of kukuis were noted in the gullies below.

21. The EIS is inadequate because it fails to disclose vital information regarding the impacts of the project on flora, fauna, mammals, and birds; for example, a consultant's report in the EIS indicates that more study is needed to determine the project's impact on endangered plant species:

...It is recommended that a more in depth survey be conducted in the ohia-koa zone, specifically, the alignment areas behind Kapalama, Tantalus, and on Waahila Ridge. Exocarpus quadichaudii which is on the Federal Register (1976) of rare and endangered plants has been collected from the Waahila Ridge area and is known to be near the proposed alignment." (EIS page C-15)

Until such further study is undertaken, and the results included in the EIS, the EIS is incomplete. Another example of a case in which further study is needed is indicated on page B-21 of the EIS:

There is one questionable report of "one (possibly two) Oahu Creepers" in this area (Waahila Ridge) (Elepaio, 34, 1973:18). The Oahu Creeper (Loxops maculata maculata) has now been listed as an "endangered" species (Federal Register, vol. 41, Wednesday, October 27, 1976, page 47188)."

22. The EIS is inadequate because much of the conservation area which will be impacted by the proposed project was not studied. For example, the EIS states on page A-3:

The extreme inland portion of this part of the proposed power line (Waahila Ridge) right-of-way was not surveyed because of the difficulty of access to the area. Although no sites have been recorded in the area, the possibility of their presence should not be discounted.

The inventory of archeological and historic sites in the EIS is incomplete.

23. The EIS fails to discuss the negative impacts of the development of trails under the proposed wires, once installed, due to the trimming of trees in the sag areas, and due to hikers who follow the wires as directional aids. This will greatly increase the rate at which weedy species will be introduced to the Waahila (and other) areas. That this will occur should the lines be installed can be readily verified by examining the trail which has developed under the existing 138 kv lines between Ia-i Road and Ka'au Crater.

24. 138 kv lines in forest areas are maintained through the use of helicopter visual inspection. The EIS is inadequate in that it fails to document the negative impacts and inconvenience to residents living near the proposed lines due to helicopter rotor blast.

25. The EIS misrepresents alternative III-B, and is incorrect in its brief examination of this alternative. On page 4] of the EIS it is stated that, mid-way in the underwater cable it would be diverted to Cooke St. for an oil pumping facility. This procedure would unduly raise the cost of the alternative III-B, as oil pumping could be done from either end of the cable. Refer to the enclosed study by H.H. Huang, PhD., of the Hawaii Natural Energy Institute, University of Hawaii at Manoa, regarding linking the islands of Maui, Moloka'i, and Lana'i by undersea electric cable. On page 14 of this study, reference is made to underwater cables ]0 miles long with no pumping stations between the terminals. On page ]7, the report states that ]38kv cables can be up to 45 miles long using existing technology.

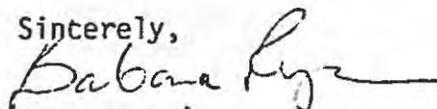
26. The EIS misrepresents the drawbacks of underwater cables (EIS page 42) by stating that use of such cables would entail, "(1) very high cost, (2) very difficult maintenance and long probable outage periods in case of failure and (3) detrimental ocean environmental effects due to the trenching requirements." With respect to point (1), the above-referenced report by Dr. Huang states on page ]3, table 2-1, comparative costs per mile of overhead, underground, and submarine cables. The figures for overhead and underground cables included in this table were supplied by Hawaiian Electric Company. Submarine cable costs approximately three times as much as overhead, and 1/2 as much as underground. Therefore, Hawaiian Electric's estimate of \$55.6 million, included in the EIS, is highly inaccurate.

Regarding point (2) above in the EIS, Dr. Huang's report documents responses from utility companies using underwater cables: No power outages have been reported to occur due to electrical faults in 40 years experience (see page 43 of Dr. Huang's report). Further, the use of a spare cable as proposed by Hawaiian Electric for alternative III-B further reduces the probability of power outages. Dr. Huang's report also reviews mechanical damages to undersea cables due to anchors and trawling, as well as other conceivable damaging factors (see pages 43 and 45 of Dr. Huang's report). Dr. Huang's study also indicates that maintenance costs on undersea cables are nil (page 74), until such time as the cable must be replaced, and the cables are insured in many cases (page 74).

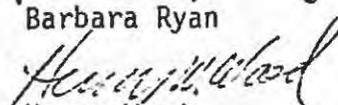
Detrimental ocean environmental effects, as mentioned in point (3) above in the EIS, are studied on pages 49 through 51 of Dr. Huang's report, and are deemed very insignificant.

In view of the above inadequacies of the EIS, we hope that it will be considered unacceptable by the Board of Land and Natural Resources and all other accepting parties.

Sincerely,



Barbara Ryan

  
Henry Wood

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840



JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

February 20, 1979

ENV 2-1  
H-P-K  
NV/G/NV

Ms. Barbara Ryan and  
Mr. Henry Wood  
2801 La-i Road  
Honolulu, Hawaii 96816

Dear Ms. Ryan and Mr. Wood:

Subject: EIS for the Proposed Halawa-Pukele-Kamoku  
138 kv Transmission Lines

This is in response to your letter of February 12, 1979 regarding the Environmental Impact Statement for the proposed Halawa-Pukele-Kamoku 138 kv transmission lines. The following responses are specifically addressed to the concerns and questions you discussed in your letter:

COMMENT: 1. The EIS is biased in favor of Hawaiian Electric Company and totally misrepresents and misinterprets the future situation of power shortage which the proposed project is intended to address. The EIS is entirely based on the unsupported assumption that a need for more electricity will exist, when, in fact, a need for additional energy supply, which could be provided through a variety of forms, may be anticipated. The alternatives of increased reliance on gas, solar, geothermal, and other forms of energy, individually and in different combinations, and the impacts of these alternatives are fully neglected. The EIS is therefore misleading and inadequate in its entirety.

RESPONSE: We do not feel that the EIS is biased and misrepresentative. The need for relief at the Pukele Substation will become progressively more acute and relief must be provided.

The transmission and distribution of electrical energy will be necessary regardless of the source unless individual sources not now generally available are developed. As you are probably aware, Hawaiian Electric Company is involved in many alternate energy projects.

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 2

Solar energy may ultimately provide significant power in the future; however, if solar energy is converted to electrical energy at a central site, it still must be transmitted to the user. Therefore, increased use of solar energy will still require transmission lines. Individual solar energy to electrical energy devices are still in the developmental stages and will not contribute to the reduction in load at the Pukele Substation in the next few years.

Solar water heaters reduce energy consumption of electricity. When the weather turns bad for several days, as it has been in recent months, the solar heater becomes ineffective and energy and peak demands are no longer reduced by solar heaters. We then, must transmit the power load for water heating. The weather is usually worst in the winter months which further compounds the problem because this is when our peak occurs.

Increased use of gas to alleviate the power needs of the Pukele service area would probably not reduce the need for the power lines substantially due to the following: (1) Almost all of the high-rise buildings in the Pukele service area that require large amounts of hot water already use central gas water heating and water heating accounts for at least three quarters of the residential heating and cooking load. (2) Many of the restaurants in the area already use gas for water heating and cooking. (3) Most other nonresidential, commercial facilities have little or no need for water heating or cooking; and (4) Many of the older homes and apartments in the Kaimuki, Kapahulu, and McCully area already use gas appliances. Therefore, a massive conversion to gas for residential cooking and water heating would only affect peak demands on the Pukele system by a few percent at the most.

COMMENT: 2. The EIS fails to examine the short and long-term economic, environmental, and social impacts of increased reliance on oil-based electricity production in comparison with reliance on alternative forms of energy. This is of particular importance in light of uncertain future availability and cost of oil.

RESPONSE: As you state, the EIS does not address our reliance on oil-based electrical production in comparison with reliance on alternative forms of energy. The

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 3

transmission and distribution of electrical energy will be necessary regardless of the source unless individual sources not now generally available are developed. Such a discussion is not properly a portion of this EIS since the project is to supply electrical energy to an already approved substation site, not the generation of electrical energy.

COMMENT: 3. The EIS is inadequate in that it does not disclose, for each alternative means of meeting the anticipated need for power: 1) the number of years for which the equipment used could reasonably be expected to function and remain in place; 2) the amortization schedule for the project; 3) the manner in which costs of the project will be passed on to various consumer groups over time; 4) the projected level of energy demand throughout the expected life of the project. In addition to a comparison of all alternatives with respect to these four points, a presentation of all assumptions, data, data sources, and methods used in determining the above is needed in order to disclose the cumulative environmental, economic, and social impacts of the project.

RESPONSE: Transmission equipment has an average service life of 24 to 50 years depending on the type of equipment. The accounting procedures for the proposed project will follow our standard amortization procedures in that towers and fixtures are amortized over 50 years, overhead conductors over 26 years, underground conduits over 50 years and underground conductors over 30 years. We do not have standard average service lines for submarine cables but presumably they would be amortized over a 40 year period similar to underground conductors.

The cost of this or any other capital project we enter into is not automatically passed on to the ratepayers. Rate increases must be approved by the Public Utilities Commission.

It is not at this time necessary to project level of demand into the long term future. Short range projections show that Kamoku Substation is required. Kamoku Substation is designed so that its capacity can be increased as long term load growth requires such expansion.

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 4

COMMENT: 4. The EIS inadequately describes the impacts of each alternative means of meeting energy demands on residential property values. The method used in the EIS to suggest that overhead 138 kv lines in residential areas will have no significant effect on property values is thoroughly unrealistic and inappropriate. A competent research of this problem should be undertaken to disclose the economic impacts of the project.

RESPONSE: The potential effects of this project on property values are discussed on pages 89-91 of the EIS. We believe that the information is reliable and valid. Since you do not detail your particular area of concern, we cannot respond in detail.

COMMENT: 5. A study on file at the Public Utilities Division, entitled, "Makaloa-McCully-Kapiolani-Kaimuki-Aina Koa Load Study," the stated purpose of which was, "to determine whether another 138 kv transmission substation in addition to Pukele is required in the area from Makaloa to Aina Koa" (Load Study, page 1) states that: "a new 138 kv transmission substation is required by 1976 to meet the system load requirements for this area" (Load Study, page 3). Clearly, load requirement projections are not always correct. The assumptions, methodology, data, and data sources used in projecting peak loads for the Pukele Substation are not presented in the EIS. Therefore, the EIS is inadequate. The alternative assumptions, methodologies, data, and data sources which might have been used, in addition to an explanation of why those which were used were chosen, and a comparison of those which were used in arriving at the (incorrect) 1976 data with those used in arriving at the 1981 date cited in the EIS (pages 6 through 13) are needed to fully describe the alternative of no action or delayed action.

RESPONSE: As you point out, forecasts are not always correct since input data changes with time. We must plan the system in a reasonable and prudent manner. The company is legally required to supply service on demand. Decisions to expand facilities must be made on the best information available at the time the decision is made as was the case in the Load Study you cite.

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 5

As pointed out in the EIS on page 11, the projection of load in the Pukele service area considered growth in load on each individual distribution substation transformer. There are approximately 40 distribution substation transformers in the Pukele service area. These projections were based on known, definite requests for new services. A service request is considered to be confidential between the customer and the company.

The peak demand projections contained in TABLE 3 of the EIS were based on personal interviews with large customers as to their anticipated need for service over the next few years, not population growth. Past trends, customer interviews and marketing analysis were the bases for the projections for small customers.

COMMENT: 6. In referring to a single failure analysis which was done in order to substantiate the need for the proposed project (EIS pages 8 through 12), the EIS fails to adequately disclose: 1) the probability of failure for each line and each transformer; 2) the probability that such a failure would occur at a peak demand period; 3) the impacts and probable duration of outages caused by such failures; 4) the alternative methods of providing emergency systems in case of failure. Therefore, the claim of need for the project is unsubstantiated and unqualified.

RESPONSE: The probability of failure of each component of the 138 kv transmission system and 46 kv transmission system was not used in the single failure analysis. A full probabilistic analysis of failure modes including mean time to failure, mean time to repair and effect on consumers is, at this time, computationally infeasible. The problem is further compounded by the "cascade" effect when a failure causes other components to fail producing events which are not independent of each other. The Electric Power Research Institute is conducting research into algorithms and computational methods to attempt to make a probabilistic analysis of a complex electrical system feasible with modern computational equipment.

It is the policy of the company that no single failure in the 138 kv transmission system, the 138 to 46 kv

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 6

transmission substation, or the 46 kv subtransmission system will cause failure of other equipment due to overload or will cause major extended outages to the consumers.

COMMENT: 7. On page 33 of the EIS, the statement is made that, "If the probability of a simultaneous failure per year per mile of double circuit line were known with reasonable accuracy, a direct evaluation of the tradeoffs could be made." Calculation of this probability is essential to decision making. The EIS is inadequate in that it does not disclose the probability of such a failure.

RESPONSE: In reference to Figure 1 of the existing 138 kv circuits on Oahu, there are approximately 31 miles of double circuit lines presently in existence. With three 138 kv double circuit failures in the last nine years, this amounts to 0.0106 failures per mile per year. With 2.1 miles of double circuit lines on Waahila Ridge as indicated on Alternatives G, H and I, this translates to 0.0223 failures/year or about one failure in 45 years. Although this does not appear to be of much concern, it should be noted that failure of any one of the existing double circuit lines shown in Figure 1 would not result in an outage to a substation as no two lines to any substation are on the same double circuit structure. However, in the case of Kamoku, the entire substation would sustain an outage should a failure occur on the portion of double circuit line on Waahila Ridge.

COMMENT: 8. The cost estimates presented in the EIS for each of the alternatives discussed are unsubstantiated, inaccurate, and reflect poor investigation of cost-saving alternatives. Savings could be realized through coordinating the proposed alternatives with other projects scheduled to be undertaken in a similar time frame by public and semi-public agencies. For example, the Board of Water Supply has tentatively scheduled reconstruction of water mains in Palolo Valley for 1981 and 1983. Putting electric lines underground at the same time could considerably reduce costs and inconvenience to the public. On page 34 of the EIS, it is stated that, "accomodation of such a large use of right of way (as would be required for two 138 kv underground lines) would have had to have been planned for when the streets and other utilities were first

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 7

laid out." Redevelopment of the Kakaako area in the near future should provide such an opportunity for planning and installation of underground utilities at reduced cost.

RESPONSE: HECO's cost estimates reflect applicable unit costs for material, labor, and contract work at the time the estimates are prepared. All alternate routes utilize the same unit costs as the preferred routes wherever similar situations are encountered. The cost estimates shown in TABLES 5, 6, and 7 of the EIS reflect latest unit costs as of December, 1978, which take into account the effects of inflation, and these costs are then escalated further to account for construction in future years.

As for coordination with public and semi-public agencies, HECO is in constant contact with the various departments of the City and State and with the other utilities. HECO is a member of the Utilities Coordinating Committee which meets monthly under the direction of the City and County Department of Public Works, Division of Engineering. Projects currently being coordinated include East Kakaako Major Drain, Piikoi Street Widening, Kuhio Avenue Sewer Project, etc. HECO also attends monthly utilities committee meetings with the State Department of Transportation, Land Transportation Facilities Division, and is a member of the Hawaii Joint Pole Committee. By actively coordinating with other utilities and governmental agencies, HECO will continue to realize cost savings. For the example given on the BWS project, should the alternative H route be selected, we will coordinate our construction with the BWS as well as with other governmental agencies and utilities.

COMMENT: 9. The alternative of connecting the Kamoku substation to the Halawa substation via the Iwilei substation, overhead and underground, is inadequately covered in the EIS.

RESPONSE: Cost estimates, route descriptions, environmental impacts, and mitigating measures are presented in Category III of the EIS which can be compared to the data presented in Categories I, II, and IV.

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 8

COMMENT: 10. The Honolulu generating plant, mentioned on page 1 of the EIS, is not included on the map entitled, "Figure 1", which is supposed to present "the generation facilities of Hawaiian Electric Company on Oahu" (EIS, page 1). The EIS is inadequate because it does not include discussion of how the Honolulu plant could be utilized in meeting the projected need for power in the nearby area.

RESPONSE: FIGURE 1 of the EIS is entitled "Existing 138 kv circuits on Oahu" and the Honolulu Generating Station does not tie directly into these circuits. Power generated at the Honolulu Generating Station is transmitted to distribution substations in the downtown, urban area and to the Iwilei and School Street substations by 46 kv lines. The Honolulu Generating Station is limited in capacity and cannot be expanded due to space limitations.

COMMENT: 11. In discussion of the alternative routes through urban areas, the impacts of the project on the health of people living near the transmission lines is given inadequate consideration. No study is presented which indicates that 138 kv lines are not harmful to health to people living near the lines.

RESPONSE: The potential health effects of the transmission of electrical energy is presented on pages 81-87 of the EIS. Data from numerous research programs are presented which indicate that the electrostatic field gradient directly under our proposed 138 kv lines will be far below the threshold of any health related response including even those cited in the controversial and very conservative Russian studies. No study we have examined has indicated that any health effects would occur due to the lines. A review entitled "High-Voltage Power Lines and Human Health" is presented in the January 4, 1979 edition of Public Utilities Fortnightly (vol. 103, no. 1, pp. 11-15) which may be of interest to you.

To answer your question directly, no reputable scientist would ever flatly state that there is no effect from this electrostatic field, rather they would state, as is the case, the threshold for measurable response.

COMMENT: 12. The impacts of line noise in high winds are not thoroughly studied and considered in the EIS. Contrary to the claims of Hawaiian Electric Company, line noise

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 9

does occur in periods of high winds, and such noise has been a source of great distress to residents of Palolo Valley residing in close proximity to existing lines. Consideration in this regard should be given to the fact that the elderly residents of Palolo Chinese Home may be adversely effected if the route passing over the Home is utilized.

RESPONSE: It is possible for a humming noise to be produced by wind flowing past conductors. The factors contributing to this noise are wind velocity, terrain, route of the conductor in relation to wind direction and the number of conductors impacted upon by the wind. It is usually a combination of these factors which produce wind noise discernible to the public.

The velocity of the wind is a key factor. In normal cases of little or no wind there is no noise. However, in times of high wind, the wind will produce noise as it flows past any object in its path. This includes trees and buildings as well as transmission lines.

Terrain is a major contributing factor. In certain locations on the island the features of the land present a narrow opening to the wind causing a funneling effect. As the wind forces its way through this narrow opening a noise is produced. This feature exists at the location of one complaint received from Palolo.

The orientation of the conductors in relation to the wind direction is also important. If the route of the conductors is perpendicular to the wind direction, they present an obstacle to the wind and noise is produced at times of high wind. If the route is parallel to the wind direction, little or no noise is produced. In the area of the Palolo Chinese Home the line will be essentially parallel to the normal direction of the wind. It should also be noted that HECO has received an easement for this line from the Palolo Chinese Home.

The configuration of the conductors is also a factor. If a large number of conductors are placed in a vertical configuration across the path of a high wind, the wind impacting on the conductors could create noise.

Several mitigating measures are available to HECO in solving problems of this nature. Among these are

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 10

changing the line configuration or installing vibration dampers. It is HECO's policy upon receiving these complaints to investigate and take the appropriate mitigating measures.

COMMENT: 13. In discussion of the "Potential Danger from Electric Power Lines and Poles", on page 77 of the EIS, reference is made to "normal conditions (80 deg.F, no wind)." These are not normal conditions in Palolo Valley, where strong winds are often channeled down the routes of alternative lines 1 and 2. The design criteria noted in the EIS page 77, refer to maximum tension at 50 degrees F and 60 mile per hour winds. In view of the high winds and freak gusts which have hit the islands this past year, design criteria for more severe condition should be presented. The EIS is inadequate in this and other respects with regard to impacts of the project on health and safety.

RESPONSE: The conditions of "80°F, no wind" and "50°F, 9-pound wind (60 miles per hour)" are only two of many design parameters used as inputs to our computer program to calculate conductor tensions and sags at various conductor temperatures and span lengths utilized throughout the system. As such, these do not represent the wind and temperature conditions specifically for Palolo Valley but for all Oahu including the top of the Koolau Range where very severe conditions are encountered.

As indicated on Page 77, the maximum conductor design temperature of 9,200 pounds at 50°F and 9-pound wind (60 miles per hour) is only 34 percent of the rated tensile strength of 27,000 pounds of the conductor.

Our maximum wind loading condition of 9-pound wind is more stringent than that required by Rule 43.2 of the State of Hawaii General Order No. 6 (8-pound wind or 56.6 miles per hour) and is in line with the American National Standard Institute's National Electrical Safety Code which specifies a 9-pound wind (60 miles per hour). As indicated by the Beaufort Scale, a wind speed of 8 or 9-pounds (56.6 or 60 miles per hour) is considered to be a heavy storm or whole gale (55 to 63 miles per hour). The effects on land caused by the wind would be uprooted trees and much structural damage. Wind speeds of higher than 64 miles per hour are considered to be of hurricane force winds which would cause widespread damage throughout the

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 11

island. As such, HECO's design without safety factors take into account winds of almost hurricane force. With almost three times as much safety factor (2.93), the design tensions are well within the rated ultimate tensile strength of the conductor.

COMMENT: 14. The statement that, "The proposed poles could actually be considered to be less of a traffic hazard than the existing poles," (EIS, page 80), is biased and misleading. The proposed poles will be an additional traffic hazard, beyond that posed by the existing poles which, under current plans, would remain in place.

RESPONSE: The poles for the 138 kv lines would not constitute any more of a traffic hazard than existing subtransmission and distribution wooden poles; in fact, due to wider spacing, they would present less of a hazard. It is true, however, that more poles along the streets would be added and, thereby, add to the objects with which an out-of-control vehicle could collide.

COMMENT: 15. The EIS does not fully describe the limitation on construction and other future uses of private property under or adjacent to the overhead lines. Therefore, the EIS is misleading, biased, and inadequately discloses negative impacts of the proposed project.

RESPONSE: Pages 90 and 91 of the EIS address the restrictions placed on private properties. In summary:

a. Along City streets and public rights-of-way, 138 kv overhead lines generally do not traverse private property, and no building restrictions, present or future, are placed on the homeowner within his own property if an easement is not required.

b. Wherever the 138 kv lines do traverse private property, HECO obtains an easement from the landowner. The landowner still retains title to the land but both HECO and the landowner and/or lessee are subject to the terms and conditions agreed upon in the easement document. For example, across agricultural lands, pineapple and sugar cane are still grown and harvested within the 138 kv line easement. To permit the safe

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 12

operation of planting and harvesting equipment, HECO provides additional conductor to ground clearance.

However, HECO does not permit construction of dwellings within the easement area although other facilities such as parking lots, tool sheds, hothouses, etc. have been allowed provided all General Order No. 6 requirements are met.

COMMENT: 16. The statement made in response to many letters expressing concern for the visual impact of the proposed overhead wires that, "the steel poles to be used are modern, slim, and would have a neat appearance as opposed to the 'jungle of wires' appearance on many existing wooden poles," is biased in favor of Hawaiian Electric. These steel poles could just as truthfully be described as, "outdated, bulky, fat, obsolete eyesores in addition to the 'jungle of wires' on existing wooden poles." The EIS is filled with such judgemental and misleading statements.

RESPONSE: We feel that for the size of the transmission lines in question, the poles may be described as modern, slim, and would have a neat appearance as opposed to the existing wooden poles. Aesthetics is judged by the beholder and we obviously differ in our judgment. The steel poles aren't outdated or obsolete with respect to overhead transmission facilities.

COMMENT: 17. The EIS is inadequate in that it makes no reference to or attempt to document and measure the impact of the proposed overhead lines on views from residential structures at street level and above.

RESPONSE: Aesthetic qualities are difficult to quantify since each person's perception is different. FIGURE 14 on page 78 shows a view of an existing 138 kv steel pole similar to those we propose to use for the Halawa-Pukele-Kamoku line. It is true that these poles will represent an aesthetic intrusion into the area; however, as stated in the previous question, the use of modern, slim line poles will reduce this impact.

COMMENT: 18. The "Typical View" of the proposed steel poles along an urban street, which is presented in Figure 14, page 78 of the EIS, is a misrepresentation. If the existing wooden poles are 60 to 65 feet tall, as stated on page 60 of the EIS, and the steel poles for

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 13

the proposed project are to be 105 to 125 feet tall as stated in the EIS on page 76 and elsewhere, then the steel poles should be approximately twice as tall as the existing wooden poles. The picture in Figure 14 is extremely misleading, making the steel poles appear to be approximately the same height or slightly taller than the existing poles. Also, the picture conveniently leaves out any of the service lines which cross the streets from the existing wooden poles which further detract from the view.

RESPONSE: FIGURE 14 of the EIS has been changed to show an actual view of a 138 kv steel pole in a residential area along School Street. The original figure was an artist's conception of the poles and was not intended to be misleading. We appreciate your calling this figure to our attention

COMMENT: 19. Discussion of mitigation measures in the EIS is inadequate in that it does not include the option of removing all the existing wooden poles and transferring all the existing wires to the proposed steel poles. The mitigation measures also fail to address the issue of compensation to property owners for reduced property values in those communities in which the lines would be installed. There are also many other mitigating measures which are not included in the EIS, but which are possible ways of reducing negative impacts of the proposed project.

RESPONSE: Although it would be technically feasible to combine  
A all lines on the steel poles, the following points must be considered:

1. The existing wood poles are "joint poles" which are owned by three agencies--Hawaiian Electric Company (HECO), Hawaiian Telephone (HTCO), and the City. To eliminate the wood poles, the consent of all three parties is required, especially since additional relocation costs are involved. While the City has indicated its willingness, HTCO has indicated a preference for maintaining the existing wood pole line.

2. The combination of all lines on the steel poles would not necessarily eliminate the need for the wood poles. Wood poles, spaced 150-200 feet apart, would still be required to support lower voltage facilities (transformers), telephone facilities (splices), and

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 14

street light facilities (luminaires) which serve the individual customers along the alignment.

3. Combining all facilities on a single pole line (assuming the willingness of others) would require taller steel poles to obtain adequate vertical clearance between the 138/46 kv conductors and the intermediate wood poles.

B Evaluation of the effects of some existing 138 kv lines in urban Oahu has shown that the presence of 138 kv lines near residential properties has neither significantly decreased the market value of the properties nor has affected the neighborhood stability with respect to the turnover rate. As such, no mitigating measures for compensation to property owners for reduced property value is necessary.

COMMENT 20. The EIS is inadequate because it contains conflicting, yet supposedly factual, information. For example, on page B-29 is written:  
...There is no virgin or near virgin native ecosystem at any place along the proposed power line. The entire route passes through areas whose native ecosystems were devastated more than 100 years ago, with the result that the vast majority of all plant life now consists of introduced species.

while on page c-13 the Eis states:

Study Site 7: Waahila Ridge.  
...This was the least disturbed site and consisted of a large number of native species. Many of the weedy species such as...were confined to the trailsides. A large colony of the native white hibiscus, Hibiscus ornottianus, was seen on the slopes facing Palolo Valley. The lichen, Usnea, was very common on the branches and twigs of trees in the study site. Large, pale green tussocks of the moss Leucobryum were frequently found on the ground near the base of the trees.

Uluhe covers much of the open steeper slopes and ridges. Trees such as ohia, koa, 'akahea, and kalia (Elacocarpus bifidus) were scattered throughout the uluhe and accounted for 25% of the cover. Large groves of kukuis were noted in the gullies below.

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 15

RESPONSE: It is our understanding that Dr. Berger (Appendix B) is referring to complete native ecosystems and that the "native forest" designation by E.I.S. Corp. (Appendix C) is for areas that contain significant quantities of native flora but do not constitute self sufficient native ecosystems. Although there is a difference in emphasis between the findings of the two consultants there is no basic conflict. The questions of whether there will be any interference with endangered species and what mitigating measures will be taken will be adequately answered by the detailed surveys that will be done at each pole site.

COMMENT: 21. The EIS is inadequate because it fails to disclose vital information regarding the impacts of the project on flora, fauna, mammals, and birds; for example, a consultant's report in the EIS indicates that more study is needed to determine the project's impact on endangered plant species:

...It is recommended that a more in depth survey be conducted in the ohia-koa zone, specifically, the alignment areas behind Kapalama, Tantalus, and on Waahila Ridge. Exocarpus quadichaudii which is on the Federal Register (1976) of rare and endangered plants has been collected from the Waahila Ridge area and is known to be near the proposed alignment." (EIS page C-15)

Until such further study is undertaken, and the results included in the EIS, the EIS is incomplete. Another example of a case in which further study is needed is indicated on page B-21 of the EIS:

There is one questionable report of "one (possibly two) Oahu Creepers" in this area (Waahila Ridge) (Elepaio, 34, 1973:18). The Oahu Creeper (Loxops maculata maculata) has now been listed as an "endangered" species (Federal Register, vol. 41, Wednesday, October 27, 1976, page 47188)."

RESPONSE: As stated in the EIS, a biologist and an archaeologist will accompany the survey crews as each pole site is

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 16

surveyed in order to assure that no endangered species or archaeological remains are disturbed. The State Division of Forestry has indicated that it will require a plan for every pole site plus an on-site inspection in order to assure the minimal amount of environmental impact to forested areas. Therefore, should the questionable report of an Oahu Creeper in the Waahila Ridge area be verified, mitigating measures to protect this species can be implemented.

COMMENT: 22. The EIS is inadequate because much of the conservation area which will be impacted by the proposed project was not studied. For example, the EIS states on page A-3":

The extreme inland portion of this part of the proposed power line (Waahila Ridge) right-of-way was not surveyed because of the difficulty of access to the area. Although no sites have been recorded in the area, the possibility of their presence should not be discounted.

The inventory of archeological and historic sites in the EIS is incomplete.

RESPONSE: The answer to this question is addressed in response to your question number 21. The State Department of Land and Natural Resources (DLNR) has indicated that "The proposed mitigation measure of the applicant to avoid interference with archaeological sites (p. vii of the EIS) appear adequate but should be coordinated with the Historic Sites archaeologist at an early stage as possible." (See DLNR letter in Appendix E of the EIS.)

COMMENT: 23. The EIS fails to discuss the negative impacts of the development of trails under the proposed wires, once installed, due to the trimming of trees in the sag areas, and due to hikers who follow the wires as directional aids. This will greatly increase the rate at which weedy species will be introduced to the Waahila (and other) areas. That this will occur should the lines be installed can be readily verified by examining the trail which has developed under the existing 138 kv lines between La-i Road and Ka'au Crater.

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 17

RESPONSE: Discussions with Mr. Gene Renard (Department of Land and Natural Resources, Planning Branch, State Parks) have indicated that the proposed lines may be compatible with the trail system. Mr. Renard felt that integration of hiking trails and the lines in the Makiki-Tantalus-Manoa area is possible. Although the alignment of some of these trails has not been determined, he felt that the trail planner and the company could work together to mitigate visual impact. The judicious use of existing vegetation by the company and the DLNR should minimize the impact you mention.

COMMENT: 24. 138 kv lines in forest areas are maintained through the use of helicopter visual inspection. The EIS is inadequate in that it fails to document the negative impacts and inconvenience to residents living near the proposed lines due to helicopter rotor blast.

RESPONSE: Little if any inconvenience due to helicopter rotor blast should be experienced since helicopter inspection will be used only in forested areas when ground survey is not possible or practical. These forested areas are well removed from residential areas.

COMMENT: 25. The EIS misrepresents alternative III-B, and is incorrect in its brief examination of this alternative. On page 4] of the EIS it is stated that, midway in the underwater cable it would be diverted to Cooke Street for an oil pumping facility. This procedure would unduly raise the cost of the alternative III-B, as oil pumping could be done from either end of the cable. Refer to the enclosed study by H. H. Huang, PhD., of the Hawaii Natural Energy Institute, University of Hawaii at Manoa, regarding linking the islands of Maui, Moloka'i, and Lana'i by undersca electric cable. On page 14 of this study, reference is made to underwater cables ]0 miles long with no pumping stations between the terminals. On page ]7, the report states that ]38 kv cables can be up to 45 miles long using existing technology.

RESPONSE: After reviewing our proposed underwater route, we have decided to eliminate the portion of the route that diverted from the sea to HECO's Cooke Street property. Oil pump facilities will be relocated to end of cable terminals near Kamoku and Iwilei. This will serve to avert any detrimental environmental effect caused by

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 18

trenching through the coral reefs off lower Kakaako as discussed below in our comments relative to point (3) of item 26.

A revised description of this route and a new cost estimate is noted on page 41 of the EIS.

In reference to Dr. Huang's study, he did not mention the need for an oil pump station because we believe the submarine system he is proposing will utilize a pressurized oil tank, as noted in the material list of major accessories on page 117 of his report, to maintain the oil pressure in the cables. With the type of cables being proposed by Dr. Huang and HECO, the oil in the cables must be maintained under high pressure at all times regardless of cable length. For HECO's installation, oil pumps are to be utilized for this purpose.

In reference to page 17 of Dr. Huang's report, the 45 mile limit on 138 kv underwater cable installations is based on the charging current requirements of the cables rather than oil pump requirements.

COMMENT:

26. The EIS misrepresents the drawbacks of underwater cables (EIS page 42) by stating that use of such cables would entail, "(1) very high cost, (2) very difficult maintenance and long probable outage periods in case of failure and (3) detrimental ocean environmental effects due to the trenching requirements." With respect to point (1), the above-referenced report by Dr. Huang states on page 3, table 201, comparative costs per mile of overhead, underground, and submarine cables. The figures for overhead and underground cables included in this table were supplied by Hawaiian Electric Company. Submarine cable costs approximately three times as much as overhead, and 1/2 as much as underground. Therefore, Hawaiian Electric's estimate of \$55.6 million, included in the EIS is highly inaccurate.

Regarding point (2) above in the EIS, Dr. Huang's report documents responses from utility companies using underwater cables: No power outages have been reported to occur due to electrical faults in 40 years experience (see page 43 of Dr. Huang's report). Further, the use of a spare cable as proposed by Hawaiian Electric for alternative III-B further reduces the probability of power outages. Dr. Huang's report also reviews mechanical

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 19

damages to undersea cables due to anchors and trawling, as well as other conceivable damaging factors (see pages 43 and 45 of Dr. Huang's report). Dr. Huang's study also indicates that maintenance costs on undersea cables are nil (page 74), until such time as the cable must be replaced, and the cables are insured in many cases (page 74).

Detrimental ocean environmental effects, as mentioned in point (3) above in the EIS, are studied on pages 49 through 51 of Dr. Huang's report and are deemed very insignificant.

RESPONSE: As noted in our response to item 25 above, the proposed underwater route has been revised. The new estimate based on a shorter route is now \$42.9 million. However, we still do not agree with you that our original underwater route estimate was "highly inaccurate." HECO's underwater estimate is based on the installation of two (2) circuits consisting of seven (7) single-conductor high-pressure oil filled 138 kv submarine cables (3 cables per circuit plus 1 spare cable). This estimate also includes the cost of land facilities such as termination stations and relatively short sections of underground pipe-type cables. Dr. Huang's underwater estimate is based on the installation of a single circuit, consisting of one (1) three (3) conductor oil filled 138 kv submarine cable, rated at only 100 MVA. In addition, HECO's estimate is a 1983 escalated cost. We believe, Dr. Huang's estimate is at 1978 costs. Based on these differences, a valid comparison between his estimate and HECO's cannot be made.

HECO and its customers do not appreciate the difference between outages caused by "electrical failures", and outages caused by failures due to external mechanical cable damages, such as anchor or trawling damages. Both types of failures will require repairs to the cable, and may possibly cause loss of power to our customers. We feel your use of Dr. Huang's statement "No power outages...due to electrical faults in 40 years of experience" is misleading. This statement may be true, however, outages due to other causes such as cable anchor damages are just as much a disruption and require just as much maintenance. For these

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 20

failures, we still contend that the repairs will be difficult, the outage periods long, and costs substantial. The Long Island Lighting Company's report, "Long Island Sound Submarine Cable Interconnection Operating Experience", which is referred to in Dr. Huang's report, emphasizes this point. In the first eight years of operation, the company experienced eleven (11) incidences of physical damages to its cables, requiring three (3) major forced outages, resulting in 500 days of half capacity operation. Two major cable repair costs amounted to 2.4 million dollars each. The report covered in detail the difficulties associated with making these repairs as well as a good discussion of the other nine (9) incidences of cable damage. We agree with you, the spare cable will reduce the length of each outage. Long Island does have a spare cable in its installation and without it, the 500 days of half capacity operation would have been much worse. HECO does not insure its cables or underground systems.

The marine environmental impact of the submarine cable may well be insignificant as you mention since it may be possible to avoid trenching in active coral reef areas. Dredging in Honolulu Harbor and the Ala Wai Canal should not cause substantial damage to the soft bottom benthic community. Cables could be placed in the entrance channels to these harbors and, thereby, avoid the reefs. Offshore the cables could be placed at a sufficient depth so as to obviate the need for trenching.

The major impact would probably be the turbidity produced during the dredging. This impact is transitory in nature; however, increased turbidity can have a profound effect on living coral. For example, during the construction of the offshore outfall at our Kahe Generating Station, we found that construction induced turbidity caused or contributed to a reduction of approximately 12% of the living coral along approximately one mile of beach. Such a stress on corals near Honolulu Harbor and the Ala Wai Canal entrances may not be acceptable since these corals are probably already exposed to considerable turbidity stress due to the nature of the harbors. Repairs and maintenance of the lines may also cause repeated stress.

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Barbara Ryan and Mr. Henry Wood  
February 20, 1979  
Page 21

The portion of the submarine cable which was to be brought into Kakaako would cross a living reef area and construction damage would occur. This damage may not be significant since living coral would probably repopulate the backfill material and develop to a mature size in about ten years.

Hawaiian Electric Company appreciates your concern about this project.

Yours truly,

*John C. McCain*

JCMc:cal

HOUSE OF REPRESENTATIVES  
THE TENTH LEGISLATURE

STATE OF HAWAII  
STATE CAPITOL  
HONOLULU, HAWAII 96813



February 12, 1979

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Mr. Carl Williams, President  
Hawaiian Electric Co.  
900 Richards Street  
Honolulu, Hi 96813

SUBJ: CONCERNING THE 138KV TRANSMISSION LINES AND  
THEIR ALTERNATIVES

Dear Mr. Williams,

I feel the proposed two circuit 138 KV transmission line is not consistent with the mandates of the recently passed Hawaii State Plan. Act 100 of the 1978 Legislature calls for " the accleration of research and use of new energy sources".

With the precarious nature of international politics today it is frightening that Hawaii is almost totally dependent on imported crude oil and petroleum products for its energy. In 1976 the airlines (35%), electric utilities (33%), and service stations(15%), accounted for most energy sales in our state.

I have read your Environmental Impact Statement and can fully appreciate the necessity to provide for load relief for the existing Pukele Station. However I think the long range effects of increased dependency on electrical energy must be considered. Is there some way to delay construction until a more futuristic solution can be found.

If, however, it is decided in this instance, that today's needs take precedence to long term planning than I am against the proposed route of the transmission lines through Palolo Valley. Palolo has already performed its share of "public duty" by permitting the installation of the existing Pukele Substation. This Substation and all its disadvantages has been accepted by Palolo Valley for the past 15 years. I feel it would be more equitable and just for another community to do their share in providing power to Honolulu.

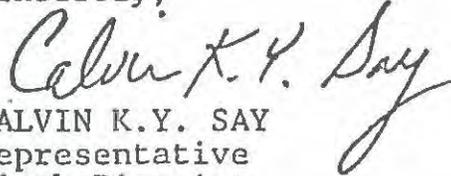
The use of a single circuit overhead line through Manoa primarily via University Avenue(line A) and through Waahila Ridge midway between Manoa and Palolo Valley(line D) is the most just and economical solution.

February 12, 1979

Page 2

I realize that the alternatives are many and the final decision will not be easy. I hope my comments will aid you in making the best decision.

Sincerely,

A handwritten signature in cursive script that reads "Calvin K.Y. Say". The signature is written in dark ink and is positioned to the right of the typed name.

CALVIN K.Y. SAY  
Representative  
Ninth District

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840

February 17, 1979



JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

ENV 2-1  
H-P-K  
NV/G/NV

Honorable Calvin K. Y. Say  
House of Representatives  
State of Hawaii  
State Capitol  
Honolulu, Hawaii 96813

Dear Representative Say:

Subject: EIS for the Proposed Halawa-Pukele-Kamoku 138 kv  
Transmission Lines

Your letter of February 12, 1979 to Mr. Carl Williams concerning the 138 kv Halawa-Pukele-Kamoku transmission lines, which Hawaiian Electric Company proposes to construct, has been referred to me for response. The following responses are addressed specifically to the concerns and questions you discussed in your letter:

COMMENT: The proposed transmission lines are not consistent with the Hawaii State Plan. Act 100 of the 1978 Legislature calls for "the acceleration of research and use of new energy sources."

RESPONSE: The transmission and distribution of electrical energy will be necessary regardless of the source unless individual sources not now generally available are developed. As you are probably aware, Hawaiian Electric Company is involved in many alternate energy projects since we too share your concern.

COMMENT: Is there some way to delay construction until a more futuristic solution can be found:

RESPONSE: As stated in the EIS under the section entitled "Justification for the Proposed Project", our analysis of the need for the transmission lines will become acute in 1981. Time-of-day pricing, energy conservation, solar water heating, and other energy reducing measures do not necessarily reduce peak demand. Consider, for example, solar water heaters. These devices do reduce energy consumption and peak demand. If the weather turns bad for several days, as it has been in

HAWAIIAN ELECTRIC COMPANY, INC.

Honorable Calvin K. Y. Say  
February 17, 1979  
Page 2

RESPONSE recent months, the solar heater becomes ineffective,  
Cont'd: then energy and peak demand are no longer affected  
by solar heaters. We must meet this demand and, as  
stated earlier, this demand will become critical in  
only a few years. Futuristic solutions require time  
which is not available.

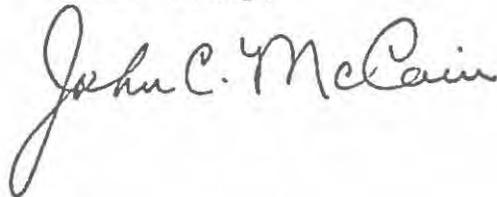
COMMENT: The use of a single circuit overhead line through  
Manoa primarily via University Avenue (line A) and  
through Waahila Ridge, midway between Manoa and  
Palolo Valley (line D), is the most just and economical  
solution.

RESPONSE: As shown on TABLE 5 of the EIS, the combine cost  
estimate for lines A and D is \$12,268,400. Our  
proposed routes through Palolo Valley, Lines 1 and  
2, are estimated to cost \$9,795,400. Therefore,  
the costs for the alternatives you suggest exceed  
that of our proposed routes by approximately \$2.5  
million and your suggested alternatives are not the  
most economical solution.

Hawaiian Electric Company is not in a position to  
judge whether or not the alternatives you suggest  
are the most just solution. We appreciate the fact  
that the residents of Palolo Valley have accepted  
the Pukele Substation for the past 15 years; however,  
the lines we propose are to relieve load on that sub-  
station, thereby, providing for the most reliable,  
low cost electrical power to the residents.

Hawaiian Electric Company appreciates your concern about this  
project.

Yours truly,



JCMc:cm

HOUSE OF REPRESENTATIVES  
THE TENTH LEGISLATURE

STATE OF HAWAII  
STATE CAPITOL  
HONOLULU, HAWAII 96813



February 13, 1979

Mr. Carl Williams, President  
Hawaiian Electric Co.  
900 Richards Street  
Honolulu, Hi 96813

SUBJ: CONCERNING THE 138KV TRANSMISSION LINES AND THEIR ALTERNATIVES

Dear Mr. Williams,

I am opposed to the installation of two single overhead lines through Palolo Valley. It would be an eye sore and a potential traffic and health hazard.

I have been studying the various alternatives presented in the Environmental Impact Statement. I am curious about the possibility of routing the transmission lines under the existing Palolo concrete bed stream. This would eliminate many of the objections raised by the residents of the area.

I look forward to your response.

Sincerely,

*Calvin K.Y. Say*  
CALVIN K.Y. SAY  
Representative  
Ninth District

- Speaker  
JAMES H. WAKATSUKI
- Deputy Speaker  
NIEL J. KIHANO
- Majority Leader  
HENRY HAALILIO PETERS
- Minority Floor Leader  
KATSUYA YAMADA
  
- First District  
WICK K. SUWA
- Second District  
HERBERT A. SEGAWA  
KATSUYA YAMADA
- Third District  
MOSHITO-TAKAMINE
- Fourth District  
MINORU INABA
- Fifth District  
CHRISTOPHER A. CROZIER  
GERALD K. MACHIDA
- Sixth District  
HERBERT J. HONDA  
ANTHONY P. TAKITANI
- Seventh District  
ROBERT D. DODS  
DORIS R. IKEDA
- Eighth District  
JACK LARSEN  
BARBARA MARUMOTO
- Ninth District  
ED T. MORIOKA  
ALVIN K. Y. SAY
- Tenth District  
KEN KIYABU  
BERTRAND KOBAYASHI
- Eleventh District  
LINAU BOYD KAMALII  
PAUL L. LACY, JR.
- Twelfth District  
DAVID M. HAGINO  
LIFFORD T. UWAIINE
- Thirteenth District  
GERALD de HEER  
CAROL FUKUNAGA  
CHARLES T. USHIDJIMA
- Fourteenth District  
RUSSELL BLAIR  
KATHLEEN STANLEY
- Fifteenth District  
BYRON BAKER  
RICHARD IKE SUTTON
- Sixteenth District  
MILTON HOLT  
TONY NARVAES
- Seventeenth District  
RICHARD GARCIA  
KENNETH LEE
- Eighteenth District  
MITSUO UECHI  
JAMES H. WAKATSUKI
- Nineteenth District  
CLARICE Y. HASHIMOTO  
DONALD T. MASUTANI, JR.
- Twentieth District  
DANIEL J. KIHANO  
MITSUO SHITO
- Twenty-First District  
JAMES AKI  
HENRY HAALILIO PETERS
- Twenty-Second District  
OLLIE LUNASCO  
YOSHIRO NAKAMURA
- Twenty-Third District  
CHARLES T. TOGUCHI
- Twenty-Fourth District  
MARSHALL K. IGE  
FAITH P. EVANS
- Twenty-Fifth District  
WHITNEY T. ANDERSON  
JOHN J. MEDEIROS
- Twenty-Sixth District  
RUSSELL J. SAKAMOTO
- Twenty-Seventh District  
RICHARD A. KAWAKAMI  
TONY T. KUNIMURA  
DENNIS R. YAMADA
  
- Minority Leader  
Minority Floor Leader

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840  
February 20, 1979



JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

ENV 2-1  
H-P-K  
NV/G/NV

Honorable Calvin K. Y. Say  
House of Representatives  
State of Hawaii  
State Capitol  
Honolulu, Hawaii 96813

Dear Representative Say:

Subject: EIS for the Proposed Halawa-Pukele-Kamoku 138 kv  
Transmission Lines

This is in response to your letter to Mr. Carl Williams dated February 13, 1979 concerning the Environmental Impact Statement for the proposed Halawa-Pukele-Kamoku 138 kv transmission lines. The following is in response to your comment concerning the possible use of the Palolo stream bed as an alternate underground route for the transmission lines:

COMMENT: I have been studying the various alternatives presented in the Environmental Impact Statement. I am curious about the possibility of routing the transmission lines under the existing Palolo concrete bed stream. This would eliminate many of the objections raised by the residents of the area.

RESPONSE: We have reviewed your proposal to utilize the Palolo Stream drainage canal as a possible underground route for the transmission lines between Pukele Substation and Kamoku Substation. Utilizing the high-pressure oil pipe-type system as proposed for Alternate H, the estimated cost of this proposal is \$68.7 million. Some of the construction constraints that must be considered in this proposal are as follows:

1. Easements for constructing and maintaining this line must be obtained from property owners for a portion of the stream.

HAWAIIAN ELECTRIC COMPANY, INC.

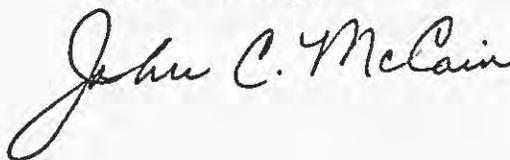
Honorable Calvin K. Y. Say  
February 20, 1979  
Page 2

2. Adequate access must be provided in and out of the stream requiring more easements or rights of entry.
3. Provisions must be made for temporarily dividing the stream from the construction area.
4. Provision must be made for flood control during and after construction.
5. Work can proceed only during dry weather.
6. Extensive shoring, sheet piling and bracing of the canal walls to prevent cave-ins and damage to the canal walls and adjacent properties must be constructed without obstructing flow.
7. Provision for proper HECO maintenance of its facilities under all types of climatic conditions must be made.
8. City approval for use of the drainage canal for this purpose must be obtained.

Because the above constraints and apparent high cost, we cannot consider this a more attractive alternative to Alternate H.

Hawaiian Electric Company appreciates your concern about this project.

Yours truly,



JCMc:cm

3284 Loke Place  
Honolulu, Hawaii 96816  
February 15, 1979

Mr. Susumu Ono  
Chairman, Board of Land and  
Natural Resources  
Department of Land and  
Natural Resources  
P. O. Box 621  
Honolulu, Hawaii 96809

Dear Mr. Ono,

I have completed my review of the "Environmental Impact Statement for the Proposed Halawa to Kamoku 138 KV Transmission Line." I am submitting my comments below as a member and officer of the Palolo Community Council.

1. The EIS should include a discussion on government alternative energy policies and how the project could be modified (including adding more alternatives) to accomodate these policies and prevent adverse environmental effects.
2. Documentation should be presented to explain the \$1000 per hour cost for helicopter use.
3. The "Birds and Mammal Study" and "Botanical Survey" present conflicting conclusions and findings. On page B-29 Mr. Berger states: "The entire route passes through areas whose native ecosystems were devastated more than 100 years ago, with the result that the vast majority of all plant life now consists of introduced species." However, on page C-15 M & E Pacific, Inc. states: "Approximately 70% of the proposed alignment will pass through previously disturbed areas." What is the project's impact on native ecosystems or undisturbed areas?
4. The EIS should adequately describe the impact of powerline towers and poles on present or proposed hiking trails. Will any of these towers or poles cause a realignment of present or proposed hiking trails? Will they be visible from these trails?
5. Does any part of the project enter the Diamond Head District? Will the project be affected in any way by Diamond Head District? If applicable, these questions should be discussed.
6. The EIS should discuss the extent to which the Kakaako redevelopment will reduce the difficulties associated with the Pukele-Kamoku underground route, especially if transmission lines are placed underground through this area.
7. The EIS does not elaborate on other means of expanding the Pukele substation, ie. through condemnation powers. This should be done.
8. The EIS should include in it the Kamoku substation. EIS Regulations (sec. 1122-b) requires the inclusion of the Kamoku substation in the EIS. Paragraph 2, page 14 inadequately justifies the exclusion of the

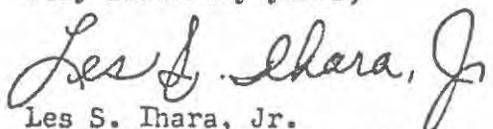
- Kamoku substation in the EIS. Also, HECO has stated that construction on the substation has begun, but in a letter dated May 6, 1977 to HECO, BLNR Chairman wrote: ". . . no work can be initiated on any land which will be within the scope of the required EIS." Discussion on these points should be included.
9. Table 3, page 12 shows a projected Oahu peak demand of 937 and 979 megawatts in 1977 and 1978, respectively. What were the actual peak demand for these years? What formula and population assumptions were used for these calculations? What is the current per capita electrical consumption, and what per capita consumption assumptions were used? Documentation for these points should be included.
  10. Other questions that should be answered include: would the use of gas in place of an equivalent amount of electricity require more or less oil (percentages more or less)? What percentage increase in the use of gas by Pukele service area consumers would be required to reduce electrical peak demands to levels necessary to prevent a Pukele overload in 1981?
  11. What agency approval is the EIS required for? Has HECO submitted a conservation district use application to the Board or DLNR? If so, when was the CDDA been approved and/or revoked? What are the differences between the project description in the CDDA and this EIS? These questions should be addressed in the EIS.
  12. It appears that the EIS inadequately describes the differences between 138 KV and 46 KV lines. The first paragraph on page 16 states that it would take six 46KV lines to carry the same amount of power as a 138KV line. Does this mean that Pukele substation can be expanded? Currently two 138KV lines enter Pukele substation, but only eight 48KV lines exit it. This should be explained. The same paragraph also states that 46KV lines would have larger environmental effects than a 138KV line. This statement is inadequately documented.
  13. The EIS inadequately discusses the reasons why two lines from Halawa cannot be routed directly to Kamoku substation thereby avoiding Pukele substation. The Pukele substation presently receives its power from two lines from Koolau substation.
  14. The EIS is inadequate because it does not include an alternative route which includes two lines, one <sup>each</sup> from Pukele and Halawa substations on one pole line to Kamoku substation. The EIS should explain the reasons why this cannot be done. Alternative I-A (Leeward Koolau Route) includes two circuits on one pole line connecting two different substations.
  15. The EIS is inadequate because it does not include the following two alternatives to providing power to the Pukele service area: (1) connect 138KV lines to transformers located near Pukele substation and route all 46KV lines underground or overground on existing wooden poles to areas serviced, (2) connect 138KV lines to transformers located in or near the origination point of 46KV lines in Manoa and route all 46KV lines underground or overground on existing wooden poles to areas serviced.
  16. The probability of double outage on alternative "C" is not adequately discussed. Are there any such routes (two 138KV lines on one pole line)

currently used on the mainland? How many? And how many simultaneous failures of both feeder circuits have occurred on those lines?

17. How many oil pumping stations would be required for alternative "H"? What locations along this route would make this alternative infeasible?
18. The cost estimates on Table 5, page 36 are inadequately documented. The easement values for lines "C" and "D" should be documented. Also, cancellation charges should not be included in the total costs. Why were the steel poles ordered prior to completion of the EIS?
19. How tall are the wooden poles presently in Palolo Valley that carry 46KV lines?
20. What specific areas within the Pukele service area are expected to have significant population and economic related growth? This and all other questions listed in this letter should be discussed.
21. The EIS inadequately describes the project's impact on property values. Data necessary to make a determination as to increases or decreases in property values should be included in the EIS.
22. What population and growth impacts would the project have on the Pukele service area?
23. The EIS is inadequate because it does not include in it any alternative destination substation to meet the objective of providing power to relieve the load from the Pukele substation.
24. The alternative of postponing the project should be included in the EIS. A discussion of the reasons for its exclusion should be included.
25. The EIS should include a discussion on the extent to which the project forecloses the future option of underground and submarine cable route alternatives.

Thank you for your consideration of my comments. I will transmit a copy of this letter to Hawaiian Electric Company. I look forward to receiving their responses to my comments.

Very sincerely yours,

  
Les S. Ihara, Jr.  
Palolo Community Council

cc: Hawaiian Electric Company

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840

February 20, 1979



JOHN C. McCAIN, Ph.D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

ENV 2-1  
H-P-K  
NV/G/NV

Mr. Les Ihara, Jr.  
3284 Loke Place  
Honolulu, Hawaii 96816

Dear Mr. Ihara:

Subject: EIS for the Proposed Halawa-Pukele-Kamoku 138 kv  
Transmission Line

This is in response to your letter of February 15, 1979 regarding the Environmental Impact Statement for the proposed Halawa-Pukele-Kamoku 138 kv transmission lines. The following responses are addressed specifically to the concerns and questions you discussed in your letter.

COMMENT: The EIS should include a discussion on government alternative energy policies and how the project could be modified (including adding more alternatives) to accommodate these policies and prevent adverse environmental effects.

RESPONSE: The proposed project is consistent with the Hawaii State Plan. The transmission and distribution of electrical energy will be necessary regardless of the source unless individual sources not now generally available are developed.

As you are probably aware, Hawaiian Electric Company is involved in many alternate energy projects. The alternatives to the proposed project are almost endless and we, therefore, opted to consider those that were deemed viable or those suggested by concerned individuals. Based on cost estimates for the various alternatives, the proposed project is in the interest of all Oahu ratepayers in that it provides for the transmission of electrical energy at the lowest cost and will provide the reliability expected by the public. Some environmental impact can be expected from almost any project and we feel that such impact is not substantial for the proposed project.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Les Ihara, Jr.  
February 20, 1979  
Page 2

COMMENT: Documentation should be presented to explain the  
No. 2 \$1,000 per hour cost for helicopter use.

RESPONSE: The lifting capacity of the commercial helicopters based in Hawaii are limited to approximately 1,800 lbs. These helicopters are primarily used by HECO for ferrying crews at the referenced rate of \$300-\$400 per hour. The 3,500-pound capacity helicopter referenced in the EIS was utilized in 1977 on a wood pole project. The contract cost for this helicopter was \$20,000 and included shipping the helicopter to Hawaii from the mainland and a specified number of lifts. If the number of lifts was exceeded, the charges for the flight time (in 1977) were \$850 per hour, therefore, escalated to 1981 dollars the cost would be approximately \$1,000 per hour.

To further clarify the helicopter charges, it should be noted that, subsequent to the EIS submittal, HECO completed the installation of steel poles/structures on another project by utilizing a helicopter with a lifting capacity of approximately 9,000 pounds. The contract cost of using this helicopter included \$181,000 for shipping to Hawaii for a specified number of lifts and a \$1,800 per hour charge for additional work.

COMMENT: The "Birds and Mammal Study" and "Botanical Survey" present conflicting conclusions and findings. On  
No. 3 page B-29 Mr. Berger states: "The entire route passes through areas whose native ecosystems were devastated more than 100 years ago, with the result that the vast majority of all plant life now consists of introduced species." However, on page C-15 M&E Pacific, Inc. states: "Approximately 70% of the proposed alignment will pass through previously disturbed areas." What is the project's impact on native ecosystems or undisturbed areas?

RESPONSE: It is our understanding that Dr. Berger (Appendix B) is referring to complete native ecosystems and that the "native forest" designation by E.I.S. Corp. (Appendix C) is for areas that contain significant quantities of native flora but do not constitute self-sufficient native ecosystems. Although there is a difference in emphasis between the findings of the two consultants, there is no basic conflict. The questions of whether there will be any interference with endangered species and what mitigating measures will be taken will be adequately answered by the detailed surveys that will be done at each pole site.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Les Ihara, Jr.  
February 20, 1979  
Page 3

COMMENT: The EIS should adequately describe the impact of powerline towers and poles on present or proposed hiking trails. Will any of these towers or poles cause a realignment of present or proposed hiking trails? Will they be visible from these trails?  
No. 4

RESPONSE: As we have done on past projects, HECO has and will continue to work closely with the DLNR's Divisions of Forestry and State Parks to coordinate the tower locations and trail routes. This coordination includes the realignment of trails as necessary.

The visibility of the steel tower structures from hiking trails will depend upon the background against which the hiker views the structure. Viewed against the background of the blue sky, the structure will probably be silhouetted as would be steel poles or any solid object. However, when viewed against a background of vegetation, the structures may not be readily visible since it is HECO's standard practice to paint metal poles/structures in Conservation Districts to blend with the surrounding vegetation. As noted earlier, HECO will continue to coordinate the location and appearance of its facilities in Conservation Districts with the DLNR, particularly its Divisions of State Parks and Forestry.

COMMENT: Does any part of the project enter the Diamond Head District? Will the project be affected in any way by Diamond Head District? If applicable, these questions should be discussed.  
No. 5

RESPONSE: The alignment of Line 2 is within the limits of the Diamond Head District along the makai side of Date Street. However, a legal opinion rendered by the City Corporation Counsel's office has determined that the underground provisions were not applicable since the ordinances were enacted subsequent to approval of plans for overhead construction.

COMMENT: The EIS should discuss the extent to which the Kakaako redevelopment will reduce the difficulties associated with the Pukele-Kamoku underground route, especially if transmission liens are placed underground through this area.  
No. 6

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Les Ihara, Jr.  
February 20, 1979  
Page 4

RESPONSE: HECO has long made it a practice to coordinate its future installations with those of the various governmental agencies. These joint efforts have many times resulted in benefits to both parties. As such, we will continue this practice.

In the specific case of the planned redevelopment of Kakaako and the possibility of coordinating the installation of 138 kv underground circuits to Kamoku Substation with the redevelopment, it should be noted that the City's redevelopment plans for the Kakaako area are still in the development stage. They have not yet reached the final detailed engineering stage at which utility-government coordination could result in any benefits. It is not anticipated that they will reach this stage in the time frame necessary for HECO to meet its requirement data from Kamoku Substation.

COMMENT: The EIS does not elaborate on other means of expanding the Pukele substation, i.e. through condemnation powers. This should be done.

RESPONSE: The present Pukele Substation size is approximately 260 feet by 250 feet for a total of approximately 65,000 square feet. Although the lot size is larger, much of the land is unusable due to the hillside and adjacent stream. During the initial development of the substation site, the lot was graded and the hillside terraced to obtain the desired level area upon which the substation is situated.

It is reasonable to assume that at least 65,000 square feet of level land would be required to duplicate the Kamoku Substation in its entirety adjacent to Pukele Substation. HECO would attempt to negotiate the fee purchase of this land from the neighboring landowners prior to utilizing any condemnation powers. It should further be noted that, although HECO has the power of condemnation, HECO cannot exercise these powers unless they can demonstrate that no other viable alternatives exist.

The expansion of the Pukele Substation area would not eliminate the need for new 138 kv lines to the Pukele Substation area since the duplicate substation would require power and backup capabilities. Finally, to export the power out of the new substation would require eight new 46 kv lines to the load areas. These eight 46 kv lines would require considerably more

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Les Ihara, Jr.  
February 20, 1979  
Page 5

materials and rights-of-way thereby increasing the overall cost of the project, especially if overhead routes were not available and undergrounding of the 46 kv lines were required. Please note that the eight new 46 kv lines will be in addition to the eight 46 kv lines presently emanating from Pukele Substation.

COMMENT: The EIS should include in it the Kamoku substation. No. 8 EIS Regulations (sec. 1:22-b) requires the inclusion of the Kamoku substation in the EIS. Paragraph 2, page 14 inadequately justifies the exclusion of the Kamoku substation in the EIS. Also, HECO has stated that construction on the substation has begun, but in a letter dated May 6, 1977 to HECO, DLNR Chairman wrote: "... no work can be initiated on any land which will be within the scope of the required EIS." Discussion on these points should be included.

RESPONSE: The regulatory approvals for the Kamoku Substation predate the effective date of the EIS regulation June 2, 1975. On February 9, 1973, the Public Utilities Commission (PUC) approved the purchase of the Kamoku Substation site. After receiving PUC approval for the purchase of the site, we entered into an agreement to purchase the site on February 15, 1973 and with the condominium developer, Business Investments, Ltd., on August 22, 1974. An agreement for engineering services was signed with Westinghouse on February 21, 1975. Since that time, there has been a substantial commitment of funds to the Kamoku Substation.

We view the project as bringing power to an existing, approved substation site. In any case, Section 1:21 of the EIS Regulation specifically exempts the substation site from consideration even if it is considered a component action of a larger project. To quote the applicable portion of Section 1:21: "For any action for which the applicant has not obtained all necessary approvals and for which an EIS was not previously required, the applicant may be subject to Chapter 343, Hawaii Revised Statutes, provided, however, that any subsequent EIS that is required is limited to that component of the action for which approval is necessary."

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Les Ihara, Jr.  
February 20, 1979  
Page 6

COMMENT: Table 3, page 12 shows a projected Oahu peak demand of 937 and 979 megawatts in 1977 and 1978, respectively. What were the actual peak demand for these years? What formula and population assumptions were used for these calculations? What is the current per capita electrical consumption, and what per capital consumption assumptions were used? Documentation for these points should be included.

RESPONSE: The recorded system peaks for 1977 and 1978 were 919 MW and 917 MW respectively, somewhat below those projected. The weather was unusually cold at the time of the 1978 system peak. It has been estimated that if the weather had been normal, the 1978 system peak would have been approximately 971 MW. As stated in the EIS, the load projections for the Pukele service area were made on the basis of known new requests for service, not on population projections. The peak demand projections contained in TABLE 3 of the EIS were based on personal interviews with large customers as to their anticipated need for service over the next few years. Past trends, customer interviews, and marketing analysis were the bases for the projections for small customers.

In 1978, the sales per average customer (not per capita) was 24,253 kwh (Total Sales/Average Number Consumers). The peak demand projections contain no assumptions on per capita consumption rather the assumption is that past trends in usage will continue in the next few years as substantiated by marketing analyses.

COMMENT: Other questions that should be answered include: No. 10 would the use of gas in place of an equivalent amount of electricity require more or less oil (percentages more or less)? What percentage increase in the use of gas by Pukele service area consumers would be required to reduce electrical peak demands to levels necessary to prevent a Pukele overload in 1981?

RESPONSE: There will be no significant differences in the amount of crude or residual oil required to provide needed energy supplies to homes and apartments in the Pukele service area with all electric appliances as compared to those that have gas appliances.

This was thoroughly discussed before the Public Utilities Commission in its Docket 3147. In this Docket, we submitted exhibits reporting on the results of four studies of the actual metered energy consumption of large groups of customers that proved conclusively that there was no significant difference

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Les Ihara, Jr.  
February 20, 1979  
Page 7

in the amount of raw fuel energy required to serve all electric homes as compared to homes with gas appliances. These studies were conducted by the Utah Chapter of ASHRAE (American Society of Heating Refrigeration and Air Conditioning Engineers), the Oklahoma Gas and Electric Company and the Hawaiian Electric Co., Inc.

With respect to the second question, we do not know the amount of gas being consumed in the Pukele service area so we cannot estimate a percent increase in the consumption of this commodity.

However, we would like to respond to this question by noting the following:

- A. Almost all of the high-rise buildings in the Pukele service area that require large amounts of hot water already use central gas water heating (water heating accounts for at least three quarters of the residential heating and cooking load).
- B. Many of the restaurants in the Pukele service area already use gas for water heating and cooking.
- C. Most nonresidential commercial facilities (other than restaurants) have little or no need for water heating or cooking.
- D. Many of the older homes and apartments in the Kaimuki, Kapahulu and McCully area already use gas appliances.

Therefore, a massive conversion to gas for residential cooking and water heating would only affect peak demands on the Pukele system by a few percent at the most.

Accordingly, any such conversion would only serve to defer the needed system's improvement for a short time. In any event, the equipment to serve these growing electrical loads will have to be installed.

COMMENT: What agency approval is the EIS required for? Has  
No. 11 HECO submitted a conservation district use application to the Board or DLNR? If so, when was the CDUA been approved and/or revoked? What are the differences between the project description in the CDUA and this EIS? These questions should be addressed in the EIS.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Les Ihara, Jr.  
February 20, 1979  
Page 8

RESPONSE: The EIS is a portion of our Conservation District Use Application (CDUA) which was submitted to the Chairman, Board of Land and Natural Resources on May 10, 1974. It is our understanding that, upon receipt of such application, the Chairman passes them to the staff of the Department of Land and Natural Resources (DLNR) for comment. After the staff comments are returned to the Chairman, the Board meets to make a decision on the CDUA. The EIS is meant to complete the CDUA so that the staff of DLNR can make their comments to the Board. Approval of or rejection of the EIS will be made by the staff of DLNR.

The CDUA covers only that portion of the proposed project which is located in Conservation Areas whereas the EIS addresses the entire project, bringing electrical power to the Kamoku Substation, including the routing of lines along City streets.

COMMENT: No. 12 It appears that the EIS inadequately describes the differences between 138 kv and 46 kv lines. The first paragraph on page 16 states that it would take six 46 kv lines to carry the same amount of power as a 138 kv line. Does this mean that Pukele substation can be expanded? Currently two 138 kv lines enter Pukele substation, but only eight 48 kv lines exit it. This should be explained. The same paragraph also states that 46 kv lines would have larger environmental effects than a 138 kv line. This statement is inadequately documented.

RESPONSE: As you have correctly pointed out, there are two 138 kv lines entering Pukele Substation and eight 46 kv lines existing from Pukele Substation. We have developed the following discussion which we hope will clear up any misunderstandings you may have regarding the subject of 138 kv and 46 kv line capabilities.

As noted in the EIS, any major transmission system must have a high degree of reliability to serve the consumers. To achieve this reliability, redundancy of component is provided so that, should one component fail, the remaining components can pick up the load. In the case of 138 kv lines, a minimum of two lines insure continuous service since one line is expected to pick up the full load whenever the other line is out of service.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Les Ihara, Jr.  
February 20, 1979  
Page 9

The same type of redundancy is also provided in other parts of the system. For example, Pukele Substation has four transformers each of which feeds two 46 kv lines for a total of eight outgoing 46 kv lines. Should any of these transformers fail, the load would be distributed among the three remaining transformers and therefore the remaining six 46 kv lines.

It can, therefore, be concluded that the load capacity of Pukele Substation is six outgoing 46 kv lines which agrees with the incoming capability of one 138 kv line. Hence, Pukele Substation cannot be expanded to accommodate any additional outgoing 46 kv lines.

Regarding the comment of larger environmental effects, please consider the following:

- A. HECO's 138 kv circuits are conductored with either two conductors per phase in the mountainous areas or one larger conductor (equivalent capacity to the two smaller conductors) in the urban area. The total number of wires for a 138 kv circuit is therefore seven (includes shield wire) in the mountains and four (includes shield wire) in the urban area. The six 46 kv lines, however, require a total of 18 wires (one conductor per phase for each of six circuits) thereby greatly increasing the visibility of the lines.
- B. A single 138 kv circuit can normally be supported on a single steel pole. The equivalent six 46 kv lines would require either a much taller single pole or a much wider structure of the same height or the 46 kv lines separated over several routes.

COMMENT: The EIS inadequately discusses the reasons why two lines from Halawa cannot be routed directly to Kamoku substation thereby avoiding Pukele substation. The Pukele substation presently receives its power from two lines from Koolau substation.

RESPONSE: The combination of either Alternative I-A (Leeward Koolau Route) or Alternative I-B (Trans-Koolau Route) with Alternative G (Double Circuit on Waahila Ridge) would result in two circuits to Kamoku from Halawa without any reconnections required at Pukele Substation. However, utilization of this arrangement would make the system more susceptible to the possibility of a total outage at Kamoku since both circuits to Kamoku would be supported on the same structure.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Les Ihara, Jr.  
February 20, 1979  
Page 10

We have calculated the probability of double circuit failure to be 0.0106 failures per mile per year for HECO's system (see response to question 16). On this basis, the 12.3 miles of double circuit lines for the combination of Alternatives I-A and G would result in a failure rate of 0.13038 failures per year or one failure every 7.7 years. Similarly, the 15.7 miles of double circuit lines for the combination of Alternatives I-B and G would result in a failure rate of 0.16642 failures per year or 1 failure every 6 years.

This type of failure rate is unacceptable because of the expected frequency especially since the entire service area of the Kamoku Substation would be out of power until the cause was determined and corrected. Because of the length and unaccessibility of this routing, the outage duration could be considerable.

COMMENT:  
No. 14

The EIS is inadequate because it does not include an alternative route which includes two lines, one each from Pukele and Halawa substations on one pole line to Kamoku substation. The EIS should explain the reasons why this cannot be done. Alternative I-A (Leeward Koolau Route) includes two circuits on one pole line connecting two different substations.

RESPONSE:

Among the factors considered in determining whether or not to utilize the single pole double circuit configuration is the source and receiving end of the power to be transmitted. In the case of Alternative I-A (Leeward Koolau Route), there is one source (Halawa) but two receiving ends (Pukele and Kamoku). In your alternative, there would be two sources (Pukele and Halawa) but only one receiving end (Kamoku). Note that, given the simultaneous failure of both lines in Alternative I-A, service would be maintained at both Pukele and Kamoku through their respective backup feeders. However, should a similar type simultaneous failure occur on the alternative you suggest, Kamoku substation would sustain a total outage since there would be no backup capabilities.

COMMENT:  
No. 15

The EIS is inadequate because it does not include the following two alternatives to providing power to the Pukele service area: (1) connect 138 kv lines to transformers located near Pukele substation and route all 46 kv lines underground or overground on existing wooden poles to areas serviced, (2) connect 138 kv lines to transformers located in or near the origination point of 46 kv lines in Manoa and route all 46 kv lines underground or overground on existing wooden poles to areas serviced.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Les Ihara, Jr.  
February 20, 1979  
Page 11

RESPONSE: Several points must be addressed in response to your comment.

- A. The connection of incoming 138 kv lines and outgoing 46 kv lines to transformers requires a substation with all its associated appurtenances (circuit breakers, relays, controls, etc.). Hence, the alternatives suggested would require a substation site in either Palolo (in addition to Pukele) or Manoa Valley. As discussed in question 7, HECO would require the fee purchase of the lot and could not acquire the land through condemnation unless we could demonstrate that no viable alternative was available.
- B. Ideally, a bulk transmission substation is located in the heart of its service area or, at least, in close proximity to that heart. Locating the substation in upper Palolo or Manoa Valleys would not accomplish this.
- C. The cost of routing eight new 46 kv lines (either overhead or underground) to the service area would be much higher than the cost of the comparable 138 kv lines. This higher cost would be due to the extra materials and labor required for the 46 kv lines.

COMMENT: The probability of double outage on alternative "G" is not adequately discussed. Are there any such routes (two 138 kv lines on one pole line) currently used on the mainland? How many? And how many simultaneous failures of both feeder circuits have occurred on those lines?

RESPONSE: We are aware of double circuited lines for various transmission voltages, not only for 138 kv. We have been unable, however, to determine the number of those double circuited lines which feed the same substation as proposed in Alternative G. We have also been unable to determine the number of simultaneous failures which have occurred on those lines.

However, based on HECO's experience with double circuited lines, we have determined that there are approximately 31 miles of double circuit lines presently on HECO's system. With three 138 kv double circuit failures in the last nine years, this amounts

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Les Ihara, Jr.  
February 20, 1979  
Page 12

to 0.0106 failures per mile per year. With 2.1 miles of double circuit lines on Waahila Ridge as indicated on Alternatives G, H and I, this translates to 0.0223 failures/year or about one failure in 45 years. Although this does not appear to be of much concern, it should be noted that failure of any one of the existing double circuit lines shown in Figure 1 would not result in an outage to a substation as no two lines to any substation are on the same double circuit structure. However, in the case of Kamoku, the entire substation would sustain an outage should a failure occur on the portion of double circuit line on Waahila Ridge.

COMMENT: How many oil pumping stations would be required for alternative "H"? What locations along this route would make this alternative infeasible?  
No. 17

RESPONSE: Alternative "H" requires two oil pumping stations. One of the stations would be located at Pukele while the other would be located at the midpoint of the route.

We do not foresee any specific problem areas which would make this route technically unfeasible. It appears, at this time, that bridges (through which provisions for underground have not been made) could cause some severe design problems. Routing the underground line around existing utilities will be another. In addition, it has been HECO's experience for underground lines, in general, that the greatest problems occur during actual construction when unmapped utilities are discovered and must be dealt with. For small distribution type underground facilities, these problems can be severe. For the massive underground transmission line, this severity will be substantially compounded.

COMMENT: The cost estimates on Table 5, page 36 are inadequately documented. The easement values for lines "C" and "D" should be documented. Also, cancellation charges should not be included in the total costs. Why were the steel poles ordered prior to completion of the EIS?  
No. 18

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Les Ihara, Jr.  
February 20, 1979  
Page 13

RESPONSE: Easement values (costs) are based on the land area requirements for each of the alternatives. Note that whenever HECO does not have franchise rights or existing easements, we must obtain easements to a strip of land encompassing the supporting poles, conductors, and guys. Large portions of the Alternatives "C" and "D" alignments are not covered by franchise rights or adequate existing easements. The cost of the new or additional easements are therefore included as "easement values" in Table 5.

Purchase orders for the Lines 1 and 2 steel poles were placed with the manufacturers in 1974. At that time, HECO was in compliance with all applicable State of Hawaii laws and City and County ordinances and was not required to submit an EIS and/or cost comparisons. Subsequent to the placing of the orders, however, various State of Hawaii and City and County ordinances were enacted which resulted in various public and governmental informational meetings.

At that time, the purchase orders were placed in suspension and negotiations with the steel pole manufacturer were undertaken to determine the cost of cancelling the purchase orders. These negotiations resulted in a dollar figure being placed on any order cancellation to compensate the manufacturer for loss in revenue. Therefore, a true cost comparison must include the cancellation costs for all urban alternatives other than Lines 1 and 2 since we had proceeded with the necessary engineering and material ordering in good faith and in compliance with all applicable laws during the initial stages of the project.

COMMENT: How tall are the wooden poles presently in Palolo  
No. 19 Valley that carry 46 kv lines?

RESPONSE: The wood poles supporting 46 kv lines in Palolo Valley  
are 55 to 65 feet in length.

COMMENT: What specific areas within the Pukele service area  
No. 20 are expected to have significant population and  
economic related growth? This and all other questions  
listed in this letter should be discussed.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Les Ihara, Jr.  
February 20, 1979  
Page 14

- RESPONSE: As stated on page 11 of the EIS, the projection of load in the Pukele service area considered growth in load on each individual distribution substation transformer. There are approximately 40 such transformers in the area. These projections were based on known, definite requests for new service. A service request is considered to be confidential between the customer and the company.
- COMMENT: No. 21 The EIS inadequately describes the project's impact on property values. Data necessary to make a determination as to increases or decreases in property values should be included in the EIS.
- RESPONSE: The potential effects of the project on property values are discussed on pages 89-91 of the EIS. We believe that this information is reliable and valid. Since special areas of concern are not identified, we cannot respond in detail.
- COMMENT: No. 22 What population and growth impacts would the project have on the Pukele service area?
- RESPONSE: Hawaiian Electric Company is responsible for planning, designing and installing facilities to provide adequate, reliable service at the least cost to the consumers. We must provide service to all customers and, therefore, cannot contribute to population and growth impacts. Such impacts and the planning to mitigate these impacts are the responsibility of the State and local governments.
- COMMENT: No. 23 The EIS is inadequate because it does not include in it any alternative destination substation to meet the objective of providing power to relieve the load from the Pukele substation.
- RESPONSE: As stated in response to your question number 8, we view the project as bringing electrical power to an existing, approved substation site. Section 1:21 of the EIS Regulation specifically exempts the substation site from consideration and, therefore, alternative substation sites were not included in the EIS.

HAWAIIAN ELECTRIC COMPANY, INC.

Mr. Les Ihara, Jr.  
February 20, 1979  
Page 15

COMMENT: The alternative of postponing the project should be included in the EIS. A discussion of the reasons for its exclusion should be included.  
No. 24

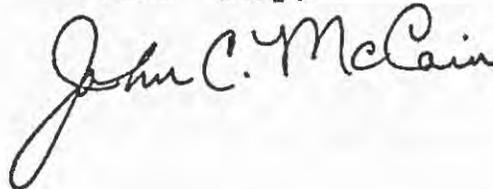
RESPONSE: The alternative of postponing the project would mean that consumers will incur increasingly more severe outages with time. We do not view this as a viable alternative to the project since it means that we cannot meet our responsibility for planning, designing, and installing facilities to provide adequate, reliable service at the least cost to the consumers. The EIS Regulations require the consideration of "Any known alternatives for the action which could feasibly attain the objectives of the action... ." Postponement of the project would not attain the objective of the project nor fulfill our responsibilities.

COMMENT: The EIS should include a discussion on the extent to which the project forecloses the future option of underground and submarine cable route alternatives.  
No. 25

RESPONSE: The installation of the proposed overhead transmission lines is a long-term commitment; however, should governmental requirements mandate undergrounding of electrical lines or the use of a submarine cable, we would, of course, comply. Obviously, there would be costs associated with the removal of the lines and the installation of alternate lines which would be borne by the ratepayers.

Hawaiian Electric Company appreciates your concern about this project.

Yours truly,



JCMc:cm

3443 Hardesty Street  
Honolulu, HI 96816

February 16, 1979

Dr. John C. McCain, Manager  
Environmental Department  
Hawaiian Electric Company, Inc.  
Box 2750  
Honolulu, HI 96840

Dear Dr. McCain:

In reference to your letter of February 2, 1979 to Mr. Les Ihara, I am submitting additional comments on the environmental impact statement for the proposed Malawa-Pukele-Kamoku 138 kv Transmission Line. These comments are on behalf of concerned residents of Palolo Valley.

First, we do not believe that alternate energy has been considered for use by the ultimate service area. To elaborate, gas and solar energy have not been adequately considered as sources to alleviate the power needs of the entire service area.

Next, we question the scope of the project when it has been expressed that Kamoku substation is to be an emergency-basis plant. If it is to be a relief line to Pukele, why does it have to be of such high voltage? Why can't the 46 kv system be expanded to accommodate the overload?

The area to be serviced by the power lines will be in or around the Kakaako area which we understand will have energy corridors planned. If this is the case, why couldn't the power lines be routed through these energy corridors, thus making a shorter path to Kamoku substation?

The greatest concern is the health hazard question. It is too easily dismissed by the EIS. It might be easy to state that there are no health hazards, but what do you do if they are wrong. Do you apologize emphatically and try to make a monetary settlement? Of what value is human life?

This project should be looked upon with a futuristic perspective. Something of this magnitude and lifespan should not be looked at in terms of today's technology or utilization--if tomorrow's city will have a clean look and the trend will be to go underground, why should we engrave a blotch on the scenery with additional poles? Alternatives with mixes of underground and overhead have not been addressed to our satisfaction.

Dr. John C. McCain  
February 16, 1979  
Page 2

A systematic approach to planning for our future neighborhoods will be relevant to the imposition of such high poles which do not blend in with the atmosphere of the neighborhood. We would point out that should such a project be permitted in Palolo, who knows which other districts could be jeopardized in the same manner. Two wrongs do not make a right--just because there is a network of wires there now doesn't make it any better when an additional network is superimposed on it. There is strong contention that the additional poles will not make the aesthetic view any nicer. Also, the idea of painting poles to blend in with the scenery is hideous.

Very truly yours,

*Karen H. Iwamoto*

Karen H. Iwamoto

HAWAIIAN ELECTRIC COMPANY, INC.

Box 2750 / Honolulu, Hawaii / 96840



JOHN C. McCAIN, Ph D.  
MANAGER, ENVIRONMENTAL DEPARTMENT

February 20, 1979

ENV 2-1  
H-P-K  
NV/G/NV

Ms. Karen H. Iwamoto  
3443 Hardesty Street  
Honolulu, Hawaii 96816

Dear Ms. Iwamoto:

Subject: EIS for the Proposed Halawa-Pukele-Kamoku 138 kv  
Transmission Lines

This is in response to your letter of February 16, 1979 regarding the Environmental Impact Statement for the proposed Halawa-Pukele-Kamoku 138 kv transmission lines. The following responses are addressed specifically to the concerns and questions you discussed in your letter:

COMMENT: First, we do not believe that alternate energy has been considered for use by the ultimate service area. To elaborate, gas and solar energy have not been adequately considered as sources to alleviate the power needs of the entire service area.

RESPONSE: Solar energy may ultimately provide significant power in the future; however, if solar energy is converted to electrical energy at a central site, it still must be transmitted to the user. Therefore, increased use of solar energy will still require transmission lines. Individual solar energy to electrical energy devices are still in the developmental stages and will not contribute to the reduction in load at the Pukele Substation.

Solar water heaters reduce energy consumption for electricity. As the weather turns bad for several days, as it has been in recent months, the solar heater becomes ineffective and energy and peak demands are no longer affected by solar heaters. We then, must transmit the power load for water heating. The weather is usually worst in the winter months which further compounds the problem because this is when our peak occurs.

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Karen H. Iwamoto  
February 20, 1979  
Page 2

Increased use of gas to alleviate the power needs of the Pukele service would probably not reduce the needs for the power lines substantially due to the following: (1) Almost all of the high-rise buildings in the Pukele service area that require large amounts of hot water already use central gas water heating and water heating accounts for at least three quarters of the residential heating and cooking load. (2) Many of the restaurants in the area already use gas for water heating and cooking. (3) Most other nonresidential, commercial facilities have little or no need for water heating or cooking; and (4) Many of the older homes and apartments in the Kaimuki, Kapahulu, and McCully area already use gas appliances. Therefore, a massive conversion to gas for residential cooking and water heating would only affect peak demands on the Pukele system by a few percent at the most.

The development of alternate energy sources will not alleviate the need for the transmission and distribution of electrical energy unless individual sources not now generally available are developed.

**COMMENT:** Next, we question the scope of the project when it has been expressed that Kamoku Substation is to be an emergency-basis plant. If it is to be a relief line to Pukele, why does it have to be of such high voltage? Why can't the 46 kv system be expanded to accommodate the overload?

**RESPONSE:** The Kamoku Substation is not intended to be an emergency-basis station. It is intended to relieve load on the Pukele Substation. When energized the Kamoku Substation will serve a portion of the area currently served by the Pukele Substation. This will relieve load on the Pukele Substation.

The 46 kv system draws its energy from the 138 kv system. The contingency analysis presented in the "Justification for the Proposed Project" section of the EIS shows that the 138 kv to 46 kv transformers at the Pukele Substation will be reaching the limit of their capacity in 1981.

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Karen H. Iwamoto  
February 20, 1979  
Page 3

COMMENT: The area to be serviced by the power lines will be in or around the Kakaako area which we understand will have energy corridors planned. If this is the case, why couldn't the power lines be routed through these energy corridors, thus making a shorter path to Kamoku Substation?

RESPONSE: HECO has long made it a practice to coordinate its future installations with those of the various governmental agencies. These joint efforts have many times resulted in benefits to both parties. As such, we will continue this practice.

In the specific case of the planned redevelopment of Kakaako and the possibility of coordinating the installation of 138 kv underground circuits to Kamoku Substation with this redevelopment, it should be noted that the City's redevelopment plans for the Kakaako area are still in the developmental stage. They have not yet reached the final detailed engineering stage at which utility-government coordination could result in any benefit. It is not anticipated that they will reach this stage in the time frame necessary for HECO to meet its requirement date for Kamoku.

COMMENT: The greatest concern is the health hazard question. It is too easily dismissed by the EIS. It might be easy to state that there are no health hazards, but what do you do if they are wrong. Do you apologize emphatically and try to make a monetary settlement? Of what value is human life?

RESPONSE: We, too, share your concern for human life and value it extremely high. This is one reason why we have installed relays in our substation which will isolate a line almost instantaneously should it break. The design criteria for the proposed lines are presented in the EIS.

The EIS also contains a discussion of the health effects associated with high voltage transmission lines. The maximum electrostatic field gradient expected under our proposed 138 kv lines is less than 0.65 kv/m. This gradient is far below even the controversial and apparently conservative Russian

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Karen H. Iwamoto  
February 20, 1979  
Page 4

standard of 5 kv/m for a 24-hour period. From the results of numerous studies outlined in the EIS, it can be concluded that there is no reason to believe that electrical fields from overhead 138 kv lines will have any effect on human health.

COMMENT: This project should be looked upon with a futuristic perspective. Something of this magnitude and life-span should not be looked at in terms of today's technology or utilization - if tomorrow's city will have a clean look and the trend will be to go underground, why should we engrave a blotch on the scenery with additional poles? Alternatives with mixes of underground and overhead have not been addressed to our satisfaction.

RESPONSE: As stated in the EIS under the section entitled "Justification for the Proposed Project," our analysis of the need for the transmission lines will become acute in 1981. Time-of-day pricing, energy conservation, solar water heating, and other energy reducing measures do not necessarily reduce peak load as mentioned earlier. We must meet this demand and this demand will become critical in only a few years. Futuristic solutions require time which is not available.

Numerous alternatives to the proposed project are presented in the EIS. Obviously, the number of alternatives could be almost endless; however, we opted to discuss those alternatives which we deemed viable or which were called to our attention by concerned individuals. Each alternative we consider requires considerable engineering design to determine costs and it would be prohibitively expensive to consider an almost endless variety of alternatives.

Alternative I is a mix of underground and overhead lines. The principal drawback is that for each transition from an overhead to an underground system, a substation is necessary. This adds considerably to the cost and to the construction time.

HAWAIIAN ELECTRIC COMPANY, INC.

Ms. Karen H. Iwamoto  
February 20, 1979  
Page 5

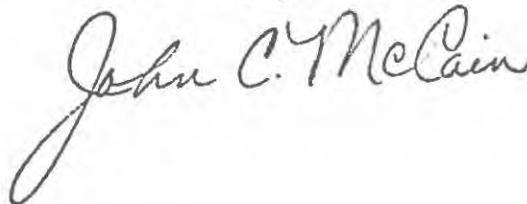
COMMENT: A systematic approach to planning for our future neighborhoods will be relevant to the imposition of such high poles which do not blend in with the atmosphere of the neighborhood. We would point out that should such a project be permitted in Palolo, who knows which other districts could be jeopardized in the same manner. Two wrongs do not make a right - just because there is a network of wires there now doesn't make it any better when an additional network is superimposed on it. There is strong contention that the additional poles will not make the aesthetic view any nicer. Also, the idea of painting poles to blend in with the scenery is hideous.

RESPONSE: As proposed, the 46 kv lines existing on the top of the poles along Palolo Avenue and Tenth Avenue would be moved to the new steel poles and the top of the old poles removed. This should mitigate aesthetic intrusion somewhat; however, you are correct, the view will probably not be nicer.

I fail to understand why the idea of painting poles and lines to blend in with the scenery is hideous. Dark poles and lines in the forested areas do blend in with the background much better than metallic poles. Painted poles and darkened lines are now installed in several areas such as on the windward side and the line is much less visible than would be the case if the pole and lines were not painted.

Hawaiian Electric Company appreciates your concern about this project.

Yours truly,

A handwritten signature in cursive script that reads "John C. McCain". The signature is written in dark ink and is positioned below the typed name "John C. McCain".

JCMc:cal