PETITIONER'S EXS.#2
A97-722

ORIGINAL

Maui Electric Company, Limited's
Proposed Waena Generating Station

Land Use Commission Petition
Docket A 97-722
ORIGINAL **Exhibit 6**

October 1997

MECO GENERATION SITING STUDY

CENTRAL MAUI

232-MW GENERATION STATION

MAUI ELECTRIC COMPANY, LIMITED

NOVEMBER 1995

Prepared By

STONE & WEBSTER ENGINEERING CORPORATION

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EXECUTIVE SUMMARY

Maui Electric Company, Limited (MECO) proposes to design, construct, and operate a 232-MW electrical generation facility to supply future electrical power needs for the Island of Maui. The purpose of this siting study by Stone & Webster Engineering Corporation (SWEC) was to determine the highest ranked site for the Central Maui Generation Project by evaluating the final three sites, A-2, D-1, and C-3, identified through a series of previous siting studies.

Site A-2 was determined to be the highest ranked site by Dames & Moore (D&M) (*Environmental Screening and Siting Report for the Central Maui Generation Project*). Site D-1 was identified by Trinity Consultants (*Central Maui Siting Study Air Quality Analysis*) as having the best air quality. Site C-3 has been included in siting and environmental studies conducted by Belt Collins Hawaii (BCH) (*Central Maui Siting Study*, and *Alternate Puunene Airport, Environmental Screening Report*) and is compared to the other two sites in this study.

The study compares previous environmental screening of the sites and includes the air quality modeling results generated using the one year meteorological data collected in 1994 and 1995 from meteorological towers at Sites D-1 and C-3. The study also adds engineering and infrastructure considerations to the evaluation criteria and considers concerns of the Maui community and local County Government Agencies.

The nine environmental issues (groundwater, surface water, plants, wildlife, cultural resources, noise, hazardous materials/wastes, natural hazards, and traffic) included in the D&M and BCH studies are part of this study. These issues have been identified as important to the site selection process and are generally regarded as critical in the siting of electrical generation facilities. Air quality has been added to the list of environmental issues evaluated and was found to be an important environmental issue in the selection of the final site from the three candidate sites.

The air quality screening analysis conducted by Jim Clary & Associates (*Air Quality Screening Analysis for the Central Maui Generation Project*) determined Site A-2 to be the best site, followed in order by Sites D-1 and C-3. Site A-2 was found to be the only candidate site that will not require reductions in the existing emission inventory (quantity of emissions currently permitted in the area) in order to attain compliance with the air quality standards. The analysis shows that reductions will be required in the current SO_2 inventory to permit the first combined-cycle unit at Site C-3 and in the current PM_{10} (particulates less than 10 microns in size) inventory when permitting the first combustion turbine for the fourth dual-train combined-cycle unit. At Site D-1, reductions would be required in the existing SO_2 emission inventory to permit the first combustion turbine for the fourth dual-train combined-cycle unit.

This study also includes a cost estimate and schedule for the candidate sites. The cost of constructing the first dual-train combined-cycle units and the infrastructure required is essentially the same for each of the candidate sites with Site A-2 having the lowest total cost for the first dual train combined cycle followed by Site C-3 and Site D-1, which are 0.5 % and 3.5 % higher in overall cost than Site A-2 respectively. The schedule represents the first combined-cycle generating unit and is essentially the same for each site. Site specific items such as roads and transmission line extensions can easily be constructed within the construction portion of the schedule at all sites.

A fuel oil delivery study is included to evaluate the cost of trucking and piping of fuel oil from the Kahului Harbor to each of the candidate sites. Depending on the requirements for the pipe (single vs. double wall), piping of fuel oil to the candidate sites may be economically feasible. However, due to the uncertainty of regulatory requirements for double wall pipes in the future, trucking of fuel oil is recommended for the initial units at any of the candidate sites.

Overall, of the three sites evaluated, Site A-2 is ranked the highest and should be considered as the best location for the Central Maui Generation Project. Next in order are Sites D-1 and C-3. Although ranked approximately the same, Site D-1 has fewer air quality constraints than Site C-3.

CHAPTER 1

INTRODUCTION

1.0 INTRODUCTION

1.1 PURPOSE OF THE MECO GENERATION SITING STUDY

MECO proposes to design, construct, and operate a 232-MW electrical generation facility to supply future electric power needs for the Island of Maui. The purpose of this study is to determine the best generation site by evaluating the final three sites, A-2, D-1, and C-3, identified as the most preferred candidate sites through a series of previous siting studies. The study provides a comparative analysis of the final three candidate sites relative to environmental issues, engineering and infrastructure considerations, and the concerns of the Maui community. The general project area and the three site locations are shown on Figures 1-1 and 1-2.

The study includes an evaluation of the nine environmental issues: groundwater, surface water, plants, wildlife, cultural resources, noise, hazardous materials/wastes, natural hazards, and traffic that were included in the *Environmental Screening and Siting Report for the Central Maui Generation Project* (Dames & Moore, 1995) (D&M) and *Central Maui Siting Study* (Belt Collins Hawaii, 1994) (BCH) studies. These environmental issues have been identified as being important to a site selection process, and are also generally regarded as critical issues to be evaluated in the siting of electrical generation facilities. The results of the recently completed air quality analysis have been added to the environmental issues for the selection of the best site from the three candidate sites (Appendix G, Jim Clary & Associates, 1995).

1.2 DESCRIPTION OF THE CANDIDATE SITES

Site A-2 was determined to be highest ranked site by D&M in their *Environmental Screening and Siting Report for the Central Maui Generation Project*. Site D-1 was identified as having the best air quality by Trinity Consultants *Central Maui Siting Study Air Quality Analysis* (1993). Site C-3 was evaluated in previous siting and environmental studies conducted by BCH in the *Central Maui Siting Study* (1994) and Belt Collins & Associates (BCA) in the *Alternate Puunene Airport Site, Environmental Screening Report* (1992). A brief description of each of the candidate sites follows.

1.2.1 Site A-2

Site A-2 is generally located north of Waikapu Road, approximately 700 feet west of Pulehu Road. Site A-2 is a portion of TMK 3-8-03:01, a 1071-acre parcel owned by A&B-Hawaii, Inc. (A&B-Hawaii). The site is currently cultivated in sugarcane by Hawaiian Commercial & Sugar (HC&S) (D&M, 1995).

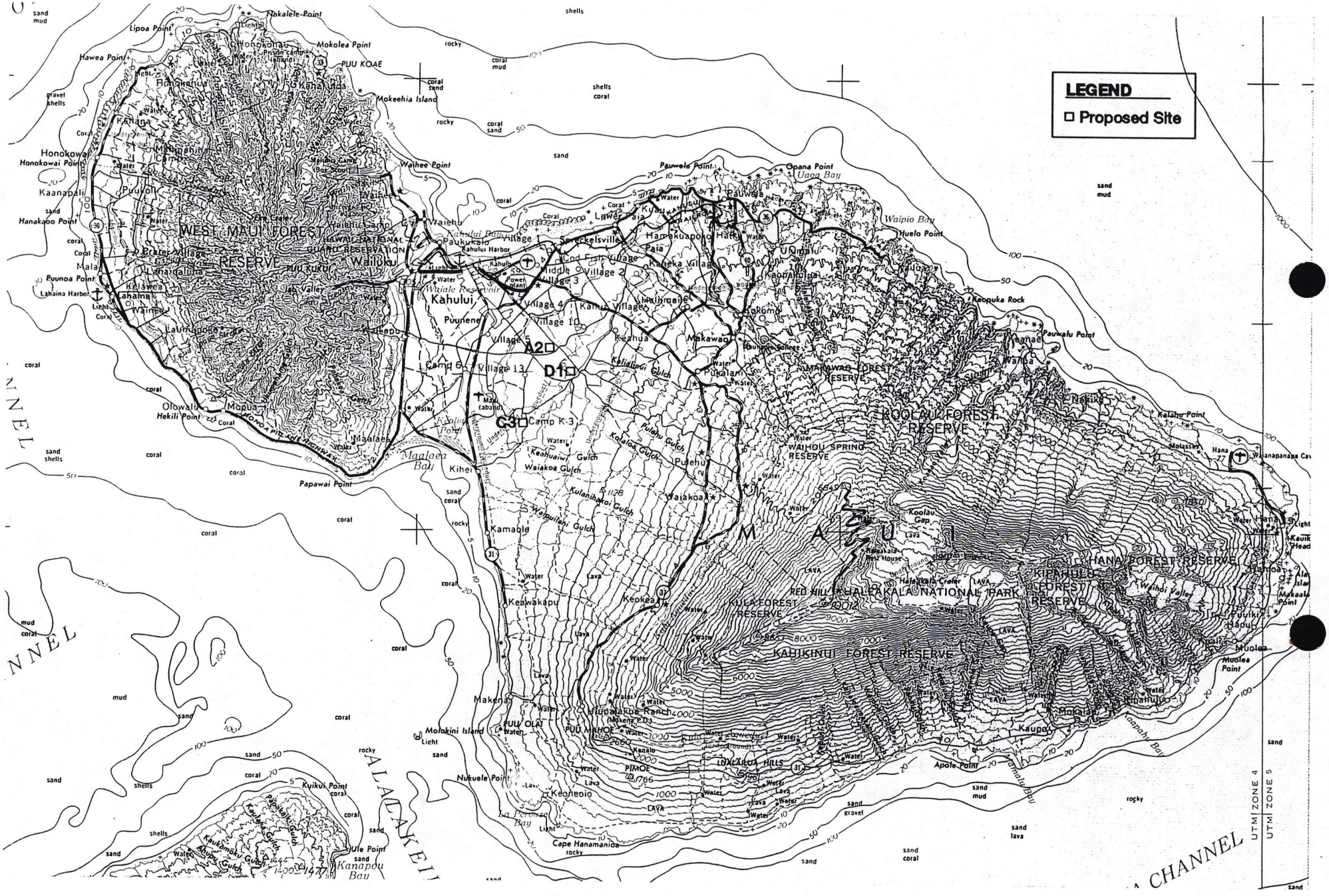

Figure 1-1. Alternative sites

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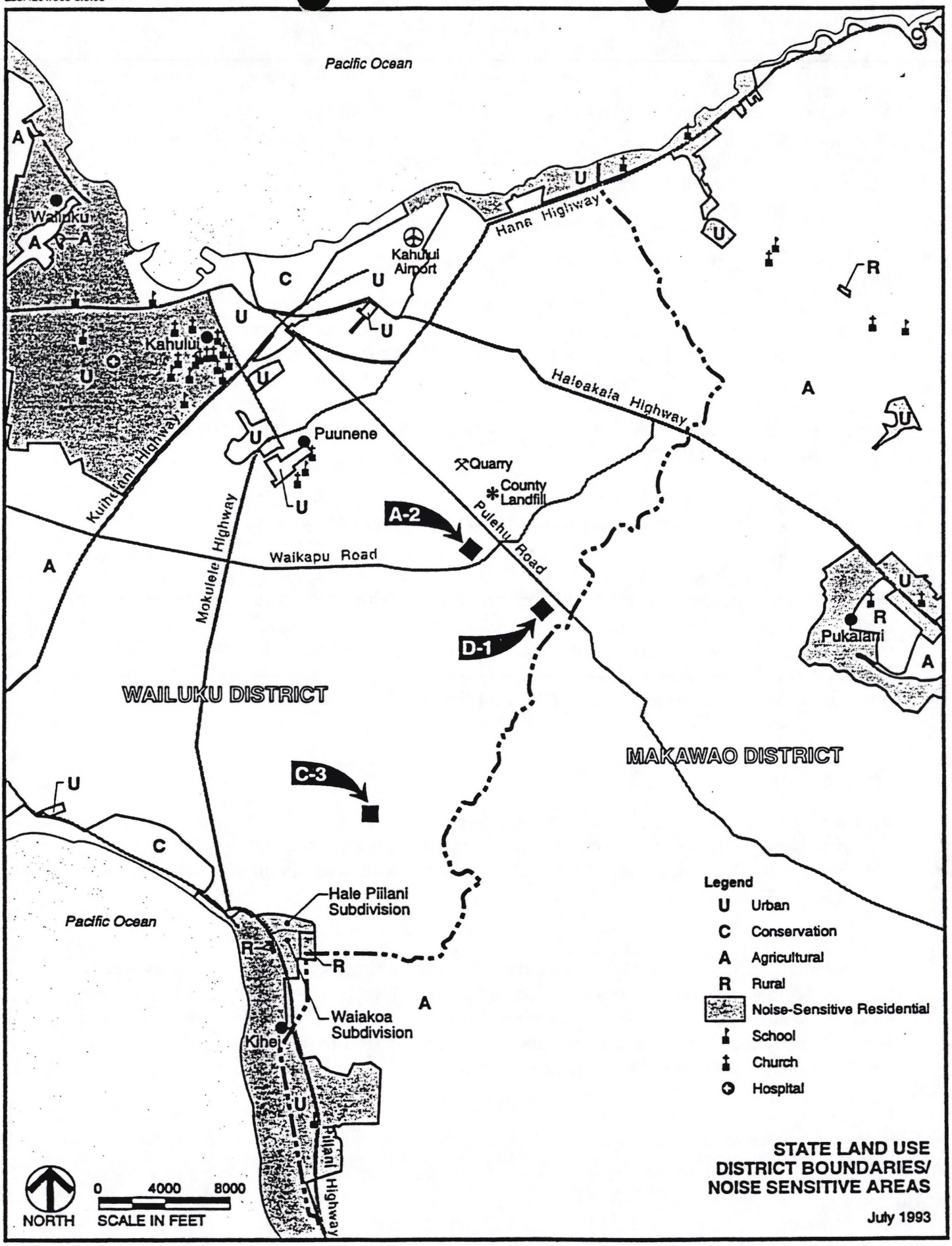


FIGURE 1-2

1.2.2 Site D-1

Site D-1 is located at the northwest quadrant of Pulehu Road and Lowrie Ditch Road. Site D-1 is a portion of TMK 3-8-03:02, a 1539-acre parcel owned by A&B-Hawaii, Inc. A meteorological station was previously located on this site to collect data for the project. This data is representative of Sites A-2, and D-1. The site is currently cultivated in sugarcane by HC&S (D&M, 1995).

1.2.3 Site C-3

Site C-3 is an undeveloped parcel located approximately 2 miles northeast of the Pi'ilani Highway in the *ahupua'a* of Pulehu Nui, Wailuku, Maui. The site is zoned as agricultural land and is a portion of TMK 3-8-04:02, a parcel owned by A&B-Hawaii, Inc. The site is bounded by Upper Kihei Road to the east, an unpaved cane haul road to the north, and to the south and west are cultivated sugarcane fields. The site is uncultivated and covered by boulders, grass, shrubs, and small trees (BCA, 1992). A meteorological station was previously located on this site to collect data for the project.

1.3 BACKGROUND OF PROJECT SITING EFFORTS

The current study builds upon and is the final addition to a body of work intended to assist MECO in selecting the next electrical generation site. This study incorporates the latest air quality data (Appendix G, Jim Clary & Associates, 1995), engineering criteria, and cost estimates into the site selection. A historical log of the siting studies conducted for this project follows. This information was taken from the *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) and supplemented with studies completed after that work.

1989

An island-wide site selection study was conducted by SWEC in 1989. This study assessed ten candidate sites. Of these, three were identified as viable candidate sites for accommodating new generation units: Kahului Power Plant, HC&S Puunene Mill, and Mā'alaea Power Plant.

1991

A generating facility siting study conducted by Black & Veatch (B&V) in 1991 identified central Maui as the most appropriate location for a new, stand-alone (not a unit addition to an existing production unit) electrical generation facility. B&V (1991a, 1991b) identified the preferred site as the "Quarry Site," which it approximately 1 mile north of Site A-2, and the alternate site as the "Puunene Airport Site," which is near Site C-3.

1992

Further evaluation of the Quarry and Puunene Airport sites by MFCO as well as by A&B-Hawaii and HC&S resulted in the identification of major concerns regarding both sites. In light of those concerns, A&B-Hawaii offered a new land parcel for evaluation and possible purchase by MECO, which is the site now identified as Site C-3. It is located approximately 2 miles northeast of Pi'ilani Highway.

In December 1992, BCA conducted an environmental screening of Site C-3 for four investigations: botany, wildlife, acoustics, and archaeology. The purpose of the environmental screening was to identify potential environmental "fatal flaws" of the site, however, none were identified, and Site C-3 remained a viable candidate site for consideration and further environmental evaluation.

1993

Further site evaluations were accomplished in 1993. BCH conducted a Phase I Preliminary Site Assessment of Site C-3 which concluded that no observable evidence exists to indicate the presence of hazardous substances in site soil or groundwater (BCH, 1993).

Tom Nance Water Resource Engineering assessed groundwater supply and disposal issues for Site C-3. This assessment did not identify any substantial groundwater concerns associated with the site (Tom Nance, 1993).

Trinity Consultants, Inc., utilized estimated project emission data in conjunction with known permitted uses to assess effects and permitting issues associated with siting the proposed project within the Central Maui region. This analysis identified areas of moderate, higher, and highest difficulty of air permitting for the proposed project. No areas within Central Maui were found to have a low level of permitting difficulty (Trinity Consultants, 1993).

1994

Information from previous studies was used by BCH to identify ten candidate sites within the Central Maui region potentially suitable for evaluation. Of the ten candidate sites, six were determined to be viable and were evaluated for a variety of environmental factors. Sites A-1, A-2, and D-1 were identified as the most preferred sites.

In 1994, meteorological towers were placed at two locations to collect ambient data. One station was located on Site C-3 and the other was located on Site D-1 at the northwest quadrant of Lowrie Ditch and Pulehu Road to represent Sites A-1, A-2, and D-1.

1995

In January 1995, D&M initiated an environmental screening and siting study. The intent of the study was to evaluate the three candidate sites, A-1, A-2, and D-1, relative to environmental issue areas identified as important to the site selection decision-making process.

Site A-1, included in the D&M screening study, was eliminated from the previously evaluated candidate sites. In its environmental screening study, D&M ranked Site A-2 as the best site in the Pulehu Road area, however, that study stated that air quality was very important and an air quality study should be performed prior to the selection of a final site. Since Sites A-2 and A-1 were in the same air quality area and Site A-2 ranked better for other environmental issues evaluated, Site A-1 was not selected as a final candidate site. Although Site D-1 was found to be the least environmentally desirable of the three sites in the Pulehu Road area, it was selected as a final candidate site because it was identified as having the best air quality in the earlier air quality study, *Central Maui Siting Study Air Quality Analysis* (Trinity Consultants, 1993). Site C-3 was included as one of the final candidate sites since it is not currently being used for sugarcane production and the landowner indicated it was available.

The air quality collected from the two meteorological towers installed in 1994 at Site C-3 and Site D-1 were used to model the project emissions from Sites A-2, C-3, and D-1 (Appendix G, Jim Clary & Associates, 1995). Predicted air emissions for the project were modeled at various stack heights to meet state ambient air quality standards (SAAQS), national ambient air quality standards (NAAQS), and Federal Prevention of Significant Deterioration (PSD) increment limits. Site A-2 was determined to be the only site for which compliance could be modeled given the existing Maui emissions inventory and assuming 232 MW of generation. Reductions in the emissions inventory would be required to maintain compliance at Site D-1 and even greater reductions would be required to model compliance at Site C-3.

This study was initiated by SWEC in June 1995 to evaluate the three final sites, A-2, C-3, and D-1, and determine the highest ranked site. The study incorporates the recent air quality studies and 5 years of environmental evaluation, engineering analyses, infrastructure considerations, and consultation with the general public, elected officials, agencies, and landowners.

1.4 COMMUNITY MEETINGS

A series of community meetings have been held with area residents to discuss the proposed project and the candidate sites. The discussions at the meetings have been generally favorable toward the proposed project, however, citizens preferred the sites that were away from their community (i.e., Sites A-2 and D-1 were preferred by the Kihei community). The meeting at Makawao was not favorable toward the project at any of the candidate sites. (Ref. Appendix H)

CHAPTER 2

SYSTEM REQUIREMENTS

2.0 SYSTEM REQUIREMENTS

2.1 PROJECT PURPOSE AND NEED

MECO is a legally franchised utility responsible for the production, purchase, transmission, distribution, and sale of electricity on the islands of Maui, Moloka'i, and Lāna'i. The Company's total firm capacity for the island of Maui, after its second 58-MW DTCC expansion, will be 239-MW; 223-MW from MECO-owned plants, and 16-MW from HC&S. MECO must install new generating capacity to meet its customers' needs due to increased power demand and the expected retirement of existing generating units as they reach the end of their service life.

Peak power demand by MECO's customers increased an average of 6.6 percent per year between 1985 and 1992, rising from 101.9 MW to 159.7 MW. MECO considers this growth rate above average and expects it to slow considerably after 1995. Even with the slower growth rate expected, it is anticipated that the peak demand load will exceed the current total firm capacity within the next 20 years.

2.2 EXISTING POWER GENERATION AND TRANSMISSION SYSTEM

2.2.1 Generation Resources

MECO presently owns and operates 22 generating units on Maui, four at Kahului and 18 at Maalaea.

In addition to the above company-owned units, MECO purchases electrical energy from two non-utility generators (NUGs). One agreement is with HC&S that commits HC&S to provide 16 MW of firm capacity through 1999. This firm power normally supplements MECO's own generating capacity. An interchange and stand-by power agreement is with Pioneer Mill Company. This power is available only when the mill is producing electricity in excess of its own needs; thus, it cannot be relied upon to meet customer demand, and it is not included in MECO's firm capacity.

2.2.2 Transmission and Distribution Resources

MECO transmits power through the main 69 kV transmission grid. The higher voltage allows efficient transmission of large amounts of power to all major load centers. Substations at these major load centers have transformers that step down the 69 kV current to 12.47 kV for local distribution. Figure 2-1 shows the existing Transmission and Distribution (T&D) power lines and substations. Figure 2-2 shows the T&D power lines and substation that would be needed to transmit the power generated from a full 232 MW plant from the three candidate sites.

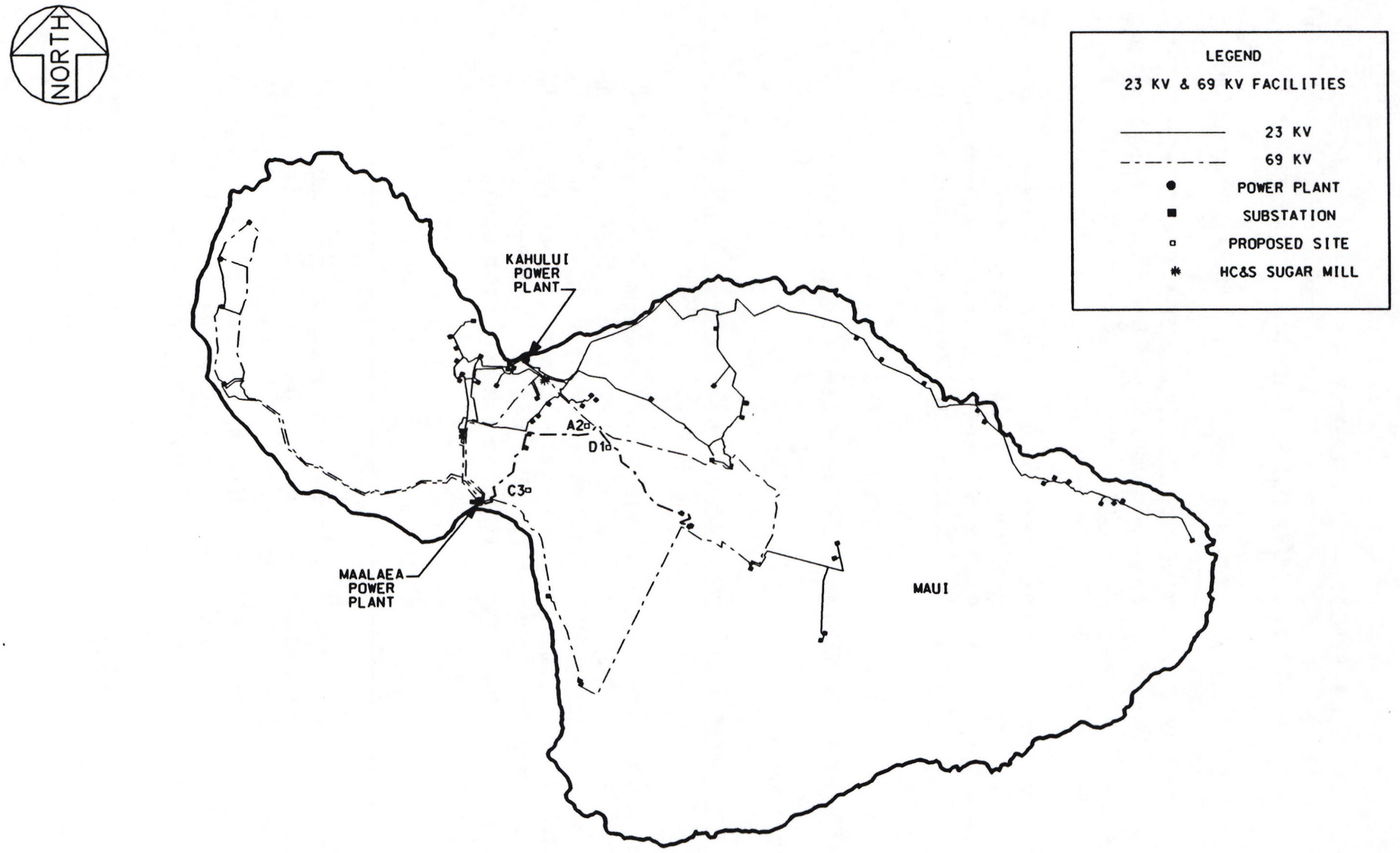


FIGURE 2-1 ALTERNATIVE SITES IN RELATION TO EXISTING ELECTRICAL GENERATION AND DISTRIBUTION

SUNNY SIDE ROAD

4. FUTURE SINGLE CIRCUIT LINE FROM SITE A-2 TO PAIA MILL
TOTAL MILES 4.5
EASEMENT WIDTH 50 FEET

2. SINGLE CIRCUIT LINE FROM SITE A-2
CIRCUIT TIES INTO FUTURE LINE TO PUUNENE
TOTAL MILES 3.6
EASEMENT WIDTH 50 FEET

2. FUTURE SINGLE LINE FROM SITE D-1
CIRCUIT TO PUUNENE MILL
TOTAL MILES 4.7
EASEMENT WIDTH 50 FEET

T.M.K.: 2-5-05-19
0.61 MILES
3.67 ACRES

T.M.K.: 3-8-01
0.45 MILES
2.75 ACRES

HALEAKALA HIGHWAY

T.M.K.: 3-8-03-04
1.67 MILES
10.1 ACRES

4. FROM SITE D-1 FUTURE
CIRCUIT TO PAIA MILL
TOTAL MILES 5.5
EASEMENT WIDTH 50 FEET

T.M.K.: 3-8-03-04
1.6 MILES
10.33 ACRES

3. DOUBLE CIRCUIT LINE FROM SITE A-2
TIE INTO EXISTING KANAHA-PUKALANI LINE
ONE CIRCUIT TO KANAHA
ONE CIRCUIT TO PUKALANI

DAIRY ROAD

T.M.K.: 3-8-06-01
2.0 MILES
12.62 ACRES

PULEHU ROAD

UPPER DIVISION ROAD

50' WIDE
EASEMENT
0.3 MILES
1.84 ACRES

SOUTH FIREBREAK ROAD

SPANISH ROAD

50' WIDE
EASEMENT
.10 MILES
.57 ACRES

40' WIDE ROAD
EASEMENT
TOTAL MILES: 1-TENTH
0.5 ACRES

KEAHUA ROAD

3. DOUBLE CIRCUIT LINE FROM SITE D-1 TIE
INTO EXISTING KANAHA-PUKALANI CIRCUIT
ONE CIRCUIT TO KANAHA
ONE CIRCUIT TO PUKALANI
TOTAL MILES TWO-THIRDS
EASEMENT WIDTH 100 FEET

A-2

WAIKAPU ROAD

T.M.K.: 3-8-03-01
1.18 MILES
7.12 ACRES

D-1

T.M.K.: 3-8-03-04
0.8 MILES
4.82 ACRES

1. DOUBLE CIRCUIT LINE FROM SITE A-2
TIE INTO EXISTING MAALAEA-KEALAHOU LINE
ONE CIRCUIT TO MAALAEA
ONE CIRDUIT TO KEALAHOU
TOTAL MILES 0.5
EASEMENT WIDTH 50 FEET

T.M.K.: 3-8-08-01
2.46 MILES
14.92 ACRES

3. DOUBLE CIRCUIT LINE FROM SITE C-3
CIRCUIT TO BE CUT AND TERMINATED INTO THE NEW WAINU TO KANAHA CIRCUIT.
ONE CIRCUIT GOES TO WAINU SUBSTATION.
ONE CIRCUIT GOES TO KANAHA SUBSTATION.
TOTAL MILES 3.22
EASEMENT WIDTH 50 FEET

T.M.K.: 3-8-04-22
3.03 MILES
18.365 ACRES

1. DOUBLE CIRCUIT LINE FROM SITE C-3
CUT AND TERMINATE INTO EXISTING MAALAEA TO KEALAHOU LINE
ONE CIRCUIT GOES TO KEALAHOU SUBSTATION (NEW)
ONE CIRCUIT GOES TO MAALAEA POWER
TOTAL MILES 3.03
EASEMENT WIDTH 50 FEET

1. DOUBLE CIRCUIT LINE FROM SITE D-1 TIE
INTO EXISTING MAALAEA-KEALAHOU LINE
ONE CIRCUIT TO KEALAHOU
ONE CIRCUIT TO MAALAEA
TOTAL MILES ONE-FIFTH
EASEMENT WIDTH 100 FEET

T.M.K.: 3-8-04-22
0.76 MILES
4.59 ACRES

35

2. DOUBLE CIRCUIT LINE FROM SITE C-3
CUT AND TERMINATE INTO EXISTING MAALAEA TO KIHEI LINE.
ONE CIRCUIT GOES TO KIHEI SUBSTATION.
ONE CIRCUIT GOES TO MAALAEA POWER PLANT.
TOTAL INFRASTRUCTURE FOR ROADWAY 2.25 MILES
TOTAL LINE MILES 2.25
EASEMENT WIDTH 65 FEET

C-3

T.M.K.: 3-8-04-22
0.83 MILES
6.55 ACRES

T.M.K.: 3-8-06-01
1.21 MILES
9.5 ACRES

UPPER KIHEI ROAD

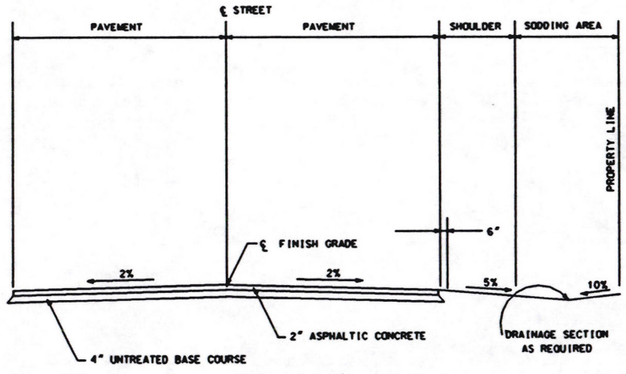
WAIAKOA ROAD

KIHEI

MAALAEA
BAY

NORTH

LEGEND:
- A-2
- C-3
- D-1
- EXISTING HC & S DISTRIBUTION



STONE & WEBSTER ENGINEERING CORPORATION
DENVER, CO.

TRANSMISSION CORRIDORS
AND ACCESS ROADS

MAUI ELECTRIC CO., LTD.
KAHULUI, HAWAII

FIGURE 2-2

2.3 PROJECT DESCRIPTION

The following is an overview of the features of the generation facility that would be constructed on the candidate site.

2.3.1 Generation Station

The site arrangements for the Sites A-2, D-1, and C-3 are provided in Appendix A.

There will be two entrances to each of the sites. The main entrance will provide access for all vehicles except for the fuel delivery trucks. A separate entrance will provide access for fuel delivery. Parking for power plant personnel will be outside of the fenced area. The only vehicles in the Production area will be MECO vehicles and delivery trucks.

The main office and warehouse will be located near the main entrance to limit delivery traffic in the power block area of the plant. The fire protection tanks and pump house will also be located near the entrance for maximum fire truck accessibility.

The four dual train combined cycle (DTCC) blocks will be arranged with the stacks generally running perpendicular to the prevailing trade winds. Each block will consist of two combustion turbine generators (CTG), two heat recovery steam generators (HRSG), and one steam turbine generator (STG). A steam turbine building will be provided for the first two DTCC blocks with another steam turbine building provided for the last two blocks. The air cooled condensers for the steam turbines will be located adjacent to the steam turbine buildings. The maintenance building and control room will be located between the two steam turbine buildings.

The water treatment building and associated water tanks will be adjacent to the steam turbine buildings.

The switchyard area shown in the site arrangements is located based upon the transmission corridors required for the sites. The switchyard will be approximately 200 feet x 400 feet and contain 12 bays, one for each of the generating units, and one control house.

As an option, T&D Facility baseyard could be located near the entrance to the site. A T&D Facility would consist of three buildings: General Facilities, Warehouse, and Shop. Parking will be available in the T&D area for 85 T&D service trucks.
The General Facilities Building will consist of the engineering center, training center, office space, file storage area, showers, lockers, and rest rooms. The building will be approximately 204 feet x 66 feet and contain 13,464 square feet.

The Warehouse will consist of enclosed and open storage areas, a yard storage area, office space for Warehouse personnel, rest rooms, automotive parts storage, truck washing area, gas station area, and staging/assembly area. The building will be approximately 390 feet x 85 feet with 33,150 square feet.

The Shop will consist of a maintenance shop, meter shop, relay shop, radio shop, communications room, and computer room. The building will be approximately 300 feet x 66 feet with 19,800 square feet.

58-MW DTCC System

A brief description of the major components of a complete 58-MW DTCC System is provided below.

- Two diesel oil-fired CTGs, each with a nominal 20-MW capacity are used as prime movers to turn generators and produce electricity. Each CTG can be operated independently (i.e., in "simple-cycle" mode) or in conjunction with the HRSGs and steam turbine described below ("combined-cycle" mode).

- An HRSG will use the heat in the exhaust gases from each CTG to produce steam. A single, nominal 18-MW capacity STG uses the steam produced by the HRSGs to produce electricity.

- Air-cooled condensers will convert the spent steam exhausted from the STG back to liquid. Pumps will recycle the condensed water back to the HRSGs; makeup water for the steam system is supplied on an "as-needed" basis by the demineralized water system.

- Pumps and piping will provide feedwater to the HRSGs.

- On-site water supply and treatment (demineralization) facilities including water supply wells, a water treatment plant that removes impurities from the well water, storage tanks for the treated water and several small storage tanks for chemicals used in the water treatment process.

- Support equipment, including hydraulic starting units for the CTGs, fuel pumps, fuel pre-filters, turbine control panel, water injection pumps skid, lube oil coolers, and turbine wash water equipment.

- A 24 foot-diameter exhaust stack made of carbon steel; the stack would contain two 8 foot-diameter stainless steel flues, one for each of the combustion turbines. The height will be 150 feet to 210 feet, depending on the site.

- Fuel oil storage tanks (approximate capacity of 1.15 million gallons per tank) for #2 diesel fuel oil used in the combustion turbines.

- Metal buildings for warehouse, office, and shop space (to be erected during the installation of the first DTCC). The administration building located near the main entrance to the generation station will include the administrative offices, a conference/training room, computer rooms, a file storage area, a lunch room, rest rooms, and a lobby/reception area.

- A sanitary wastewater treatment and disposal system consisting of a septic tank for primary treatment (solids removal and anaerobic treatment), a dosing tank (for disinfection using chlorine), and sand filters (for removal of suspended solids and completion of the biological treatment).

- A drain system that collects all wastewater from ongoing on-site activities that might contain oil or other similar contaminants (including HRSG blowdown water, equipment cleaning products, and plant drain fluids) and conveys it to an oil/water separator.

- A wastewater reinjection system mixes treated wastewater from the reinjection tank with other plant wastewater and disposes of it in an injection well. The system would receive wastewater from the reverse osmosis water treatment equipment, regeneration of ion exchange equipment, filter backwash, treated sanitary, and cleaned oil/water separator wastewater.

- A storm water runoff system collects storm water runoff, conveys it to the oil interceptors, and discharges clean storm water.

A detailed listing of the equipment necessary for the DTCC Systems is included in Appendix D.

Transmission Lines

The full 232 MW plant will require three transmission corridors that connect the new switchyard and generating units with Maui's electrical transmission grid. The routing of these corridors is unique to each site. The proposed transmission corridors from each candidate site are shown on Figure 2-2.

The A-2 site has approximately 2.2 miles of double circuit lines and 4.8 miles of single circuit lines. The C-3 site has approximately 8.5 miles of double circuit lines. The D-1 site has approximately 3.6 miles of double circuit lines and 4.8 miles of single circuit lines.

CHAPTER 3

PROJECT SCHEDULE AND COST

3.0 PROJECT SCHEDULE AND COST

3.1 PROJECT SCHEDULE

3.1.1 Permitting Schedule

The schedule included as Appendix F indicates all the permits and reports required to be filed with County, State, and Federal agencies to support the start of construction for the first CT (CT-1). It is sorted by County, State, and Federal agencies (Reference Appendix E). In order to support a commercial operation date of January 2004 for CT-1, it is estimated that the permitting effort would have to commence in the last quarter of 1998.

The critical path of the project is through the permitting effort for receipt of the PSD permit from the State Department of Health and U.S. EPA. This effort could take as long as thirty months. This permitting effort is presently shown on the CT-1 schedule to start in October 1998. This allows the mechanical contractor to start his efforts on CT-1 in the last quarter of 2002.

3.1.2 Engineering/Construction Schedule

The phased installation of DTCC generating systems has been chosen to be the lowest cost and most flexible generation system for future power production. The 58-MW DTCC expansion, to be installed between 1996 and 2000 at the Mā'alaea Generating Station, will be constructed in three phases and is anticipated to supply generating capacity to meet MECO's customers' current forecasted needs through 2003. It is projected that additional generation will be needed about 2004. To accomplish the January 2004 commercial operation date for the first combustion turbine, the engineering effort would have to commence in November 2000. This represents a total engineering/construction/startup duration of three years and two months. The CT-1 schedule is about three months longer than the CT-2 schedule. The lengthened schedule for CT-1 accommodates the additional facility infrastructure construction for CT-1. It is assumed that the first CT unit construction will include the office/warehouse, control room, and a significant portion of the water treatment facility (Reference Appendix F).

The engineering effort for CT-2 is scheduled to commence in March 2003 and achieve commercial operation in January 2006. The engineering effort for the first Steam Turbine (ST-1) is scheduled to commence in February 2005 and achieve commercial operation in January 2008, thus completing the first of the four DTCCs.

3.2 COST SUMMARY

The overall cost of engineering, procurement and construction of four complete combined cycle units at Site A-2 is estimated at $388,235,000. The overall cost of engineering, procurement, and construction at Site C-3 is estimated at $392,617,000. The overall cost of engineering, procurement, and construction at Site D-1 is estimated at $401,963,000 (Reference Appendix C).

The above estimates are all based on 1995 dollars. No provision for escalation has been made. No provision for contingency, owner's costs, or interest during construction has been made.

The variance in costs between Sites A-2, C-3, and D-1 are explained below.

Structures and Improvements - Site Preparation

Total site preparation costs for Site C-3 are approximately $2,200,000 higher than Site A-2. There is an extensive amount of additional road work required on Site C-3. The projected site preparation costs for D-1 are estimated to be approximately $100,000 lower than the projected costs for Site A-2 due to its location adjacent to Pulehu Road. Site A-2 will require a short access road from Pulehu Road.

Plant Equipment - Water Treatment and Storage

Water treatment costs for Sites A-2 and C-3 are estimated to be the same, and include both water treatment and wastewater treatment equipment.

Since injection wells are not an option for Site D-1, a brine concentrator and crystallizer are required for disposal of the wastewater, increasing the costs at this site. The added cost for this system is estimated to be $3,317,000 per combined cycle unit. It should be noted that the cost for injection wells and reinjection filters of $381,500 per combined cycle unit will not be incurred at Site D-1.

Prime Movers - Stack

Stack costs for Sites C-3 and D-1 are estimated to be $400,000 higher than Site A-2 per combined cycle unit. A 210 foot tall stack is recommended at Sites C-3 and D-1, compared to the 150 foot tall stack recommended for Site A-2.

Station Equipment - Transmission Corridors

The transmission line costs are spread among the first three DTCCs for each site. Each of the three sites has three transmission corridors which connect the new switchyard with Maui's electrical transmission grid. One corridor, with a dual circuit entering and exiting the site, will be installed during the construction of the first CT for DTCC-1. The second corridor will be

installed during construction of the first CT for DTCC-2 and the third corridor installed during construction of the first CT for DTCC-3.

The estimated costs of the three transmission corridors for Site A-2 are $3,082,000; Site C-3, $4,675,000; and Site D-1, $3,835,000.

Indirect - Land Appraised Values

The land appraised values used are based on an appraisal by Medusky & Co., Inc. dated August 1995. The current land appraised values, which include the power plant site, transmission and access easements, and damages to the adjacent lands, are as follows: Site A-2, $1,837,421; Site C-3, $811,512; and Site D-1, $1,569,218.

CHAPTER 4

SITE EVALUATION

4.0 SITE EVALUATION

This section describes the steps taken and methods used to evaluate and comparatively rank the candidate sites: A-2, D-1, and C-3. The general steps taken in the study were:

- Develop facility layouts with elevations, transmission corridors, and service routes
- Develop screening factors, weight screening factors, and develop evaluation criteria
- Evaluate candidate sites
- Rank candidate sites
- Obtain and review additional information on fuel delivery methods and cost, capital costs for the facility and infrastructure, major equipment, permitting requirements, scheduling, and air quality for each site

The evaluation of candidate sites by individual resource area presents the results of the Central Maui Generation Project site selection process. First, an evaluation is made of any fatal flaws that might remove a candidate site from further consideration. The fatal flaw evaluation is followed by a list of the screening factors (parameters) used to evaluate the candidate sites, including a description of applicable evaluation criteria for each screening factor and the weight assigned to each screening factor to indicate its importance in the site selection process. Candidate sites are briefly described with respect to each screening factor, and each site is scored according to the pertinent evaluation criteria. Finally, weighted site scores for each screening factor are summed to produce overall site scores, which are then ranked to indicate the order of preference of the sites. A sensitivity analysis is performed to verify the findings of the site selection process.

4.1 FATAL FLAW EVALUATION

"Fatal flaws" are characteristics of a site that would constrain development of the Central Maui Generation Project. An example of such a fatal flaw would be the consumption of more than the allowed AAQS/PSD (Ambient Air Quality Standards/Prevention of Significant Deterioration) increment. The presence of a fatal flaw would eliminate a candidate site from further consideration. Review of past siting studies, i.e., the *Central Maui Siting Study* (BCH, 1994) and the *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995), as well as the results of the current study, indicate that no candidate site is fatally flawed. Therefore, Sites A-2, D-1, and C-3 are carried forward for further investigation and comparative evaluation.

4.2 SCREENING FACTORS AND SITE SCORING

This section evaluates the candidate sites according to the screening factors judged to be relevant to assessing their suitability for the proposed generating facilities. In general, the criteria used to evaluate each screening factor are described in decreasing order, beginning with the ones that define the conditions that are most favorable to power plant development and ending with conditions that are least favorable. Weights assigned to each screening factor reflect the importance of that factor in the site selection process, with the most important factors being assigned a weight of 5 and the least important assigned a weight of 1. In the scoring of sites for each screening factor, a score of 1 represents the most suitable conditions and a score of 3 the least suitable conditions.

The evaluation criteria for each screening factor are described and discussed. The evaluation criteria established in the *Central Maui Siting Study* (BCH, 1994) and the *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) were used in the evaluation of the candidate sites. Those definitions were incorporated into this study to maintain consistency in the screening factor descriptions. For screening factors that were not included in the two previous studies, evaluation criteria were established by SWEC in consultation with MECO, Hawaiian Electric Company, Inc. (HECO), and BCH. Each screening factor was scored for each site according to the evaluation criteria to obtain a Raw Site Score.

4.2.1 Land Ownership, Use, and Regulations

Land Ownership

The existing ownership of a potential site affects its suitability for power plant development in that it influences the complexity and/or cost of acquisition. At least 50 acres are needed for the proposed power plant.

Evaluation Criteria The *Central Maui Siting Study* (BCH, 1994) used the following criteria to evaluate land ownership, and the same criteria are used in this evaluation of the candidate sites.

- MECO already owns all or part of the site. Areas already owned by MECO (in whole or part) are the best with respect to this factor.

- Areas of at least 50 acres that are controlled by a single owner are considered the second most favorable with respect to this factor because single-ownership would simplify negotiations between the utility and the landowner.

- Areas of at least 50 acres owned by between two and ten owners are considered the next most suitable. The larger number of owners complicates purchase negotiations and decreases the probability that acquisition can be completed without condemnation.

- Areas of at least 50 acres where ownership is split among more than ten owners are the least favorable because the large number of owners complicates the acquisition process.

Weight MECO's power to condemn land needed for utility purposes limits the importance of this factor, but it remains a consideration. Purchasing is simplified if the area being acquired is owned by one or a few parties who are inclined to negotiate an agreement rather than to force condemnation. Land ownership was assigned a weight of 1 (BCH, 1994).

Scoring All sites are under the sole ownership of A&B-Hawaii and, therefore, were given raw site scores of 2 for this factor.

Existing Land Use

The existing uses of prospective sites is relevant because it affects the ease and cost of acquisition.

Evaluation Criteria It was assumed that sites that could be developed without displacing existing uses are preferable to sites already in productive use. Areas already being used were rated according to the relative cost of relocating those uses. The *Central Maui Siting Study* (BCH, 1994) used the following criteria to evaluate land use, and the same criteria are used in this evaluation of the candidate sites.

- Vacant land on existing power plant sites is considered most favorable with respect to this parameter because its development would not preclude any existing or potential economic use.

- Vacant land that is not being used for any purpose, including agriculture, is considered the second most favorable because power plant development would not displace any existing use.

- Land currently used for ranching or other low-density agricultural uses (or that is temporarily fallow) is considered the next most favorable because development of a power plant would have a limited effect on existing economic uses.

- Land currently being cultivated is considered the next most favorable for power plant development. Irrigated lands or lands that are part of a larger integrated operation (e.g., sugarcane cultivation) are less suitable than isolated farm parcels because relocation costs and the economic impact on ongoing operations are likely to be higher.

- Areas already developed for urban uses other than industrial are considered generally unsuitable for power plant development because of the cost of relocating the existing uses and the likelihood that power plant operations would prove to be incompatible with adjacent uses.

Weight Existing land use is often one of the most important in power plant siting decisions. In this case, the largely agricultural nature of the candidate sites moderates the importance of this factor, and existing land use was assigned a weight of 2 (BCH, 1994).

Scoring Sites A-2 and D-1 are part of HC&S's sugar plantation, and power plant development would remove the plant site from cultivation. However, the area required (50 acres) is small enough that its removal would not have a significant secondary effect on operations, e.g., by reducing the area under cultivation to the point where sugar mill operation is uneconomical. Therefore, Sites A-2 and D-1 were given raw site scores of 3 for this factor. Site C-3 is located within a relatively large parcel of vacant land. Because construction of a power plant would not displace any existing uses from the site or from immediately adjacent areas, the site was given a raw site score of 1 for this factor.

State Land Use District Designation

The existing State Land Use designation of a potential site is relevant because it affects the ease and cost of obtaining approval for power plant development.

Evaluation Criteria The *Central Maui Siting Study* (BCH, 1994) used the following state land use designation criteria, and the same criteria are used in this evaluation of the candidate sites.

- Areas already in the Urban District are considered most suitable for power plant development. The Urban District is intended for uses that involve "city-like" concentrations of people, structures, streets, and land uses. Power plants are clearly urban uses and are most appropriately developed within urban areas. In practice, however, land classified as Urban must also be zoned by the county for heavy industrial uses such as power plant development (see Community Plan Designation, below).

- Lands within the Agricultural District are the next most suitable designation with respect to this factor. Such lands are subdivided into two categories depending on the master productivity rating assigned to them by the Land Study Bureau (see Section 5.2.3). Because the productivity ratings reflect an area's potential agricultural importance, the Land Use Commission has been more reluctant to urbanize areas with soils having high ratings (A or B) than areas having lower rated soils (C, D, or E). Thus, lands within the Agricultural District with lower rated soils are considered more suitable for power plant development than lands with higher rated soils.

- Although public utilities are permissible uses in the Rural District, the county zoning needed for power plant development (Heavy Industrial) would not normally be allowed in the Rural District, and any potential site would likely have to be redesignated as Urban for power plant development to take place. Consequently, Rural areas are considered less suitable for power plant development than land in the Urban and Agricultural Districts.

- Uses in the Conservation District are regulated by the State Department of Land and Natural Resources. Power generation facilities are allowable uses in all five subzones of the Conservation District, provided they use the renewable resources of the area, such as hydroelectric, geothermal or wind energy, meaning fossil-fueled power plants would be generally incompatible with Conservation District objectives. Therefore, areas within the Conservation District are considered the least desirable.

Weight Because it is relatively important that a power plant site have the appropriate state land use designation, this factor was assigned a weight of 3 (BCH, 1994).

Scoring All three sites are located in the state Agricultural District. Because the soils at Sites A-2 and D-1 have high productivity ratings (A and B), these sites were given raw site scores of 3 for this factor. The soils at Site C-3 are less suited for agricultural production (C, D, or E) and the site was given a raw site score of 1.

Community Plan Designation

Community Plans govern the character of development in each of the County's planning districts. These plans implement the planning objectives stated in the *Maui County General Plan* by establishing region-specific goals and objectives and through maps showing allowable land uses.

Evaluation Criteria The *Central Maui Siting Study* (BCH, 1994) used the following community plan designation criteria, and the same criteria are used in this evaluation of the candidate sites.

- Areas designated Heavy Industrial by the Community Plan are considered most suitable for power plant development. This designation is reserved for major industrial operations whose effects are potentially noxious due to noise, airborne emissions, or liquid discharges. It is assumed that such effects have been considered in the Community Plan process and that there would be relatively little public objection to power plant development in areas so designated.

- Locations within extensive areas designated Agricultural by the Community Plan are considered the next most suitable because power plant development is unlikely to significantly affect nearby agricultural activities. Locations on the fringe of areas designated Agricultural are less suitable if they are adjacent to residential or other incompatible uses.

- Areas designated Light Industrial by the Community Plan are the next most suitable because power plant development there would require amending the Community Plan. Amendment might be difficult if opposed by neighboring property owners.

- Areas with other designations (e.g., Residential and some public or quasi-public uses such as hospitals, recreation areas, etc.) are considered least suitable because the primary uses of these areas are generally incompatible with power plant operations.

Weight Because it is relatively important that a power plant site have the appropriate county land use designation or that it would be likely that zoning changes could be obtained, this factor was assigned a weight of 3 (BCH, 1994).

Scoring All three sites are located in areas designated Agricultural by the county Community Plan and were given raw site scores of 3 for this factor.

County Zoning

The County of Maui Zoning Ordinance regulates the timing of land development and establishes specific design criteria. The ordinance lists public utility uses as permitted uses in most zoning districts, but does not specifically mention power plants as either permitted or special uses in any zoning district. MECO's two existing power plants are located in the M-2 Heavy Industrial Zoning District, and the Maui County Planning Department has indicated to MECO that it believes the M-2 designation is generally the most appropriate one for future power plants.

Evaluation Criteria The *Central Maui Siting Study* (BCH, 1994) used the following county zoning criteria, and the same criteria are used in this evaluation of the candidate sites.

- M-2 Heavy Industrial designation is considered the most appropriate for power plant development.

- The next most suitable areas are those not yet zoned for heavy industrial use but having characteristics that make them suitable for that use. Such areas would be likely to receive the necessary zone change from the County. They include areas adjacent to existing M-2 zones and areas removed from existing and future uses (such as residential) that are incompatible with anticipated activities at the power plant site.

- Areas least suitable are those close to residential and other uses typically sensitive to the noise, traffic, and other factors generally resulting from power plant operations.

Weight Because it is relatively important that a power plant site have the appropriate County zoning designation or that it is likely that zoning changes can be obtained, this factor was assigned a weight of 3 (BCH, 1994).

Scoring None of the candidate sites is located in the M-2 Heavy Industrial Zoning District. Development at any of the sites would require a county zoning change, and Sites A-2, C-3, and D-1 were given raw site scores of 3 on that basis.

Existing/Planned Adjacent Land Use

Existing and planned uses of lands adjacent to candidate sites could affect the ease of siting approval.

Evaluation Criteria The following criteria were used for the evaluation (D&M, 1995):

- Sites where adjacent land is undeveloped and where no future development is planned are considered most favorable with respect to this parameter because their development would not conflict with any existing or planned use of adjacent land.

- Sites where adjacent land is used or is planned to be used for ranching or other low-density agricultural uses (or that is temporarily fallow) are considered the next most favorable because development of a power plant would have a limited effect on existing or planned uses of adjacent land.

- Sites where adjacent land is cultivated or is planned to be cultivated are considered the next most favorable because power plant development would not have significant effects on existing or planned uses of adjacent land.

- Sites adjacent to areas developed or planned for urban uses other than industrial are considered generally unsuitable because power plant development would be incompatible with such existing or planned uses of adjacent land.

Weight Because it is moderately important to select a site that is not adjacent to an incompatible use or planned use, this factor was assigned a weight of 2 (D&M, 1995).

Scoring Based on the existing and planned agricultural use of lands in the vicinity of all of the site, each site was given a raw site score of 1.

4.2.2 Air Quality

Air quality constitutes one of the most important environmental screening factors in the site selection process. Preliminary air quality data were reported in the *Central Maui Siting Study Air Quality Analysis* (Trinity Consultants, 1993). In this study, the central valley area of Maui was divided into zones of air quality permitting difficulty (moderate, higher, and highest) using modeling data of criteria pollutants. The preliminary study indicated there were no areas of low difficulty. Using the Trinity Consultants data, BCH reported Site D-1 as having the least air quality permitting difficulty, with the permitting difficulty of Site A-2 close to that of Site D-1, and Site C-3 potentially having the most air quality permitting difficulty.

In 1994, with the assistance of Jim Clary & Associates, MECO established two meteorological stations for the purpose of collecting meteorological data for modeling air quality in the areas of Site C-3 and Sites A-2 and D-1. The air quality screening results reported in *Air Quality Screening Analysis for the Central Maui Generation Project* (Jim Clary & Associates, 1995) were used to establish minimum stack height, significant impacts, and required changes in the existing source inventory for each of the three candidate sites. A summary of the results follows:

- At equal stack heights, air quality impacts of a facility at Site A-2 are significant for fewer pollutants and averaging periods and, thus, should be easier to permit.

- Considering the existing source inventory, a 232-MW plant modeled compliance at Site A-2 only. Compliance at Site A-2 would be achieved with a stack height of 150 feet. Sites D-1 and C-3 would require changes in the existing source inventory for 232 MW even with the maximum allowable stack height of 210 feet.

Maximum AAQS/PSD Increment Consumed

Weight The ability to permit the entire 232 MW at a candidate site is an important factor in the site selection process. As reported in the *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995), the time and cost associated with air quality permitting, the cost of pollution control devices, and potential restrictions on operation of electrical generation facilities can fluctuate, depending on location. Existing air quality was assigned a weight of 5 to indicate the importance of this site selection factor.

Scoring The following scores were obtained from the air quality screening results reported in *Air Quality Screening Analysis for the Central Maui Generation Project* (Jim Clary & Associates, 1995).

Site A-2 was given a raw site score of 1 for this factor because a 232-MW plant modeled compliance considering the existing source inventory. Site D-1 was given a raw site score of 2 for this factor because it had more significant pollutants (SO_2) than Site A-2 and would require changes in the existing SO_2 emission inventory for even the first 20 MW combustion turbine unit. Site C-3 was given a raw site score of 3 for this factor because it had more significant pollutants (SO_2 and PM_{10}) than Site A-2 and would require changes in the existing SO_2 emission inventory for the first combustion turbine unit and changes in the existing PM_{10} emission inventory for the fourth combustion turbine unit.

Minimum Stack Height Reported

The recommended height of the stack at a candidate site is also relevant because the tallest stack is the least favorable aesthetically. As the height of the stack increases, the visual awareness of the plant is greatly increased.

Weight Due to the importance of aesthetics and cost, minimum stack height was assigned a weight of 5.

Scoring Site A-2 was given a raw site score of 1 because it would have the lowest minimum stack height required (105 feet). Compliance at Site A-2 for the complete facility would be achieved with the recommended stack height of 150 feet. Site D-1 would have the second lowest minimum stack height required (150 feet) and Site C-3 would have the highest minimum stack height required (180 feet). The recommended stack height for Sites C-3 and D-1 would be 210 feet. Sites D-1 and C-3 were given raw site scores of 2.

Distance From Residential Receptor

The distance from an emission source to the surrounding residential receptor will influence the effect of emissions on the surrounding area and subsequent permitting conditions.

Weight A weight of 5 was assigned to this screening factor to indicate the importance of the location of a power plant in relation to surrounding residential areas.

Scoring Sites A-2 and D-1 were given raw site scores of 1 because the sites were not near any major residential areas. Site C-3 was given a raw site score of 3 because it is relatively close to a Kihei residential subdivision.

4.2.3 Soils and Geology

Soils

The potential agricultural productivity of soils is relevant to power plant siting because site development could remove agriculturally productive soils for uses other than agriculture.

Evaluation Criteria The Land Study Bureau has classified soils from "A" (highest productivity) to "E" (lowest productivity). The rating system reflects the relative importance of preserving areas in agricultural use. It is also directly linked to the State Land Use District controls (see Section 5.2.1). The *Central Maui Siting Study* (BCH, 1994) used the following two soils criteria to evaluate this factor, and the same criteria are used in this evaluation of the candidate sites.

- Soils rated C, D, or E are considered preferable to A or B rated soils because withdrawing these less productive soils from agricultural use would have less effect on potential agricultural output.

- Soils rated A or B are considered less suitable for power plant development because their removal from agricultural use would have a greater effect on agricultural potential.

Weight Agriculture is a major part of the economy of Maui, and both state and county governments are dedicated to maintaining viable agricultural sectors in the economy. Because it is considered moderately important to try to avoid sites having the most agriculturally productive soils, this factor was assigned a weight of 2 (BCH, 1994).

Scoring All three candidate sites have deep, nearly level to moderately sloping, well-drained and excessively drained soils that have a moderately fine-textured to coarse-textured subsoil or underlying material. Soils at Sites A-2 and D-1 are classified by the U.S.D.A. Soil Conservation Service (SCS) as Waiakoa silty clay loams (WeB) (Foote et al., 1972). The soil at Site C-3 has not been cleared of surface stones, as has been the case at the other sites and is, therefore, described as being extremely stony Waiakoa silty clay loam (WID2).

Because most of the soils in the vicinity of Sites A-2 and D-1 have high agricultural productivity ratings (A and B), these sites were given raw site scores of 2 for this factor. Site C-3, which is located in an area with soils less suited for agricultural production (C, D, or E) and which is the only site not currently used for agriculture, was given a raw site score of 1.

Geology

Bedrock geology can affect engineering considerations related to the power plant foundation and, consequently, may influence construction costs.

Evaluation Criteria The evaluation is based on the depth to bedrock. Sites with bedrock less than 25 feet from the surface are considered more favorable than sites with bedrock greater than 25 feet from the surface.

Weight Because this factor is not considered of overriding importance in power plant siting, it was assigned a weight of only 1.

Scoring The geologic materials over which the soils have formed are weathered igneous rocks that have been influenced by volcanic ash. The hardrock geologic foundation of all of the candidate sites is basaltic rock. The depth to bedrock is less than 25 feet at all sites. Therefore, all sites were given raw site scores of 1 for this factor.

4.2.4 Topography

Topography affects the difficulty (and, therefore, the expense) of developing heavy industrial facilities. It also influences the potential for soil erosion and other adverse environmental effects.

Evaluation Criteria In general, sites that have moderate topographic relief are preferable to sites with steeper terrain or that are too flat to provide good site drainage. The *Central Maui Siting Study* (BCH, 1994) used the following criteria to evaluate topography, and the same criteria are used in this evaluation of the candidate sites.

- Sites with average slopes of between 2 and 4 percent are considered most favorable for power plant development. Slopes in this range provide positive drainage without requiring special engineering measures or requiring excessive cut volumes or cost.

- Sites with average slopes of less than 2 percent or between 4 and 8 percent and that do not include substantial amounts of steeper terrain are considered next most suitable. Both require some special engineering (either to ensure adequate drainage or to provide suitable building space), but the additional cost of the special provisions is moderate. Significant erosion hazards and other adverse environmental effects can usually be avoided using standard construction techniques.

- Sites with average slopes of 8 to 16 percent and sites with lower average slopes that have substantial amounts of steeper terrain are considered next most suitable. The limitations of the relatively steep terrain can be overcome with appropriate engineering measures, but development costs are higher and the potential for adverse environmental effects (e.g., erosion during construction, unsightly cut slopes, etc.) is greater than for sites with lesser slopes.

- Areas with average slopes in excess of 16 percent are considered generally unsuitable for power plant development because of the additional costs required to provide stable foundations and avoid excessive erosion. Consequently, they are given the lowest suitability rating with respect to this factor.

Weight The average slope of the sites is relatively unimportant for the range of conditions on the sites under consideration. Slopes are not sufficient to create potential problems with respect to slope stability or soil erosion. Therefore, topography was assigned a weight of 1 (BCH, 1994).

Scoring The greater part of all sites have topography that is reasonably suitable for power plant development. Slopes range from 0 to 8 percent. Normal construction techniques can be used without creating a potential for significant environmental harm (BCH, 1994). Sites A-2, D-1, and C-3 were all given raw site scores of 1 for this factor.

4.2.5 Groundwater

Groundwater Supply -- Availability

The availability of groundwater supply for operations can influence the attractiveness of a candidate site.

Evaluation Criteria Because all sites investigated in the *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) were known to have available groundwater, that study focused on the cost of supply wells based on depth to groundwater, well capacity/yield, and whether optional off-site sources are available. The same criteria are used in this evaluation.

Weight Because of the importance of siting the power plant over or near an aquifer from which sufficient quantities of groundwater can be withdrawn for plant use, this factor was assigned a weight of 5 (D&M, 1995).

Scoring Groundwater in the area of all candidate sites occurs as a basal lens in the Honomanu volcanic series and, to a lesser extent, the Kula volcanic series. The aquifer comprises lava and associated extrusive volcanic rocks, which are highly permeable and readily yield water to pumping. The sites lie within Maui's central sector, which includes four aquifer systems; specifically, all sites lie within the Paia aquifer system (DLNR, 1992). Groundwater flow in the vicinity of the sites is from higher ground elevation toward the coastal reach (D&M, 1995). Sufficient groundwater is available to meet the estimated needs of the proposed generation project. For this reason, all candidate sites were given raw site scores of 1.

Groundwater Supply -- Interference with Existing Uses

Potential interference with pumping from existing wells could increase the difficulty of permitting a candidate site.

Evaluation Criteria Areas where pumping groundwater from supply wells is unlikely to interfere significantly with pumping from existing wells are preferable to locations where well interaction might occur (D&M, 1995).

Weight Because this screening factor is considered moderately important to the siting process, it was assigned a weight of 3 (D&M, 1995).

Scoring All three candidate sites are located sufficiently distant from any water supply wells that pumping from the underlying aquifers would be unlikely to interfere significantly with existing uses. Therefore, all sites were given raw site scores of 1 for this factor.

Groundwater Supply -- Quality

The quality of groundwater supply for operations can affect water treatment costs and the relative difficulty of permitting a candidate site.

Evaluation Criteria Locations where wells are likely to provide water of lower salinity are considered generally superior because water treatment for use in power plant operations would be less costly. However, areas with potable quality water are considered less desirable than areas where chlorides exceed drinking water standards because permitting industrial supply wells in areas that are potential sources of drinking water has the potential to be more difficult and costly (D&M, 1995).

Weight This screening factor was assigned a relatively low weight of 2 (D&M, 1995).

Scoring Groundwater in the Paia aquifer system is a mixture of brackish and potable water. The estimated sustainable yield of the aquifer is 8 million gallons per day (MGD) (DLNR, 1992), of which about one-half has potable water quality. Wells at Sites A-2 and D-1 would probably provide water of lower salinity than the well at Site C-3. However, it is likely that there would be little difference in the cost of treating the groundwater from any of these sites for industrial use (D&M, 1995). Because Sites A-2 and C-3 overlie non-potable quality portions of the aquifer, permitting may be relatively easy at these locations, and the two sites were each given raw site scores of 1 for this factor. Because Site D-1 overlies a potable quality portion of the aquifer, permitting may be more difficult, and this site was given a raw site score of 2.

Wastewater Disposal -- Proximity to Supply Wells

Problems associated with underground injection of wastewater could affect surrounding land uses that rely on groundwater for irrigation or other uses.

Evaluation Criteria The distance to the nearest water supply well was evaluated to assess the potential for contaminating existing water supplies at each site (D&M, 1995).

Weight Because the ability to inject wastewater from the proposed facility without adversely affecting the quality of significant groundwater resources is considered to be a moderately important consideration in the siting process, this factor was assigned a weight of 3 (D&M, 1995).

Scoring All three candidate sites are located sufficiently distant from any water supply wells that the likelihood of contamination of existing wells would be negligible. Therefore, all candidate sites were given raw site scores of 1 for this factor.

Wastewater Disposal -- Regulation

The location of candidate sites with respect to subsurface disposal conditions can affect the relative ease of permitting.

Evaluation Criteria Locations below the State Department of Health's Underground Injection Control (UIC) line are considered more favorable than locations above the UIC line. On-site disposal of industrial wastewater is severely constrained at locations above the UIC line because the use of injection wells above the UIC is discouraged by State Department of Health Regulations (D&M, 1995).

Weight This factor is a relatively important consideration in the siting process and was assigned a weight of 4 (D&M, 1995).

Scoring Sites A-2 and C-3 are located below the UIC line and, therefore, are allowed the use of specific types of injection wells for disposal of typical wastewater generated by the operation of a power station, as well as other related wastes. Therefore, Sites A-2 and C-3 were given raw site scores of 1. Because of its location above the UIC line, only disposal of non-contact cooling water by injection well would be permitted. Options exist for wastewater disposal by piping industrial wastewater to injection wells below the UIC line. Because disposal of wastewater at Site D-1 through underground injection is more likely to raise concerns during the permitting process than would injection at the other sites, this site was given a raw site score of 3.

4.2.6 Surface Water

Surface Water -- Quality

If surface water runoff is disposed of off site, the quality of receiving waters could be important to permitting efforts, as well as to the maintenance of Maui water resources.

Evaluation Criteria The *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) used the value of surface water runoff receiving waters to evaluate this factor, and the same criteria are used in this evaluation. Natural waterways discharging to the ocean are considered more valuable than irrigation ditches, and sites with characteristics that would result in impacts to natural surface waters are less suitable than sites that would impact irrigation waters. The distance between the project site and the surface receiving waters also influences site suitability in that greater distances would theoretically allow greater opportunities for rainwater infiltration.

Weight Based on the importance of maintaining surface water quality, this screening factor was assigned a moderate weight of 3 (D&M, 1995).

Scoring Surface water in the area of the candidate sites comprises natural streams within Kalialinui and Pulehu Gulches, three reservoirs (designated by HC&S as 80, 84, and 52), and concrete-lined irrigation ditches. The reservoirs and ditches are owned and were created by HC&S specifically and solely for the impoundment and transportation of irrigation water (Moore, 1995). In addition to being integral to sugarcane production, the reservoirs also serve as wildlife habitats. The water quality of the ditch system is unknown.

The streambeds of Kalialinui and Pulehu Gulches are normally dry and heavily vegetated. It is possible that a storm event could cause water to flow in these gulches; therefore, the streams are designated "intermittent" (USGS, 1983). Water quality data are not available for the Kalialinui or Pulehu Gulches.

Site A-2 is approximately 1,000 feet from Kalialinui Gulch and 5,000 feet from Pulehu Gulch. Flow from the site is directed to the northwest, away from both gulches. Reservoir 84 is approximately 2,000 feet from the site and is too far away to be of concern. There is an irrigation ditch bordering the northeast side of the site that could be susceptible to storm water impact from the site, especially during construction along that side of the power plant.

Site D-1 is located approximately 2,000 feet from Kalialinui Gulch and 3,000 feet from Pulehu Gulch. Flow from the site is directed to the northwest and down gradient from Lowrie Ditch. Storm water flow from the site is unlikely to impact Lowrie Ditch water; however, Lowrie Ditch may overflow onto the site during heavy rainfall (25-year event) (Moore, 1995; Chin, 1995). Surface water flows from the Lowrie Ditch through the western-boundary irrigation ditch and ultimately into Reservoir 80, which is less than 100 feet down gradient of the site. Another irrigation ditch is located adjacent to and down gradient from the southwest border of the site and is vulnerable to storm water flows from the site.

There are no ditches down gradient from the C-3 site. Flow from the site is directed to undeveloped land to the south and west. There are no reservoirs within 3,000 feet of the site.

Based on these site characteristics relative to the quality of receiving waters and proximity of the candidate sites to surface receiving waters, each of the three sites was given a raw site score of 1.

Surface Water -- Disposal Options

The range of surface water disposal options could affect the relative attractiveness of candidate sites.

Evaluation Criteria The *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) evaluated the candidate sites with respect to the range of disposal options available at each site, and the same criteria are used in this evaluation. The range of options for surface water disposal includes off-site direct discharge to surface receiving waters, off-site discharge to a municipal disposal system, on-site impoundment, and on-site discharge via underground injection wells. Sites with greater flexibility in terms of feasible disposal options are considered more favorable than sites with fewer disposal options.

Weight Based on its contribution to future project design and layout considerations, the range of viable surface water disposal options was assigned a weight of 2 (D&M, 1995).

Scoring At Sites A-2 and D-1, storm water could be discharged directly into irrigation surface water ditches and reservoirs with HC&S permission. Direct discharge to surface waters is not an option at Site C-3, which has no down-gradient ditch or nearby reservoir. Based on the facts that the existing municipal storm and waste water systems do not currently extend beyond the urbanized areas of Kahului and Kihei and that there are no plans to extend these systems to the vicinity of the candidate sites, it is unlikely that off-site discharge to a municipal disposal system would be available to any of the candidate sites in the near future. Conversely, storm water disposal in an on-site impoundment is an available option at all three sites. Based on existing drainage patterns, inadvertent storm water runoff from impoundments on Sites A-2 and D-1 would likely enter the HC&S irrigation system or run on to adjacent cane fields. Impoundment overflows from Site C-3 would run on to the undeveloped land to the south and west of the site. On-site underground injection is a viable option at Sites A-2 and C-3. Site D-1 is located approximately three-quarters mile above the UIC line, which means that implementation of this option would require attaining an easement to a location below the UIC line, drilling an injection well, and installing a pipeline to the well.

Based on the range of surface water disposal options available, Site A-2 was given a raw site score of 1 and Sites C-3 and D-1 were given raw site scores of 2.

Surface Water -- Disposal Regulation

If surface water is to be disposed of via injection or off-site discharge, a UIC or National Pollutant Discharge Elimination System (NPDES) permit, respectively, would be required.

Evaluation Criteria The *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) evaluated the candidate sites with respect to their "permitability," including the ability to permit the site and the anticipated degree of difficulty of such permitting. The same criteria are used in this evaluation. Obviously, easily permitted sites are preferable to sites where permitting would be difficult, prolonged, or unlikely.

Weight Based on its potential influence on the ease of project permitting, this screening factor was assigned a moderate weight of 3 (D&M, 1995).

Scoring Storm water disposal into HC&S irrigation surface water ditches and reservoirs may require NPDES permitting for Sites A-2 and D-1. Because irrigation waters are not considered "natural," it is anticipated that NPDES permitting would not be unduly difficult; the ease of permitting is anticipated to be equal for the two sites. Off-site disposal into surface waters is not considered a viable option for Site C-3, so NPDES permitting is not applicable to that site.

Disposal into an injection well would require UIC permitting. The relative degree of permitting difficulty can be expected to be higher for Site D-1 than for the other two sites based on the more unusual system configuration required by the site's location above the UIC line (see Surface Water - Disposal Options, above).

Based on the anticipated difficulty of permitting surface water disposal systems, Sites C-3 and A-2 were given a raw site score of 1 and Site D-1 was given a raw site score of 2.

4.2.7 Noise

Noise Production

Noise generated at the power plant site has the potential to affect current and future users of adjacent and nearby sites.

Evaluation Criteria The evaluation is based on whether the proposed facilities would generate less than or greater than 70 db(A), as measured at the power plant property line. Sites with less than 70 db(A) are considered more favorable than sites with greater than 70 db(A). Since Maui County does not have a noise regulation, the noise standard is based upon "Title 11 Administrative Rules, Department of Health, Chapter 43-Community Noise Control for Oahu".

Weight Because MECO has adopted 70 db(A) at the property line as a standard for the proposed project, it is assumed that violations would be infrequent and this screening factor was assigned a relatively low weight of 2.

Scoring Because there is the potential for occasional violations of the noise standard, particularly during plant startup, all sites were given raw site scores of 2 for this factor.

Proximity to Receptors

The 232-MW generation facilities are envisioned to have the potential to produce noise levels that are incompatible with some noise-sensitive uses (e.g., residences, hospitals, schools, etc.).

Evaluation Criteria The *Central Maui Siting Study* (BCH, 1994) used the following criteria to evaluate noise, and the same criteria are used in this evaluation of the candidate sites.

- Areas that are at least 3 miles from the nearest noise-sensitive use and would not require fuel trucks to pass through residential neighborhoods are highest-rated with respect to this factor.

- Areas that are at least 1.5 miles from the nearest noise-sensitive use and would not require fuel trucks to pass through residential neighborhoods are considered the next most favorable.

- Areas that are less than 1.5 miles from the nearest noise-sensitive use or that would require fuel trucks to pass through residential neighborhoods are considered the least favorable with respect to this factor. Noise impacts from facilities located in such areas can be mitigated, but the effort is likely to increase overall construction and/or operating costs.

Weight None of the candidate sites are close to noise-sensitive areas. Moreover, relatively inexpensive mitigation measures are available that can be used to reduce adverse noise impacts. Therefore, this factor was assigned a moderate weight of 3.

Scoring Sites A-2 and D-1 were each given raw site scores of 1 because they are located more than 3 miles from the nearest noise-sensitive receptor and because no residential haul routes would be involved. Site C-3 received a raw site score of 3 because it is closer to the nearest noise-sensitive receptor.

4.2.8 Aesthetics

When fully developed, the 232-MW generating facility will constitute a relatively large industrial complex. The structures housing the generating machinery, support equipment, and offices will be between 15 and 70 feet high and will cover approximately 50 percent of the 50-acre site. The four stacks will be 150 to 210 feet high and 24 feet in diameter. When these features are considered together with the electrical transmission lines, fuel storage tanks, and on-site roadways and storage areas, the overall visual effect will be decidedly industrial. In open terrain, the complex will be visible from a considerable distance (BCH, 1994).

Evaluation Criteria In general, areas that are least visible from residential areas, from scenic points, and from major highways are the most suitable for the project. Visibility is a qualitative criterion that involves a number of factors, including distance from important viewpoints, presence or absence of intervening terrain, and the ease with which screening can be provided to soften the visual impact. It also involves the extent to which generation facilities might be highlighted against the skyline when seen from important viewpoints (BCH, 1994).

Weight Power plants are inherently industrial in nature, and their bulk and height (particularly their stacks) make them highly visible from surrounding areas. Their appearance is generally considered undesirable, even to passers-by. For this reason, aesthetic considerations are considered quite important, and the factor was assigned a weight of 4.

Scoring Views of Site A-2 from Pukalani and from Haleakala Highway, and views of Site C-3 from Kihei Road at Kealia Pond and from Hale Piilani are included in Appendix A.

Sites A-2 and D-1 were judged the best with respect to aesthetic considerations; they were each given raw site scores of 1. The high ratings are related primarily to the sites' distance from residential areas, heavily travelled roads, and public viewpoints. Site C-3 was given a raw site score of 2. Although it is not as visually isolated as the two other sites, its distance from heavily travelled roads, residential areas, and scenic viewpoints makes it unsuitable for power plant development with respect to aesthetics.

4.2.9 Biology

Vegetation

Power plant development typically results in a complete change in the biota present on a project site and, therefore, could have an adverse impact on natural ecosystems, critical wildlife habitats, and threatened or endangered plant species.

Evaluation Criteria The *Central Maui Siting Study* (BCH, 1994) used the following criteria to evaluate vegetation, and the same criteria are used in this evaluation of the candidate sites.

- Areas that are currently under intense cultivation are considered most suitable because they are the most disturbed and the least likely to contain critical habitat or species.

- Areas that were previously disturbed but are not currently cultivated are considered next most suitable because they typically contain common exotic species and do not have critical habitat or species.

- Areas that contain undisturbed natural vegetation are considered least suitable because of the greater possibility that they contain critical habitat or species. Areas known to provide suitable habitat for threatened or endangered species are considered unsuitable.

Weight Given the findings of BCH (1994) and D&M (1995), there is little interest or concern about vegetation at any of the candidate sites studied. Because the sites under consideration are either in sugar cane cultivation or have typical introduced scrub vegetation, vegetation was assigned a moderate weight of 3.

Scoring None of the plants found on any of the candidate sites is a listed, proposed, or candidate threatened or endangered species according to the U.S. Fish and Wildlife Service (USFWS, 1994a, USFWS, 1994b), nor is any plant considered rare and vulnerable (Wagner et al., 1990).

The vegetation of all candidate sites is dominated by introduced or alien species, i.e., plants introduced by humans after Western contact (1778). Because the vegetation of Sites A-2 and D-1 consists of sugar cane fields and the weedy species commonly associated with such agricultural lands, these sites were given raw site scores of 1. The vegetation of Site C-3 consists primarily of buffle grass, kiawe trees, and Klu. A few native plant species occur on Site C-3, including 'ilima, 'uhaloa, and alena. Two species that may be indigenous at Site C-3 are hairy merremia (koali kuahulu) and koali 'ai. Because it is a "natural" ecosystem with a slightly higher possibility of containing significant biota, Site C-3 was given a raw site score of 2.

Wildlife Resources

Four endangered species occur within the general area of the candidate sites, including the Hawaiian duck (koloa), Hawaiian coot (alae keo keo), Hawaiian stilt (aeo), and Hawaiian hoary bat. The waterbirds use and travel between the reservoirs that occur on the central isthmus of Maui. The bat is most probably transient.

Evaluation Criteria Unless the project entails a direct taking of an endangered species, a loss of habitat determined by the USFWS to be "critical" to the species survival, involves an area zoned for conservation or results in a loss of wetlands, there is unlikely to be any jurisdictional concern by either the USFWS or Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) with regard to the siting of the project.

The *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) evaluated candidate sites according to the actual on-site presence of threatened, endangered, or sensitive wildlife species or habitats. In addition, a qualitative assessment was made of the likelihood that threatened, endangered, or sensitive species or habitats are located within 0.25 mile of a candidate site. The same criteria are used in this evaluation.

Weight Because the habitats at the candidate sites are unlikely to support threatened, endangered, or sensitive wildlife species, this factor was assigned a moderate weight of 3 (D&M, 1995).

Scoring Wildlife surveys were conducted for the candidate sites; Sites A-2 and D-1 were surveyed by Mr. Tim J. Ohashi (D&M, 1995), while Site C-3 was surveyed by Mr. Phillip L. Bruner (BCA, 1992). Neither of the surveys documented the presence of any endangered species at the candidate sites. However, federally endangered Hawaiian stilts and Hawaiian coots were observed at Reservoir 50, which is located near Site D-1. Therefore, Site D-1 was given a raw site score of 2 for this factor. Similarly, Site C-3 was given a raw site score of 2 because of its relatively close proximity to Kealia Pond and the West Maui Forest Reserve. Site A-2 was given a raw site score of 1 for this factor based on the absence of threatened or endangered animal species and on its distance from important wildlife habitats.

4.2.10 Cultural Resources

Historical and archaeological resources are relevant to power plant siting because the presence of known or suspected historical or archaeological sites could trigger costly and time-consuming state or federal regulatory processes.

Evaluation Criteria The following criteria were used to evaluate potential historical and archaeological resources.

- Sites that contain no known significant historical or archaeological resources and are considered to have a low potential for discovery of such resources are the most favorable for power plant development with respect to this factor.

- Sites that contain no known significant historical or archaeological resources but are considered to have a high potential for discovery of significant historical or archaeological resources are the next most favorable for power plant development.

- Sites in the immediate vicinity of known burials are the next most favorable.

- Sites known to contain historical or archaeological resources of state or federal significance are the least favorable.

Weight Based on the regulatory consequences of attempting to site a power plant in the presence of significant historical or archaeological resources, this factor was assigned a moderate weight of 3 (D&M, 1995).

Scoring Major sources of background historical and archaeological information were reviewed by archaeologists conducting surveys of the project sites. Sites A-2 and D-1 were surveyed by Cultural Surveys Hawaii, Inc. (D&M, 1995) and Site C-3 was surveyed by International Archaeological Research Institute (BCH, 1992). Sites A-2 and D-1 are both cultivated sugar cane fields. Cane cultivation can generate plow zones of up to 4 feet in depth, which means that, if there were ever archaeological sites at these locations, they have probably been destroyed. Site C-3 has not been cultivated for crops. The only archaeological feature found on the latter property was a double alignment of small (1- to 2-foot-diameter) boulders roughly

parallel and 6 feet apart in the south-central portion of the site (BCA, 1992). The alignment appeared to define a trail or narrow road.

The results of both archaeological surveys indicate that there are no known historical or archaeological resources that would preclude power plant development on any of the candidate sites. Therefore, all sites were given raw site scores of 1.

4.2.11 Natural Hazards (Flooding, Wind, and Earthquakes)

Areas that are subject to repeated flooding (whether from surface runoff, storm waves, or tsunami) or other natural hazards such as earthquakes or extreme winds are considered unsuited for power plants. At the very least, such locations require engineering protection that increases costs.

Evaluation Criteria A natural hazards study performed for the *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) was not able to distinguish among sites located within the central valley area of Maui on the basis of exposure to seismic hazards or exposure to extreme winds. Therefore, no formal evaluation criteria have been developed for these aspects of the Natural Hazards screening factor.

The *Central Maui Siting Study* (BCH, 1994) used the following flood hazard criteria, and the same criteria are used in this evaluation of the candidate sites.

- Areas that are situated outside any of the flood zones identified on the Flood Insurance Rate Maps are considered most suitable for power plant development.

- Areas whose flood hazards have not been precisely defined on the Flood Insurance Rate Maps but which have topography indicating they are likely to be outside of drainageways are rated just below those in the first category.

- Areas whose flood hazards have not been precisely defined on the Flood Insurance Rate Maps but which have topography indicating they might be affected by flooding from known drainageways are rated the next most suitable.

- Areas within wetlands and flood zones identified on the Flood Insurance Rate Maps are considered unsuited for power plant development.

Weight Because previous stages in the site screening process eliminated locations likely to be subject to flooding or from which storm runoff was likely to be troublesome, this factor was assigned a moderate weight of 3 (D&M, 1995).

Scoring The natural hazards study conducted for the *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) concluded that the mountainous topography of both east Maui (Haleakala) and west Maui will tend to channel winds through the

central valley area. This will apply equally to winds blowing from the general northeasterly direction that are associated with trade winds and to winds from the general southwesterly direction (Kona storms). In addition to the channeling effects, the sloping terrain from the shoreline to higher elevations at Sites A-2 and D-1 will tend to escalate wind speeds. As indicated above, the study was unable to distinguish among sites located within the central valley area of Maui with respect to hazards from extreme winds.

The natural hazards study also concluded that, although Maui has had only two recent significant earthquakes, the island's proximity to the Big Island (Hawaii) should be of sufficient concern to warrant a more conservative approach to this natural hazard. The design seismic zonation for Maui was raised from 2 to 2B in the 1991 edition of the Uniform Building Code (UBC). As indicated above, the study was unable to distinguish among sites located within the central valley area of Maui with respect to seismic hazards.

Drainage patterns were determined using U.S. Geological Service (USGS) topographic maps and soils data from the SCS. Flood Insurance Rate Maps were also reviewed for information on flood zones. The Flood Insurance Rate Maps show that all of the candidate sites are in Zone C, "areas of minimal flooding." Although extensive overflow is likely to occur during periods of intense rainfall, none of the candidate sites is subject to major flooding that would influence the design of the project (BCH, 1994). Furthermore, none of the candidate sites are subject to tsunami inundation. The *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) found that, while Site D-1 is not prone to flooding from natural sources, it is known to flood when the Lowrie Ditch irrigation system overflows its banks during heavy rains (i.e., the 25-year event). Additional design and construction effort would likely be required to avoid flooding, and potential flooding may affect full utilization of Site D-1. For this reason, Site D-1 was given a raw site score of 2 for the Natural Hazards screening factor. Sites A-2 and C-3 were each given a raw site score of 1.

4.2.12 Waste Management/Hazardous Materials

Phase I environmental site assessments were prepared for Sites A-2 and D-1 (D&M, 1995) and for Site C-3 (BCH, 1994). Both of these reports were conducted to evaluate the potential presence of hazardous substances and/or groundwater contamination at the sites studied. The conclusions presented were professional opinions based solely upon indicated data, visual observations of the sites and vicinity, and interpretations of the available historical information and documents reviewed. They were not intended to be a definitive investigation of contamination at any of the sites, so the recommendations provided are not necessarily inclusive of all the possible conditions. No subsurface explorations or chemical analyses of soil, water, or potential asbestos-containing building materials samples were conducted as part of the investigations. However, no underground storage tanks, transformers, or other surficial evidence of hazardous materials were observed and no release of hazardous substances within one-quarter mile of the sites were listed in public records reviewed.

Weight A weight of 5 was assigned to hazardous waste/materials because their presence at a site could create potential permitting problems and costly clean-up activities (D&M, 1995).

Scoring As indicated in the *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995), the environmental site assessment did not identify potential site contamination that would distinguish one site from another, and raw site scores of 1 were given to each candidate site.

4.2.13 Transmission and Distribution Issues

The *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) evaluated the candidate sites for their proximity to existing transmission facilities; the closer the site, the less cost there would be to construct connecting transmission facilities. Sites A-2 and D-1 were evaluated in that report. Site C-3 was evaluated along with Sites A-2 and D-1 in the *Central Maui Siting Study* (BCH, 1994).

- The location of Sites A-2 and D-1 relative to the existing Mā'alaea-Kealahou 69-kV transmission line along Pulehu Road accounted for the lowest scores for this screening factor. The total lengths of the transmission corridors for the three candidate sites is 7 miles (Site A-2), 8.4 miles (Site D-1) and 8.5 miles (Site C-3). All transmission corridors from Site C-3 are double-circuit, which increases the overall cost. The majority of the transmission corridors from Sites A-2 and D-1 are single-circuit lines.

Weight Transmission and distribution issues were assigned a weight of 1 in the previous two reports because none of the transmission interconnects involve difficult conditions.

Scoring In the *Central Maui Siting Study* (BCH, 1994) and the *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995), Sites A-2 and D-1 were each given raw site scores of 1 because the transmission corridors from the sites have a majority of single circuit corridors and the cost is less than double circuit corridors. In this evaluation, Site C-3 was given a raw site score of 3 based on the higher cost of the double circuit transmission corridor from the site. The *Central Maui Siting Study* (BCH, 1994) previously gave Site C-3 a raw site score of 5; however, the transmission corridor length defined by MECO in 1995 for Site C-3 lowered the previous raw site score in this evaluation.

4.2.14 Engineering Issues

Geotechnical

Geotechnical considerations look at the effect existing soil conditions may have on the overall construction costs and whether there are any potential problems that would be difficult to overcome during construction.

The following was taken from the *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995):

Weight While subsurface conditions affect construction costs and the specific erosion control and stabilization techniques that are required, they do not constitute a high percentage of project costs or involve adverse effects that are particularly difficult to mitigate for the range of conditions present on the sites under consideration. Because of this, it was given a weight of only 1.

Scoring Based on engineering reviews of these sites, all sites were given raw site scores of 2.

Fuel Delivery

Fuel delivery is an important part of the operations of an oil-fired power plant. All candidate sites are presently within the same delivery zone used by trucking firms to establish charges (BCH, 1994).

All three sites were determined to be located within the same fuel delivery zone as Mā'alaea Power Plant (BCH, 1994), therefore the fuel truck transport costs are equivalent for all three sites.

The following was taken from the *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) for fuel delivery by truck:

Weight Fuel delivery costs can form a substantial part of the on-going operational costs of an oil-fired facility such as is proposed. Because of this, fuel delivery distance was given a weight of 2.

Scoring Currently, the cost of fuel delivery by truck is based upon fuel delivery zones. The three candidate sites are all in the same fuel delivery zone, and each of the sites was given a raw site score of 1. The scoring is different from that of the *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) as its scoring was based on distance and not zones. If fuel delivery charges were changed in the future to be based solely on distance, the previous scoring would be applicable.

Road Improvements

Access to the site is an engineering concern for Site C-3. That site would require an access road approximately 2.25 miles long to reach a public roadway. Sites D-1 and A-2 are adjacent to or can reach Pulehu Road with a short access road.

Weight Road improvements require additional engineering and construction time to develop; however, this factor is a small part of the overall design for the facility and was assigned a weight of 1.

Scoring Site C-3 would require construction of approximately 2.25 miles of access road and was given a raw site score of 3. Site D-1 is immediately adjacent to an existing public highway and was given a raw site score of 1. Site A-2 is adjacent to the same public highway as Site D-1 and would require a short access road from the public highway. Site A-2 was also given a raw site score of 1.

4.2.15 Traffic and Transportation

Traffic

The effect of increased project-related traffic on area roadways can influence the relative attractiveness of candidate sites.

Evaluation Criteria The *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) evaluated the potential effects of fuel haul on existing traffic patterns, the adequacy of the existing roadway configuration for fuel haul, and the adequacy of existing roadbed integrity for fuel haul trucks. The same criteria are used in this evaluation.

Weight This screening factor was assigned a moderate weight of 3 (D&M, 1995).

Scoring There is no distinguishable difference between Sites A-2 and D-1 on the basis of roadway configuration or roadway integrity. There would also be no significant impacts to existing traffic operations from Sites A-2 and D-1. Therefore, Sites A-2 and D-1 were given raw site scores of 1. There would, however, be an impact on traffic along Mokulele Highway if the access road to Site C-3 is connected to that highway, and this site was given a raw site score of 2 for this screening factor.

Transportation

The range of fuel transportation options can influence the relative attractiveness of candidate sites.

Evaluation Criteria The *Environmental Screening and Siting Report for the Central Maui Generation Project* (D&M, 1995) concluded that Sites A-2 and D-1 could be served by a fuel pipeline from the Chevron Kahului Harbor bulk terminal facility. This is equally true for Site C-3. This evaluation is based strictly on proximity to the bulk terminal area of Kahului and assumes that the most direct pipeline route could be accomplished and would be the most cost effective.

A study comparing fuel truck transport costs versus underground pipeline transport costs for the three sites is included in Appendix B. The study evaluates 6 inch through 10 inch pipeline sizes and investigates different pumping rates varying from 4 hours to 20 hours to meet the daily fuel requirement for eight combustion turbines. Although federal, state, and local codes do not

currently require secondary containment for underground pipelines, secondary contained pipeline systems were considered along with single un-contained transport pipelines.

The study shows for all three sites, a 6, 8, or 10 inch epoxy coated carbon steel pipeline without secondary containment is economically feasible. The costs were lower or comparable to truck transport costs.

When secondary containment of the pipeline is considered, a 6 inch carbon steel carrier pipe with secondary fiberglass containment is economically feasible for Site A-2 and only $600,000 higher than trucking costs for Site D-1. The cost for this same pipeline system is $3,000,000 higher than trucking costs for Site C-3. All other secondary containment pipe systems are higher than truck transport costs.

Weight Because this screening factor would not be highly important to the site selection process, it was assigned a weight of 1 (D&M, 1995).

Scoring Based on minimum anticipated pipeline length from the Kahului Harbor bulk terminal area to each of the candidate sites, Site A-2 was given a raw site score of 1 for this factor, and Sites D-1 and C-3 were each given raw site scores of 2.

4.2.16 Facility Capital

Facility capital costs look at the overall cost to build the base power plant at any of the candidate sites. The equipment at the candidate sites changes very little based on their location. At Site D-1, an evaporator may be required due to the site's location above the UIC line. At Sites D-1 and C-3, taller emission stacks are recommended than at Site A-2. These changes do not constitute a large percentage change in the overall facility capital cost at any of the candidate sites.

Weight Since facility capital costs represent the majority of the total overall costs associated with development of the power plant, a weight of 5 was assigned.

Scoring Because the facility capital cost would be approximately the same for all candidate sites, a raw site score of 1 was given to each site.

4.2.17 Infrastructure and Land Costs

Infrastructure Cost

The infrastructure costs look at the cost of developing transmission lines and roads to any of the candidate sites.

Weight Since infrastructure costs represent a small portion of the overall costs of the project, a weight of 1 was assigned.

Scoring Site A-2 was given a raw site score of 1 because it would require the shortest length of transmission lines and would require a relatively short access road. Site D-1 would need the shortest access road but has a longer transmission corridor than Site A-2; therefore, Site D-1 was given a raw site score of 2. Site C-3 would require the longest access road and the most expensive transmission corridor and was given a raw site score of 3.

Land Costs

Land costs look at the overall cost of land acquisition for any of the candidate sites.

Weight Due to the relatively low cost of land acquisition compared to the overall cost of the project, a weight factor of 1 was used.

Scoring Based upon appraisal values of the candidate sites, Sites A-2 and D-1 were given a raw site score of 2 and Site C-3 was given a raw site score of 1. The appraisal values are indicated in Project Costs in Appendix C.

4.3 OVERALL SITE SCORES AND RANKS

Overall Site Scores for each site were obtained by summing the Weighted Site Scores for all screening factors. Overall Site Scores were ranked from 1 to 3, with the lowest rank indicating the least constrained site.

Each screening factor was scored for each site according to the evaluation criteria for that factor (Raw Site Score) (see Sections 4.2). Weights assigned each screening factor were then applied to each of the raw scores obtained (Weighted Site Score) (see Sections 4.2). Weighted Site Scores were summed for each site (Overall Site Score), and the Overall Site Scores were ranked.

Table 4-1 gives the Raw Site Scores and Weighted Site Scores by screening factor and the Overall Site Scores and Overall Site Ranks for each site. The Overall Site Scores are: Site A-2 = 129; Site D-1 = 158; and Site C-3 = 169. Site A-2 is the least constrained and highest ranked of the three candidate sites.

4.4 SENSITIVITY ANALYSIS

In order to test the validity of the screening factor weighting scheme utilized in this analysis, a sensitivity analysis was conducted. The sensitivity analysis systematically (i.e., one data factor at a time) distorts or exaggerates the weights utilized in the analysis, in this case by a factor of 10. The corresponding overall site ranks are then reviewed to determine if a different result arises with the use of the distorted weight for that particular data factor. This process is repeated once for each screening factor, with the original weights maintained for all but one factor at a time.

A sensitivity analysis was performed to test the validity of the screening factor weighting scheme. The sensitivity analysis was performed for the 37 screening factors used in the site evaluation.

Results of the sensitivity analysis are presented in Table 4-2. In general, the overall order of site preference remains the same as in the original analysis, with Site A-2 remaining the most preferred in 35 of 37 (over 94 percent) of the cases.

Table 4-1
Alternative Site Analysis

Environmental Issue Area/Screening Factor	Weight	Raw Site Score (1)			Site Weighted Score (2)		
		A-2	D-1	C-3	A-2	D-1	C-3
Land Ownership, Regulation, Use							
Land Ownership	1	2	2	2	2	2	2
Existing Candidate Site Land Use	2	3	3	1	6	6	2
State Land Use District Designation	3	3	3	1	9	9	3
Community Plan Designation	3	3	3	3	9	9	9
Zoning Designation	3	3	3	3	9	9	9
Existing/Planned Adjacent Land Use	2	1	1	1	2	2	2
Air Quality							
Compliance with AAQS/PSD Increment	5	1	2	3	5	10	15
Minimum Stack Height Required	5	1	2	2	5	10	10
Distance from Residential Receptor	5	1	1	3	5	5	15
Soils and Geology							
Soils	2	2	2	1	4	4	2
Geology	1	1	1	1	1	1	1
Topography	1	1	1	1	1	1	1
Groundwater							
Groundwater Supply -- Availability	5	1	1	1	5	5	5
Groundwater Supply -- Interference with Existing Wells	3	1	1	1	3	3	3
Groundwater Supply -- Quality	2	1	2	1	2	4	2
Wastewater Disposal -- Proximity to Supply Wells	3	1	1	1	3	3	3
Wastewater Disposal -- Regulation	4	1	2	1	4	8	4
Surface Water (storm water disposal)							
Quality	3	1	1	1	3	3	3
Disposal options	2	1	2	2	2	4	4
Regulation	3	1	2	1	3	6	3
Noise							
Noise Produced	2	2	2	2	4	4	4
Proximity to Residential Receptor	3	1	1	3	3	3	9
Aesthetics	4	1	1	2	4	4	8
Biology							
Vegetation	3	1	1	2	3	3	6
Wildlife	3	1	2	2	3	6	6
Cultural Resources	3	1	1	1	3	3	3
Natural Hazards	3	1	2	1	3	6	3
Waste Management/Hazardous Materials	5	1	1	1	5	5	5
Transmission and Distribution	1	1	1	3	1	1	3

Environmental Issue Area/Screening Factor	Weight	Raw Site Score (1)			Site Weighted Score (2)		
		A-2	D-1	C-3	A-2	D-1	C-3
Engineering Considerations							
Geotechnical	1	2	2	2	2	2	2
Fuel Delivery (truck)	2	1	1	1	2	2	2
Road Improvements	1	1	1	3	1	1	3
Traffic/Transportation							
Traffic	3	1	1	2	3	3	6
Transportation	1	1	2	2	1	2	2
Facility Capital	5	1	1	1	5	5	5
Infrastructure and Land Costs							
Infrastructure Costs	1	1	2	3	1	2	3
Land Costs	1	2	2	1	2	2	1
Sum of Site Scores (lowest is least constrained, most preferred)					**129**	**158**	**169**
Normalized Sums (100 is least constrained)					**100.00**	**81.7**	**76.3**
Overall Site Rank (Lowest is least constrained)					**1**	**2**	**3**

NOTES:

(1) Raw Site Score is a site's rank for a specific screening factor.
(2) Site Weighted Score is the site's raw score times the assigned weight of the screening factor.
(3) Overall Site Rank is the rank order of the summed weighted ranks.

Table 4-2
Sensitivity Analysis

Environmental Issue Area/Screening Factor	Overall Site Rank w/ Assigned Weight X10		
	A-2	D-1	C-3
Land Ownership, Regulation, Use			
Land Ownership	1	2	3
Existing Candidate Site Land Use	2	3	1
State Land Use District Designation	2	3	1
Community Plan Designation	1	2	3
Zoning Designation	1	2	3
Existing/Planned Adjacent Land Use	1	2	3
Air Quality			
Compliance with AAQS/PSD Increment	1	2	3
Minimum Stack Height Required	1	2	3
Distance from Residential Receptor	1	2	3
Soils and Geology			
Soils	1	3	2
Geology	1	2	3
Topography	1	2	3
Groundwater			
Groundwater Supply -- Availability	1	2	3
Groundwater Supply -- Interference with Existing Wells	1	2	3
Groundwater Supply -- Quality	1	3	2
Wastewater Disposal -- Proximity to Supply Wells	1	2	3
Wastewater Disposal -- Regulation	1	3	2
Surface Water (storm water disposal)			
Quality	1	2	3
Disposal options	1	2	3
Regulation	1	2	3
Noise	1	2	3
Noise Produced	1	2	3
Proximity to Residential Receptor			
Aesthetics	1	2	3
Biology			
Vegetation	1	2	3
Wildlife	1	2	3
Cultural Resources	1	2	3
Natural Hazards	1	3	2
Waste Management/Hazardous Materials	1	2	3
Transmission and Distribution	1	2	3

Environmental Issue Area/Screening Factor	Overall Site Rank w/ Assigned Weight X10		
	A-2	D-1	C-3
Engineering Considerations			
Geotechnical	1	2	3
Fuel Delivery (truck)	1	2	3
Road Improvements	1	2	3
Traffic/Transportation			
Traffic	1	2	3
Transportation	1	2	3
Facility Capital	1	2	3
Infrastructure and Land Costs			
Infrastructure Costs	1	2	3
Land Costs	1	3	2
Number of Times Site Ranks #1	**35**	**0**	**2**
Percent of Time Site Ranks #1	94.6	0.0	5.4
Number of Times Site Ranks #2	**2**	**30**	**5**
Percent of Time Site Ranks #2	5.4	81.1	13.5
Number of Times Site Ranks #3	**0**	**7**	**30**
Percent of Time Site Ranks #3	0.0	18.9	73.0
Original Overall Site Rank	**1**	**2**	**3**

CHAPTER 5

SUMMARY AND RECOMMENDATION

5.0 SUMMARY AND RECOMMENDATION

This section presents a summary of the results, and provides a recommendation regarding the highest rated candidate site based upon the evaluation conducted for this study.

5.1 SUMMARY

MECO must install new generating capacity to meet its customers' needs due to increased power demand and the expected retirement of existing generating units as they reach the end of their service life.

MECO proposes to design, construct, and operate a 232-MW electrical generation facility to supply future electric power needs for the Island of Maui. The purpose of this study was to determine the best generation site by evaluating the final three sites, A-2, D-1, and C-3, identified as the most preferred candidate sites through a series of previous siting studies. The study provided a comparative analysis of the final three candidate sites relative to environmental issues, engineering and infrastructure considerations, and the concerns of the Maui community.

The study included an evaluation of the nine environmental issues: groundwater, surface water, plants, wildlife, cultural resources, noise, hazardous materials/wastes, natural hazards, and traffic that were included in the *Environmental Screening and Siting Report for the Central Maui Generation Project* (Dames & Moore, 1995) (D&M) and *Central Maui Siting Study* (Belt Collins Hawaii, 1994) (BCH) studies.

The results of the recently completed air quality analysis have been added to the environmental issues for the selection of the best site from the three candidate sites. Air quality constituted one of the most important environmental screening factors in the site selection process. Considering the existing source inventory, a 232-MW plant modeled compliance at Site A-2 only. Compliance at Site A-2 was achieved with a stack height of 150 feet. Sites D-1 and C-3 would require changes in the existing source inventory for 232 MW even with the maximum allowable stack height of 210 feet. The ability to permit the entire 232 MW at a candidate site was an important factor in the site selection process.

The location of the candidate sites in relation to existing infrastructure (roads and transmission lines), and the distance from residential areas (due to noise impact and visibility) was significant in the evaluation. The location of Sites A-2 and D-1 were rated significantly better than Site C-3.

Overall Site Scores for each site were obtained by summing the Weighted Site Scores for all screening factors. Overall Site Scores were ranked from 1 to 3, with the lowest rank indicating the least constrained site. The Overall Site Scores are: Site A-2 = 129; Site D-1 = 158; and Site C-3 = 169. Site A-2 is the least constrained and highest ranked.

5.2 RECOMMENDATION

Site A-2 is ranked highest of the three candidate sites evaluated. Site A-2 had the largest advantage with respect to air quality. Sites D-1 and C-3 ranked second and third respectively.

It is recommended that landowner negotiations between MECO and A&B-Hawaii, Inc. for procurement of Site A-2 be continued.

CHAPTER 6

REFERENCES

6.0 REFERENCES

Belt Collins & Associates, 1992. *Maui Electric Company 1995 Unit Addition Project: Alternate Puunene Airport Site, Environmental Screening Report.* Note: Site C-3 is identified as the "Alternate Puunene Airport Site" in this study.

Belt Collins Hawaii, 1993. *Phase I Preliminary Site Assessment Alternative Puunene Airport Site, TMK 3-8-04:02 (Portion of), Wailuku, Maui, Hawaii.* Note: Site C-3 is identified as the "Alternative Puunene Airport Site" in this study.

Belt Collins Hawaii, 1994. *MECO Central Maui Siting Study.*

Black & Veatch, 1991a. *Generation Facility Siting Study: Candidate Sites Report*

Black & Veatch, 1991b. *Generation Facility Siting Study: Preferred and Alternate Site/Technology Report.*

Chin, R. 1995. Dames & Moore interview of Rodney Chin, Irrigation Supervisor, HC&S. January 30, 1995.

Jim Clary & Associates, 1995. *Air Quality Screening Analysis for the Central Maui Generation Project.*

Dames & Moore, 1995. *Environmental Screening and Siting Report for the Central Maui Generation Project.*

DLNR (State of Hawaii, Department of Land and Natural Resources), 1992. Draft Maui County Water Use and Development Plan.

Foote, D.E., E.L. Hill, S. Nakamura, and F. Stephens. *Soil Survey of the Islands of Kaua'i, Oahu, Maui, Moloka'i and Lāna'i, State of Hawai'i.* U.S. Department of Agriculture, U.S. Government Printing Office, Washington, D.C.

Moore, R. 1995. Dames & Moore interview of Randall Moore, Vice President of Field Operations, HC&S, January 30, 1995.

Tom Nance Water Resource Engineering, 1993. Memo report on permitting issues for groundwater supply and disposal. Note: Site C-3 is identified as the "Lower Puunene Airport Site" in this study.

Stone & Webster Engineering Corporation, 1989. *Site Selection Study, Maui Electric Company, Ltd.*

Trinity Consultants, 1993. *Central Maui Siting Study Air Quality Analysis*

USGS (U.S. Department of the Interior, Geological Survey), 1983. State of Hawaii, Island of Maui topographic map, Paia Quadrangle, scale 1:24,000.

Wagner, W.L., D.R. Herbst, and S.H. Sohmer, 1990. *Manual of the Flowering Plants of Hawai'i.* University of Hawai'i Press and B.P. Bishop Museum Press, Honolulu. B.P. Bishop Museum Special Publication Number 83, 2 volumes.

CHAPTER 7

APPENDICES

7.0 APPENDICES

APPENDIX A	Renderings, Ground Shots and Facility Layouts with Elevations
APPENDIX B	Fuel Delivery Methods and Cost Estimates
APPENDIX C	Preliminary Capital Cost Estimates (1995 Dollars) for Facility and Infrastructure (Access Roads, Transmission Lines, Interconnection, and Other Items) for Each Site
APPENDIX D	List of Major Equipment Components with System Descriptions and Capacities Covered by the Capital Cost Estimate
APPENDIX E	County, State, and Federal Permitting and Approval Requirements and Assessed Level of Difficulty to Obtain
APPENDIX F	Detailed Schedule to Install the First DTCC (This Schedule Includes Permitting and Approval Activities, Engineering Design, Equipment Procurement, Construction, and Start Up)
APPENDIX G	Air Quality Modeling
APPENDIX H	Public and Agency Consultation

APPENDIX A

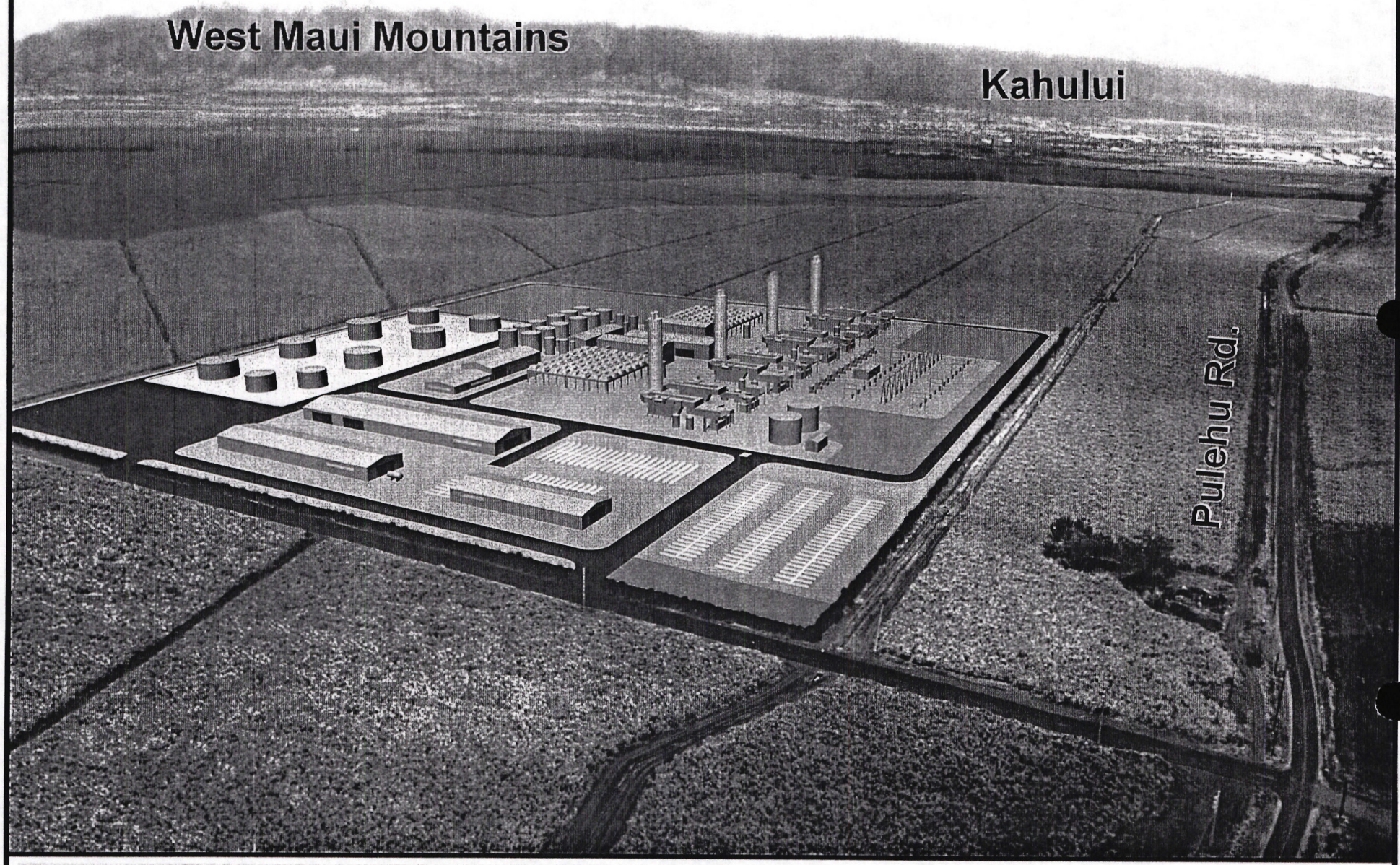
RENDERINGS, GROUND SHOTS, AND FACILITY LAYOUTS WITH ELEVATIONS



CENTRAL MAUI GENERATION SITING STUDY
EXISTING VIEW
PULEHU ROAD A-2 SITE
SEPTEMBER 1995

Maui Electric
Company, Limited

Stone & Webster
Engineering Corporation



CENTRAL MAUI GENERATION SITING STUDY
PROPOSED FACILITY
PULEHU ROAD A-2 SITE
SEPTEMBER 1995

Maui Electric
Company, Limited

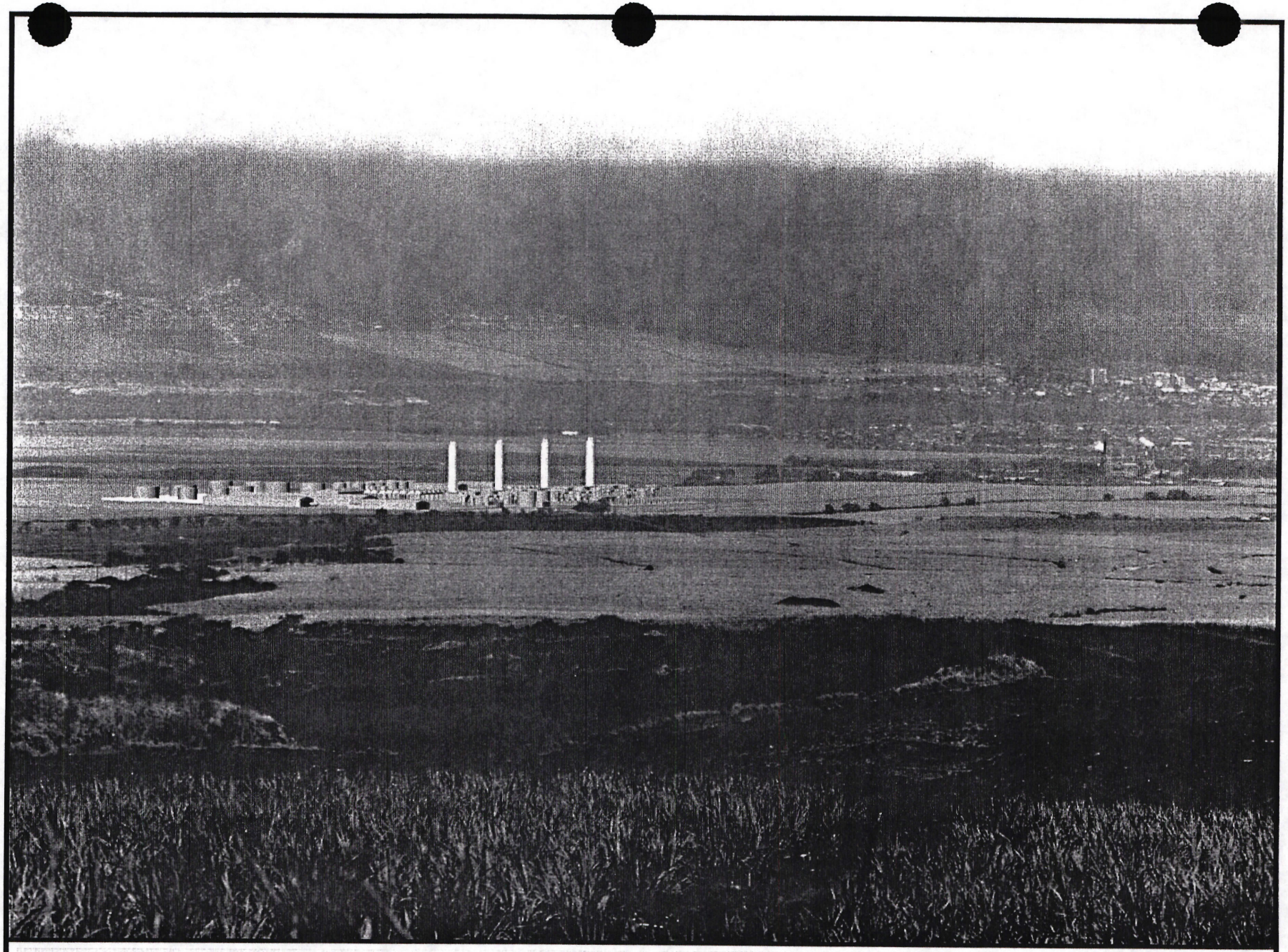
Stone & Webster
Engineering Corporation



Maui Electric
Company, Limited

CENTRAL MAUI GENERATION SITING STUDY
EXISTING VIEW
SITE A-2 FROM PUKALANI GOLF COURSE
SEPTEMBER 1995

Stone & Webster
Engineering Corporation



CENTRAL MAUI GENERATION SITING STUDY
PROPOSED FACILITY
SITE A-2 FROM PUKALANI GOLF COURSE
SEPTEMBER 1995

Maui Electric
Company, Limited

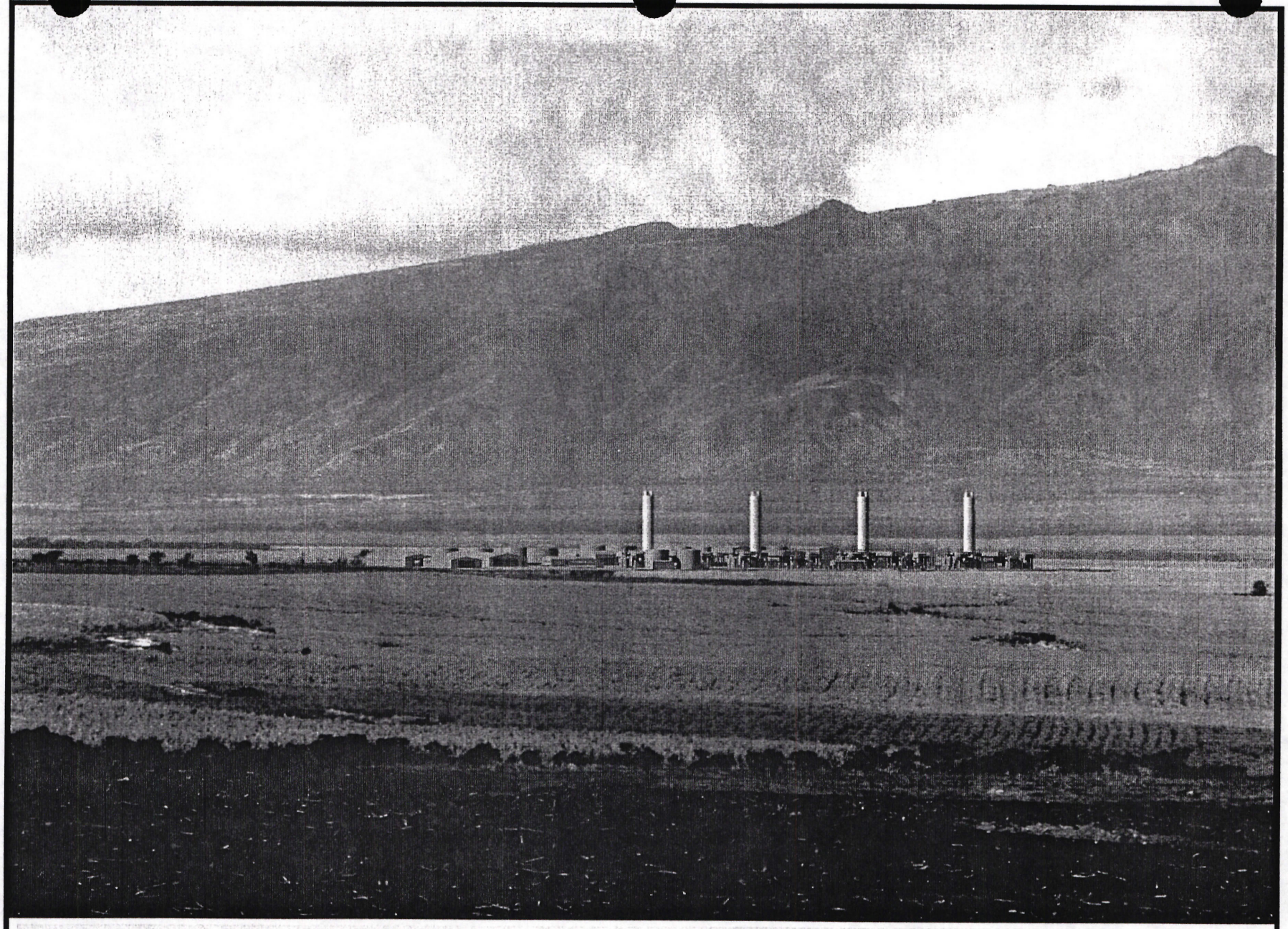
Stone & Webster
Engineering Corporation



Maui Electric
Company, Limited

CENTRAL MAUI GENERATION SITING STUDY
EXISTING VIEW
SITE A-2 FROM HALEAKALA HIGHWAY
SEPTEMBER 1995

Stone & Webster
Engineering Corporation



CENTRAL MAUI GENERATION SITING STUDY
PROPOSED FACILITY
SITE A-2 FROM HALEAKALA HIGHWAY
SEPTEMBER 1995

Maui Electric
Company, Limited

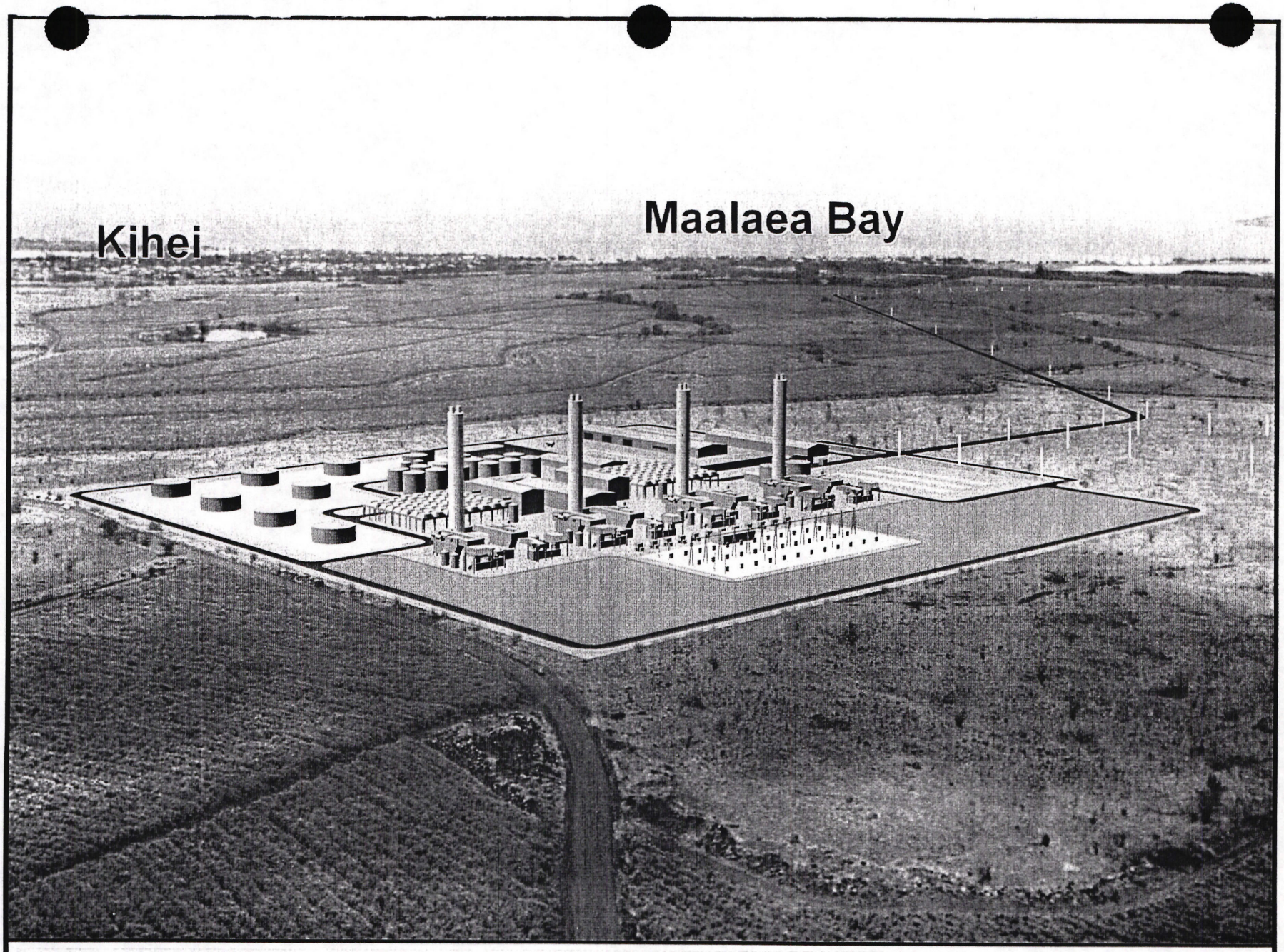
Stone & Webster
Engineering Corporation



Maui Electric
Company, Limited

CENTRAL MAUI GENERATION SITING STUDY
EXISTING VIEW
PUUNENE AIRPORT C-3 SITE
SEPTEMBER 1995

Stone & Webster
Engineering Corporation



CENTRAL MAUI GENERATION SITING STUDY
PROPOSED FACILITY
PUUNENE AIRPORT C-3 SITE
SEPTEMBER 1995

Maui Electric
Company, Limited

Stone & Webster
Engineering Corporation



Maui Electric
Company, Limited

CENTRAL MAUI GENERATION SITING STUDY
EXISTING VIEW
SITE C-3 FROM HALE PIILANI SUBDIVISION
SEPTEMBER 1995

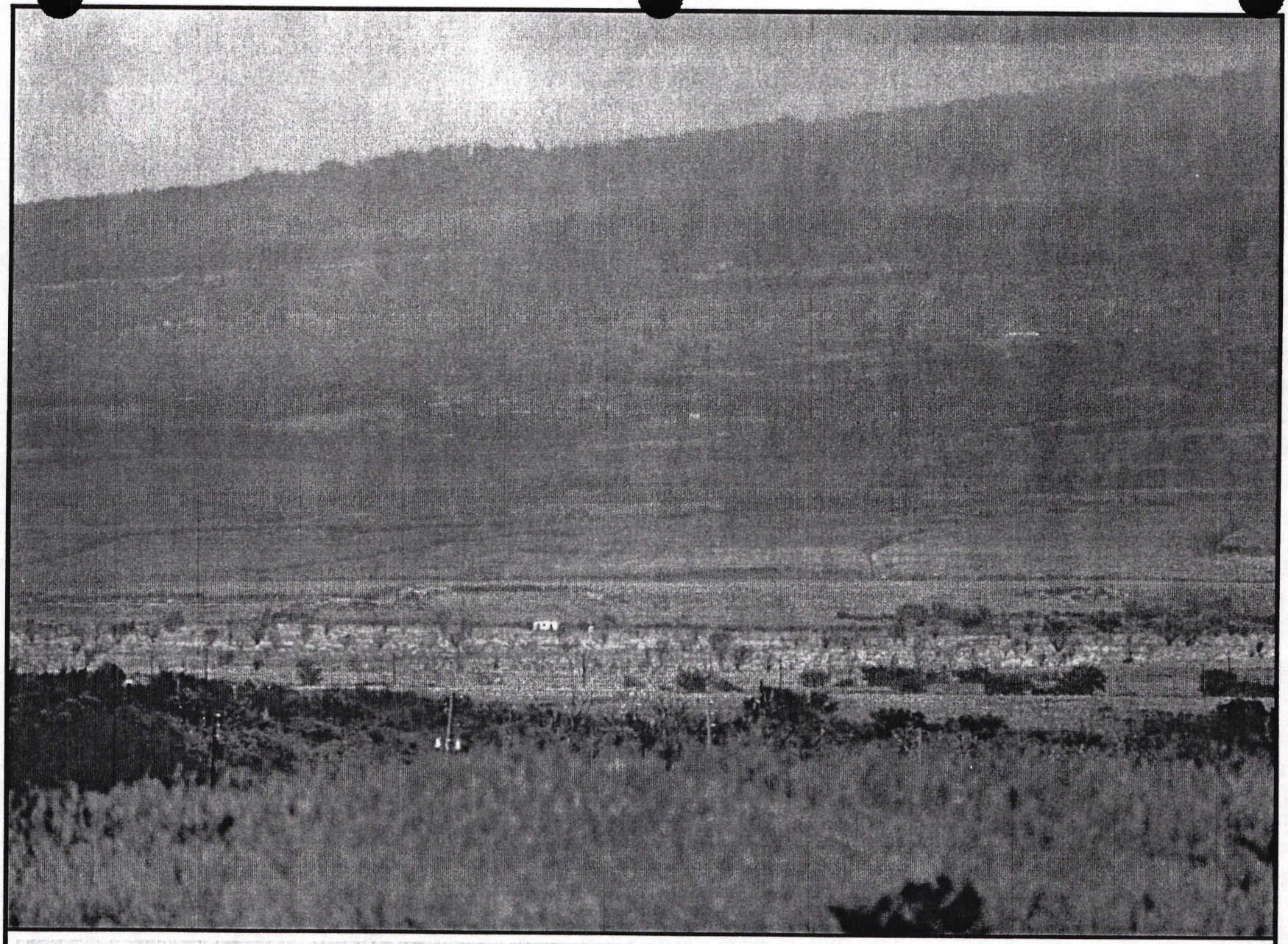
Stone & Webster
Engineering Corporation



Maui Electric
Company, Limited

CENTRAL MAUI GENERATION SITING STUDY
PROPOSED FACILITY
SITE C-3 FROM HALE PIILANI SUBDIVISION
SEPTEMBER 1995

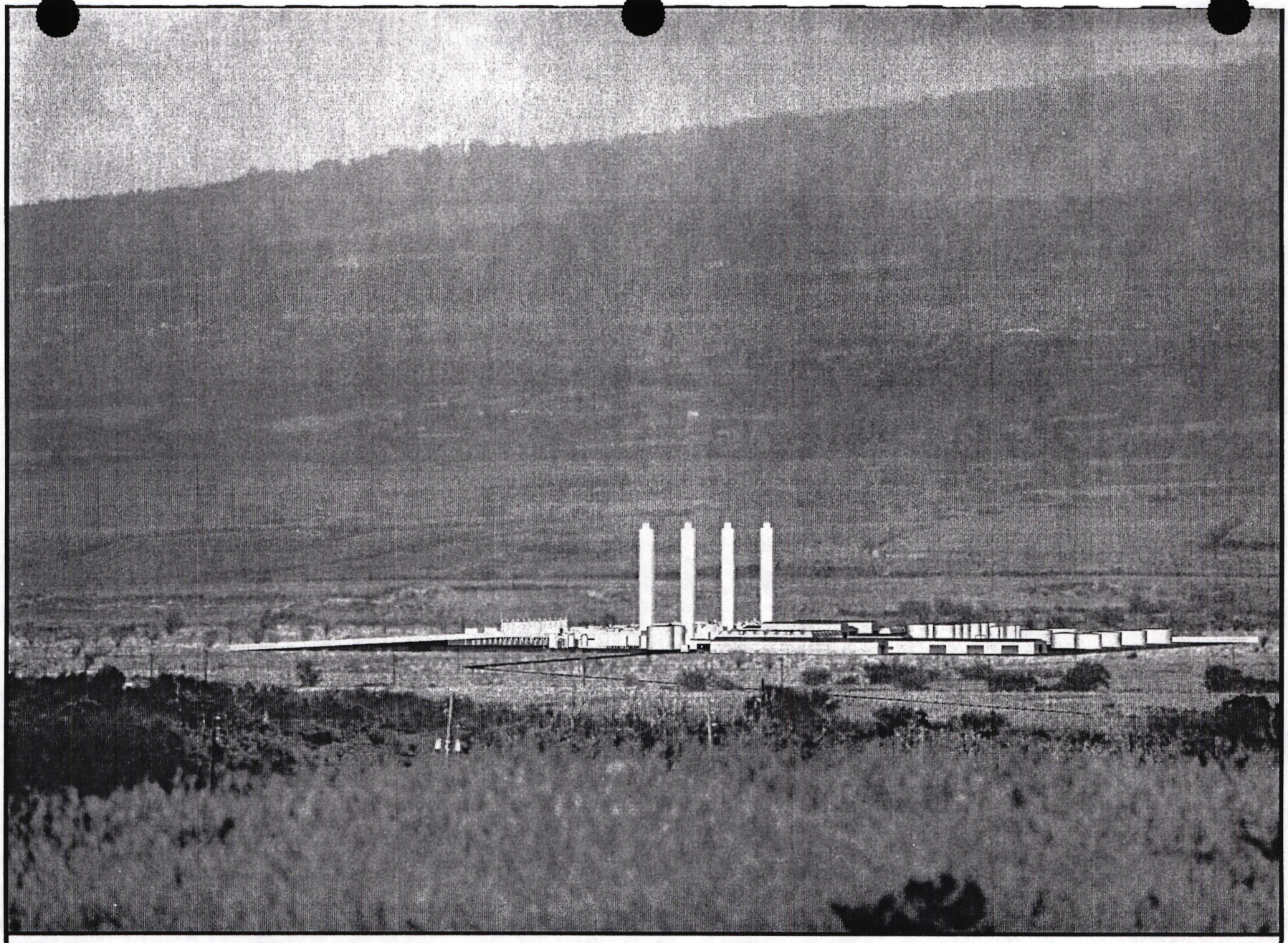
Stone & Webster
Engineering Corporation



Maui Electric Company, Limited

CENTRAL MAUI GENERATION SITING STUDY
EXISTING VIEW
SITE C-3 FROM NORTH KIHEI ROAD AT KEALIA POND
SEPTEMBER 1995

Stone & Webster Engineering Corporation



CENTRAL MAUI GENERATION SITING STUDY
PROPOSED FACILITY
SITE C-3 FROM NORTH KIHEI ROAD AT KEALIA POND
SEPTEMBER 1995

Maui Electric Company, Limited

Stone & Webster Engineering Corporation

NORTH

NORTH MOD'D PLANT

WEST TRD'D PLANT

EAST TRD'D PLANT

SOUTH MOD'D PLANT

FUEL TANK
80' DIA. x 36' H
32,200 BBLS.

FUEL TANK
80' DIA. x 36' H
32,200 BBLS.

FUEL TANK
80' DIA. x 36' H
32,200 BBLS.

FUEL TANK
80' DIA. x 36' H
32,200 BBLS.

FUEL TANK
80' DIA. x 36' H
32,200 BBLS.

FUEL TANK
80' DIA. x 36' H
32,200 BBLS.

FUEL TANK
80' DIA. x 36' H
32,200 BBLS.

(2) FUEL TANK
50' DIA. x 36' H
12,600 BBLS.

FUEL UNLOADING PUMPS

WASTE WATER AND NEUTRALIZATION WATER TANKS

WATER TREATMENT BUILDING

RAW WATER AND DEMINERALIZED WATER STORAGE TANKS

WAREHOUSE

ADMINISTRATION AND ENGINEERING OFFICES

AIR COOLED CONDENSER

24' DIA. x 150' H DIESEL FLUE STACK (TYPICAL)

CONDENSATE STORAGE TANK

ST UNIT 11

ST UNIT 8

STEAM TURBINE BUILDING

MAINTENANCE SHOP

CONTROL ROOM

STEAM TURBINE BUILDING

ST UNIT 5

ST UNIT 2

CONDENSATE STORAGE TANK

AIR COOLED CONDENSER

CT UNIT 12

CT CONTROL ROOM

CT UNIT 10

DEMINERALIZED WATER DAY TANK (TYPICAL)

FUEL OIL DAY TANK (TYPICAL)

CT UNIT 9

CT CONTROL ROOM

CT UNIT 7

CT UNIT 1

CT CONTROL ROOM

CT UNIT 3

SWITCHYARD CONTROL HOUSE

12 BAY SWITCHYARD (200' x 400')

CT UNIT 4

CT CONTROL ROOM

CT UNIT 6

DEMINERALIZED WATER DAY TANK (TYPICAL)

FUEL OIL DAY TANK (TYPICAL)

FIRE WATER STORAGE TANKS

FIRE PUMP HOUSE

GUARD HOUSE

T & D WAREHOUSE (390' x 85')

OVERSIZED PARKING

T & D SHOP BUILDING (300' x 66')

GASOLINE STORAGE TANK

GENERAL FACILITIES (264' x 66')

EMPLOYEE AND VISITOR PARKING

FUEL TRUCK ENTRANCE

MAIN ENTRANCE

TO PULEHU ROAD

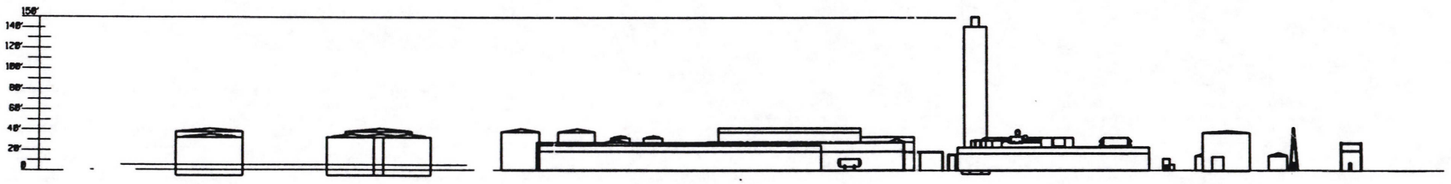
NOTES:

SITE ARRANGEMENT A-2
OTEC/MAN FACILITY SITING STUDY

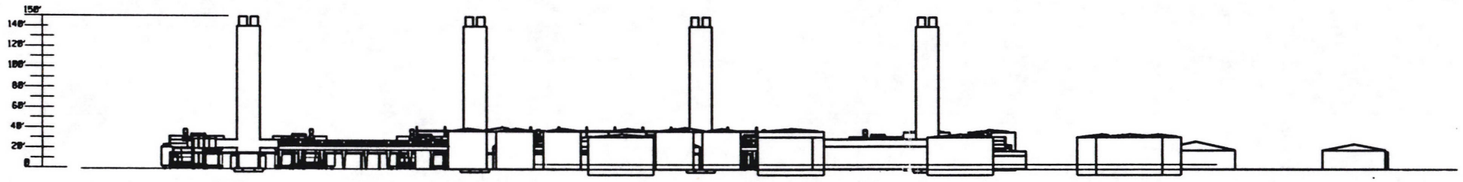
MAUI ELECTRIC CO., LTD.
KAHULUI, MAUI

SCALE 1"=50'

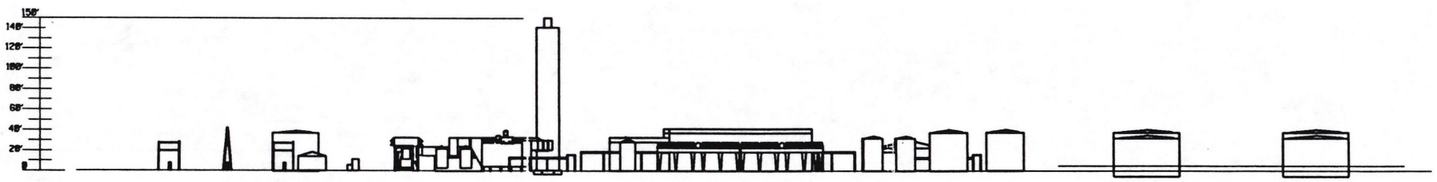
SITEA-2



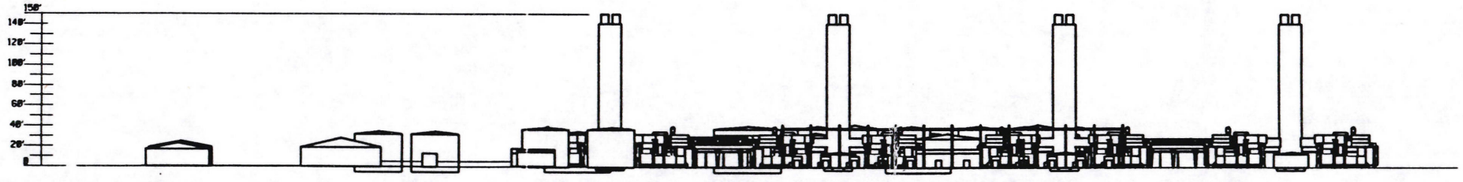
ELEVATION LOOKING NORTH



ELEVATION LOOKING EAST



ELEVATION LOOKING SOUTH



ELEVATION LOOKING WEST

NOTES:

0 25 50 75 125
SCALE: 1" = 50'-0"

SITE A-2 ELEVATIONS
GENERATION FACILITY SITING STUDY

A-2ELEV

VHL: Tue Sep 12 09:01:17 1995

NORTH

NORTH END OF PLANT

WEST END OF PLANT

EAST END OF PLANT

SOUTH END OF PLANT

12 BAY SWITCHYARD (488' x 288')

SWITCHYARD CONTROL HOUSE

CT UNIT 6

CT UNIT 4

CT UNIT 3

CT UNIT 1

CT UNIT 7

CT UNIT 9

CT UNIT 10

CT UNIT 12

CT CONTROL ROOM

24' DIA. x 218' H DUEL FLUE STACK (TYPICAL)

FIRE WATER STORAGE TANKS

FIRE PUMP HOUSE

CONDENSATE STORAGE TANK

AIR COOLED CONDENSER

ST UNIT 2

ST UNIT 5

STEAM TURBINE BUILDING

CONTROL ROOM

MAINTENANCE SHOP

ST UNIT 8

ST UNIT 10

EMPLOYEE AND VISITOR PARKING

MAIN ENTRANCE

GUARD HOUSE

TO NEW ROAD TO KING

GENERAL FACILITIES (284' x 66')

T & D SHOP BUILDING (288' x 66')

T & D WAREHOUSE (394' x 85')

OVERSIZED PARKING

GASOLINE STORAGE TANK

FUEL TRUCK ENTRANCE

ADMINISTRATION AND ENGINEERING OFFICES

WAREHOUSE

WATER TREATMENT BUILDING

RAW WATER AND DEMINERALIZED WATER STORAGE TANKS

WASTE WATER AND NEUTRALIZATION WATER TANKS

FUEL UNLOADING PUMPS

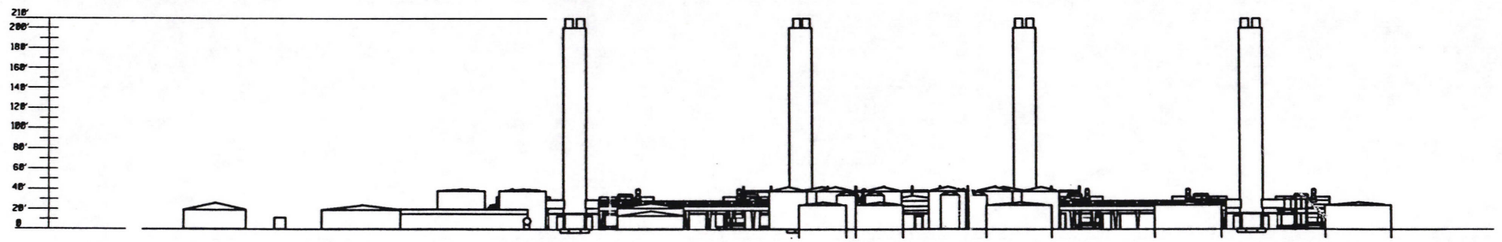
(2) FUEL TANK 58' DIA. x 36' H 12,600 BBLS.

FUEL TANK 88' DIA. x 36' H 32,200 BBLS.

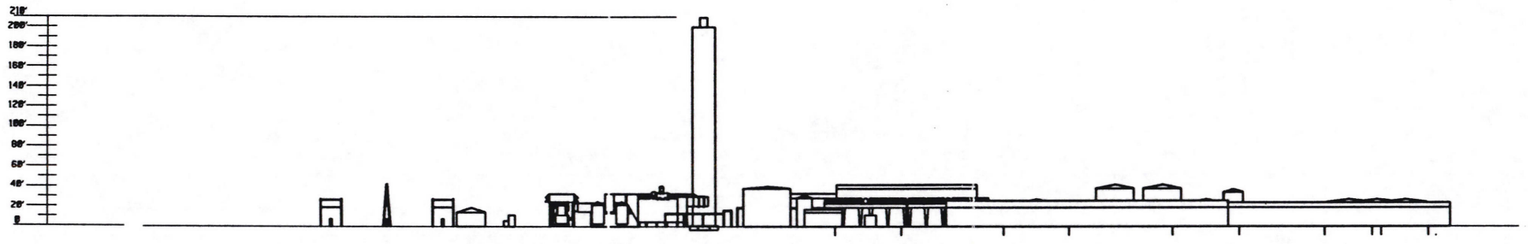
NOTES:

SITE ARRANGEMENT C-2
GENERATION FACILITY SITING STUDY

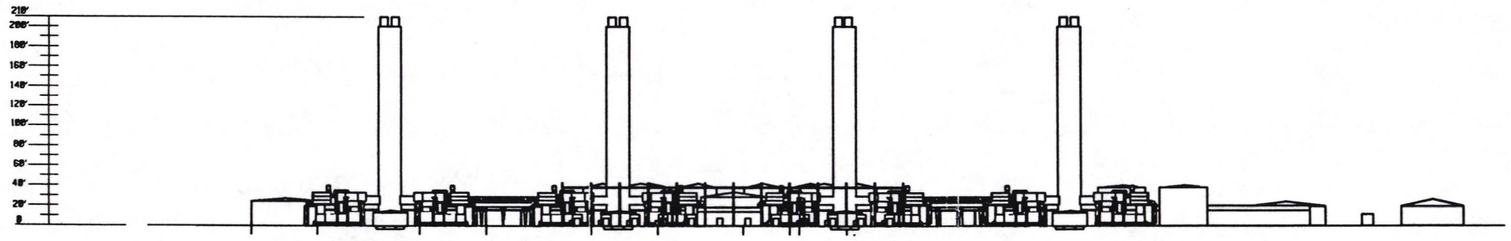
SITEC-3



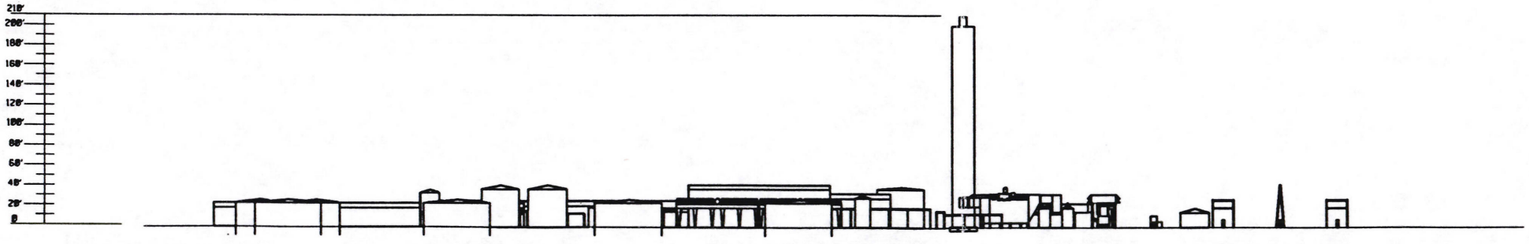
ELEVATION LOOKING NORTH



ELEVATION LOOKING EAST



ELEVATION LOOKING SOUTH



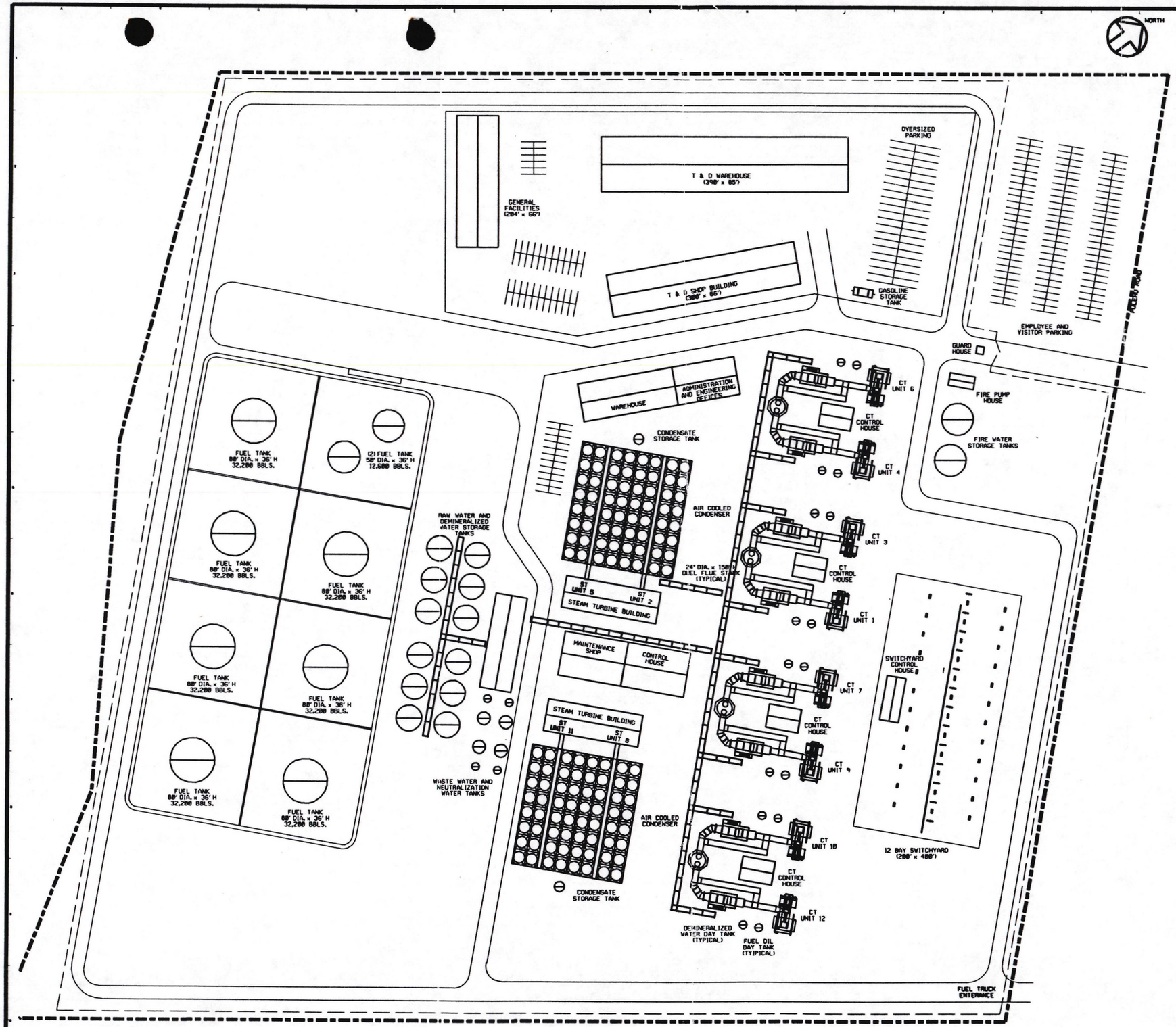
ELEVATION LOOKING WEST

NOTES:

SITE C-3 ELEVATIONS
GENERATION FACILITY SITING STUDY

C-3ELEV

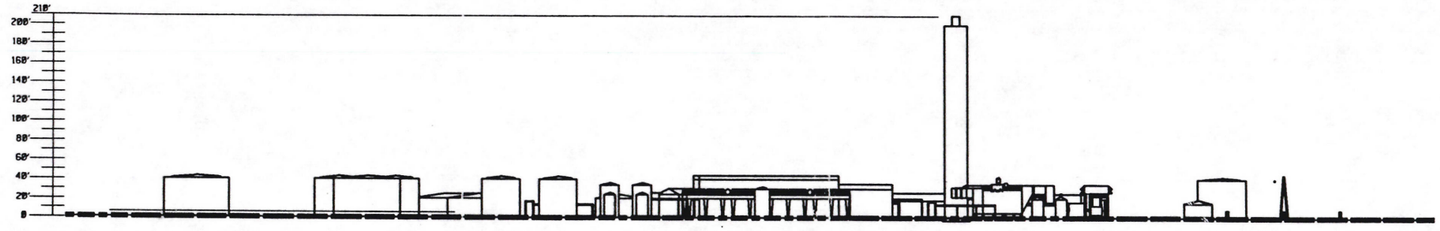
YHL Mon Mar 6 08:41:08 1995



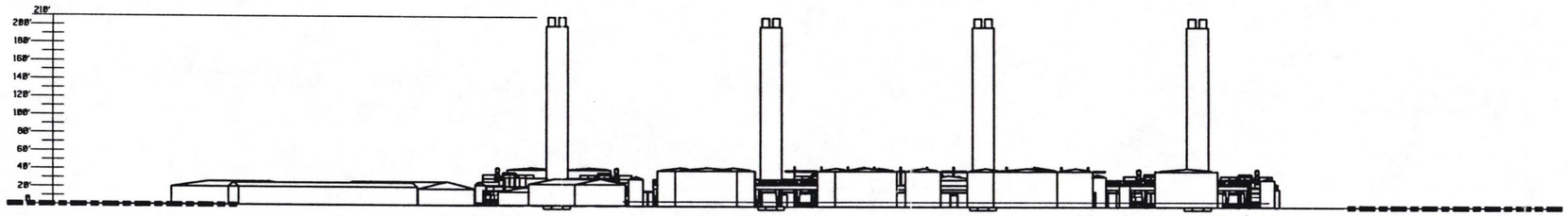
NOTES:

SITE ARRANGEMENT D-1
GENERATION FACILITY SITING STUDY

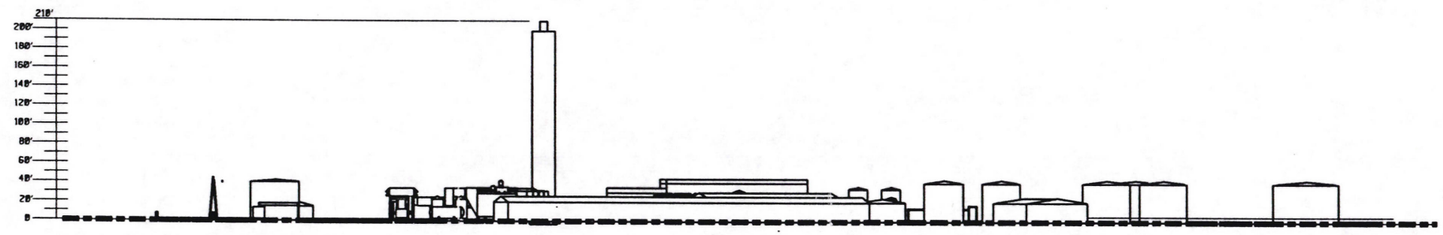
SITED-1



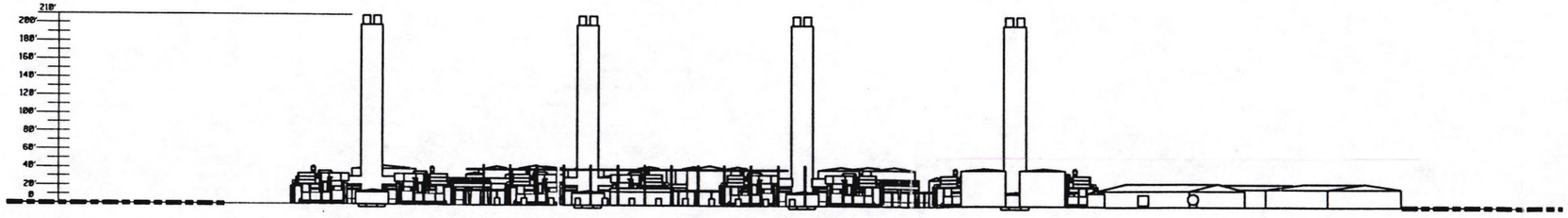
ELEVATION LOOKING NORTH



ELEVATION LOOKING EAST



ELEVATION LOOKING SOUTH



ELEVATION LOOKING WEST

NOTES:

SITE ELEVATIONS
COGENERATION FACILITY SITING STUDY

D-ELEV

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APPENDIX B

FUEL DELIVERY METHODS AND COST ESTIMATES

EXECUTIVE SUMMARY

The addition of the eight combustion turbines at the proposed power plant will require approximately 49 daily truckloads of fuel per week. The fuel delivery would require twelve trucks for single shift delivery operation or six trucks for double shift delivery operation to meet the fuel requirements based on a five day work schedule. This study compares the cost of trucking the fuel versus pumping the fuel by pipeline to potential Sites A-2, C-3 and D-1.

The study is based on a 28 year period for capital cost recovery and evaluates pumping durations varying from four hours to twenty hours through a pipeline sized from four inches to ten inches. Attachment B-1 summarizes the Accumulated Present Worth Revenue Requirement (APWRR) for trucking and all pipeline cases for each site. Attachment B-4 describes the pipeline cases considered and costs with each.

The study indicated that for all three sites, a lower cost APWRR was calculated for six, eight or ten inch epoxy coated carbon steel pipeline without secondary containment than the truck transport APWRR cost. The cost differences of the lowest cost pipeline versus trucking transport for the sites are; $2.7 million less for the Site A-2, $900,000 less for the Site C-3, and $2.2 million less for the Site D-1.

The only site for which the cost of the fuel delivery using secondary containment piping is less than trucking is the Site A-2 for six inch carbon steel pipe with secondary fiberglass containment. The cost of fuel delivery by pipeline is approximately $188,000 less than fuel delivery by trucking. The fuel delivery cost differences for the lowest cost secondary contained pipe versus trucking costs for Sites C-3 and D-1 respectively, are approximately $3 million and $650,000 higher than the trucking cost.

Based on the results of the study, a fuel pipeline without containment is economically attractive for all three sites. However, future environmental regulations and laws may prohibit installation of a pipeline without secondary containment. Federal regulations currently require secondary containment and monitoring for underground storage tanks and piping associated with such tanks. The Code of Federal Regulation (CFR) 49, Part 195 covers pipelines for interstate transport and does not currently require secondary containment, only adequate corrosion protection. The State of Hawai'i or County of Maui do not currently require secondary containment, however, based on previous permitting and site planning experience in Maui County, permits for a pipeline without secondary containment will not be easily obtained. The economics are based on a complete build-out of the power plant facility. Because the schedule for the site build-out is long (approximately 30 years), it is impossible to say when all units at the site will be in the DTCC format, or if all future units will utilize fuel oil. Because of these reasons, and the relatively small cost differential of a contained pipeline at only one site, Site A-2, we believe trucking should be the method of fuel delivery for all sites.

INTRODUCTION

The purpose of this study is to determine if a fuel oil pipeline to the proposed Sites A-2, C-3 and D-1 is economically feasible when compared to the cost of truck transport of fuel to the sites.

The study evaluates various pipeline options versus trucking of No. 2 diesel fuel to the future sites. A total of eleven different pipe combinations and secondary containment options were evaluated. These eleven different case are summarized in Attachment B-4. Among these cases are 6, 8 and 10 inch pipe sizes installed both with and without secondary containment.

PIPELINE ASSUMPTIONS

The following assumptions and criteria were used for fuel pipeline economic analysis:

1. First operational year for the pipeline - 2004.

2. Base year for all Present Worth Accumulation - 2004.

3. Levelized After Tax Rate of Return - 13.91%

4. Escalation rate for O&M of pipeline, capital cost values, and power cost - 3.1%/year.

5. Revenue Requirement for O&M - 1.09751.

6. Electric power cost - 9.872 $/Kw-Hr 2004 cost escalated 3.1%/year from 7.5 $/KW-Hr 1995 cost.

7. O & M Labor Rate - 43.27 $/Hr 2004 cost escalated 3.1%/year.

8. Fuel handling requirements are from HECO GEPPS run (Attachment B-29).

9. Revenue Requirement Factor for capital - Per HECO IFPS model based on 28 year recovery.

10. Maintenance cost of pipeline 1/2% of initial capital cost and escalated 3.1% annually.

11. Pipeline distance from Kahului refinery area to Site A-2 - 26,140 ft.

12. Pipeline distance from Kahului refinery area to Site C-3 - 41,000 ft.

13. Pipeline distance from Kahului refinery area to Site D-1 - 30,240 ft.

14. Daily pumping requirements based on 7-day week.

15. Full build-out of the facility in year 1.

FUEL TRUCKING ASSUMPTIONS

1. First operational year for trucking - 2004.

2. Base year for all Present Worth Accumulation - 2004.

3. Levelized After Tax Rate of Return - 13.91%

4. Escalation rate for fuel trucking cost - 3.1%/year.

5. Fuel handling requirements are from HECO GEPPS run (Attachment B-29).

6. Truck loads are 180 bbls.

7. Trucking cost for Site A-2 - .7621 $/bbl 2004 cost escalated 3.1%/year from .5790 $/bbl 1995 cost.

8. Trucking cost for Site C-3 - .7621 $/bbl 2004 cost escalated 3.1%/year from .5790 $/bbl 1995 cost.

9. Trucking cost for Site D-1 - .7621 $.bbl 2004 cost escalated 3.1%/year from .5790 $/bbl 1995 cost.

10. Revenue Requirement for trucking - 1.09751.

11. Daily truckloads based on 5-day work week @ 12 truckloads per day.

12. Trucking distance from Kahului refinery area to Site A-2 - 26,140 ft.

13. Trucking distance from Kahului refinery area to Site C-3 - 41,000 ft.

14. Trucking distance from Kahului refinery area to Site D-1 - 30,240 ft.

ECONOMIC EVALUATION

GENERAL

In order to economically evaluate the costs for trucking and pipelines on an equal basis, the total costs were converted to an Accumulated Present Worth Revenue Requirement (APWRR) to the year 2004. Attachment B-1 summarizes the results of this study for all cases evaluated. The alternative with the lowest APWRR is considered the best economic option. The HECO IFPS information provided capital revenue requirement factors based on a 28 year period. Shorter evaluation periods would favor the trucking option.

The study does not include costs for tank storage facilities at the refinery or plant site, costs associated with obtaining rights of way for routing of pipeline, acquisition of pipeline easements, or additional costs for road maintenance due to truck traffic.

Potential impacts to the environment were not evaluated in this study.

FUEL TRUCKING

Transport distance to the sites was measured from the Kahului refinery area. All transport distances fall within the same fuel transport pricing zone as the Maalaea Power Plant, therefore the fuel transport cost for Maalaea was used to determine fuel transport cost to the new sites. The 1995 Maalaea fuel transport price of .5790 $/bbl was escalated 3.1%/year to obtain 2004 dollar values. Additionally, fuel trucking values are escalated 3.1%/year in the study. Attachments B-5, B-17 and B-29 show the APWRR for the Sites A-2, C-3 and D-1, respectively. The fuel transport APWRR for all three sites is calculated to be $8,442,170 for the evaluation period.

The annual fuel consumption was provided by HECO GEPPS run and was used to determine a daily fuel trucking requirement based on a 5 day work week for trucking. When all 8 combustion turbines are operational, the fuel delivery requirements will be 49 fuel deliveries a day using 12 trucks for single shift operation or 6 trucks for double shift operation.

The HECO GEPPS run provided fuel consumption requirements for a period of 20 years. For the remaining years of the study the fuel consumption requirements of year 20 were used.

PIPELINE

Various pipeline sizes were evaluated to provide a range of pumping flow rates and pumping times. Based on a full site installation of 8 combustion turbines, pumping times of 20, 16, 12, 8 and 4 hours were evaluated to determine pipe and pumping sizes. Attachments B-2 and B-3 show the criteria used to determine pipe velocities, pump head

requirements and pump power requirements for carbon steel and fiberglass carrier pipe. In the attachments, 4, 6, 8 and 10 inch pipe sizes are considered. In Attachment B-2 (carbon steel) the 4 inch carrier pipe was eliminated from consideration completely and higher pump rates in 6 inch and 8 inch pipe were eliminated because pressures were considered too high. In Attachment B-3 (fiberglass carrier pipe) only the 8 and 10 inch pipe sizes were evaluated. Pressures in the 4 and 6 inch were considered too high for fiberglass pipe systems.

The pipeline line cost (APWRR) is based on a capital cost for material, installation costs, and additional costs for engineering, permitting, annual maintenance costs, annual operator costs and annual power consumption costs. The pipeline costs do not include any costs associated with obtaining right-of-way for routing of the pipeline or acquisition of pipeline easements.

For each pipeline size, a dollar per foot cost was determined based on vendor budgetary quotes. These prices were then escalated 3.1%/year to provide 2004 dollar values. Attachment B-4 shows $/ft costs for eleven different cases of pipe systems considered. The cost for each case include material costs, a 10% allowance for fittings, cathodic protection for carbon steel systems, leak detection for secondary containment systems, installation costs, and radiography for carbon steel pipe. A 10% contingency was also added to the total $/ft cost. These values listed in Attachment B-4 were then used to calculate the total capital cost of the pipeline installation with the additional cost for a pumping station located at the refinery, and engineering and permitting costs.

Annual maintenance costs for the pipeline are based on 1/2% of the initial capital cost and escalated 3.1% annually.

Power consumption costs are based on the power (KW) requirements calculated for pumps in Attachments B-2 and B-3 adjusted for pump operation time and based on a .09872 $/KW-Hr 2004 dollar rate.

Attachment B-4 includes capital costs for a pump station to be located at the refinery and estimated engineering and permitting costs.

SCHEDULE

A barchart schedule is included in Attachment B-43. Total duration from preliminary engineering to completion of construction for a pipeline to Site A-2 or D-1 is estimated to take 4 years and 9 months and to Site C-3 to take 5 years and 4 months. The additional construction time required for Site C-3 is based on the 14,500 feet longer pipeline than the Site A-2.

Estimated construction times shown are based on an estimate of 100 ft/day of pipeline installed. Because of the long construction period, the material procurement and delivery is shown overlapping assuming material would be scheduled for periodic deliveries.

SUMMARY AND RECOMMENDATION

Based on the results of the study, a pipeline without secondary containment is the most economical case for all three sites, however, because of environmental considerations the only viable option may be pipe with secondary containment. If secondary requirement is required, a six inch carbon steel with secondary fiberglass containment is an option for Sites A-2 and D-1. However, for Site C-3 the lowest cost secondary contained pipeline is $3 million higher than trucking, costs making truck transport of fuel the economic choice.

We recommend the following actions be taken and pipeline options reviewed closer to the actual pipeline service date prior to any decisions on transport method.

1. The results of the study showed a pipe without containment to be economically feasible, however, given the fact that the pipeline will not be installed for several years, federal and local environmental regulations could change requiring use of a secondary containment system to mitigate leaks. At such time pipeline options may need to be reviewed.

2. Trucking of fuel although relatively inexpensive now could increase dramatically. The 1987 trucking cost used in the Maalaea Fuel Study was 1.42 $/bbl, double the trucking cost used in this study. If the delivery cost would increase to this magnitude in the future, it would make a pipeline with secondary containment economically more attractive.

3. Environmental factors should be evaluated to compare the potential environmental impact such as daily truck traffic and damage occurring from a pipeline rupture.

4. The infrastructure required to support 49 daily fuel transports per week should be reviewed.

5. The operational year for the pipeline should be considered at a later time period at which time the fuel consumption is higher which would increase the cost of trucking and economically favor a pipeline.

APPENDIX C

PRELIMINARY CAPITAL COST ESTIMATES (1995 DOLLARS) FOR FACILITY AND INFRASTRUCTURE (ACCESS ROADS, TRANSMISSION LINES, INTERCONNECTION, AND OTHER ITEMS) FOR EACH SITE

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #1 – CT#1

ACCT NO		DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTION PLANT							
STRUCTURES & IMPROVEMENTS							
341	1000	SITE PREPARATION	$2,163,800	$4,363,800	$2,063,800	($2,200,000)	$100,000
341	2000	LANDSCAPING	$100,000	$100,000	$100,000	$0	$0
341	3000	PLANT/EQUIPMENT DRAINAGE	$724,400	$724,400	$724,400	$0	$0
341	5400	FACILITIES	$10,360,000	$10,360,000	$10,360,000	$0	$0
341	5500	WATER TREATMENT & STORAGE	$2,665,700	$2,665,700	$5,982,900	$0	($3,317,200)
341	6200	INJECTION WELLS	$475,000	$475,000	$93,500	$0	$381,500
341	6300	SUPPLY WELLS/WATER	$435,200	$435,200	$435,200	$0	$0
FUEL HOLDERS, PRODUCERS & ACCESSORIES, FOUNDATIONS							
342	2010	TANK FOUNDATIONS	$140,000	$140,000	$140,000	$0	$0
342	2020	TANKS	$830,000	$830,000	$830,000	$0	$0
342	2030	PUMPS	$39,700	$39,700	$39,700	$0	$0
342	2050	PIPING	$204,000	$204,000	$204,000	$0	$0
342	2060	VALVES	$52,500	$52,500	$52,500	$0	$0
342	2070	CONDITIONERS	$150,500	$150,500	$150,500	$0	$0
PRIME MOVERS							
343	1010	COMBUSTION TURBINE FOUNDATION	$200,000	$200,000	$200,000	$0	$0
343	1030	COMBUSTION TURBINE	$11,777,600	$11,777,600	$11,777,600	$0	$0
343	1040	PIPE RACK & FOUNDATIONS	$150,000	$150,000	$150,000	$0	$0
343	1090	EXHAUST DUCTWORK	$894,700	$894,700	$894,700	$0	$0
343	2010	STACK FOUNDATION	$100,000	$100,000	$100,000	$0	$0
343	2030	STACK	$1,387,000	$1,787,000	$1,787,000	($400,000)	($400,000)
343	6000	LUBE OIL SYSTEM	$12,100	$12,100	$12,100	$0	$0
343	8000	PLATFORMS	$15,700	$15,700	$15,700	$0	$0
ACCESSORY ELECTRICAL EQUIPMENT							
345	2020	RACEWAYS	$541,000	$541,000	$541,000	$0	$0
345	2021	DUCTBANKS	$405,000	$405,000	$405,000	$0	$0
345	3000	CABLE	$627,000	$627,000	$627,000	$0	$0
345	4000	ELECTRICAL EQUIPMENT	$1,023,400	$1,023,400	$1,023,400	$0	$0
345	5000	RELAYS & INSTRUMENT PANELS	$840,200	$840,200	$840,200	$0	$0
345	6000	INSTRUMENTATION & CONTROLS	$290,600	$290,600	$290,600	$0	$0
345	8000	GROUNDING	$176,900	$176,900	$176,900	$0	$0
345	9000	YARD LIGHTING	$100,000	$100,000	$100,000	$0	$0
MISCELLANEOUS POWER PLANT EQUIPMENT							
346	1000	INSTRUMENT & SERVICE AIR SYSTEMS	$466,000	$466,000	$466,000	$0	$0
346	1010	PIPE SUPPORTS	$152,400	$152,400	$152,400	$0	$0
346	3000	FIRE PROTECTION SYSTEM	$883,200	$883,200	$883,200	$0	$0
TRANSMISSION PLANT (SWITCHYARD)							
STRUCTURES AND IMPROVEMENTS							
352	1000	SWITCHYARD FND. & CTRL. HOUSE	$400,000	$400,000	$400,000	$0	$0
352		SCADA & MICROWAVE TOWER	$186,000	$186,000	$186,000	$0	$0
352	2020	SWITCHYARD CONDUIT – ALL SIZES	$19,000	$19,000	$19,000	$0	$0
352	2021	SWITCHYARD DUCTBANK	$52,000	$52,000	$52,000	$0	$0
352	3000	SWITCHYARD WIRE & CABLE	$26,300	$26,300	$26,300	$0	$0
352		SWITCHYARD BATTERIES:	$37,000	$37,000	$37,000	$0	$0
352	4000	SWITCHYARD STRUCTURES	$100,000	$100,000	$100,000	$0	$0
352	8000	GROUNDING & CONNECTIONS	$24,500	$24,500	$24,500	$0	$0
STATION EQUIPMENT							
353	1010	TRANSFORMER PADS	$50,000	$50,000	$50,000	$0	$0
353	1030	MAIN XFMR – 33.3 MVA	$491,000	$491,000	$491,000	$0	$0
353	2031	69 KV BREAKER (3)	$123,300	$123,300	$123,300	$0	$0
353		TRANSMISSION CORRIDOR ($ BY MECO)	$2,752,000	$1,771,000	$3,357,000	$981,000	($605,000)
353		CONTROL & RELAY PANELS	$157,000	$157,000	$157,000	$0	$0
353	2032	DISCONNECT SWITCHES	$46,500	$46,500	$46,500	$0	$0
353	4110	YARD LIGHTING	$7,000	$7,000	$7,000	$0	$0
353	5000	PLANT ACCESS SECURITY	$80,000	$80,000	$80,000	$0	$0
DISTRIBUTABLES							
400	9000	MOBILIZATION/DEMOBILIZATION	$653,600	$653,600	$653,600	$0	$0
INDIRECTS							
410	2100	CONTRACTED ENGINEERING	$4,020,000	$4,020,000	$4,020,000	$0	$0
410	2200	CONSTRUCTION MGMT/SUPPORT	$1,080,000	$1,080,000	$1,080,000	$0	$0
410	2300	START-UP SERVICES	$542,979	$542,988	$542,982	($9)	($3)
410	6000	INTEREST DURING CONST (not included)	$0	$0	$0	$0	$0
410	8000	OWNERS COST (not included)	$0	$0	$0	$0	$0
		LAND COSTS ($ BY MECO)	$1,837,421	$811,512	$1,569,216	$1,025,909	$268,203
SUBTOTAL – DTCC #1 – CT#1			$51,069,200	$51,662,300	$54,641,700	($593,100)	($3,572,500)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #1 – ST#1

ACCT NO		DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
STEAM PRODUCTION PLANT							
STRUCTURES AND IMPROVEMENTS							
311	1000	SITE PREPARATION	$200,000	$200,000	$200,000	$0	$0
311	3000	PLANT DRAINAGE	$61,800	$61,800	$61,800	$0	$0
311	5400	FACILITIES	$1,974,000	$1,974,000	$1,974,000	$0	$0
311	9000	YARD LIGHTING	$35,000	$35,000	$35,000	$0	$0
BOILER PLANT EQUIPMENT							
312	1010	HRSG FOUNDATIONS	$200,000	$200,000	$200,000	$0	$0
312	1030	HRSG	$5,966,200	$5,966,200	$5,966,200	$0	$0
312	2000	BOILER FEED WATER SYSTEM	$843,200	$843,200	$843,200	$0	$0
TURBINE GENERATOR UNIT							
314	1010	STEAM TURBINE FOUNDATION	$350,000	$350,000	$350,000	$0	$0
314	1030	STEAM TURBINE / GENERATOR	$5,629,000	$5,629,000	$5,629,000	$0	$0
314	1040	PIPE RACKS & FOUNDATIONS	$220,000	$220,000	$220,000	$0	$0
314	2000	CRITICAL PIPING SYSTEM	$906,000	$906,000	$906,000	$0	$0
314	3200	SAMPLING SYSTEM	$426,800	$426,800	$426,800	$0	$0
314	4000	CONDENSATE PIPING SYSTEM	$845,300	$845,300	$845,300	$0	$0
314	5010	CONDENSER FOUNDATION	$400,000	$400,000	$400,000	$0	$0
314	5020	AIR COOLED CONDENSER	$5,771,600	$5,771,600	$5,771,600	$0	$0
314	6000	STEAM TURBINE LUBE OIL SYSTEM	$89,200	$89,200	$89,200	$0	$0
314	8000	PLATFORMS	$15,700	$15,700	$15,700	$0	$0
314	9000	CONDENSER PIPE SUPPORTS	$101,900	$101,900	$101,900	$0	$0
ACCESSORY ELECTRICAL EQUIPMENT							
315	2020	RACEWAYS	$339,000	$339,000	$339,000	$0	$0
315	2021	DUCTBANKS	$205,000	$205,000	$205,000	$0	$0
315	3000	CABLE	$647,000	$647,000	$647,000	$0	$0
315	4000	ELECTRICAL EQUIPMENT	$843,400	$843,400	$843,400	$0	$0
315	5000	RELAYS & INSTRUMENT PANELS	$285,000	$285,000	$285,000	$0	$0
315	6000	INSTRUMENTATION AND CONTROLS	$461,200	$461,200	$461,200	$0	$0
315	8000	GROUNDING	$96,200	$96,200	$96,200	$0	$0
MISCELLANEOUS POWER PLANT							
316	1000	INSTRUMENT & SERVICE AIR SYSTEMS	$283,500	$283,500	$283,500	$0	$0
316	1010	PIPE SUPPORTS	$246,200	$246,200	$246,200	$0	$0
316	1020	PAINT PIPE / TURBINE BLDG	$310,000	$310,000	$310,000	$0	$0
316	3000	FIRE PROTECTION SYSTEM	$350,000	$350,000	$350,000	$0	$0
316	4000	BRIDGE CRANE (30 TN 40 SP)	$194,500	$194,500	$194,500	$0	$0
TRANSMISSION PLANT (SWITCHYARD)							
STRUCTURES AND IMPROVEMENTS							
352	2020	SWITCHYARD CONDUIT – ALL SIZES	$19,000	$19,000	$19,000	$0	$0
352	2021	SWITCHYARD DUCTBANK	$52,000	$52,000	$52,000	$0	$0
352	3000	SWITCHYARD WIRE & CABLE	$26,000	$26,000	$26,000	$0	$0
352	1000	SWITCHYARD STRUCTURES / FDTNS	$61,100	$61,100	$61,100	$0	$0
352	4000	SWITCHYARD STRUCTURES	$73,600	$73,600	$73,600	$0	$0
352	8000	GROUNDING & CONNECTIONS	$23,700	$23,700	$23,700	$0	$0
STATION EQUIPMENT							
353	1010	TRANSFORMER PADS	$35,700	$35,700	$35,700	$0	$0
353	1030	MAIN XMFR 33.3 MVA	$491,000	$491,000	$491,000	$0	$0
353	2031	69 KV BREAKERS (3)	$123,300	$123,300	$123,300	$0	$0
353		CONTROL & RELAY PANELS	$157,000	$157,000	$157,000	$0	$0
353	2032	69 KV DISCONNECT SWITCHES	$46,300	$46,300	$46,300	$0	$0
353	4110	YARD LIGHTING	$7,000	$7,000	$7,000	$0	$0
DISTRIBUTABLES							
400	1000	MOBILIZATION & DEMOB	$798,000	$798,000	$798,000	$0	$0
INDIRECTS							
410	2100	CONTRACTED ENGINEERING	$2,450,000	$2,450,000	$2,450,000	$0	$0
410	2200	CONSTRUCTION MANAGEMENT	$1,223,000	$1,223,000	$1,223,000	$0	$0
410	2300	START-UP SERVICES	$790,000	$790,000	$790,000	$0	$0
410	6000	INTEREST DURING CONST (not included)	$0	$0	$0	$0	$0
410	6000	OWNERS COST (not included)	$0	$0	$0	$0	$0
SUBTOTAL – DTCC #1 – ST#1			$34,673,400	$34,673,400	$34,673,400	$0	$0

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #1 – CT#1

ACCT NO	DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTION PLANT						
341	STRUCTURES AND IMPROVEMENTS	$16,924,100	$19,124,100	$19,759,800	($2,200,000)	($2,835,700)
342	FUEL HOLDERS, PRODUCERS & ACCESSORIES	$1,416,700	$1,416,700	$1,416,700	$0	$0
343	PRIME MOVERS	$14,537,100	$14,937,100	$14,937,100	($400,000)	($400,000)
345	ACCESSORY ELECTRICAL EQUIPMENT	$4,004,100	$4,004,100	$4,004,100	$0	$0
346	MISCELLANEOUS POWER PLANT EQUIPMENT	$1,501,600	$1,501,600	$1,501,600	$0	$0
352	TRANSMISSION PLANT (SWITCHYARD) STRUCTURES AND IMPROVEMENTS	$844,800	$844,800	$844,800	$0	$0
353	STATION EQUIPMENT	$3,706,800	$2,725,800	$4,311,800	$981,000	($605,000)
400	DISTRIBUTABLES	$653,600	$653,600	$653,600	$0	$0
410	INDIRECTS	$7,480,400	$6,454,500	$7,212,200	$1,025,900	$268,200
SUBTOTAL – DTCC #1 – CT#1		$51,069,200	$51,662,300	$54,641,700	($593,100)	($3,572,500)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #1 – ST#1

ACCT NO	DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"A2" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
STEAM PRODUCTION PLANT						
311	STRUCTURES AND IMPROVEMENTS	$2,270,800	$2,270,800	$2,270,800	$0	$0
312	BOILER PLANT EQUIPMENT	$7,009,400	$7,009,400	$7,009,400	$0	$0
314	TURBINE GENERATOR UNIT	$14,755,500	$14,755,500	$14,755,500	$0	$0
315	ACCESSORY ELECTRICAL EQUIPMENT	$2,876,800	$2,876,800	$2,876,800	$0	$0
316	MISCELLANEOUS POWER PLANT	$1,384,200	$1,384,200	$1,384,200	$0	$0
352	TRANSMISSION PLANT (SWITCHYARD) STRUCTURES AND IMPROVEMENTS	$255,400	$255,400	$255,400	$0	$0
353	STATION EQUIPMENT	$860,300	$860,300	$860,300	$0	$0
400	DISTRIBUTABLES	$798,000	$798,000	$798,000	$0	$0
410	INDIRECTS	$4,463,000	$4,463,000	$4,463,000	$0	$0
SUBTOTAL – DTCC #1 – ST#1		$34,673,400	$34,673,400	$34,673,400	$0	$0

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #1 – CT#2

ACCT NO	DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTION PLANT (COMB TURBINES)						
341	STRUCTURES AND IMPROVEMENTS	$1,317,500	$1,317,500	$1,317,500	$0	$0
342	FUEL HOLDERS, PRODUCERS & ACCESSORIES	$1,009,000	$1,009,000	$1,009,000	$0	$0
343	PRIME MOVERS	$13,252,000	$13,252,000	$13,252,000	$0	$0
345	ACCESSORY ELECTRICAL EQUIPMENT	$2,600,100	$2,600,100	$2,600,100	$0	$0
346	MISCELLANEOUS POWER PLANT EQUIPMENT	$233,800	$233,800	$233,800	$0	$0
352	TRANSMISSION PLANT (SWITCHYARD) STRUCTURES AND IMPROVEMENTS	$269,300	$269,300	$269,300	$0	$0
353	STATION EQUIPMENT	$858,900	$858,900	$858,900	$0	$0
400	DISTRIBUTABLES	$381,200	$381,200	$381,200	$0	$0
410	INDIRECTS	$1,955,800	$1,955,800	$1,955,800	$0	$0
SUBTOTAL – DTCC #1 – CT#2		$21,877,600	$21,877,600	$21,877,600	$0	$0
TOTAL ESTIMATE – DTCC #1		$107,620,200	$108,213,300	$111,192,700	($593,100)	($3,572,500)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #1 – CT#2

ACCT NO		DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTIONS PLANT (COMB TURBINES)							
STRUCTURES AND IMPROVEMENTS							
341	1000	SITE PREPARATION	$80,000	$80,000	$80,000	$0	$0
341	3000	PLANT DRAINAGE	$61,600	$61,600	$61,600	$0	$0
341	5400	FACILITIES	$604,000	$604,000	$604,000	$0	$0
341	5500	WATER TREATMENT & STORAGE	$538,300	$538,300	$538,300	$0	$0
341	9000	YARD LIGHTING	$33,600	$33,600	$33,600	$0	$0
FUEL HOLDERS, PRODUCERS & ACCESSORIES							
342	2010	TANK FOUNDATIONS	$50,000	$50,000	$50,000	$0	$0
342	2020	TANKS	$807,000	$807,000	$807,000	$0	$0
342	2050	FUEL PIPING	$59,000	$59,000	$59,000	$0	$0
342	2060	FUEL VALVES	$15,800	$15,800	$15,800	$0	$0
342	2060	FUEL CONDITIONERS	$77,200	$77,200	$77,200	$0	$0
PRIME MOVERS							
343	1010	COMBUSTION TURBINE FOUNDATION	$200,000	$200,000	$200,000	$0	$0
343	1030	COMBUSTION TURBINE	$11,821,600	$11,821,600	$11,821,600	$0	$0
343	1040	PIPE RACK & FOUNDATIONS	$137,300	$137,300	$137,300	$0	$0
343	1090	EXHAUST DUCTWORK	$835,800	$835,800	$835,800	$0	$0
343	2030	CONT EMISSIONS MONITORING SYS	$229,600	$229,600	$229,600	$0	$0
343	6000	LUBE OIL SYSTEM	$12,000	$12,000	$12,000	$0	$0
343	8000	PLATFORMS	$15,700	$15,700	$15,700	$0	$0
ACCESSORY ELECTRICAL EQUIPMENT							
345	2020	RACEWAYS	$161,000	$161,000	$161,000	$0	$0
345	2021	DUCTBANKS	$205,000	$205,000	$205,000	$0	$0
345	3000	CABLE	$505,700	$505,700	$505,700	$0	$0
345	4000	ELECTRICAL EQUIPMENT	$663,200	$663,200	$663,200	$0	$0
345	5000	RELAY & INSTRUMENT PANELS	$840,200	$840,200	$840,200	$0	$0
345	6000	INSTRUMENTATION & CONTROLS	$138,900	$138,900	$138,900	$0	$0
345	8000	GROUNDING	$86,100	$86,100	$86,100	$0	$0
MISCELLANEOUS POWER PLANT EQUIPMENT							
346	1000	COMPRESSED AIR SYSTEM	$77,400	$77,400	$77,400	$0	$0
346	1010	PIPE SUPPORTS	$156,400	$156,400	$156,400	$0	$0
TRANSMISSION PLANT (SWITCHYARD)							
STRUCTURES AND IMPROVEMENTS							
352	1000	SITE PREPARATION					
352	1000	SWITCHYARD FOUNDATION	$70,000	$70,000	$70,000	$0	$0
352	2020	SWITCHYARD CONDUIT – ALL SIZES	$19,000	$19,000	$19,000	$0	$0
352	2021	SWITCHYARD DUCTBANK	$52,000	$52,000	$52,000	$0	$0
352	3000	SWITCHYARD WIRE & CABLE	$26,000	$26,000	$26,000	$0	$0
352	4000	SWITCHYARD STRUCTURES	$80,000	$80,000	$80,000	$0	$0
352	8000	GROUNDING & CONNECTIONS	$22,300	$22,300	$22,300	$0	$0
STATION EQUIPMENT							
353	1010	TRANSFORMER PADS	$35,700	$35,700	$35,700	$0	$0
353	1030	MAIN XMFR 33.3 MVA	$491,000	$491,000	$491,000	$0	$0
353	2031	69 KV BREAKER (3)	$123,300	$123,300	$123,300	$0	$0
353		CONTROL & RELAY PANELS	$157,000	$157,000	$157,000	$0	$0
353	2032	69 KV DISCONNECT SWITCHES	$44,900	$44,900	$44,900	$0	$0
353	4110	YARD LIGHTING	$7,000	$7,000	$7,000	$0	$0
DISTRIBUTABLES							
400	1000	MOBILIZATION & DEMOBILIZATION	$381,200	$381,200	$381,200	$0	$0
INDIRECTS							
410	2100	CONTRACTED ENGINEERING	$1,188,000	$1,188,000	$1,188,000	$0	$0
410	2200	CONSTRUCTION MANAGEMENT/SUPPORT	$508,000	$508,000	$508,000	$0	$0
410	2300	START-UP SERVICES	$259,800	$259,800	$259,800	$0	$0
410	6000	INTEREST DURING CONST (not included)	$0	$0	$0	$0	$0
410	8000	OWNERS COST (not included)	$0	$0	$0	$0	$0
SUBTOTAL – DTCC #1 – CT#2			$21,877,600	$21,877,600	$21,877,600	$0	$0
TOTAL ESTIMATE – DTCC #1			$107,620,200	$108,213,300	$111,192,700	($593,100)	($3,572,500)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #2 – CT#3

ACCT NO		DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTION PLANT							
STRUCTURES & IMPROVEMENTS							
341	1000	SITE PREPARATION	$373,800	$373,800	$373,800	$0	$0
341	2000	LANDSCAPING	$10,000	$10,000	$10,000	$0	$0
341	3000	PLANT/EQUIPMENT DRAINAGE	$553,000	$553,000	$553,000	$0	$0
341	5400	FACILITIES	$1,360,000	$1,360,000	$1,360,000	$0	$0
341	5500	WATER TREATMENT & STORAGE	$2,665,700	$2,665,700	$5,982,900	$0	($3,317,200)
341	6200	INJECTION WELLS	$475,000	$475,000	$93,500	$0	$381,500
341	6300	SUPPLY WELLS/WATER	$435,200	$435,200	$435,200	$0	$0
FUEL HOLDERS, PRODUCERS & ACCESSORIES, FOUNDATIONS							
342	2010	TANK FOUNDATIONS	$140,000	$140,000	$140,000	$0	$0
342	2020	TANKS	$730,000	$730,000	$730,000	$0	$0
342	2050	PIPING	$204,000	$204,000	$204,000	$0	$0
342	2060	VALVES	$52,500	$52,500	$52,500	$0	$0
342	2070	CONDITIONERS	$80,500	$80,500	$80,500	$0	$0
PRIME MOVERS							
343	1010	COMBUSTION TURBINE FOUNDATION	$200,000	$200,000	$200,000	$0	$0
343	1030	COMBUSTION TURBINE	$11,777,600	$11,777,600	$11,777,600	$0	$0
343	1040	PIPE RACK & FOUNDATIONS	$150,000	$150,000	$150,000	$0	$0
343	1090	EXHAUST DUCTWORK	$894,700	$894,700	$894,700	$0	$0
343	2010	STACK FOUNDATION	$100,000	$100,000	$100,000	$0	$0
343	2030	STACK	$1,387,000	$1,787,000	$1,787,000	($400,000)	($400,000)
343	6000	LUBE OIL SYSTEM	$12,100	$12,100	$12,100	$0	$0
343	8000	PLATFORMS	$15,700	$15,700	$15,700	$0	$0
ACCESSORY ELECTRICAL EQUIPMENT							
345	2020	RACEWAYS	$541,000	$541,000	$541,000	$0	$0
345	2021	DUCTBANKS	$405,000	$405,000	$405,000	$0	$0
345	3000	CABLE	$627,000	$627,000	$627,000	$0	$0
345	4000	ELECTRICAL EQUIPMENT	$1,023,400	$1,023,400	$1,023,400	$0	$0
345	5000	RELAYS & INSTRUMENT PANELS	$840,200	$840,200	$840,200	$0	$0
345	6000	INSTRUMENTATION & CONTROLS	$290,600	$290,600	$290,600	$0	$0
345	8000	GROUNDING	$176,900	$176,900	$176,900	$0	$0
345	9000	YARD LIGHTING	$50,000	$50,000	$50,000	$0	$0
MISCELLANEOUS POWER PLANT EQUIPMENT							
346	1000	INSTRUMENT & SERVICE AIR SYSTEMS	$421,000	$421,000	$421,000	$0	$0
346	1010	PIPE SUPPORTS	$152,400	$152,400	$152,400	$0	$0
346	3000	FIRE PROTECTION SYSTEM	$154,000	$154,000	$154,000	$0	$0
TRANSMISSION PLANT (SWITCHYARD)							
STRUCTURES AND IMPROVEMENTS							
352	1000	SWITCHYARD FND. & CTRL. HOUSE	$200,000	$200,000	$200,000	$0	$0
352	2020	SWITCHYARD CONDUIT – ALL SIZES	$19,000	$19,000	$19,000	$0	$0
352	2021	SWITCHYARD DUCTBANK	$52,000	$52,000	$52,000	$0	$0
352	3000	SWITCHYARD WIRE & CABLE	$26,300	$26,300	$26,300	$0	$0
352	4000	SWITCHYARD STRUCTURES	$100,000	$100,000	$100,000	$0	$0
352	8000	GROUNDING & CONNECTIONS	$24,500	$24,500	$24,500	$0	$0
STATION EQUIPMENT							
353	1010	TRANSFORMER PADS	$50,000	$50,000	$50,000	$0	$0
353	1030	MAIN XFMR – 33.3 MVA	$491,000	$491,000	$491,000	$0	$0
353	2031	69 KV BREAKER (3)	$123,300	$123,300	$123,300	$0	$0
353		TRANSMISSION CORRIDOR ($ BY MECO)	$275,000	$1,667,000	$368,500	($1,392,000)	($93,500)
353		CONTROL & RELAY PANELS	$157,000	$157,000	$157,000	$0	$0
353	2032	DISCONNECT SWITCHES	$46,500	$46,500	$46,500	$0	$0
353	4110	YARD LIGHTING	$7,000	$7,000	$7,000	$0	$0
353	5000	PLANT ACCESS SECURITY	$80,000	$80,000	$80,000	$0	$0
DISTRIBUTABLES							
400	9000	MOBILIZATION/DEMOBILIZATION	$653,600	$653,600	$653,600	$0	$0
INDIRECTS							
410	2100	CONTRACTED ENGINEERING	$4,020,000	$4,020,000	$4,020,000	$0	$0
410	2200	CONSTRUCTION MGMT/SUPPORT	$1,080,000	$1,080,000	$1,080,000	$0	$0
410	2300	START-UP SERVICES	$543,000	$543,000	$543,000	$0	$0
410	6000	INTEREST DURING CONST (not included)	$0	$0	$0	$0	$0
410	8000	OWNERS COST (not included)	$0	$0	$0	$0	$0
SUBTOTAL – DTCC #2 – CT#3			$34,246,500	$36,038,500	$37,675,700	($1,792,000)	($3,429,200)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #2 – ST#2

ACCT NO		DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
STEAM PRODUCTION PLANT							
STRUCTURES AND IMPROVEMENTS							
311	1000	SITE PREPARATION	$200,000	$200,000	$200,000	$0	$0
311	3000	PLANT DRAINAGE	$61,800	$61,800	$61,800	$0	$0
311	5400	FACILITIES	$1,906,000	$1,906,000	$1,906,000	$0	$0
311	9000	YARD LIGHTING	$35,000	$35,000	$35,000	$0	$0
BOILER PLANT EQUIPMENT							
312	1010	HRSG FOUNDATIONS	$200,000	$200,000	$200,000	$0	$0
312	1030	HRSG	$5,966,200	$5,966,200	$5,966,200	$0	$0
312	2000	BOILER FEED WATER SYSTEM	$843,200	$843,200	$843,200	$0	$0
TURBINE GENERATOR UNIT							
314	1010	STEAM TURBINE FOUNDATION	$350,000	$350,000	$350,000	$0	$0
314	1030	STEAM TURBINE / GENERATOR	$5,629,000	$5,629,000	$5,629,000	$0	$0
314	1040	PIPE RACKS & FOUNDATIONS	$220,000	$220,000	$220,000	$0	$0
314	2000	CRITICAL PIPING SYSTEM	$906,000	$906,000	$906,000	$0	$0
314	3200	SAMPLING SYSTEM	$426,800	$426,800	$426,800	$0	$0
314	4000	CONDENSATE PIPING SYSTEM	$682,300	$682,300	$682,300	$0	$0
314	5010	CONDENSER FOUNDATION	$400,000	$400,000	$400,000	$0	$0
314	5020	AIR COOLED CONDENSER	$5,771,600	$5,771,600	$5,771,600	$0	$0
314	6000	STEAM TURBINE LUBE OIL SYSTEM	$89,200	$89,200	$89,200	$0	$0
314	8000	PLATFORMS	$15,700	$15,700	$15,700	$0	$0
314	9000	CONDENSER PIPE SUPPORTS	$101,900	$101,900	$101,900	$0	$0
ACCESSORY ELECTRICAL EQUIPMENT							
315	2020	RACEWAYS	$339,000	$339,000	$339,000	$0	$0
315	2021	DUCTBANKS	$205,000	$205,000	$205,000	$0	$0
315	3000	CABLE	$647,000	$647,000	$647,000	$0	$0
315	4000	ELECTRICAL EQUIPMENT	$843,400	$843,400	$843,400	$0	$0
315	5000	RELAYS & INSTRUMENT PANELS	$285,000	$285,000	$285,000	$0	$0
315	6000	INSTRUMENTATION AND CONTROLS	$461,200	$461,200	$461,200	$0	$0
315	8000	GROUNDING	$96,200	$96,200	$96,200	$0	$0
MISCELLANEOUS POWER PLANT							
316	1000	INSTRUMENT & SERVICE AIR SYSTEMS	$283,500	$283,500	$283,500	$0	$0
316	1010	PIPE SUPPORTS	$246,200	$246,200	$246,200	$0	$0
316	1020	PAINT PIPE / TURBINE BLDG	$100,000	$100,000	$100,000	$0	$0
316	3000	FIRE PROTECTION SYSTEM	$46,000	$46,000	$46,000	$0	$0
TRANSMISSION PLANT (SWITCHYARD)							
STRUCTURES AND IMPROVEMENTS							
352	2020	SWITCHYARD CONDUIT – ALL SIZES	$19,000	$19,000	$19,000	$0	$0
352	2021	SWITCHYARD DUCTBANK	$52,000	$52,000	$52,000	$0	$0
352	3000	SWITCHYARD WIRE & CABLE	$26,000	$26,000	$26,000	$0	$0
352	1000	SWITCHYARD STRUCTURES / FDTNS	$61,100	$61,100	$61,100	$0	$0
352	4000	SWITCHYARD STRUCTURES	$73,600	$73,600	$73,600	$0	$0
352	8000	GROUNDING & CONNECTIONS	$23,700	$23,700	$23,700	$0	$0
STATION EQUIPMENT							
353	1010	TRANSFORMER PADS	$35,700	$35,700	$35,700	$0	$0
353	1030	MAIN XMFR 33.3 MVA	$491,000	$491,000	$491,000	$0	$0
353	2031	69 KV BREAKERS (3)	$123,300	$123,300	$123,300	$0	$0
353		CONTROL & RELAY PANELS	$157,000	$157,000	$157,000	$0	$0
353	2032	69 KV DISCONNECT SWITCHES	$46,300	$46,300	$46,300	$0	$0
353	4110	YARD LIGHTING	$7,000	$7,000	$7,000	$0	$0
DISTRIBUTABLES							
400	1000	MOBILIZATION & DEMOB	$798,000	$798,000	$798,000	$0	$0
INDIRECTS							
410	2100	CONTRACTED ENGINEERING	$2,450,000	$2,450,000	$2,450,000	$0	$0
410	2200	CONSTRUCTION MANAGEMENT	$1,223,000	$1,223,000	$1,223,000	$0	$0
410	2300	START-UP SERVICES	$790,000	$790,000	$790,000	$0	$0
410	6000	INTEREST DURING CONST (not included)	$0	$0	$0	$0	$0
410	6000	OWNERS COST (not included)	$0	$0	$0	$0	$0
SUBTOTAL – DTCC #2 – ST#2			$33,733,900	$33,733,900	$33,733,900	$0	$0

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #2 – CT#4

ACCT NO		DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTIONS PLANT (COMB TURBINES)							
STRUCTURES AND IMPROVEMENTS							
341	1000	SITE PREPARATION	$80,000	$80,000	$80,000	$0	$0
341	3000	PLANT DRAINAGE	$61,600	$61,600	$61,600	$0	$0
341	5400	FACILITIES	$604,000	$604,000	$604,000	$0	$0
341	5500	WATER TREATMENT & STORAGE	$538,300	$538,300	$538,300	$0	$0
341	9000	YARD LIGHTING	$33,600	$33,600	$33,600	$0	$0
FUEL HOLDERS, PRODUCERS & ACCESSORIES							
342	2010	TANK FOUNDATIONS	$50,000	$50,000	$50,000	$0	$0
342	2020	TANKS	$807,000	$807,000	$807,000	$0	$0
342	2050	FUEL PIPING	$59,000	$59,000	$59,000	$0	$0
342	2060	FUEL VALVES	$15,800	$15,800	$15,800	$0	$0
342	2060	FUEL CONDITIONERS	$77,200	$77,200	$77,200	$0	$0
PRIME MOVERS							
343	1010	COMBUSTION TURBINE FOUNDATION	$200,000	$200,000	$200,000	$0	$0
343	1030	COMBUSTION TURBINE	$11,821,600	$11,821,600	$11,821,600	$0	$0
343	1040	PIPE RACK & FOUNDATIONS	$137,300	$137,300	$137,300	$0	$0
343	1090	EXHAUST DUCTWORK	$835,800	$835,800	$835,800	$0	$0
343	2030	CONT EMISSIONS MONITORING SYS	$229,600	$229,600	$229,600	$0	$0
343	6000	LUBE OIL SYSTEM	$12,000	$12,000	$12,000	$0	$0
343	8000	PLATFORMS	$15,700	$15,700	$15,700	$0	$0
ACCESSORY ELECTRICAL EQUIPMENT							
345	2020	RACEWAYS	$161,000	$161,000	$161,000	$0	$0
345	2021	DUCTBANKS	$205,000	$205,000	$205,000	$0	$0
345	3000	CABLE	$505,700	$505,700	$505,700	$0	$0
345	4000	ELECTRICAL EQUIPMENT	$663,200	$663,200	$663,200	$0	$0
345	5000	RELAY & INSTRUMENT PANELS	$840,200	$840,200	$840,200	$0	$0
345	6000	INSTRUMENTATION & CONTROLS	$138,900	$138,900	$138,900	$0	$0
345	8000	GROUNDING	$86,100	$86,100	$86,100	$0	$0
MISCELLANEOUS POWER PLANT EQUIPMENT							
346	1000	COMPRESSED AIR SYSTEM	$77,400	$77,400	$77,400	$0	$0
346	1010	PIPE SUPPORTS	$156,400	$156,400	$156,400	$0	$0
TRANSMISSION PLANT (SWITCHYARD)							
STRUCTURES AND IMPROVEMENTS							
352	1000	SITE PREPARATION					
352	1000	SWITCHYARD FOUNDATION	$70,000	$70,000	$70,000	$0	$0
352	2020	SWITCHYARD CONDUIT – ALL SIZES	$19,000	$19,000	$19,000	$0	$0
352	2021	SWITCHYARD DUCTBANK	$52,000	$52,000	$52,000	$0	$0
352	3000	SWITCHYARD WIRE & CABLE	$26,000	$26,000	$26,000	$0	$0
352	4000	SWITCHYARD STRUCTURES	$80,000	$80,000	$80,000	$0	$0
352	8000	GROUNDING & CONNECTIONS	$22,300	$22,300	$22,300	$0	$0
STATION EQUIPMENT							
353	1010	TRANSFORMER PADS	$35,700	$35,700	$35,700	$0	$0
353	1030	MAIN XMFR 33.3 MVA	$491,000	$491,000	$491,000	$0	$0
353	2031	69 KV BREAKER (3)	$123,300	$123,300	$123,300	$0	$0
353		CONTROL & RELAY PANELS	$157,000	$157,000	$157,000	$0	$0
353	2032	69 KV DISCONNECT SWITCHES	$44,900	$44,900	$44,900	$0	$0
353	4110	YARD LIGHTING	$7,000	$7,000	$7,000	$0	$0
DISTRIBUTABLES							
400	1000	MOBILIZATION & DEMOBILIZATION	$381,200	$381,200	$381,200	$0	$0
INDIRECTS							
410	2100	CONTRACTED ENGINEERING	$1,188,000	$1,188,000	$1,188,000	$0	$0
410	2200	CONSTRUCTION MANAGEMENT/SUPPORT	$508,000	$508,000	$508,000	$0	$0
410	2300	START-UP SERVICES	$259,800	$259,800	$259,800	$0	$0
410	6000	INTEREST DURING CONST (not included)	$0	$0	$0	$0	$0
410	8000	OWNERS COST (not included)	$0	$0	$0	$0	$0
SUBTOTAL – DTCC #2 – CT#4			$21,877,600	$21,877,600	$21,877,600	$0	$0
TOTAL ESTIMATE – DTCC #2			$89,858,000	$91,650,000	$93,287,200	($1,792,000)	($3,429,200)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #2 – CT#3

ACCT NO	DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTION PLANT						
341	STRUCTURES AND IMPROVEMENTS	$5,872,700	$5,872,700	$8,808,400	$0	($2,935,700)
342	FUEL HOLDERS, PRODUCERS & ACCESSORIES	$1,207,000	$1,207,000	$1,207,000	$0	$0
343	PRIME MOVERS	$14,537,100	$14,937,100	$14,937,100	($400,000)	($400,000)
345	ACCESSORY ELECTRICAL EQUIPMENT	$3,954,100	$3,954,100	$3,954,100	$0	$0
346	MISCELLANEOUS POWER PLANT EQUIPMENT	$727,400	$727,400	$727,400	$0	$0
352	TRANSMISSION PLANT (SWITCHYARD) STRUCTURES AND IMPROVEMENTS	$421,800	$421,800	$421,800	$0	$0
353	STATION EQUIPMENT	$1,229,800	$2,621,800	$1,323,300	($1,392,000)	($93,500)
400	DISTRIBUTABLES	$653,600	$653,600	$653,600	$0	$0
410	INDIRECTS	$5,643,000	$5,643,000	$5,643,000	$0	$0
SUBTOTAL – DTCC #2 – CT#3		$34,246,500	$36,038,500	$37,675,700	($1,792,000)	($3,429,200)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #2 – ST#2

ACCT NO	DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
STEAM PRODUCTION PLANT						
311	STRUCTURES AND IMPROVEMENTS	$2,202,800	$2,202,800	$2,202,800	$0	$0
312	BOILER PLANT EQUIPMENT	$7,009,400	$7,009,400	$7,009,400	$0	$0
314	TURBINE GENERATOR UNIT	$14,592,500	$14,592,500	$14,592,500	$0	$0
315	ACCESSORY ELECTRICAL EQUIPMENT	$2,876,800	$2,876,800	$2,876,800	$0	$0
316	MISCELLANEOUS POWER PLANT	$675,700	$675,700	$675,700	$0	$0
352	TRANSMISSION PLANT (SWITCHYARD) STRUCTURES AND IMPROVEMENTS	$255,400	$255,400	$255,400	$0	$0
353	STATION EQUIPMENT	$860,300	$860,300	$860,300	$0	$0
400	DISTRIBUTABLES	$798,000	$798,000	$798,000	$0	$0
410	INDIRECTS	$4,463,000	$4,463,000	$4,463,000	$0	$0
SUBTOTAL – DTCC #2 – ST#2		$33,733,900	$33,733,900	$33,733,900	$0	$0

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #2 – CT#4

ACCT NO	DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTION PLANT (COMB TURBINES)						
341	STRUCTURES AND IMPROVEMENTS	$1,317,500	$1,317,500	$1,317,500	$0	$0
342	FUEL HOLDERS, PRODUCERS & ACCESSORIES	$1,009,000	$1,009,000	$1,009,000	$0	$0
343	PRIME MOVERS	$13,252,000	$13,252,000	$13,252,000	$0	$0
345	ACCESSORY ELECTRICAL EQUIPMENT	$2,600,100	$2,600,100	$2,600,100	$0	$0
346	MISCELLANEOUS POWER PLANT EQUIPMENT	$233,800	$233,800	$233,800	$0	$0
352	TRANSMISSION PLANT (SWITCHYARD) STRUCTURES AND IMPROVEMENTS	$269,300	$269,300	$269,300	$0	$0
353	STATION EQUIPMENT	$858,900	$858,900	$858,900	$0	$0
400	DISTRIBUTABLES	$381,200	$381,200	$381,200	$0	$0
410	INDIRECTS	$1,955,800	$1,955,800	$1,955,800	$0	$0
SUBTOTAL – DTCC #2 – CT#4		$21,877,600	$21,877,600	$21,877,600	$0	$0
TOTAL ESTIMATE – DTCC #2		$89,858,000	$91,650,000	$93,287,200	($1,792,000)	($3,429,200)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #3 – CT#5

ACCT NO		DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTION PLANT							
STRUCTURES & IMPROVEMENTS							
341	1000	SITE PREPARATION	$373,800	$373,800	$373,800	$0	$0
341	2000	LANDSCAPING	$10,000	$10,000	$10,000	$0	$0
341	3000	PLANT/EQUIPMENT DRAINAGE	$724,400	$724,400	$724,400	$0	$0
341	5400	FACILITIES	$3,320,000	$3,320,000	$3,320,000	$0	$0
341	5500	WATER TREATMENT & STORAGE	$2,665,700	$2,665,700	$5,982,900	$0	($3,317,200)
341	6200	INJECTION WELLS	$475,000	$475,000	$93,500	$0	$381,500
341	6300	SUPPLY WELLS/WATER	$435,200	$435,200	$435,200	$0	$0
FUEL HOLDERS, PRODUCERS & ACCESSORIES, FOUNDATIONS							
342	2010	TANK FOUNDATIONS	$140,000	$140,000	$140,000	$0	$0
342	2020	TANKS	$730,000	$730,000	$730,000	$0	$0
342	2030	PUMPS	$39,700	$39,700	$39,700	$0	$0
342	2050	PIPING	$204,000	$204,000	$204,000	$0	$0
342	2060	VALVES	$52,500	$52,500	$52,500	$0	$0
342	2070	CONDITIONERS	$150,500	$150,500	$150,500	$0	$0
PRIME MOVERS							
343	1010	COMBUSTION TURBINE FOUNDATION	$200,000	$200,000	$200,000	$0	$0
343	1030	COMBUSTION TURBINE	$11,777,600	$11,777,600	$11,777,600	$0	$0
343	1040	PIPE RACK & FOUNDATIONS	$150,000	$150,000	$150,000	$0	$0
343	1090	EXHAUST DUCTWORK	$894,700	$894,700	$894,700	$0	$0
343	2010	STACK FOUNDATION	$100,000	$100,000	$100,000	$0	$0
343	2030	STACK	$1,387,000	$1,787,000	$1,787,000	($400,000)	($400,000)
343	6000	LUBE OIL SYSTEM	$12,100	$12,100	$12,100	$0	$0
343	8000	PLATFORMS	$15,700	$15,700	$15,700	$0	$0
ACCESSORY ELECTRICAL EQUIPMENT							
345	2020	RACEWAYS	$541,000	$541,000	$541,000	$0	$0
345		SCADA – RTU CABINETS	$47,500	$47,500	$47,500	$0	$0
345	2021	DUCTBANKS	$405,000	$405,000	$405,000	$0	$0
345	3000	CABLE	$627,000	$627,000	$627,000	$0	$0
345	4000	ELECTRICAL EQUIPMENT	$1,023,400	$1,023,400	$1,023,400	$0	$0
345	5000	RELAYS & INSTRUMENT PANELS	$840,200	$840,200	$840,200	$0	$0
345	6000	INSTRUMENTATION & CONTROLS	$290,600	$290,600	$290,600	$0	$0
345	8000	GROUNDING	$176,900	$176,900	$176,900	$0	$0
345	9000	YARD LIGHTING	$50,000	$50,000	$50,000	$0	$0
345		PLANT ACCESS – SECURITY	$80,000	$80,000	$80,000	$0	$0
MISCELLANEOUS POWER PLANT EQUIPMENT							
346	1000	INSTRUMENT & SERVICE AIR SYSTEMS	$466,000	$466,000	$466,000	$0	$0
346	1010	PIPE SUPPORTS	$152,400	$152,400	$152,400	$0	$0
346	3000	FIRE PROTECTION SYSTEM	$154,000	$154,000	$154,000	$0	$0
TRANSMISSION PLANT (SWITCHYARD)							
STRUCTURES AND IMPROVEMENTS							
352	1000	SWITCHYARD FND. & CTRL. HOUSE	$400,000	$400,000	$400,000	$0	$0
352	2020	SWITCHYARD CONDUIT – ALL SIZES	$19,000	$19,000	$19,000	$0	$0
352	2021	SWITCHYARD DUCTBANK	$52,000	$52,000	$52,000	$0	$0
352	3000	SWITCHYARD WIRE & CABLE	$26,300	$26,300	$26,300	$0	$0
352		SWITCHYARD BATTERIES:	$37,000	$37,000	$37,000	$0	$0
352	4000	SWITCHYARD STRUCTURES	$100,000	$100,000	$100,000	$0	$0
352	8000	GROUNDING & CONNECTIONS	$24,500	$24,500	$24,500	$0	$0
STATION EQUIPMENT							
353	1010	TRANSFORMER PADS	$50,000	$50,000	$50,000	$0	$0
353	1030	MAIN XFMR – 33.3 MVA	$491,000	$491,000	$491,000	$0	$0
353	2031	69 KV BREAKER (3)	$123,300	$123,300	$123,300	$0	$0
		TRANSMISSION CORRIDER ($ BY MECO)	$55,000	$1,237,500	$110,000	($1,182,500)	($55,000)
353		CONTROL & RELAY PANELS	$157,000	$157,000	$157,000	$0	$0
353	2032	DISCONNECT SWITCHES	$46,500	$46,500	$46,500	$0	$0
353	4110	YARD LIGHTING	$7,000	$7,000	$7,000	$0	$0
DISTRIBUTABLES							
400	9000	MOBILIZATION/DEMOBILIZATION	$653,600	$653,600	$653,600	$0	$0
INDIRECTS							
410	2100	CONTRACTED ENGINEERING	$4,020,000	$4,020,000	$4,020,000	$0	$0
410	2200	CONSTRUCTION MGMT/SUPPORT	$1,080,000	$1,080,000	$1,080,000	$0	$0
410	2300	START-UP SERVICES	$543,000	$543,000	$543,000	$0	$0
410	6000	INTEREST DURING CONST (not included)	$0	$0	$0	$0	$0
410	8000	OWNERS COST (not included)	$0	$0	$0	$0	$0
SUBTOTAL – DTCC #3 – CT#5			$36,597,100	$38,179,600	$39,987,800	($1,582,500)	($3,390,700)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #3 – ST#3

ACCT NO		DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
STEAM PRODUCTION PLANT							
STRUCTURES AND IMPROVEMENTS							
311	1000	SITE PREPARATION	$200,000	$200,000	$200,000	$0	$0
311	3000	PLANT DRAINAGE	$61,800	$61,800	$61,800	$0	$0
311	5400	FACILITIES	$1,974,000	$1,974,000	$1,974,000	$0	$0
311	9000	YARD LIGHTING	$20,000	$35,000	$20,000	($15,000)	$0
BOILER PLANT EQUIPMENT							
312	1010	HRSG FOUNDATIONS	$200,000	$200,000	$200,000	$0	$0
312	1030	HRSG	$5,966,200	$5,966,200	$5,966,200	$0	$0
312	2000	BOILER FEED WATER SYSTEM	$843,200	$843,200	$843,200	$0	$0
TURBINE GENERATOR UNIT							
314	1010	STEAM TURBINE FOUNDATION	$350,000	$350,000	$350,000	$0	$0
314	1030	STEAM TURBINE / GENERATOR	$5,629,000	$5,629,000	$5,629,000	$0	$0
314	1040	PIPE RACKS & FOUNDATIONS	$220,000	$220,000	$220,000	$0	$0
314	2000	CRITICAL PIPING SYSTEM	$906,000	$906,000	$906,000	$0	$0
314	3200	SAMPLING SYSTEM	$426,800	$426,800	$426,800	$0	$0
314	4000	CONDENSATE PIPING SYSTEM	$835,300	$835,300	$835,300	$0	$0
314	5010	CONDENSER FOUNDATION	$400,000	$400,000	$400,000	$0	$0
314	5020	AIR COOLED CONDENSER	$5,771,600	$5,771,600	$5,771,600	$0	$0
314	6000	STEAM TURBINE LUBE OIL SYSTEM	$89,200	$89,200	$89,200	$0	$0
314	8000	PLATFORMS	$15,700	$15,700	$15,700	$0	$0
314	9000	CONDENSER PIPE SUPPORTS	$101,900	$101,900	$101,900	$0	$0
ACCESSORY ELECTRICAL EQUIPMENT							
315	2020	RACEWAYS	$339,000	$339,000	$339,000	$0	$0
315	2021	DUCTBANKS	$205,000	$205,000	$205,000	$0	$0
315	3000	CABLE	$647,000	$647,000	$647,000	$0	$0
315	4000	ELECTRICAL EQUIPMENT	$843,400	$843,400	$843,400	$0	$0
315	5000	RELAYS & INSTRUMENT PANELS	$285,000	$285,000	$285,000	$0	$0
315	6000	INSTRUMENTATION AND CONTROLS	$461,200	$461,200	$461,200	$0	$0
315	8000	GROUNDING	$96,200	$96,200	$96,200	$0	$0
MISCELLANEOUS POWER PLANT							
316	1000	INSTRUMENT & SERVICE AIR SYSTEMS	$283,500	$283,500	$283,500	$0	$0
316	1010	PIPE SUPPORTS	$246,200	$246,200	$246,200	$0	$0
316	1020	PAINT PIPE / TURBINE BLDG	$310,000	$310,000	$310,000	$0	$0
316	3000	FIRE PROTECTION SYSTEM	$150,000	$150,000	$150,000	$0	$0
316	4000	BRIDGE CRANE (30 TN 40 SP)	$194,500	$194,500	$194,500	$0	$0
TRANSMISSION PLANT (SWITCHYARD)							
STRUCTURES AND IMPROVEMENTS							
352	2020	SWITCHYARD CONDUIT – ALL SIZES	$19,000	$19,000	$19,000	$0	$0
352	2021	SWITCHYARD DUCTBANK	$52,000	$52,000	$52,000	$0	$0
352	3000	SWITCHYARD WIRE & CABLE	$26,000	$26,000	$26,000	$0	$0
352	1000	SWITCHYARD STRUCTURES / FDTNS	$61,100	$61,100	$61,100	$0	$0
352	4000	SWITCHYARD STRUCTURES	$73,600	$73,600	$73,600	$0	$0
352	8000	GROUNDING & CONNECTIONS	$23,700	$23,700	$23,700	$0	$0
STATION EQUIPMENT							
353	1010	TRANSFORMER PADS	$35,700	$35,700	$35,700	$0	$0
353	1030	MAIN XMFR 33.3 MVA	$491,000	$491,000	$491,000	$0	$0
353	2031	69 KV BREAKERS (3)	$123,300	$123,300	$123,300	$0	$0
353		CONTROL & RELAY PANELS	$157,000	$157,000	$157,000	$0	$0
353	2032	69 KV DISCONNECT SWITCHES	$46,300	$46,300	$46,300	$0	$0
353	4110	YARD LIGHTING	$7,000	$7,000	$7,000	$0	$0
DISTRIBUTABLES							
400	1000	MOBILIZATION & DEMOB	$798,000	$798,000	$798,000	$0	$0
INDIRECTS							
410	2100	CONTRACTED ENGINEERING	$2,450,000	$2,450,000	$2,450,000	$0	$0
410	2200	CONSTRUCTION MANAGEMENT	$1,223,000	$1,223,000	$1,223,000	$0	$0
410	2300	START-UP SERVICES	$790,000	$790,000	$790,000	$0	$0
410	6000	INTEREST DURING CONST (not included)	$0	$0	$0	$0	$0
410	6000	OWNERS COST (not included)	$0	$0	$0	$0	$0
SUBTOTAL – DTCC #3 – ST#3			$34,448,400	$34,463,400	$34,448,400	($15,000)	$0

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #3 – CT#6

ACCT NO		DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTIONS PLANT (COMB TURBINES)							
STRUCTURES AND IMPROVEMENTS							
341	1000	SITE PREPARATION	$80,000	$80,000	$80,000	$0	$0
341	3000	PLANT DRAINAGE	$61,600	$61,600	$61,600	$0	$0
341	5400	FACILITIES	$604,000	$604,000	$604,000	$0	$0
341	5500	WATER TREATMENT & STORAGE	$538,300	$538,300	$538,300	$0	$0
341	9000	YARD LIGHTING	$33,600	$33,600	$33,600	$0	$0
FUEL HOLDERS, PRODUCERS & ACCESSORIES							
342	2010	TANK FOUNDATIONS	$50,000	$50,000	$50,000	$0	$0
342	2020	TANKS	$807,000	$807,000	$807,000	$0	$0
342	2050	FUEL PIPING	$59,000	$59,000	$59,000	$0	$0
342	2060	FUEL VALVES	$15,800	$15,800	$15,800	$0	$0
342	2060	FUEL CONDITIONERS	$77,200	$77,200	$77,200	$0	$0
PRIME MOVERS							
343	1010	COMBUSTION TURBINE FOUNDATION	$200,000	$200,000	$200,000	$0	$0
343	1030	COMBUSTION TURBINE	$11,821,600	$11,821,600	$11,821,600	$0	$0
343	1040	PIPE RACK & FOUNDATIONS	$137,300	$137,300	$137,300	$0	$0
343	1090	EXHAUST DUCTWORK	$835,800	$835,800	$835,800	$0	$0
343	2030	CONT EMISSIONS MONITORING SYS	$229,600	$229,600	$229,600	$0	$0
343	6000	LUBE OIL SYSTEM	$12,000	$12,000	$12,000	$0	$0
343	8000	PLATFORMS	$15,700	$15,700	$15,700	$0	$0
ACCESSORY ELECTRICAL EQUIPMENT							
345	2020	RACEWAYS	$161,000	$161,000	$161,000	$0	$0
345	2021	DUCTBANKS	$205,000	$205,000	$205,000	$0	$0
345	3000	CABLE	$505,700	$505,700	$505,700	$0	$0
345	4000	ELECTRICAL EQUIPMENT	$663,200	$663,200	$663,200	$0	$0
345	5000	RELAY & INSTRUMENT PANELS	$840,200	$840,200	$840,200	$0	$0
345	6000	INSTRUMENTATION & CONTROLS	$138,900	$138,900	$138,900	$0	$0
345	8000	GROUNDING	$86,100	$86,100	$86,100	$0	$0
MISCELLANEOUS POWER PLANT EQUIPMENT							
346	1000	COMPRESSED AIR SYSTEM	$77,400	$77,400	$77,400	$0	$0
346	1010	PIPE SUPPORTS	$156,400	$156,400	$156,400	$0	$0
TRANSMISSION PLANT (SWITCHYARD)							
STRUCTURES AND IMPROVEMENTS							
352	1000	SITE PREPARATION					
352	1000	SWITCHYARD FOUNDATION	$70,000	$70,000	$70,000	$0	$0
352	2020	SWITCHYARD CONDUIT – ALL SIZES	$19,000	$19,000	$19,000	$0	$0
352	2021	SWITCHYARD DUCTBANK	$52,000	$52,000	$52,000	$0	$0
352	3000	SWITCHYARD WIRE & CABLE	$26,000	$26,000	$26,000	$0	$0
352	4000	SWITCHYARD STRUCTURES	$80,000	$80,000	$80,000	$0	$0
352	8000	GROUNDING & CONNECTIONS	$22,300	$22,300	$22,300	$0	$0
STATION EQUIPMENT							
353	1010	TRANSFORMER PADS	$35,700	$35,700	$35,700	$0	$0
353	1030	MAIN XMFR 33.3 MVA	$491,000	$491,000	$491,000	$0	$0
353	2031	69 KV BREAKER (3)	$123,300	$123,300	$123,300	$0	$0
353		CONTROL & RELAY PANELS	$157,000	$157,000	$157,000	$0	$0
353	2032	69 KV DISCONNECT SWITCHES	$44,900	$44,900	$44,900	$0	$0
353	4110	YARD LIGHTING	$7,000	$7,000	$7,000	$0	$0
DISTRIBUTABLES							
400	1000	MOBILIZATION & DEMOBILIZATION	$381,200	$381,200	$381,200	$0	$0
INDIRECTS							
410	2100	CONTRACTED ENGINEERING	$1,188,000	$1,188,000	$1,188,000	$0	$0
410	2200	CONSTRUCTION MANAGEMENT/SUPPORT	$508,000	$508,000	$508,000	$0	$0
410	2300	START-UP SERVICES	$259,800	$259,800	$259,800	$0	$0
410	6000	INTEREST DURING CONST (not included)	$0	$0	$0	$0	$0
410	8000	OWNERS COST (not included)	$0	$0	$0	$0	$0
SUBTOTAL – DTCC #3 – CT#6			$21,877,600	$21,877,600	$21,877,600	$0	$0
TOTAL ESTIMATE – DTCC #3			$92,923,100	$94,520,600	$98,313,800	($1,597,500)	($3,390,700)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #3 – CT#5

ACCT NO	DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTION PLANT						
341	STRUCTURES AND IMPROVEMENTS	$8,004,100	$8,004,100	$10,939,800	$0	($2,935,700)
342	FUEL HOLDERS, PRODUCERS & ACCESSORIES	$1,316,700	$1,316,700	$1,316,700	$0	$0
343	PRIME MOVERS	$14,537,100	$14,937,100	$14,937,100	($400,000)	($400,000)
345	ACCESSORY ELECTRICAL EQUIPMENT	$4,081,600	$4,081,600	$4,081,600	$0	$0
346	MISCELLANEOUS POWER PLANT EQUIPMENT	$772,400	$772,400	$772,400	$0	$0
352	TRANSMISSION PLANT (SWITCHYARD) STRUCTURES AND IMPROVEMENTS	$658,800	$658,800	$658,800	$0	$0
353	STATION EQUIPMENT	$929,800	$2,112,300	$984,800	($1,182,500)	($55,000)
400	DISTRIBUTABLES	$653,600	$653,600	$653,600	$0	$0
410	INDIRECTS	$5,643,000	$5,643,000	$5,643,000	$0	$0
SUBTOTAL – DTCC #3 – CT#5		$36,597,100	$38,179,600	$39,987,800	($1,582,500)	($3,390,700)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #3 – ST#3

ACCT NO	DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
STEAM PRODUCTION PLANT						
311	STRUCTURES AND IMPROVEMENTS	$2,255,800	$2,270,800	$2,255,800	($15,000)	$0
312	BOILER PLANT EQUIPMENT	$7,009,400	$7,009,400	$7,009,400	$0	$0
314	TURBINE GENERATOR UNIT	$14,745,500	$14,745,500	$14,745,500	$0	$0
315	ACCESSORY ELECTRICAL EQUIPMENT	$2,876,800	$2,876,800	$2,876,800	$0	$0
316	MISCELLANEOUS POWER PLANT	$1,184,200	$1,184,200	$1,184,200	$0	$0
352	TRANSMISSION PLANT (SWITCHYARD) STRUCTURES AND IMPROVEMENTS	$255,400	$255,400	$255,400	$0	$0
353	STATION EQUIPMENT	$860,300	$860,300	$860,300	$0	$0
400	DISTRIBUTABLES	$798,000	$798,000	$798,000	$0	$0
410	INDIRECTS	$4,463,000	$4,463,000	$4,463,000	$0	$0
SUBTOTAL – DTCC #3 – ST#3		$34,448,400	$34,463,400	$34,448,400	($15,000)	$0

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #3 – CT#6

ACCT NO	DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTION PLANT (COMB TURBINES)						
341	STRUCTURES AND IMPROVEMENTS	$1,317,500	$1,317,500	$1,317,500	$0	$0
342	FUEL HOLDERS, PRODUCERS & ACCESSORIES	$1,009,000	$1,009,000	$1,009,000	$0	$0
343	PRIME MOVERS	$13,252,000	$13,252,000	$13,252,000	$0	$0
345	ACCESSORY ELECTRICAL EQUIPMENT	$2,600,100	$2,600,100	$2,600,100	$0	$0
346	MISCELLANEOUS POWER PLANT EQUIPMENT	$233,800	$233,800	$233,800	$0	$0
352	TRANSMISSION PLANT (SWITCHYARD) STRUCTURES AND IMPROVEMENTS	$269,300	$269,300	$269,300	$0	$0
353	STATION EQUIPMENT	$858,900	$858,900	$858,900	$0	$0
400	DISTRIBUTABLES	$381,200	$381,200	$381,200	$0	$0
410	INDIRECTS	$1,955,800	$1,955,800	$1,955,800	$0	$0
SUBTOTAL – DTCC #3 – CT#6		$21,877,600	$21,877,600	$21,877,600	$0	$0
TOTAL ESTIMATE – DTCC #3		$92,923,100	$94,520,600	$96,313,800	($1,597,500)	($3,390,700)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #4 – CT#7

ACCT NO		DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTION PLANT							
STRUCTURES & IMPROVEMENTS							
341	1000	SITE PREPARATION	$373,800	$373,800	$373,800	$0	$0
341	2000	LANDSCAPING	$10,000	$10,000	$10,000	$0	$0
341	3000	PLANT/EQUIPMENT DRAINAGE	$553,000	$553,000	$553,000	$0	$0
341	5400	FACILITIES	$1,360,000	$1,360,000	$1,360,000	$0	$0
341	5500	WATER TREATMENT & STORAGE	$2,665,700	$2,665,700	$5,982,900	$0	($3,317,200)
341	6200	INJECTION WELLS	$475,000	$475,000	$93,500	$0	$381,500
341	6300	SUPPLY WELLS/WATER	$435,200	$435,200	$435,200	$0	$0
FUEL HOLDERS, PRODUCERS & ACCESSORIES, FOUNDATIONS							
342	2010	TANK FOUNDATIONS	$140,000	$140,000	$140,000	$0	$0
342	2020	TANKS	$730,000	$730,000	$730,000	$0	$0
342	2050	PIPING	$204,000	$204,000	$204,000	$0	$0
342	2060	VALVES	$52,500	$52,500	$52,500	$0	$0
342	2070	CONDITIONERS	$80,500	$80,500	$80,500	$0	$0
PRIME MOVERS							
343	1010	COMBUSTION TURBINE FOUNDATION	$200,000	$200,000	$200,000	$0	$0
343	1030	COMBUSTION TURBINE	$11,777,600	$11,777,600	$11,777,600	$0	$0
343	1040	PIPE RACK & FOUNDATIONS	$150,000	$150,000	$150,000	$0	$0
343	1090	EXHAUST DUCTWORK	$894,700	$894,700	$894,700	$0	$0
343	2010	STACK FOUNDATION	$100,000	$100,000	$100,000	$0	$0
343	2030	STACK	$1,387,000	$1,787,000	$1,787,000	($400,000)	($400,000)
343	6000	LUBE OIL SYSTEM	$12,100	$12,100	$12,100	$0	$0
343	8000	PLATFORMS	$15,700	$15,700	$15,700	$0	$0
ACCESSORY ELECTRICAL EQUIPMENT							
345	2020	RACEWAYS	$541,000	$541,000	$541,000	$0	$0
345	2021	DUCTBANKS	$405,000	$405,000	$405,000	$0	$0
345	3000	CABLE	$627,000	$627,000	$627,000	$0	$0
345	4000	ELECTRICAL EQUIPMENT	$1,023,400	$1,023,400	$1,023,400	$0	$0
345	5000	RELAYS & INSTRUMENT PANELS	$840,200	$840,200	$840,200	$0	$0
345	6000	INSTRUMENTATION & CONTROLS	$290,600	$290,600	$290,600	$0	$0
345	8000	GROUNDING	$176,900	$176,900	$176,900	$0	$0
345	9000	YARD LIGHTING	$50,000	$50,000	$50,000	$0	$0
MISCELLANEOUS POWER PLANT EQUIPMENT							
346	1000	INSTRUMENT & SERVICE AIR SYSTEMS	$421,000	$421,000	$421,000	$0	$0
346	1010	PIPE SUPPORTS	$152,400	$152,400	$152,400	$0	$0
346	3000	FIRE PROTECTION SYSTEM	$154,000	$154,000	$154,000	$0	$0
TRANSMISSION PLANT (SWITCHYARD)							
STRUCTURES AND IMPROVEMENTS							
352	1000	SWITCHYARD FND. & CTRL. HOUSE	$200,000	$200,000	$200,000	$0	$0
352	2020	SWITCHYARD CONDUIT – ALL SIZES	$19,000	$19,000	$19,000	$0	$0
352	2021	SWITCHYARD DUCTBANK	$52,000	$52,000	$52,000	$0	$0
352	3000	SWITCHYARD WIRE & CABLE	$26,300	$26,300	$26,300	$0	$0
352	4000	SWITCHYARD STRUCTURES	$100,000	$100,000	$100,000	$0	$0
352	8000	GROUNDING & CONNECTIONS	$24,500	$24,500	$24,500	$0	$0
STATION EQUIPMENT							
353	1010	TRANSFORMER PADS	$50,000	$50,000	$50,000	$0	$0
353	1030	MAIN XFMR – 33.3 MVA	$491,000	$491,000	$491,000	$0	$0
353	2031	69 KV BREAKER (3)	$123,300	$123,300	$123,300	$0	$0
353		CONTROL & RELAY PANELS	$157,000	$157,000	$157,000	$0	$0
353	2032	DISCONNECT SWITCHES	$46,500	$46,500	$46,500	$0	$0
353	4110	YARD LIGHTING	$7,000	$7,000	$7,000	$0	$0
353	5000	PLANT ACCESS SECURITY	$80,000	$80,000	$80,000	$0	$0
DISTRIBUTABLES							
400	9000	MOBILIZATION/DEMOBILIZATION	$653,600	$653,600	$653,600	$0	$0
INDIRECTS							
410	2100	CONTRACTED ENGINEERING	$4,020,000	$4,020,000	$4,020,000	$0	$0
410	2200	CONSTRUCTION MGMT/SUPPORT	$1,080,000	$1,080,000	$1,080,000	$0	$0
410	2300	START–UP SERVICES	$543,000	$543,000	$543,000	$0	$0
410	6000	INTEREST DURING CONST (not included)	$0	$0	$0	$0	$0
410	8000	OWNERS COST (not included)	$0	$0	$0	$0	$0
SUBTOTAL – DTCC #4 – CT#7			$33,971,500	$34,371,500	$37,307,200	($400,000)	($3,335,700)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #4 – ST#4

ACCT NO		DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
STEAM PRODUCTION PLANT							
STRUCTURES AND IMPROVEMENTS							
311	1000	SITE PREPARATION	$200,000	$200,000	$200,000	$0	$0
311	3000	PLANT DRAINAGE	$61,800	$61,800	$61,800	$0	$0
311	5400	FACILITIES	$1,906,000	$1,906,000	$1,906,000	$0	$0
311	9000	YARD LIGHTING	$35,000	$35,000	$35,000	$0	$0
BOILER PLANT EQUIPMENT							
312	1010	HRSG FOUNDATIONS	$200,000	$200,000	$200,000	$0	$0
312	1030	HRSG	$5,966,200	$5,966,200	$5,966,200	$0	$0
312	2000	BOILER FEED WATER SYSTEM	$843,200	$843,200	$843,200	$0	$0
TURBINE GENERATOR UNIT							
314	1010	STEAM TURBINE FOUNDATION	$350,000	$350,000	$350,000	$0	$0
314	1030	STEAM TURBINE / GENERATOR	$5,629,000	$5,629,000	$5,629,000	$0	$0
314	1040	PIPE RACKS & FOUNDATIONS	$220,000	$220,000	$220,000	$0	$0
314	2000	CRITICAL PIPING SYSTEM	$906,000	$906,000	$906,000	$0	$0
314	3200	SAMPLING SYSTEM	$426,800	$426,800	$426,800	$0	$0
314	4000	CONDENSATE PIPING SYSTEM	$682,300	$682,300	$682,300	$0	$0
314	5010	CONDENSER FOUNDATION	$400,000	$400,000	$400,000	$0	$0
314	5020	AIR COOLED CONDENSER	$5,771,600	$5,771,600	$5,771,600	$0	$0
314	6000	STEAM TURBINE LUBE OIL SYSTEM	$89,200	$89,200	$89,200	$0	$0
314	8000	PLATFORMS	$15,700	$15,700	$15,700	$0	$0
314	9000	CONDENSER PIPE SUPPORTS	$101,900	$101,900	$101,900	$0	$0
ACCESSORY ELECTRICAL EQUIPMENT							
315	2020	RACEWAYS	$339,000	$339,000	$339,000	$0	$0
315	2021	DUCTBANKS	$205,000	$205,000	$205,000	$0	$0
315	3000	CABLE	$647,000	$647,000	$647,000	$0	$0
315	4000	ELECTRICAL EQUIPMENT	$843,400	$843,400	$843,400	$0	$0
315	5000	RELAYS & INSTRUMENT PANELS	$285,000	$285,000	$285,000	$0	$0
315	6000	INSTRUMENTATION AND CONTROLS	$461,200	$461,200	$461,200	$0	$0
315	8000	GROUNDING	$96,200	$96,200	$96,200	$0	$0
MISCELLANEOUS POWER PLANT							
316	1000	INSTRUMENT & SERVICE AIR SYSTEMS	$283,500	$283,500	$283,500	$0	$0
316	1010	PIPE SUPPORTS	$246,200	$246,200	$246,200	$0	$0
316	1020	PAINT PIPE / TURBINE BLDG	$100,000	$100,000	$100,000	$0	$0
316	3000	FIRE PROTECTION SYSTEM	$46,000	$46,000	$46,000	$0	$0
TRANSMISSION PLANT (SWITCHYARD)							
STRUCTURES AND IMPROVEMENTS							
352	2020	SWITCHYARD CONDUIT – ALL SIZES	$19,000	$19,000	$19,000	$0	$0
352	2021	SWITCHYARD DUCTBANK	$52,000	$52,000	$52,000	$0	$0
352	3000	SWITCHYARD WIRE & CABLE	$26,000	$26,000	$26,000	$0	$0
352	1000	SWITCHYARD STRUCTURES / FDTNS	$61,100	$61,100	$61,100	$0	$0
352	4000	SWITCHYARD STRUCTURES	$73,600	$73,600	$73,600	$0	$0
352	8000	GROUNDING & CONNECTIONS	$23,700	$23,700	$23,700	$0	$0
STATION EQUIPMENT							
353	1010	TRANSFORMER PADS	$35,700	$35,700	$35,700	$0	$0
353	1030	MAIN XMFR 33.3 MVA	$491,000	$491,000	$491,000	$0	$0
353	2031	69 KV BREAKERS (3)	$123,300	$123,300	$123,300	$0	$0
353		CONTROL & RELAY PANELS	$157,000	$157,000	$157,000	$0	$0
353	2032	69 KV DISCONNECT SWITCHES	$46,300	$46,300	$46,300	$0	$0
353	4110	YARD LIGHTING	$7,000	$7,000	$7,000	$0	$0
DISTRIBUTABLES							
400	1000	MOBILIZATION & DEMOB	$798,000	$798,000	$798,000	$0	$0
INDIRECTS							
410	2100	CONTRACTED ENGINEERING	$2,450,000	$2,450,000	$2,450,000	$0	$0
410	2200	CONSTRUCTION MANAGEMENT	$1,223,000	$1,223,000	$1,223,000	$0	$0
410	2300	START-UP SERVICES	$790,000	$790,000	$790,000	$0	$0
410	6000	INTEREST DURING CONST (not included)	$0	$0	$0	$0	$0
410	6000	OWNERS COST (not included)	$0	$0	$0	$0	$0
SUBTOTAL – DTCC #4 – ST#4			$33,733,900	$33,733,900	$33,733,900	$0	$0

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #4 – CT#8

ACCT NO		DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTIONS PLANT (COMB TURBINES)							
STRUCTURES AND IMPROVEMENTS							
341	1000	SITE PREPARATION	$80,000	$80,000	$80,000	$0	$0
341	3000	PLANT DRAINAGE	$61,600	$61,600	$61,600	$0	$0
341	5400	FACILITIES	$604,000	$604,000	$604,000	$0	$0
341	5500	WATER TREATMENT & STORAGE	$538,300	$538,300	$538,300	$0	$0
341	9000	YARD LIGHTING	$33,600	$33,600	$33,600	$0	$0
FUEL HOLDERS, PRODUCERS & ACCESSORIES							
342	2010	TANK FOUNDATIONS	$50,000	$50,000	$50,000	$0	$0
342	2020	TANKS	$807,000	$807,000	$807,000	$0	$0
342	2050	FUEL PIPING	$59,000	$59,000	$59,000	$0	$0
342	2060	FUEL VALVES	$15,800	$15,800	$15,800	$0	$0
342	2060	FUEL CONDITIONERS	$77,200	$77,200	$77,200	$0	$0
PRIME MOVERS							
343	1010	COMBUSTION TURBINE FOUNDATION	$200,000	$200,000	$200,000	$0	$0
343	1030	COMBUSTION TURBINE	$11,821,600	$11,821,600	$11,821,600	$0	$0
343	1040	PIPE RACK & FOUNDATIONS	$137,300	$137,300	$137,300	$0	$0
343	1090	EXHAUST DUCTWORK	$835,800	$835,800	$835,800	$0	$0
343	2030	CONT EMISSIONS MONITORING SYS	$229,600	$229,600	$229,600	$0	$0
343	6000	LUBE OIL SYSTEM	$12,000	$12,000	$12,000	$0	$0
343	8000	PLATFORMS	$15,700	$15,700	$15,700	$0	$0
ACCESSORY ELECTRICAL EQUIPMENT							
345	2020	RACEWAYS	$161,000	$161,000	$161,000	$0	$0
345	2021	DUCTBANKS	$205,000	$205,000	$205,000	$0	$0
345	3000	CABLE	$505,700	$505,700	$505,700	$0	$0
345	4000	ELECTRICAL EQUIPMENT	$663,200	$663,200	$663,200	$0	$0
345	5000	RELAY & INSTRUMENT PANELS	$840,200	$840,200	$840,200	$0	$0
345	6000	INSTRUMENTATION & CONTROLS	$138,900	$138,900	$138,900	$0	$0
345	8000	GROUNDING	$86,100	$86,100	$86,100	$0	$0
MISCELLANEOUS POWER PLANT EQUIPMENT							
346	1000	COMPRESSED AIR SYSTEM	$77,400	$77,400	$77,400	$0	$0
346	1010	PIPE SUPPORTS	$156,400	$156,400	$156,400	$0	$0
TRANSMISSION PLANT (SWITCHYARD)							
STRUCTURES AND IMPROVEMENTS							
352	1000	SITE PREPARATION					
352	1000	SWITCHYARD FOUNDATION	$70,000	$70,000	$70,000	$0	$0
352	2020	SWITCHYARD CONDUIT – ALL SIZES	$19,000	$19,000	$19,000	$0	$0
352	2021	SWITCHYARD DUCTBANK	$52,000	$52,000	$52,000	$0	$0
352	3000	SWITCHYARD WIRE & CABLE	$26,000	$26,000	$26,000	$0	$0
352	4000	SWITCHYARD STRUCTURES	$80,000	$80,000	$80,000	$0	$0
352	8000	GROUNDING & CONNECTIONS	$22,300	$22,300	$22,300	$0	$0
STATION EQUIPMENT							
353	1010	TRANSFORMER PADS	$35,700	$35,700	$35,700	$0	$0
353	1030	MAIN XMFR 33.3 MVA	$491,000	$491,000	$491,000	$0	$0
353	2031	69 KV BREAKER (3)	$123,300	$123,300	$123,300	$0	$0
353		CONTROL & RELAY PANELS	$157,000	$157,000	$157,000	$0	$0
353	2032	69 KV DISCONNECT SWITCHES	$44,900	$44,900	$44,900	$0	$0
353	4110	YARD LIGHTING	$7,000	$7,000	$7,000	$0	$0
DISTRIBUTABLES							
400	1000	MOBILIZATION & DEMOBILIZATION	$381,200	$381,200	$381,200	$0	$0
INDIRECTS							
410	2100	CONTRACTED ENGINEERING	$1,180,000	$1,180,000	$1,180,000	$0	$0
410	2200	CONSTRUCTION MANAGEMENT/SUPPORT	$508,000	$508,000	$508,000	$0	$0
410	2300	START–UP SERVICES	$259,800	$259,800	$259,800	$0	$0
410	6000	INTEREST DURING CONST (not included)	$0	$0	$0	$0	$0
410	8000	OWNERS COST (not included)	$0	$0	$0	$0	$0
SUBTOTAL – DTCC #4 – CT#8			$21,869,600	$21,869,600	$21,869,600	$0	$0
TOTAL ESTIMATE – DTCC #4			$89,575,000	$89,975,000	$92,910,700	($400,000)	($3,335,700)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #4 – CT#7

ACCT NO	DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTION PLANT						
341	STRUCTURES AND IMPROVEMENTS	$5,872,700	$5,872,700	$8,808,400	$0	($2,935,700)
342	FUEL HOLDERS, PRODUCERS & ACCESSORIES	$1,207,000	$1,207,000	$1,207,000	$0	$0
343	PRIME MOVERS	$14,537,100	$14,937,100	$14,937,100	($400,000)	($400,000)
345	ACCESSORY ELECTRICAL EQUIPMENT	$3,954,100	$3,954,100	$3,954,100	$0	$0
346	MISCELLANEOUS POWER PLANT EQUIPMENT	$727,400	$727,400	$727,400	$0	$0
352	TRANSMISSION PLANT (SWITCHYARD) STRUCTURES AND IMPROVEMENTS	$421,800	$421,800	$421,800	$0	$0
353	STATION EQUIPMENT	$954,800	$954,800	$954,800	$0	$0
400	DISTRIBUTABLES	$653,600	$653,600	$653,600	$0	$0
410	INDIRECTS	$5,643,000	$5,643,000	$5,643,000	$0	$0
SUBTOTAL – DTCC #4 – CT#7		$33,971,500	$34,371,500	$37,307,200	($400,000)	($3,335,700)

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #4 – ST#4

ACCT NO	DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
STEAM PRODUCTION PLANT						
311	STRUCTURES AND IMPROVEMENTS	$2,202,800	$2,202,800	$2,202,800	$0	$0
312	BOILER PLANT EQUIPMENT	$7,009,400	$7,009,400	$7,009,400	$0	$0
314	TURBINE GENERATOR UNIT	$14,592,500	$14,592,500	$14,592,500	$0	$0
315	ACCESSORY ELECTRICAL EQUIPMENT	$2,876,800	$2,876,800	$2,876,800	$0	$0
316	MISCELLANEOUS POWER PLANT	$675,700	$675,700	$675,700	$0	$0
352	TRANSMISSION PLANT (SWITCHYARD) STRUCTURES AND IMPROVEMENTS	$255,400	$255,400	$255,400	$0	$0
353	STATION EQUIPMENT	$860,300	$860,300	$860,300	$0	$0
400	DISTRIBUTABLES	$798,000	$798,000	$798,000	$0	$0
410	INDIRECTS	$4,463,000	$4,463,000	$4,463,000	$0	$0
SUBTOTAL – DTCC #4 – ST#4		$33,733,900	$33,733,900	$33,733,900	$0	$0

MAUI ELECTRIC COMPANY
ORDER OF MAGNITUDE ESTIMATE – DRAFT
DTCC #4 – CT#8

ACCT NO	DESCRIPTION	"A2" SITE TOTAL ESTIMATE	"C3" SITE TOTAL ESTIMATE	"D1" SITE TOTAL ESTIMATE	A2 – C3 VARIANCE	A2 – D1 VARIANCE
OTHER PRODUCTION PLANT (COMB TURBINES)						
341	STRUCTURES AND IMPROVEMENTS	$1,317,500	$1,317,500	$1,317,500	$0	$0
342	FUEL HOLDERS, PRODUCERS & ACCESSORIES	$1,009,000	$1,009,000	$1,009,000	$0	$0
343	PRIME MOVERS	$13,252,000	$13,252,000	$13,252,000	$0	$0
345	ACCESSORY ELECTRICAL EQUIPMENT	$2,600,100	$2,600,100	$2,600,100	$0	$0
346	MISCELLANEOUS POWER PLANT EQUIPMENT	$233,800	$233,800	$233,800	$0	$0
352	TRANSMISSION PLANT (SWITCHYARD) STRUCTURES AND IMPROVEMENTS	$269,300	$269,300	$269,300	$0	$0
353	STATION EQUIPMENT	$858,900	$858,900	$858,900	$0	$0
400	DISTRIBUTABLES	$381,200	$381,200	$381,200	$0	$0
410	INDIRECTS	$1,947,800	$1,947,800	$1,947,800	$0	$0
SUBTOTAL – DTCC #4 – CT#8		$21,869,600	$21,869,600	$21,869,600	$0	$0
TOTAL ESTIMATE – DTCC #4		$89,575,000	$89,975,000	$92,910,700	($400,000)	($3,335,700)
GRAND TOTAL – DTCC #1 THRU DTCC #4		$379,976,300	$384,358,900	$393,704,400	($4,382,600)	($13,728,100)

APPENDIX D

LIST OF MAJOR EQUIPMENT COMPONENTS WITH SYSTEM DESCRIPTIONS AND CAPACITIES COVERED BY THE CAPITAL COST ESTIMATE

LIST OF MAJOR EQUIPMENT COMPONENTS WITH SYSTEM DESCRIPTIONS FOR FOUR DTCC SYSTEMS

COMBUSTION TURBINE GENERATOR

Eight, 22-25 MW size range combustion turbine-generators fired with No. 2 diesel fuel. Turbine generator will be a packaged system complete with turbine control, excitation, fire protection, lube oil, fuel control, and NO_x water control systems.

HEAT RECOVERY STEAM GENERATORS

Eight dual pressure HRSGs, one per combustion turbine, each producing 75,000 lb/hr, 615 psia, 800°F high pressure steam and 5000 lb/hr, 30 psia sat. low pressure steam. HRSGs will convert the condensate and feedwater to steam utilizing waste heat from the combustion turbines.

STEAM TURBINE GENERATOR

Four 16-18 MW size range condensing steam turbines, one per DTCC. Steam turbine will utilize HP and LP steam from HRSG to drive electric generator. Turbine-generator will be a packaged system complete with turbine control system, excitation, lube oil, control oil, and gland steam systems.

EXHAUST STACK

Four, 150 foot to 210 foot-high, 24 foot-diameter exhaust stacks made of carbon steel, one per DTCC. The stack will contain two 8 foot-diameter stainless steel flues, one for each of the combustion turbines.

AIR COOLED CONDENSER

Four air-cooled condensers, one air-cooled condenser per steam turbine, which recover and condense steam exhausted from the steam turbine. Each condenser will be air-cooled type, eliminating the need for a cooling tower and circulating water system.

HRSG FEED PUMPS

Sixteen, 100 hundred percent capacity feedwater pumps, two per HRSG, each 225 gpm at 2000 feet total head. Pumps transfer water from the HRSG LP section to the HRSG economizer and HP section.

CONDENSATE PUMPS

Eight, 100 hundred percent capacity pumps, two per air-cooled condenser, each rated at 250 gpm, at 250 feet total head. Condensate pumps transfer water from air-cooled condenser condensate collection tank to deaerator and HRSG LP section.

SUPPLY WELL PUMPS

Water required for power plant operation at each site will be pumped from the brackish water aquifer. Submersible deep well pumps will transfer well water to brackish water storage tanks at a rate of approximately 225 gpm each. Each pump will operate at a depth of approximately 200 feet.

FIRE PUMPS

In order to provide the required fire protection for the site, three fire pumps will be needed. A motor driven pump will serve as the primary fire protection pump, while a diesel driven pump will serve as a backup. Each of these will be rated at 2000 gpm and 125 psig. In addition, a jockey pump will maintain pressure in the plant fire water loop and will be rated at 35 gpm and 130 psig.

MISCELLANEOUS PUMPS

Miscellaneous pumps required to operate the plant include those needed to transfer fuel, brackish water, demineralized water, wastewater, and condensate. These pumps are listed below, with estimated flowrate and pressure requirements.

Four, 100 percent capacity Fuel Transfer pumps rated 400 gpm at 100 ft head

Four, 100 percent capacity Fuel Unloading pumps rated 450 gpm at 100 ft head

Eight, 100 percent capacity Brackish water transfer pumps rated 240 gpm at 200 ft total head, four operating continuously

Eight, 100 percent capacity Demineralized water transfer pumps rated 300 gpm at 300 ft total head

Eight, 100 percent capacity water treatment area sump pumps rated 150 gpm at 150 ft total head

Four, 100 percent Effluent transfer pumps rated 200 gpm at 150 total head; two pumps per oil/water separator

Eight, 100 percent capacity Wastewater reinjection pumps rated 250 gpm at 150 ft total head

Eight, 100 percent capacity Neutralization transfer pumps rated 150 gpm at 150 total head

Eight, 100 percent capacity Solid settling Basin transfer pumps

Eight, 100 percent capacity Turbine Drain pumps rated 50 gpm at 100 ft total head

Two Condensate Transfer pumps rated at 200 gpm at 200 ft total head

Miscellaneous building and pit sump pumps

AIR COMPRESSORS

Instrument air will be provided by five instrument air compressors, each of which will supply 75 SCFM of air at 125 psig. Plant service air will be provided by four service air compressors, each of which will supply 150 SCFM of air at 125 psig.

FUEL OIL CENTRIFUGES

Ten fuel oil centrifuges will receive fuel oil from fuel holding tanks and remove water sediments prior to transferring the fuel to fuel day tanks. Each centrifuge will be able to clean 30 gpm of fuel with eight operating continuously and two on standby.

STEEL TANKS

Storage of fuel, water, wastewater, and condensate at each site will be provided by the steel tanks listed below.

Two, 50 ft diameter by 36 ft high, 12,600 Bbl Fuel Tanks installed initially with the first combustion turbine

Seven, 80 ft diameter by 36 ft high, 32,200 Bbl Fuel Tanks, one per CTG

One, 20 ft diameter by 24 ft high Fuel Holding Tank providing 4 hours storage for fuel centrifuge suction

Four, 20 ft diameter by 36 ft high Brackish Water Storage Tank providing four hours storage each

Eight, 20 ft diameter by 36 ft high Demineralized Water Storage Tanks providing 2 days storage

Four, 16 ft diameter by 30 ft high Wastewater Reinjection Tanks

Eight, 12 ft diameter by 20 ft high Fuel Day Tanks each providing eight hours storage per combustion turbine

Two, 20 ft diameter by 24 ft high Condensate Storage Tanks

Two, 40 ft diameter by 32 ft high Fire Water Tanks providing 240,000 gallons each

FIBERGLASS TANKS

Fiberglass tanks will be used for neutralization of wastewater and for CT demineralized water storage as indicated below.

Four, 12 ft. diameter by 20 ft. high Neutralization Tanks

Eight, 12 ft diameter by 20 ft high Demineralized Water Day Tanks,each providing eight hours storage per combustion turbine.

BUILDING VENTILATION AND AIR CONDITIONING

Four, 60 ton AC units, one for each local control house

Two, 60 ton AC units for Main Control Room

Four, 4 ton AC units for CEMS room in stacks

Two, 50 ton AC units for Warehouse Offices

Two, 8 ton AC units for Water Treatment Labs

Two, 60 ton AC units for T&D Building Offices

Miscellaneous ventilation fans for buildings cooled with outside air

WATER TREATMENT EQUIPMENT

High purity water for use as boiler makeup and for combustion turbine injection will be produced by the demineralization systems. Each system will consist of reverse osmosis (RO) and ion exchange processes, and will be sized to produce 80 gpm of demineralized water. Four complete systems will be installed, one for each DTCC.

WASTE WATER TREATMENT SYSTEM

Injection wells will be used for disposal of wastewater at Sites A-2 and C-3, with a total of eight wells being installed at each site. The wastewater will be neutralized, and filtered through a 250 gpm filtration system prior to being reinjected.

Disposal of the wastewater in injection wells is not an option at the D-1 site, and a brine concentrator/crystallizer system is required. Wastewater will be evaporated, with only a small amount of dry solids left to be disposed of.

At each site, any wastewater that contains oil will first be processed through an oil/water separator prior to further treatment by either the filtration system of brine concentrator/crystallizer system.

EVAPORATOR (Site D-1 Only)

Wastewater will be processed through an evaporator system to eliminate the need to dispose of the wastewater in an injection well. The system will consist of a brine concentrator/evaporator which uses steam, to reduce the wastewater by approximately 95%, and at the same time, produce a clean water stream which will be recycled for plant use. The remaining wastewater, a concentrated brine solution, is then sent to a spray dryer or a crystallizer where the water is evaporated. The only remaining waste will be a small amount of dry solids, which will be disposed of in a landfill.

HRSG SAMPLING SYSTEM

Each combined cycle will have a dedicated sampling and conditioning system which will monitor steam and boiler water quality. The system will include analyzers for measuring pH, conductivity, dissolved oxygen, and sodium. The data will be monitored and recorded by the DCS.

HRSG CHEMICAL FEED SYSTEM

Each combined cycle will include boiler chemical feed system for conditioning the boiler feed water. The system will feed phosphate, amine, and oxygen scavenger chemicals to the boiler water in order to control pH, and minimize fouling and corrosion of the steam cycle equipment.

DISTRIBUTED CONTROL SYSTEM

The plant distributed control system (DCS) will be a microprocessor based system. The system will consist of color operator interface consoles, redundant processors, redundant data highway, I/O control cabinets, and Engineer's work station. The system will be capable of Sequence of Events detection, interfacing with major brands of Programmable Logic Controllers, alarm reporting, data archiving, digital/analog controlling and handling up to 5000 control tags.

CONTINUOUS EMISSIONS MONITORING SYSTEM

The Continuous Emissions Monitoring System (CEMS) will be a dilution extractive system which consists of dilution probes, transmissometer for the measurement of opacity, and gas analyzers which measure NO_X, CO, and diluent CO_2. The system also includes an IBM-compatible personal computer interconnected with the CEMS which serves as the Data Acquisition System (DAS) for data archiving, display of current emissions values, emissions report generation, and trending.

UNINTERRUPTIBLE POWER SYSTEM

The uninterruptible power system consists of two 100 percent 125Vdc and 120Vac systems. Each system includes one 125Vdc 8-hour rated battery, one 125Vdc battery charger, one 125Vdc-120Vac inverter, and a common 480V/120V single phase regulating transformer.

PROTECTIVE RELAY PANELS

The protective relay panels consist of protective devices which monitor and control the major electrical station equipment to avoid damage to the equipment or reduce the risk to personnel safety in case of an abnormal condition. The major components of the Protective Relay System consist of Generator Protective Relay Panels, a Transformer Zone Protective Relay Panel, and an Auxiliary Transformer Protective Relay Panel.

MAIN TRANSFORMER

Twelve main transformers, one per generator, which step up the voltage level of the generator from 13.8KV to the line voltage of 69KV for transmission to MECO's electrical grid. The transformer will be a three phase, oil/air cooled, 13.8KV/69KV with a dual rating of 20/33.3MVA.

AUXILIARY TRANSFORMER

Twelve auxiliary transformers, one per unit, which steps down the voltage level from 13.8KV to 480V and feeds the 480V switchgear plant auxiliary loads. The transformer will be a three phase, oil/air and forced air cooled, 480V/13.8KV, 2000KVA.

GENERATOR BREAKER

The generator breaker switchgear provides power switching capability between the generator and the main transformer. The switchgear will be an indoor metal-clad 15KV switchgear assembly to operate at a nominal 13.8KV, with vacuum breaker and bus rated 2000A continuous, 500MVA interrupting capability, and associated instrument transformers.

480 VOLT SWITCHGEAR

480V switchgear will feed the 480V auxiliary loads throughout the plant. The loads fed from the switchgear will consist of induction motors rated 100 hp and up to 200 hp, and motor control centers.

The switchgear will be rated at 600V, 3200A, NEMA 1 indoor construction. The switchgear consists of instrument compartment, 3200A main feed compartment, and 1600A breaker compartments. Power circuit breakers shall be three pole, single-throw, air break, electrically or manually operated draw out type.

The switchgear will also include a non-segregated phase bus rated at 600V, 3-phase, 3-wire, 60 Hz, 3000A continuous, 65KA RMS symmetrical short circuit current for 8 cycles, 2.2KV rated frequency withstand capability for 1 minute, self-cooled, with metal enclosure which connects the switchgear with the auxiliary transformer.

MOTOR CONTROL CENTERS

The 480V motor control centers (MCCs) supply power to all small 480V loads and motors up to 100 hp throughout the plant. Each load fed from the MCCs will have overcurrent protection provided by motor circuit protectors (MCP) consisting of the molded case breaker with instantaneous magnetic element for motor loads and thermal overload protection for non-motor loads. MCCs will be located throughout the plant.

69KV BREAKERS

The 69KV breakers located in the switchyard provides switching of power from the main transformer to the 69KV transmission lines. The breakers will be an outdoor type rated at 1200A, 69KV, 60 Hz, three pole, single throw, SF6 gas circuit breaker.

69KV DISCONNECT SWITCHES

Associated with the 69KV breakers located in the switchyard are the 69KV disconnect switches. Each breaker will have two three-pole disconnect switches which provide isolation of the breaker for maintenance purposes. The disconnect switches will be manually operated, single side break type rated at 1200A, 69KV, 350KV BIL, and momentary interrupting rating of up to 61KA. In addition, each pole of the disconnect switch will have a pair of porcelain insulators which isolate the switch from the support structure. These insulators will be rated at 69KV with a minimum creepage distance of 72 inches.

APPENDIX E

COUNTY, STATE, AND FEDERAL PERMITTING AND APPROVAL REQUIREMENTS AND ASSESSED LEVEL OF DIFFICULTY TO OBTAIN

COUNTY, STATE, AND FEDERAL PERMITTING AND APPROVAL REQUIREMENTS AND ASSESSED LEVEL OF DIFFICULTY TO OBTAIN

Table E-1 summarizes the significant county, state, and federal permitting and approval requirements that may be associated with the construction and operation of MECO's future generating facility. The table denotes the lead agency requiring the permit/approval, name of approval, the reason the approval is required, and the appropriate time frame necessary to prepare and allow the agency time to review and issue the permit/approval.
The sources of the permitting/approval information presented in the table are:

- Permitting activities for Mā'alaea Generating Units 17, 18, and 19
- Agency correspondence
- Permit Register, County of Maui Department of Public Works, June 1992
- Black & Veatch Regulatory Requirement Manual, June 1991

The level of difficulty to obtain each permit/approval is based upon the difficulty of obtaining permits for Mā'alaea Generating Units 17, 18, and 19 and the workloads of the lead agencies. The level of difficulty is set on a scale of 1 to 5, with the most difficult assigned the highest number.

Permitting and approval requirements that may be associated with the construction and operation of the transmission lines and fuel oil pipelines would mostly be associated with community concerns. Environmental permitting and approval requirements would vary in relation to the length of the line (total area disturbance) and location of the lines. For example, permitting the transmission line would probably not require an NPDES for discharge of storm water (disturbance of less than 5 acres) while the transmission line to Site C-3 might require the permit. The pipeline permitting requirements may, or may not require a Department of the Army Corps of Engineering permit to cross stream beds depending on the route chosen for the line. A list of potentially required permits and approvals follows:

Transmission Line

Change in Zoning
Community Plan Amendment
Project Master Plan Review
Development Plan Review
Permit to Perform Work Upon a State Highway Right-of-Way
Historic Site Review
NPDES, Storm Water Runoff from Construction
NPDES, Construction Dewatering
Environmental Assessment
Noise Variance
Rare and Endangered Species Review

Transmission Line (continued)

Building Permit
Grubbing Permit
Solid Waste Disposal
Corps of Engineers Section 404
Section 401 Water Quality Certification
Coastal Zone Management Consistency
Environmental Assessment/Chapter 343, Negative Declaration
Zoning Height Waiver
Construct Within FAA Air Space
Street Usage Permit

Pipeline

Change in Zoning
Community Plan Amendment
Project Master Plan Review
Development Plan Review
Permit to Perform Work Upon a State Highway Right-of-Way
Historic Site Review
NPDES, Storm Water Runoff from Construction
NPDES, Construction Dewatering
Environmental Assessment
Noise Variance
Rare and Endangered Species Review
Building Permit
Grubbing Permit
Solid Waste Disposal
Corps of Engineers Section 404
Section 401 Water Quality Certification
Coastal Zone Management Consistency
Chapter 343 Environmental Impact Statement
Compliance for SMA
Permit to Work Within City Right-of-Way
Development in Flood Hazard District

Table E-1
Permitting and Approval Requirements

Agency	Permit/Approval	Reason Required	Approximate Time Frame (Months)[1]	Level of Difficulty to Obtain[2]
County				
Maui County Planning Commission	Change In Zoning (CIZ)	Change zoning to M-2, Heavy Industrial. Requires Environmental Impact Statement (EIS), site plan, schedule, Community Plan Amendment, Project Master Plan, Development Plan, and major permit applications.	9-12	5
	Community Plan Amendment	Amend the Community Plan. Requires EIS.	3-6	2
	Project Master Plan Review	Prepare Master Plan for the facility. Can be reviewed concurrently with CIZ Permit Application.	6-9	4
	Development Plan Review	Specifies the use of land, the layout of the project's landscape, circulation, and buildings.	3-6	2
Maui County Department of Public Works	Building Permit	Construct facility.	3-6	1
	Grading and Grubbing Permit	Grading and grubbing.	1-3	1
	Administrative Height Waiver	Review of facility heights.	1-3	1

Table E-1. Permitting and Approval Requirements (Cont.)

Agency	Permit/Approval	Reason Required	Approximate Time Frame (Months)[1]	Level of Difficulty to Obtain[2]
Maui County Department of Public Works	Combustible and Flammable Liquid Tank Installation	Combustible and flammable fuel tank installation.	1-3	3
	Driveway Permit	Install driveway with county controlled right-of-way.	1-3	1
	Moving Permit	Movement of oversized and overweight vehicles on county roadways.	1-3	1
	Flood Hazard Certification or Determination	Determination of flood hazard for power plant site. Required for building permit application.	3-6	1
State				
Public Utility Commission	Certificate of Public Convenience and Necessity	Any plant for the production of and conveyance of electricity.	9-12	5
Office of Environmental Quality Control	NEPA Review (Environmental Impact Statement)	Actions affecting the environment.	18-24	5
Land Use Commission	State Land Use Commission District Boundary Amendment	Reclassification of land for power plant use and involving >15 acres. Requires EIS.	6-9	4
Department of Health-Clean Air Branch	Covered Source/Prevention of Significant Deterioration (PSD) Permit	Construct or install a new air pollution source. Requires 12 months air quality meteorological data, detailed modeling, BACT, and public comments for fuel oil tanks and generating units.	38-42	5

Table E-1. Permitting and Approval Requirements (Cont.)

Agency	Permit/Approval	Reason Required	Approximate Time Frame (Months)[1]	Level of Difficulty to Obtain[2]
Department of Health-Clean Air Branch	Best Available Control Technology (BACT)	Determination of best available control technology. Prepared for Covered Source/PSD Permit.	6-9	3
Department of Health - Clean Water Branch	National Pollutant Discharge Elimination System (NPDES)-Storm Water Discharge-Construction	Storm water discharge from construction activity.	3-6	2
	NPDES-Storm Water Discharge-Facility	Storm water discharge from a facility. Requires a Storm Water Pollution Control Plan within 120 days of permit issuance date.	9-12	4
	NPDES-Construction Dewatering Discharge (if not infiltrated on site)	Discharge of water from construction excavations.	3-6	4
Department of Health-Safe Drinking Water Branch	Underground Injection Control-Permit to Construct	Underground injection of operational wastewater.	3-6	2
	Underground Injection Control-Permit to Operate	Underground injection of operational wastewater.	6-9	1
Department of Health-Wastewater Branch	Individual Wastewater Systems	Construction and operation of an individual septic system.	9-12	3
Department of Health	Heating, Ventilation, and Air Conditioning (HVAC)	HVAC installation.	1-2	1
Department of Labor and Independent Reviewer	Boiler Installation	Boiler installation.	1-2	1
DLNR-Water Resources Management Commission	Well Construction/Pump Installation Permit	Construction and installation of supply wells and pumps.	3-6	2

Table E-1. Permitting and Approval Requirements (Cont.)

Agency	Permit/Approval	Reason Required	Approximate Time Frame (Months)[1]	Level of Difficulty to Obtain[2]
DLNR-Water Resources Management Commission	Well Completion Report	Report filed by well driller upon completion of the supply wells.	1-2	1
Department of Transportation	Permit to Change the Land Use or Construct or Alter a Structure Located Within the Airport Hazard Area	Change land use and construct structures that may cut the plain of the planned Kahului Airport Expansion.	3-6	3
Federal				
Federal Aviation Administration	Propose Construction or Alteration of Objects that may affect Navigable Air Space	Construct structures that may affect the navigable air space of Kahului Airport.	6-9	2
Environmental Protection Agency	Underground Injection Control-Permit to Construct/Operate	Underground injection of industrial wastewater.	12-15	4
Environmental Protection Agency	Covered Source/Prevention of Significant Deterioration (PSD) Permit	Construct or install a new air pollution source. Requires 12 months air quality meteorological data, detailed modeling, BACT, and public comments for fuel oil tanks and generating units.	38-42	5
	Spill Prevention Control and Countermeasures Plan	Spill prevention and countermeasures for petroleum products.	6-9	3
	Facility Oil Spill Response Plan	Facility oil spill response plan.	6-9	4

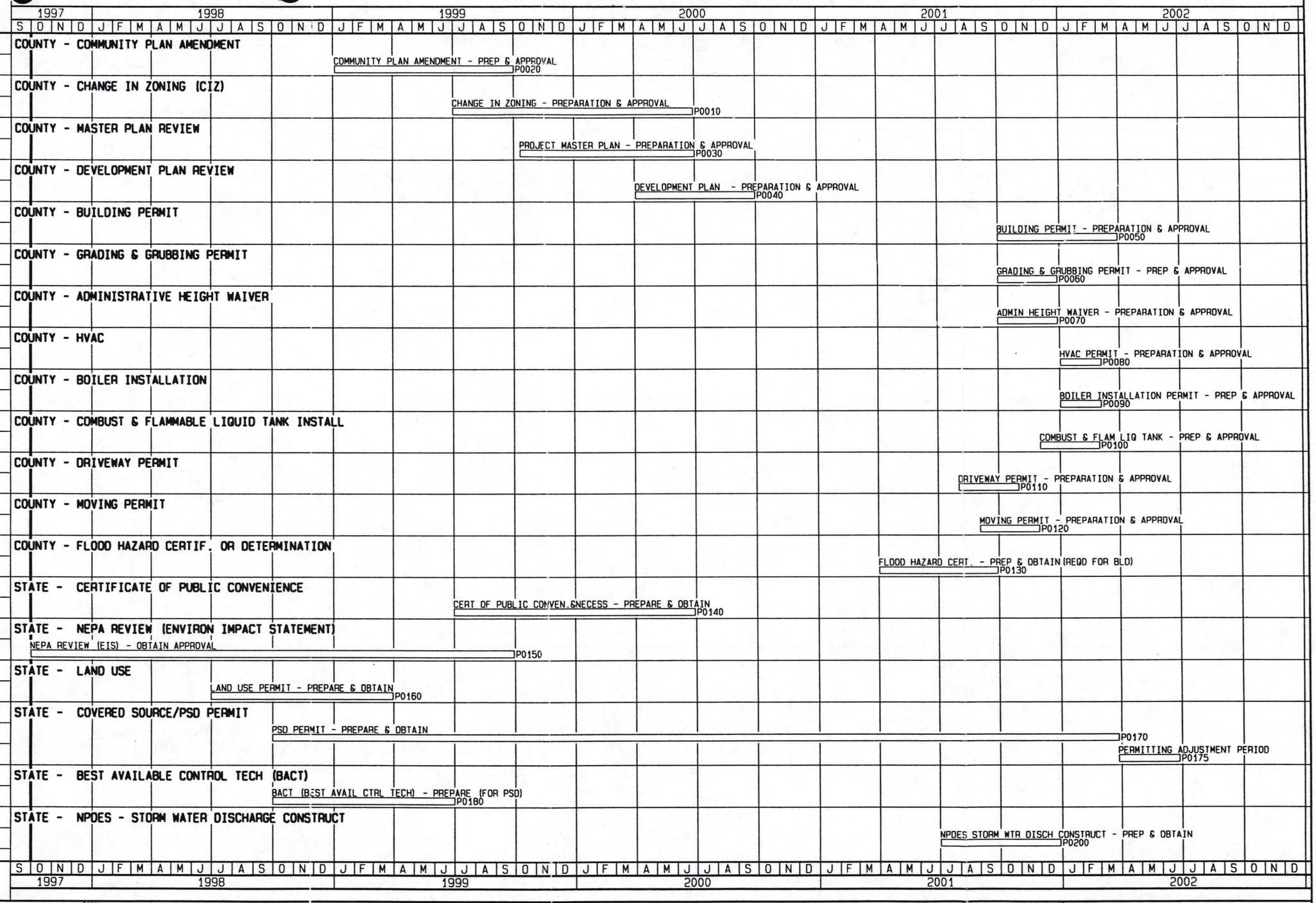
1 Includes time to prepare the permit/approval document, review by agency, and public comment period. Does not include time to obtain support documents.

2 Most difficult assigned highest number on a scale of 1 to 5.

APPENDIX F

DETAILED SCHEDULE TO INSTALL THE FIRST DTCC (THIS SCHEDULE INCLUDES PERMITTING AND APPROVAL ACTIVITIES, ENGINEERING DESIGN, EQUIPMENT PROCUREMENT, CONSTRUCTION, AND START UP)

ACTIVITY ID	EARLY START	EARLY FINISH
		COUNTY - COMMUNITY PLAN AMENDMENT
P0020	4JAN99	30SEP99
		COUNTY - CHANGE IN ZONING (CIZ)
P0010	1JUL99	28JUN00
		COUNTY - MASTER PLAN REVIEW
P0030	11OCT99	30JUN00
		COUNTY - DEVELOPMENT PLAN REVIEW
P0040	3APR00	29SEP00
		COUNTY - BUILDING PERMIT
P0050	10CT01	29MAR02
		COUNTY - GRADING & GRUBBING PERMIT
P0060	10CT01	28DEC01
		COUNTY - ADMINISTRATIVE HEIGHT WAIVER
P0070	10CT01	28DEC01
		COUNTY - HVAC
P0080	2JAN02	4MAR02
		COUNTY - BOILER INSTALLATION
P0090	2JAN02	4MAR02
		COUNTY - COMBUST & FLAMMABLE LIQUID TANK INSTALL
P0100	3DEC01	1MAR02
		COUNTY - DRIVEWAY PERMIT
P0110	1AUG01	30OCT01
		COUNTY - MOVING PERMIT
P0120	3SEP01	30NOV01
		COUNTY - FLOOD HAZARD CERTIF. OR DETERMINATION
P0130	2APR01	28SEP01
		STATE - CERTIFICATE OF PUBLIC CONVENIENCE
P0140	1JUL99	28JUN00
		STATE - NEPA REVIEW (ENVIRON IMPACT STATEMENT)
P0150	10CT97	28SEP99
		STATE - LAND USE
P0160	1JUL98	30MAR99
		STATE - COVERED SOURCE/PSD PERMIT
P0170	10CT98	27MAR02
P0175	28MAR02	26JUN02
		STATE - BEST AVAILABLE CONTROL TECH (BACT)
P0180	10CT98	30JUN99
		STATE - NPDES - STORM WATER DISCHARGE CONSTRUCT
P0200	2JUL01	28DEC01



Plot Date 30NOV95
Data Date 10CT97
Project Start 10CT97
Project Finish 6MAR03

(c) Primavera Systems, Inc.

Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

NPER

MAUI ELECTRIC COMPANY
NEW SITE PERMITTING (DTCC1-CT1)
PERMITTING SCHEDULE

Sheet 1 of 2

STONE & WEBSTER ENGINEERING CORP.

Date	Revision	Checked	Approved

ACTIVITY ID	EARLY START	EARLY FINISH	
			STATE - NPDES - STORM WATER DISCHARGE FACILITY
P0190	2JUL01	28DEC01	NPDES STORM WTR DISC FACILITY - PREPARE & OBTAIN
			STATE - CONSTRUCTION DEWATERING DISCHARGE
P0210	2JUL01	28DEC01	NPDES - CONSTR DEWATER DISCHARGE - PREP & OBTAIN
			STATE - UNDERGROUND INJECT CONTROL - CONSTRUCT
P0220	2JUL01	28DEC01	UG INJECT CTRL (TO CONSTRUCT) - PREPARE & OBTAIN
			STATE - UNDERGROUND INJECT CONTROL - FACILITY
P0230	2JUL01	29MAR02	UG INJECT CNTRL PERMIT (OPERATE) - PREP & OBTAIN
			STATE - INDIVIDUAL WASTEWATER SYSTEMS
P0240	2JAN01	31DEC01	INDIVIDUAL WASTEWTR SYS - PREPARE & OBTAIN
			STATE - WELL CONTRUCTION / PUMP INSTALL
P0250	2JAN01	2JUL01	WELL CONSTRUCTION/PUMP INSTL - PREPARE & OBTAIN
			STATE - WELL COMPLETION REPORT
P0260	6JAN03	6MAR03	WELL COMPLETION REPORT - PREPARE
			STATE - HISTORIC PRESERVATION REVIEW
P0270	1JUL99	29DEC99	HISTORIC PRESERVATION REVIEW
			STATE - LAND USE CHANGE - AIRPORT HAZARD AREA
P0280	3JAN01	3JUL01	LAND USE IN AIRPORT HAZARD AREA - PREP & OBTAIN
			STATE - STATE HIGHWAY (RIGHT-OF-WAY)
P0290	3JUL00	30MAR01	STATE HIGHWAY RIGHT-OF-WAY - PREPARE & OBTAIN
			FEDERAL - AIR SPACE CONSIDERATIONS
P0300	3JUL00	30MAR01	FAA - ALTERATION OF OBJECTS - PREPARE & OBTAIN
			FEDERAL - U.G.INJECT CONTROL (CONSTRUCT/OPERATE)
P0310	2JUL99	28SEP00	UG INJECT CTRL CONSTRUCT/OPERATE - PREP & OBTAIN
			FEDERAL - SPILL PREVENTION CONTROL
P0320	3JUL00	30MAR01	SPILL CONTROL PLAN - PREPARE & OBTAIN APPROVAL
			FEDERAL - FACILITY OIL RESPONSE PLAN
P0330	3JUL00	30MAR01	FACIL OIL SPILL RESPONSE PLAN - PREP & APPROVAL

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Plot Date 30NOV95
Data Date 10CT97
Project Start 10CT97
Project Finish 6MAR03

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Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

MPER

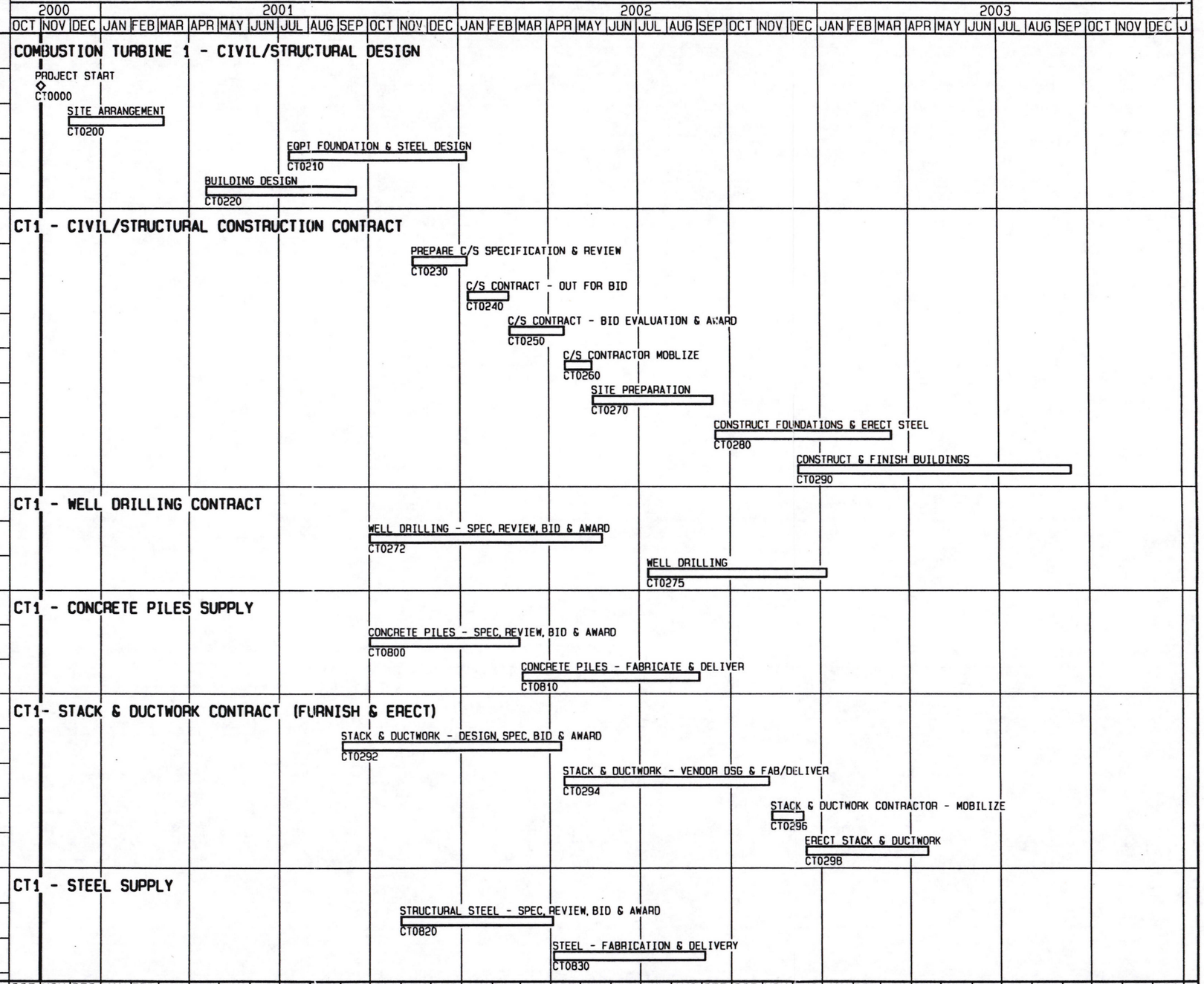
MAUI ELECTRIC COMPANY
NEW SITE PERMITTING (DTCC1-CT1)
PERMITTING SCHEDULE

Sheet 2 of 2

STONE & WEBSTER ENGINEERING CORP.

Date	Revision	Checked	Approved

ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH
	COMBUSTION TURBINE 1 - CIVIL/STRUCTURAL DESIGN		
CT0000	PROJECT START	1NOV00	
CT0200	SITE ARRANGEMENT	29NOV00	6MAR01
CT0210	EQPT FOUNDATION & STEEL DESIGN	11JUL01	8JAN02
CT0220	BUILDING DESIGN	18APR01	18SEP01
	CT1 - CIVIL/STRUCTURAL CONSTRUCTION CONTRACT		
CT0230	PREPARE C/S SPECIFICATION & REVIEW	14NOV01	8JAN02
CT0240	C/S CONTRACT - OUT FOR BID	9JAN02	19FEB02
CT0250	C/S CONTRACT - BID EVALUATION & AWARD	20FEB02	16APR02
CT0260	C/S CONTRACTOR MOBLIZE	17APR02	14MAY02
CT0270	SITE PREPARATION	15MAY02	13SEP02
CT0280	CONSTRUCT FOUNDATIONS & ERECT STEEL	16SEP02	14MAR03
CT0290	CONSTRUCT & FINISH BUILDINGS	9DEC02	12SEP03
	CT1 - WELL DRILLING CONTRACT		
CT0272	WELL DRILLING - SPEC, REVIEW, BID & AWARD	10CT01	24MAY02
CT0275	WELL DRILLING	10JUL02	7JAN03
	CT1 - CONCRETE PILES SUPPLY		
CT0800	CONCRETE PILES - SPEC, REVIEW, BID & AWARD	10CT01	1MAR02
CT0810	CONCRETE PILES - FABRICATE & DELIVER	4MAR02	30AUG02
	CT1- STACK & DUCTWORK CONTRACT (FURNISH & ERECT)		
CT0292	STACK & DUCTWORK - DESIGN, SPEC, BID & AWARD	3SEP01	12APR02
CT0294	STACK & DUCTWORK - VENDOR DSG & FAB/DELIVER	15APR02	8NOV02
CT0296	STACK & DUCTWORK CONTRACTOR - MOBILIZE	11NOV02	13DEC02
CT0298	ERECT STACK & DUCTWORK	16DEC02	18APR03
	CT1 - STEEL SUPPLY		
CT0820	STRUCTURAL STEEL - SPEC, REVIEW, BID & AWARD	1NOV01	3APR02
CT0830	STEEL - FABRICATION & DELIVERY	4APR02	4SEP02



Plot Date 14SEP95
Data Date 1NOV00
Project Start 13JUN95
Project Finish 23DEC03

Activity Bar/Early Dates
Critical Activity
Progress Bar
◇/P Milestone/Flag Activity

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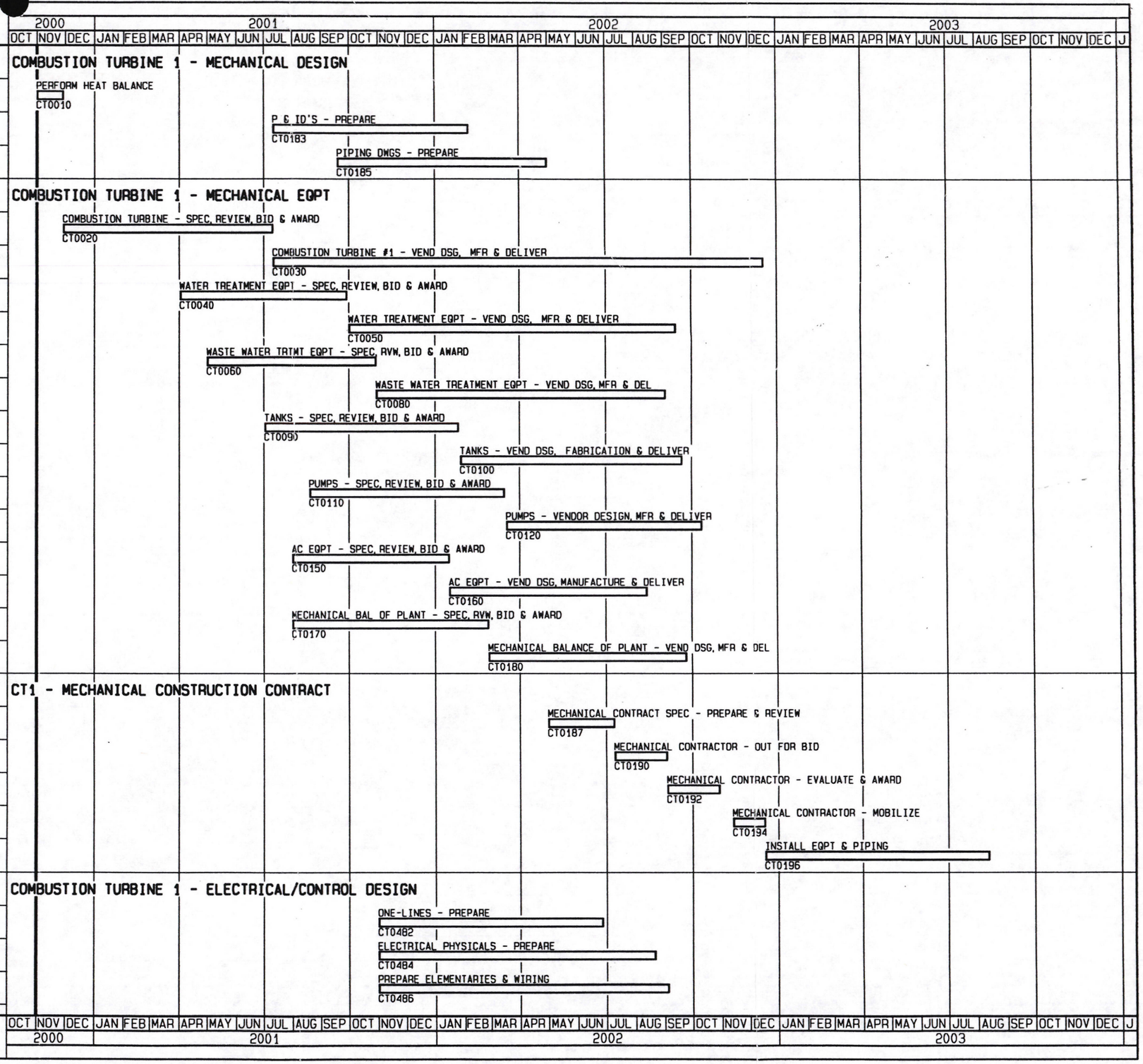
CC00

MAUI ELECTRIC COMPANY
NEW SITE - COMBINED CYCLE - CT#1
PROJECT SCHEDULE TYPICAL

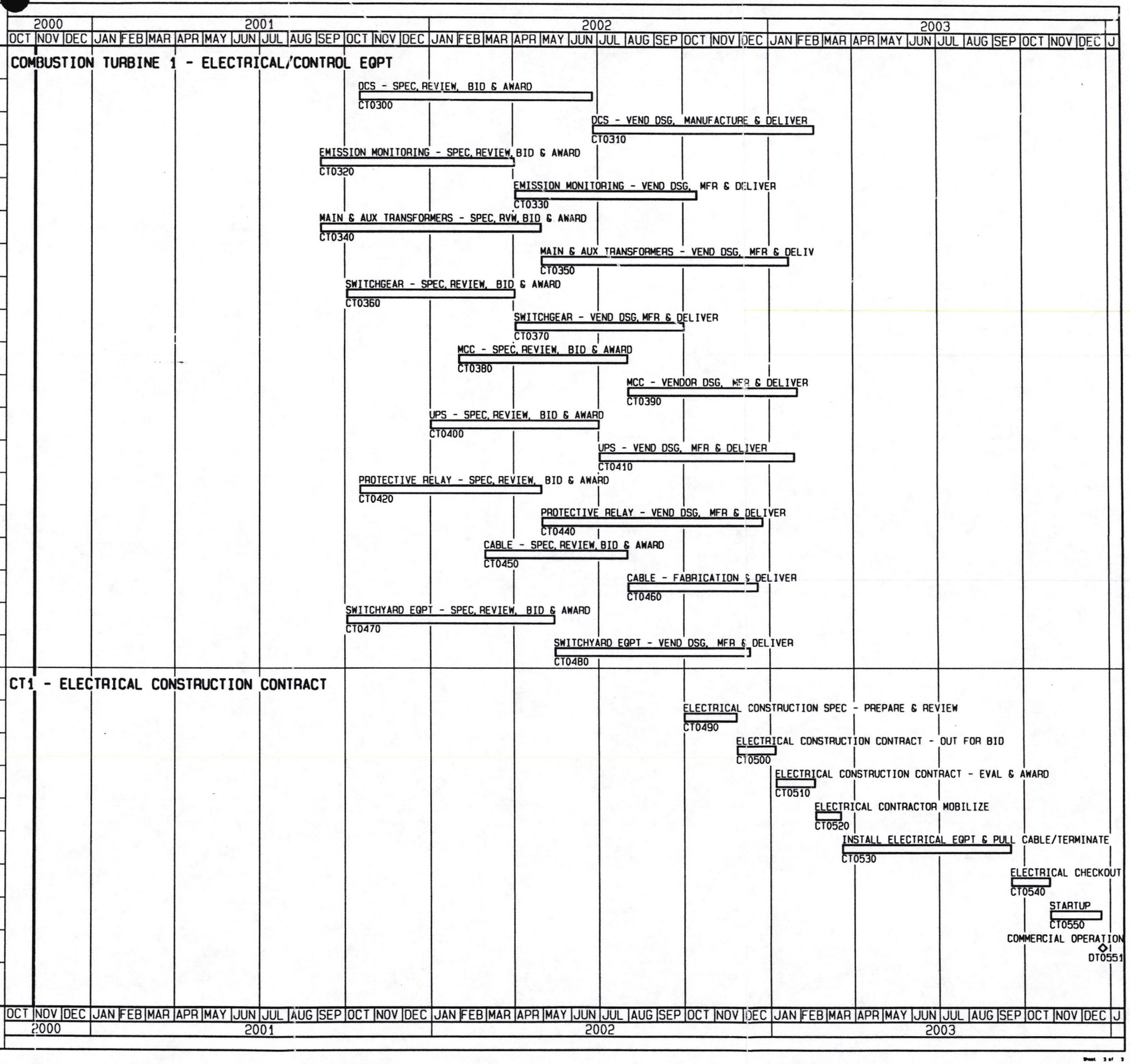
STONE & WEBSTER ENGINEERING CORP.

Date	Revision	Checked	Approved

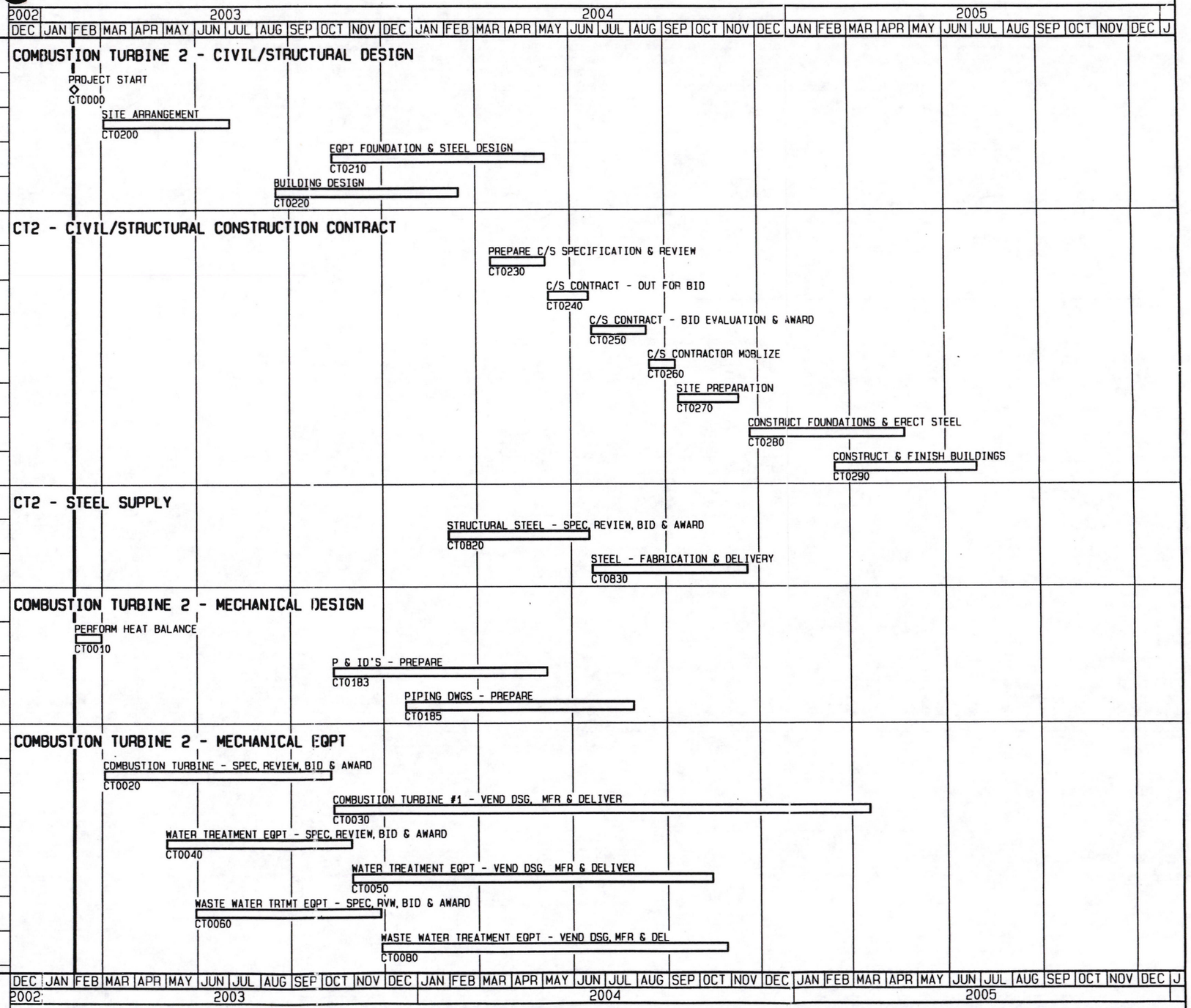
ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH
CT0010	PERFORM HEAT BALANCE	1NOV00	28NOV00
CT0183	P & ID'S - PREPARE	11JUL01	5FEB02
CT0185	PIPING DWGS - PREPARE	19SEP01	30APR02
CT0020	COMBUSTION TURBINE - SPEC, REVIEW, BID & AWARD	29NOV00	10JUL01
CT0030	COMBUSTION TURBINE #1 - VEND DSG, MFR & DELIVER	11JUL01	17DEC02
CT0040	WATER TREATMENT EQPT - SPEC, REVIEW, BID & AWARD	2APR01	28SEP01
CT0050	WATER TREATMENT EQPT - VEND DSG, MFR & DELIVER	10CT01	13SEP02
CT0060	WASTE WATER TRTMT EQPT - SPEC, RVW, BID & AWARD	1MAY01	29OCT01
CT0080	WASTE WATER TREATMENT EQPT - VEND DSG, MFR & DEL	30OCT01	2SEP02
CT0090	TANKS - SPEC, REVIEW, BID & AWARD	2JUL01	25JAN02
CT0100	TANKS - VEND DSG, FABRICATION & DELIVER	28JAN02	20SEP02
CT0110	PUMPS - SPEC, REVIEW, BID & AWARD	20AUG01	15MAR02
CT0120	PUMPS - VENDOR DESIGN, MFR & DELIVER	18MAR02	11OCT02
CT0150	AC EQPT - SPEC, REVIEW, BID & AWARD	1AUG01	15JAN02
CT0160	AC EQPT - VEND DSG, MANUFACTURE & DELIVER	16JAN02	13AUG02
CT0170	MECHANICAL BAL OF PLANT - SPEC, RVW, BID & AWARD	1AUG01	26FEB02
CT0180	MECHANICAL BALANCE OF PLANT - VEND DSG, MFR & DEL	27FEB02	24SEP02
CT0187	MECHANICAL CONTRACT SPEC - PREPARE & REVIEW	1MAY02	9JUL02
CT0190	MECHANICAL CONTRACTOR - OUT FOR BID	10JUL02	3SEP02
CT0192	MECHANICAL CONTRACTOR - EVALUATE & AWARD	4SEP02	29OCT02
CT0194	MECHANICAL CONTRACTOR - MOBILIZE	13NOV02	17DEC02
CT0196	INSTALL EQPT & PIPING	18DEC02	12AUG03
CT0482	ONE-LINES - PREPARE	1NOV01	26JUN02
CT0484	ELECTRICAL PHYSICALS - PREPARE	1NOV01	21AUG02
CT0486	PREPARE ELEMENTARIES & WIRING	1NOV01	4SEP02



ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH
CT0300	DCS - SPEC, REVIEW, BID & AWARD	17OCT01	25JUN02
CT0310	DCS - VEND DSG, MANUFACTURE & DELIVER	26JUN02	18FEB03
CT0320	EMISSION MONITORING - SPEC, REVIEW, BID & AWARD	5SEP01	2APR02
CT0330	EMISSION MONITORING - VEND DSG, MFR & DELIVER	3APR02	15OCT02
CT0340	MAIN & AUX TRANSFORMERS - SPEC, RVW, BID & AWARD	5SEP01	30APR02
CT0350	MAIN & AUX TRANSFORMERS - VEND DSG, MFR & DELIV	1MAY02	21JAN03
CT0360	SWITCHGEAR - SPEC, REVIEW, BID & AWARD	30CT01	2APR02
CT0370	SWITCHGEAR - VEND DSG, MFR & DELIVER	3APR02	10CT02
CT0380	MCC - SPEC, REVIEW, BID & AWARD	1FEB02	1AUG02
CT0390	MCC - VENDOR DSG, MFR & DELIVER	2AUG02	30JAN03
CT0400	UPS - SPEC, REVIEW, BID & AWARD	1JAN02	1JUL02
CT0410	UPS - VEND DSG, MFR & DELIVER	2JUL02	27JAN03
CT0420	PROTECTIVE RELAY - SPEC, REVIEW, BID & AWARD	17OCT01	30APR02
CT0440	PROTECTIVE RELAY - VEND DSG, MFR & DELIVER	1MAY02	24DEC02
CT0450	CABLE - SPEC, REVIEW, BID & AWARD	1MAR02	1AUG02
CT0460	CABLE - FABRICATION & DELIVER	2AUG02	19DEC02
CT0470	SWITCHYARD EQPT - SPEC, REVIEW, BID & AWARD	30CT01	14MAY02
CT0480	SWITCHYARD EQPT - VEND DSG, MFR & DELIVER	15MAY02	10DEC02
CT0490	ELECTRICAL CONSTRUCTION SPEC - PREPARE & REVIEW	10CT02	25NOV02
CT0500	ELECTRICAL CONSTRUCTION CONTRACT - OUT FOR BID	26NOV02	6JAN03
CT0510	ELECTRICAL CONSTRUCTION CONTRACT - EVAL & AWARD	7JAN03	17FEB03
CT0520	ELECTRICAL CONTRACTOR MOBILIZE	18FEB03	17MAR03
CT0530	INSTALL ELECTRICAL EQPT & PULL CABLE/TERMINATE	19MAR03	16SEP03
CT0540	ELECTRICAL CHECKOUT	17SEP03	28OCT03
CT0550	STARTUP	29OCT03	22DEC03
DT0551	COMMERCIAL OPERATION		23DEC03



ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH
	COMBUSTION TURBINE 2 - CIVIL/STRUCTURAL DESIGN		
CT0000	PROJECT START	3FEB03	
CT0200	SITE ARRANGEMENT	3MAR03	4JUL03
CT0210	EQPT FOUNDATION & STEEL DESIGN	13OCT03	7MAY04
CT0220	BUILDING DESIGN	18AUG03	13FEB04
	CT2 - CIVIL/STRUCTURAL CONSTRUCTION CONTRACT		
CT0230	PREPARE C/S SPECIFICATION & REVIEW	15MAR04	7MAY04
CT0240	C/S CONTRACT - OUT FOR BID	10MAY04	18JUN04
CT0250	C/S CONTRACT - BID EVALUATION & AWARD	21JUN04	13AUG04
CT0260	C/S CONTRACTOR MOBLIZE	16AUG04	10SEP04
CT0270	SITE PREPARATION	13SEP04	11NOV04
CT0280	CONSTRUCT FOUNDATIONS & ERECT STEEL	22NOV04	22APR05
CT0290	CONSTRUCT & FINISH BUILDINGS	14FEB05	1JUL05
	CT2 - STEEL SUPPLY		
CT0820	STRUCTURAL STEEL - SPEC, REVIEW, BID & AWARD	2FEB04	18JUN04
CT0830	STEEL - FABRICATION & DELIVERY	21JUN04	19NOV04
	COMBUSTION TURBINE 2 - MECHANICAL DESIGN		
CT0010	PERFORM HEAT BALANCE	3FEB03	28FEB03
CT0183	P & ID'S - PREPARE	13OCT03	7MAY04
CT0185	PIPING DWGS - PREPARE	22DEC03	30JUL04
	COMBUSTION TURBINE 2 - MECHANICAL EQPT		
CT0020	COMBUSTION TURBINE - SPEC, REVIEW, BID & AWARD	3MAR03	10OCT03
CT0030	COMBUSTION TURBINE #1 - VEND DSG, MFR & DELIVER	13OCT03	18MAR05
CT0040	WATER TREATMENT EQPT - SPEC, REVIEW, BID & AWARD	2MAY03	30OCT03
CT0050	WATER TREATMENT EQPT - VEND DSG, MFR & DELIVER	31OCT03	14OCT04
CT0060	WASTE WATER TRTMT EQPT - SPEC, RVW, BID & AWARD	30MAY03	27NOV03
CT0080	WASTE WATER TREATMENT EQPT - VEND DSG, MFR & DEL	28NOV03	28OCT04



Plot Date 30AUG95
Data Date 2FEB03
Project Start 13JUN95
Project Finish 1JAN08

Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

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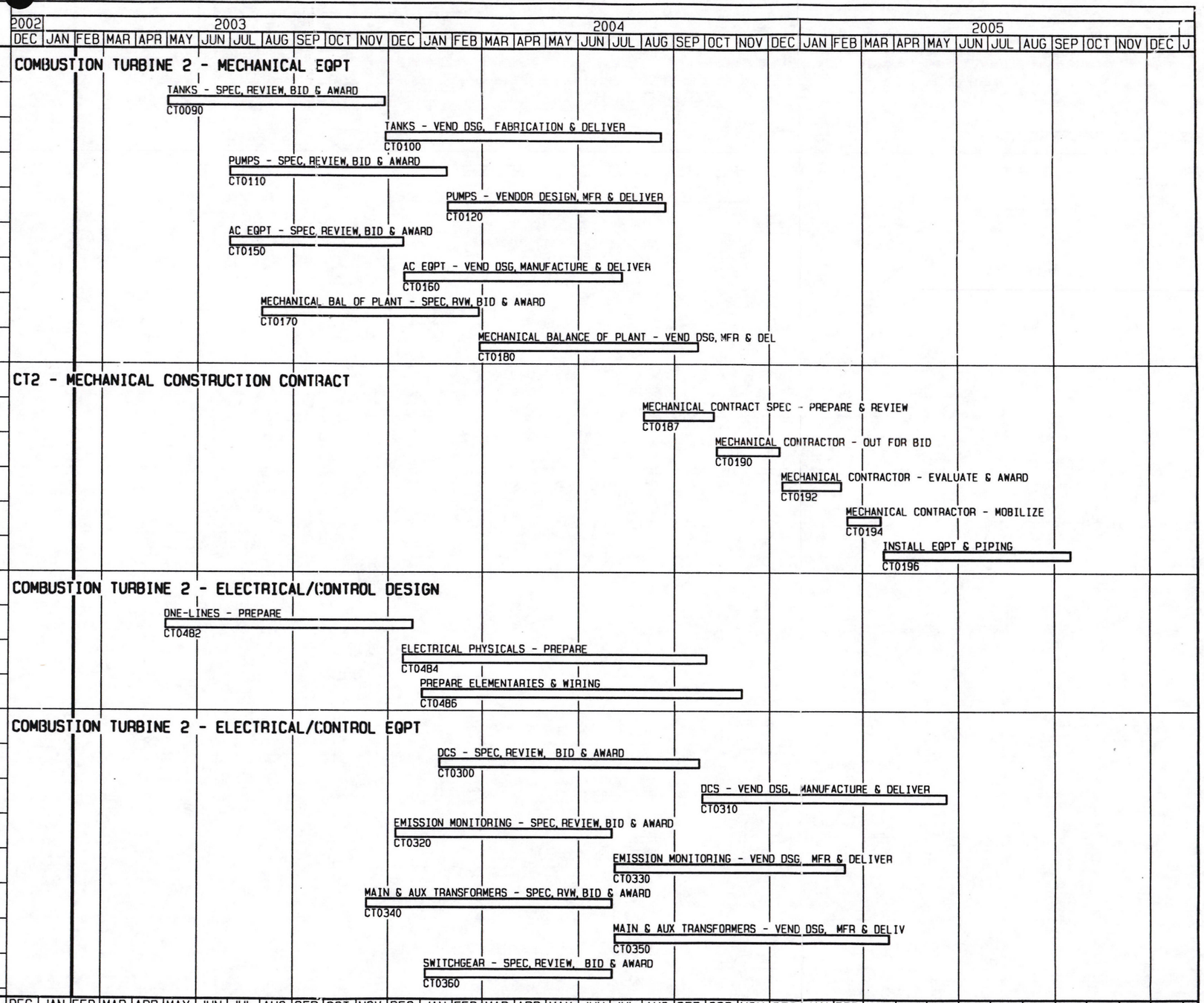
CCT2

MAUI ELECTRIC COMPANY
NEW SITE - COMBINED CYCLE - CT#2
PROJECT SCHEDULE TYPICAL

STONE & WEBSTER ENGINEERING CORP.

Date	Revision	Checked	Approved

ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH
	COMBUSTION TURBINE 2 - MECHANICAL EQPT		
CT0090	TANKS - SPEC, REVIEW, BID & AWARD	2MAY03	27NOV03
CT0100	TANKS - VEND DSG, FABRICATION & DELIVER	28NOV03	19AUG04
CT0110	PUMPS - SPEC, REVIEW, BID & AWARD	1JUL03	26JAN04
CT0120	PUMPS - VENDOR DESIGN, MFR & DELIVER	27JAN04	23AUG04
CT0150	AC EQPT - SPEC, REVIEW, BID & AWARD	1JUL03	15DEC03
CT0160	AC EQPT - VEND DSG, MANUFACTURE & DELIVER	16DEC03	12JUL04
CT0170	MECHANICAL BAL OF PLANT - SPEC, RVW, BID & AWARD	1AUG03	26FEB04
CT0180	MECHANICAL BALANCE OF PLANT - VEND DSG, MFR & DEL	27FEB04	23SEP04
	CT2 - MECHANICAL CONSTRUCTION CONTRACT		
CT0187	MECHANICAL CONTRACT SPEC - PREPARE & REVIEW	2AUG04	8OCT04
CT0190	MECHANICAL CONTRACTOR - OUT FOR BID	11OCT04	10DEC04
CT0192	MECHANICAL CONTRACTOR - EVALUATE & AWARD	13DEC04	8FEB05
CT0194	MECHANICAL CONTRACTOR - MOBILIZE	14FEB05	18MAR05
CT0196	INSTALL EQPT & PIPING	21MAR05	16SEP05
	COMBUSTION TURBINE 2 - ELECTRICAL/CONTROL DESIGN		
CT0482	ONE-LINES - PREPARE	1MAY03	24DEC03
CT0484	ELECTRICAL PHYSICALS - PREPARE	15DEC03	10CT04
CT0486	PREPARE ELEMENTARIES & WIRING	2JAN04	4NOV04
	COMBUSTION TURBINE 2 - ELECTRICAL/CONTROL EQPT		
CT0300	DCS - SPEC, REVIEW, BID & AWARD	19JAN04	24SEP04
CT0310	DCS - VEND DSG, MANUFACTURE & DELIVER	27SEP04	20MAY05
CT0320	EMISSION MONITORING - SPEC, REVIEW, BID & AWARD	8DEC03	2JUL04
CT0330	EMISSION MONITORING - VEND DSG, MFR & DELIVER	5JUL04	11FEB05
CT0340	MAIN & AUX TRANSFORMERS - SPEC, RVW, BID & AWARD	10NOV03	2JUL04
CT0350	MAIN & AUX TRANSFORMERS - VEND DSG, MFR & DELIV	5JUL04	25MAR05
CT0360	SWITCHGEAR - SPEC, REVIEW, BID & AWARD	5JAN04	2JUL04



Plot Date 30AUG95
Data Date 2FEB03
Project Start 13JUN95
Project Finish 1JAN08 *

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Activity Bar/Early Dates
Critical Activity
Progress Bar
◇/P Milestone/Flag Activity

CCT2

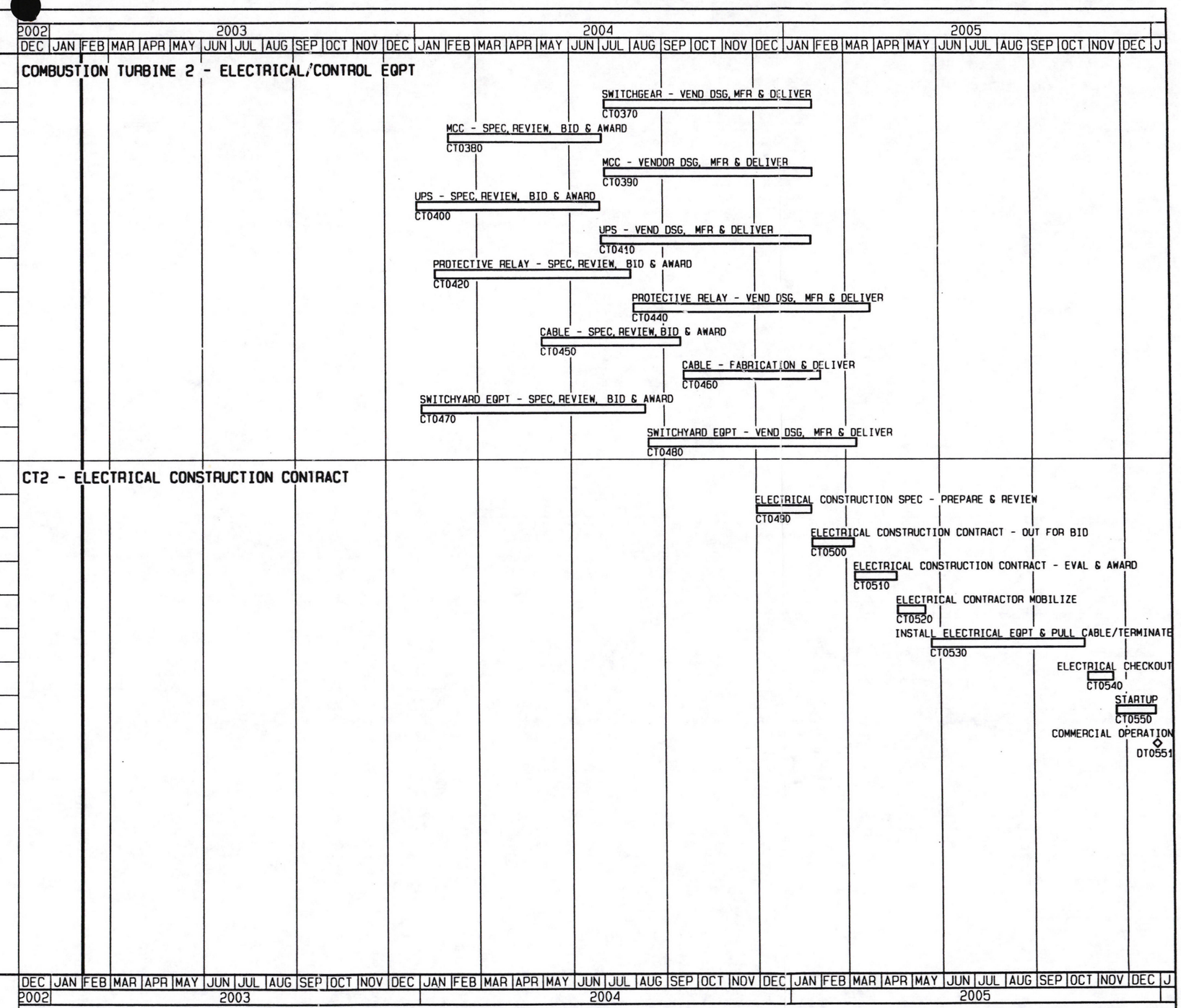
MAUI ELECTRIC COMPANY
NEW SITE - COMBINED CYCLE - CT#2
PROJECT SCHEDULE TYPICAL

Sheet 2 of 3

STONE & WEBSTER ENGINEERING CORP.

Date	Revision	Checked	Approved

ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH
	COMBUSTION TURBINE 2 - ELECTRICAL/CONTROL EQPT		
CT0370	SWITCHGEAR - VEND DSG, MFR & DELIVER	5JUL04	28JAN05
CT0380	MCC - SPEC, REVIEW, BID & AWARD	2FEB04	2JUL04
CT0390	MCC - VENDOR DSG, MFR & DELIVER	5JUL04	28JAN05
CT0400	UPS - SPEC, REVIEW, BID & AWARD	1JAN04	30JUN04
CT0410	UPS - VEND DSG, MFR & DELIVER	1JUL04	26JAN05
CT0420	PROTECTIVE RELAY - SPEC, REVIEW, BID & AWARD	19JAN04	30JUL04
CT0440	PROTECTIVE RELAY - VEND DSG, MFR & DELIVER	2AUG04	25MAR05
CT0450	CABLE - SPEC, REVIEW, BID & AWARD	3MAY04	17SEP04
CT0460	CABLE - FABRICATION & DELIVER	20SEP04	4FEB05
CT0470	SWITCHYARD EQPT - SPEC, REVIEW, BID & AWARD	5JAN04	13AUG04
CT0480	SWITCHYARD EQPT - VEND DSG, MFR & DELIVER	16AUG04	11MAR05
	CT2 - ELECTRICAL CONSTRUCTION CONTRACT		
CT0490	ELECTRICAL CONSTRUCTION SPEC - PREPARE & REVIEW	1DEC04	25JAN05
CT0500	ELECTRICAL CONSTRUCTION CONTRACT - OUT FOR BID	26JAN05	8MAR05
CT0510	ELECTRICAL CONSTRUCTION CONTRACT - EVAL & AWARD	9MAR05	19APR05
CT0520	ELECTRICAL CONTRACTOR MOBILIZE	20APR05	17MAY05
CT0530	INSTALL ELECTRICAL EQPT & PULL CABLE/TERMINATE	23MAY05	21OCT05
CT0540	ELECTRICAL CHECKOUT	24OCT05	18NOV05
CT0550	STARTUP	21NOV05	29DEC05
DT0551	COMMERCIAL OPERATION		30DEC05



Plot Date 30AUG95
Data Date 2FEB03
Project Start 13JUN95
Project Finish 1JAN08 *

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Activity Bar/Early Dates
Critical Activity
Progress Bar
◇/P Milestone/Flag Activity

CCT2

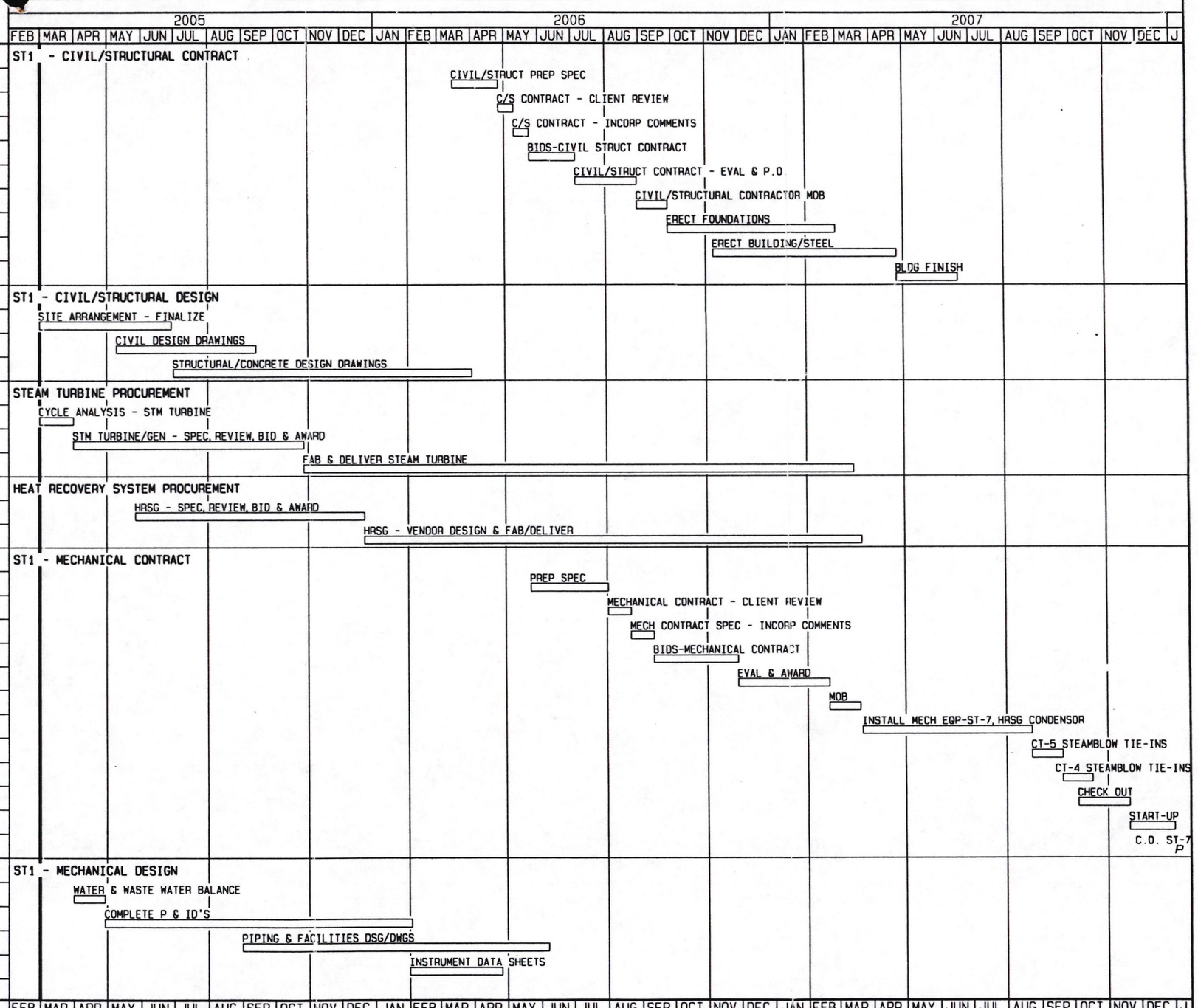
MAUI ELECTRIC COMPANY
NEW SITE - COMBINED CYCLE - CT#2
PROJECT SCHEDULE TYPICAL

Sheet 3 of 3

STONE & WEBSTER ENGINEERING CORP.

Date	Revision	Checked	Approved

ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH
	ST1 - CIVIL/STRUCTURAL CONTRACT		
34A0020	CIVIL/STRUCT PREP SPEC	15MAR06	25APR06
34A0022	C/S CONTRACT - CLIENT REVIEW	26APR06	9MAY06
34A0023	C/S CONTRACT - INCORP COMMENTS	10MAY06	23MAY06
34A0025	BIDS-CIVIL STRUCT CONTRACT	24MAY06	4JUL06
34A0030	CIVIL/STRUCT CONTRACT - EVAL & P.O.	5JUL06	29AUG06
34A0035	CIVIL/STRUCTURAL CONTRACTOR MOB	30AUG06	26SEP06
34A0045	ERECT FOUNDATIONS	27SEP06	27FEB07
34A0040	ERECT BUILDING/STEEL	8NOV06	24APR07
34A0048	BLDG FINISH	25APR07	19JUN07
	ST1 - CIVIL/STRUCTURAL DESIGN		
10A0005	SITE ARRANGEMENT - FINALIZE	1MAR05	28JUN05
34D0015	CIVIL DESIGN DRAWINGS	10MAY05	13SEP05
34E0010	STRUCTURAL/CONCRETE DESIGN DRAWINGS	1JUL05	31MAR06
	STEAM TURBINE PROCUREMENT		
23A0100	CYCLE ANALYSIS - STM TURBINE	1MAR05	31MAR05
23A0125	STM TURBINE/GEN - SPEC, REVIEW, BID & AWARD	1APR05	27OCT05
23A0145	FAB & DELIVER STEAM TURBINE	28OCT05	15MAR07
	HEAT RECOVERY SYSTEM PROCUREMENT		
23B0150	HRSG - SPEC, REVIEW, BID & AWARD	27MAY05	22DEC05
23B0170	HRSG - VENDOR DESIGN & FAB/DELIVER	23DEC05	22MAR07
	ST1 - MECHANICAL CONTRACT		
36A0080	PREP SPEC	24MAY06	1AUG06
36A0082	MECHANICAL CONTRACT - CLIENT REVIEW	2AUG06	22AUG06
36A0083	MECH CONTRACT SPEC - INCORP COMMENTS	23AUG06	12SEP06
36A0085	BIDS-MECHANICAL CONTRACT	13SEP06	28NOV06
36A0090	EVAL & AWARD	29NOV06	20FEB07
36A0095	MOB	21FEB07	20MAR07
36A0100	INSTALL MECH EQP-ST-7, HRSG CONDENSOR	23MAR07	23AUG07
36A0110	CT-5 STEAMBLOW TIE-INS	24AUG07	20SEP07
36A0115	CT-4 STEAMBLOW TIE-INS	21SEP07	17OCT07
36A0105	CHECK OUT	50CT07	20NOV07
50B0120	START-UP	21NOV07	31DEC07
50B0125	C.O. ST-7		31DEC07
	ST1 - MECHANICAL DESIGN		
10E0060	WATER & WASTE WATER BALANCE	1APR05	28APR05
20A0065	COMPLETE P & ID'S	29APR05	2FEB06
36B0075	PIPING & FACILITIES DSG/DWGS	1SEP05	7JUN06
36D0050	INSTRUMENT DATA SHEETS	1FEB06	25APR06



Plot Date 14SEP95
Data Date 1MAR05
Project Start 1JAN05
Project Finish 1JAN08

Activity Bar/Early Dates
Critical Activity
Progress Bar
Milestone/Flag Activity

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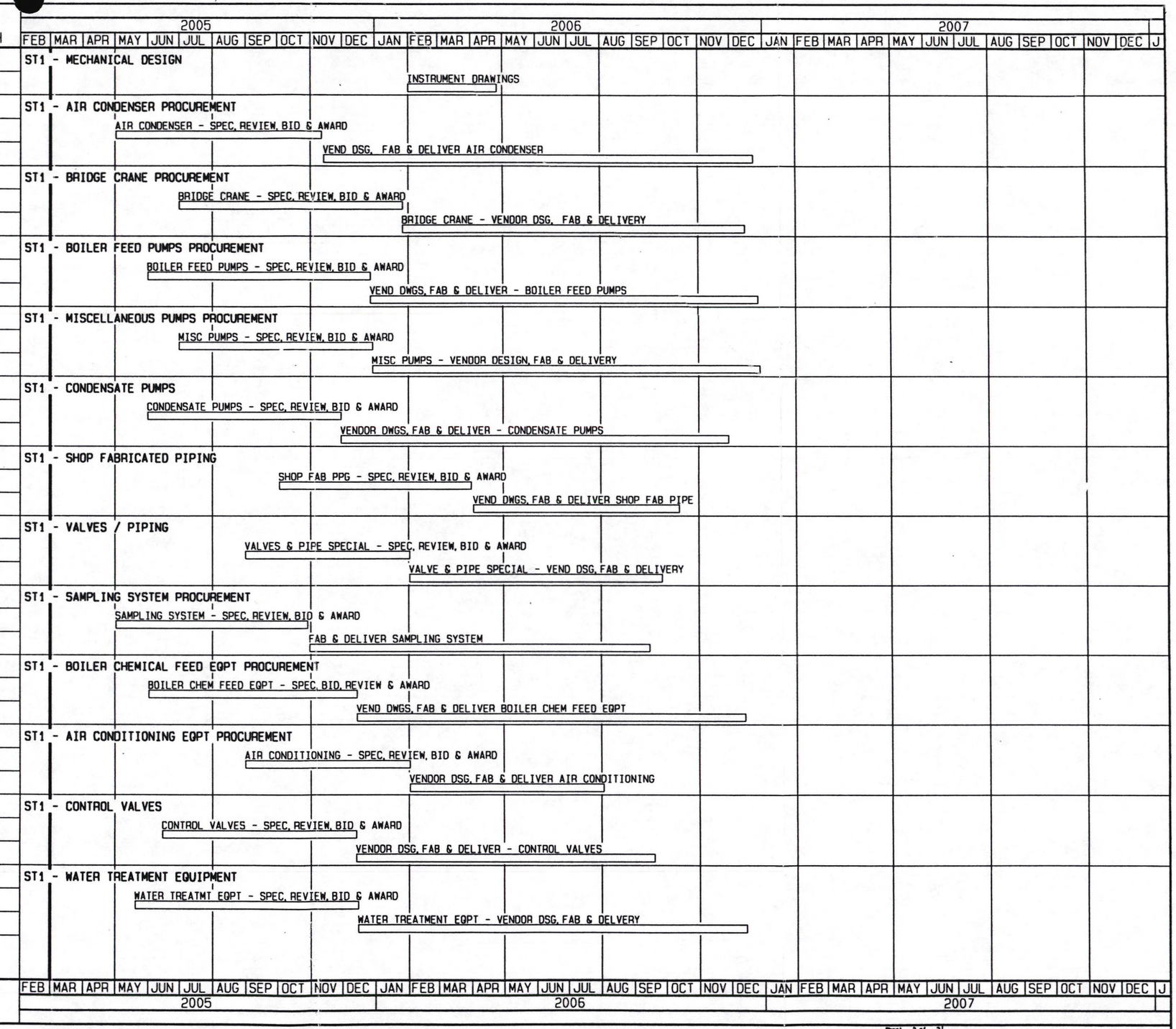
CCST

MAUI ELECTRIC COMPANY
NEW SITE - STEAM UNIT ST-1
PROJECT SCHEDULE TYPICAL

Sheet 1 of 3

Date	Revision	Checked	Approved

ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH
	ST1 - MECHANICAL DESIGN		
36D0055	INSTRUMENT DRAWINGS	1FEB06	25APR06
	ST1 - AIR CONDENSER PROCUREMENT		
23G0180	AIR CONDENSER - SPEC, REVIEW, BID & AWARD	2MAY05	11NOV05
23G0200	VEND DSG, FAB & DELIVER AIR CONDENSER	14NOV05	22DEC06
	ST1 - BRIDGE CRANE PROCUREMENT		
23J0205	BRIDGE CRANE - SPEC, REVIEW, BID & AWARD	1JUL05	26JAN06
23J0225	BRIDGE CRANE - VENDOR DSG, FAB & DELIVERY	27JAN06	14DEC06
	ST1 - BOILER FEED PUMPS PROCUREMENT		
23C0230	BOILER FEED PUMPS - SPEC, REVIEW, BID & AWARD	1JUN05	27DEC05
23C0245	VEND DWGS, FAB & DELIVER - BOILER FEED PUMPS	28DEC05	26DEC06
	ST1 - MISCELLANEOUS PUMPS PROCUREMENT		
23C0275	MISC PUMPS - SPEC, REVIEW, BID & AWARD	1JUL05	29DEC05
23C0295	MISC PUMPS - VENDOR DESIGN, FAB & DELIVERY	30DEC05	28DEC06
	ST1 - CONDENSATE PUMPS		
23C0250	CONDENSATE PUMPS - SPEC, REVIEW, BID & AWARD	1JUN05	29NOV05
23C0270	VENDOR DWGS, FAB & DELIVER - CONDENSATE PUMPS	30NOV05	28NOV06
	ST1 - SHOP FABRICATED PIPING		
23F0280	SHOP FAB PPG - SPEC, REVIEW, BID & AWARD	30OCT05	31MAR06
23F0300	VEND DWGS, FAB & DELIVER SHOP FAB PIPE	3APR06	13OCT06
	ST1 - VALVES / PIPING		
23D0305	VALVES & PIPE SPECIAL - SPEC, REVIEW, BID & AWARD	1SEP05	1FEB06
23D0307	VALVE & PIPE SPECIAL - VEND DSG, FAB & DELIVERY	2FEB06	27SEP06
	ST1 - SAMPLING SYSTEM PROCUREMENT		
26D0325	SAMPLING SYSTEM - SPEC, REVIEW, BID & AWARD	2MAY05	28OCT05
26D0345	FAB & DELIVER SAMPLING SYSTEM	31OCT05	15SEP06
	ST1 - BOILER CHEMICAL FEED EQPT PROCUREMENT		
23B0350	BOILER CHEM FEED EQPT - SPEC, BID, REVIEW & AWARD	2JUN05	14DEC05
23B0370	VEND DWGS, FAB & DELIVER BOILER CHEM FEED EQPT	15DEC05	13DEC06
	ST1 - AIR CONDITIONING EQPT PROCUREMENT		
23I0375	AIR CONDITIONING - SPEC, REVIEW, BID & AWARD	1SEP05	1FEB06
23I0395	VENDOR DSG, FAB & DELIVER AIR CONDITIONING	2FEB06	2AUG06
	ST1 - CONTROL VALVES		
25C0400	CONTROL VALVES - SPEC, REVIEW, BID & AWARD	15JUN05	13DEC05
25C0420	VENDOR DSG, FAB & DELIVER - CONTROL VALVES	14DEC05	19SEP06
	ST1 - WATER TREATMENT EQUIPMENT		
23J0500	WATER TREATMT EQPT - SPEC, REVIEW, BID & AWARD	20MAY05	15DEC05
23J0540	WATER TREATMENT EQPT - VENDOR DSG, FAB & DELVERY	16DEC05	14DEC06



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Critical Activity
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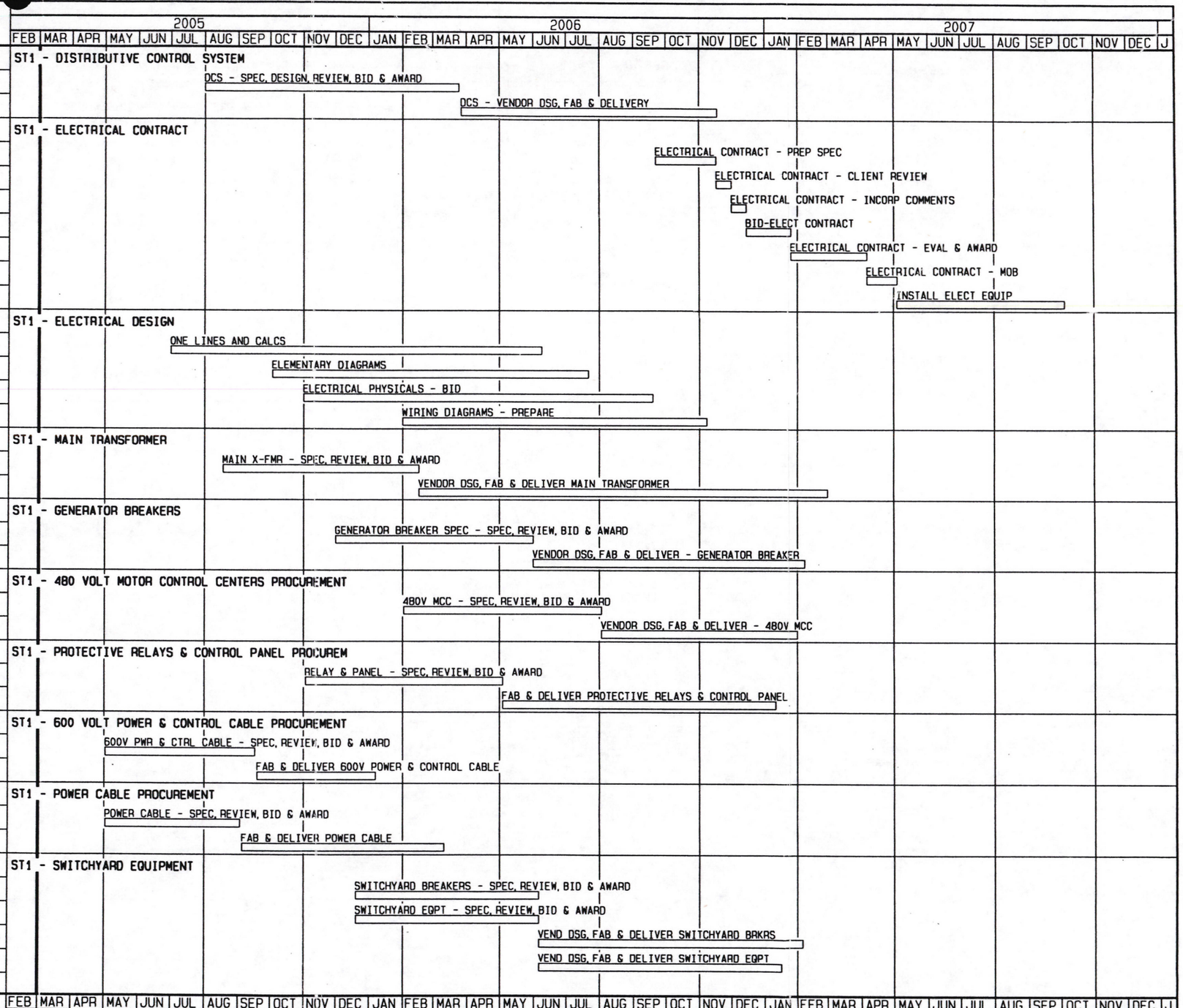
Milestone/Flag Activity

CCS1

MAUI ELECTRIC COMPANY
NEW SITE - STEAM UNIT ST-1
PROJECT SCHEDULE TYPICAL

Date	Revision	Checked	Approved

ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH
24A0400	DCS - SPEC, DESIGN, REVIEW, BID & AWARD	1AUG05	24MAR06
24A0420	DCS - VENDOR DSG, FAB & DELIVERY	27MAR06	17NOV06
3BA0430	ELECTRICAL CONTRACT - PREP SPEC	22SEP06	16NOV06
3BA0402	ELECTRICAL CONTRACT - CLIENT REVIEW	17NOV06	30NOV06
3BA0432	ELECTRICAL CONTRACT - INCORP COMMENTS	1DEC06	14DEC06
3BA0435	BID-ELECT CONTRACT	15DEC06	25JAN07
3BA0440	ELECTRICAL CONTRACT - EVAL & AWARD	26JAN07	5APR07
3BA0445	ELECTRICAL CONTRACT - MOB	6APR07	3MAY07
3BA0450	INSTALL ELECT EQUIP	4MAY07	4OCT07
20B0460	ONE LINES AND CALCS	1JUL05	8JUN06
38C0465	ELEMENTARY DIAGRAMS	30OCT05	21JUL06
38B0455	ELECTRICAL PHYSICALS - BID	1NOV05	18SEP06
38C0470	WIRING DIAGRAMS - PREPARE	1FEB06	7NOV06
24A0460	MAIN X-FMR - SPEC, REVIEW, BID & AWARD	18AUG05	15FEB06
24A0480	VENDOR DSG, FAB & DELIVER MAIN TRANSFORMER	16FEB06	28FEB07
24H0476	GENERATOR BREAKER SPEC - SPEC, REVIEW, BID & AWARD	1DEC05	31MAY06
24H0485	VENDOR DSG, FAB & DELIVER - GENERATOR BREAKER	1JUN06	7FEB07
24C0490	480V MCC - SPEC, REVIEW, BID & AWARD	2FEB06	2AUG06
24C0510	VENDOR DSG, FAB & DELIVER - 480V MCC	3AUG06	31JAN07
24D0520	RELAY & PANEL - SPEC, REVIEW, BID & AWARD	3NOV05	3MAY06
24D0540	FAB & DELIVER PROTECTIVE RELAYS & CONTROL PANEL	4MAY06	10JAN07
24E0565	600V PWR & CTRL CABLE - SPEC, REVIEW, BID & AWARD	2MAY05	16SEP05
24E0580	FAB & DELIVER 600V POWER & CONTROL CABLE	19SEP05	6JAN06
24E0545	POWER CABLE - SPEC, REVIEW, BID & AWARD	2MAY05	2SEP05
24E0560	FAB & DELIVER POWER CABLE	5SEP05	10MAR06
80A0585	SWITCHYARD BREAKERS - SPEC, REVIEW, BID & AWARD	20DEC05	5JUN06
80A0615	SWITCHYARD EQPT - SPEC, REVIEW, BID & AWARD	20DEC05	5JUN06
80A0610	VEND DSG, FAB & DELIVER SWITCHYARD BRKRS	6JUN06	5FEB07
80A0635	VEND DSG, FAB & DELIVER SWITCHYARD EQPT	6JUN06	15JAN07



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MAUI ELECTRIC COMPANY
NEW SITE - STEAM UNIT ST-1
PROJECT SCHEDULE TYPICAL

Date	Revision	Checked	Approved

ACTIVITY ID	ACTIVITY DESCRIPTION	EARLY START	EARLY FINISH
24A0400	DCS - SPEC, DESIGN, REVIEW, BID & AWARD	1AUG05	24MAR06
24A0420	DCS - VENDOR DSG, FAB & DELIVERY	27MAR06	17NOV06
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38A0402	ELECTRICAL CONTRACT - CLIENT REVIEW	17NOV06	30NOV06
38A0432	ELECTRICAL CONTRACT - INCORP COMMENTS	1DEC06	14DEC06
38A0435	BID-ELECT CONTRACT	15DEC06	25JAN07
38A0440	ELECTRICAL CONTRACT - EVAL & AWARD	26JAN07	5APR07
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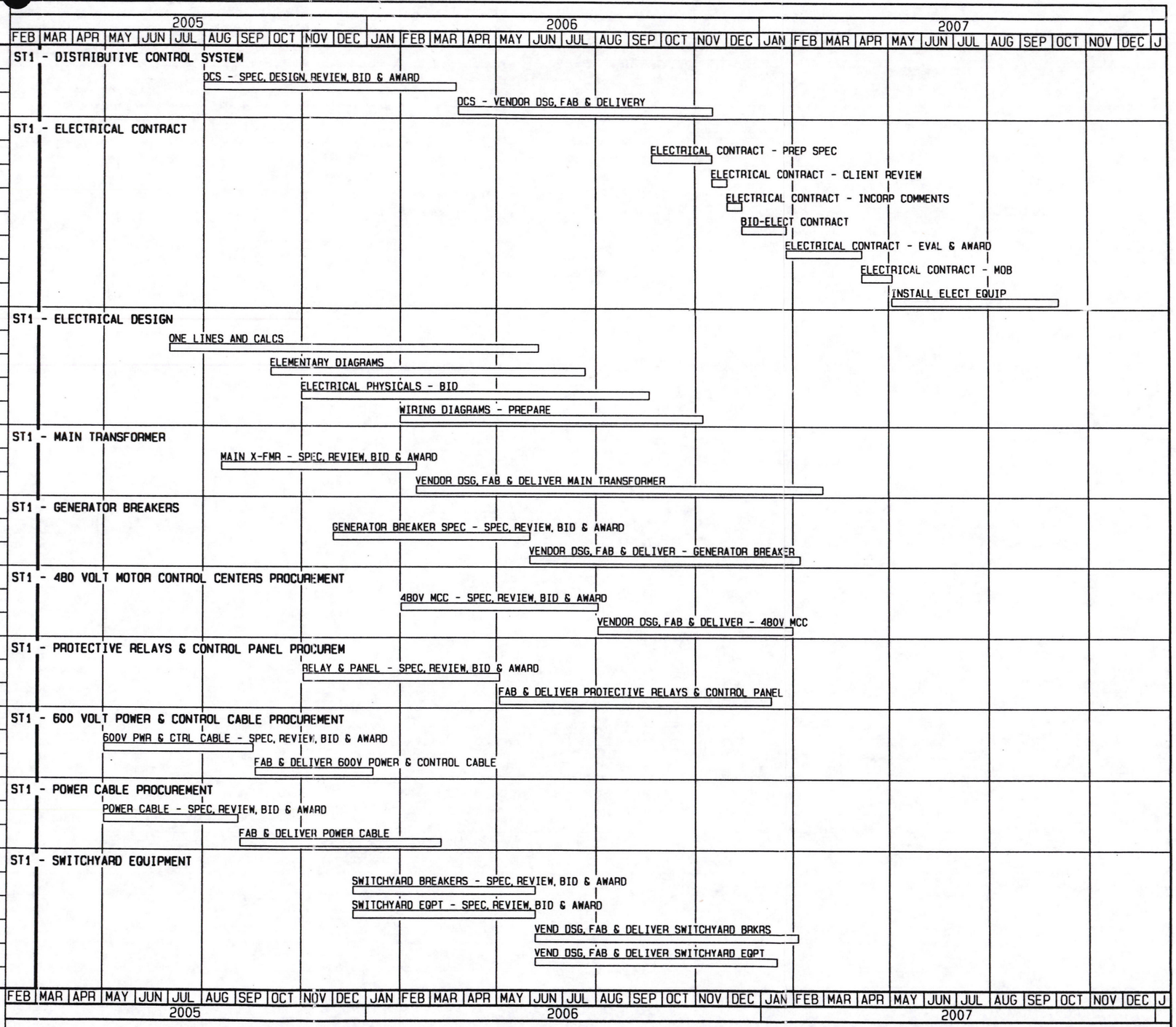
24C0490	480V MCC - SPEC, REVIEW, BID & AWARD	2FEB06	2AUG06
24C0510	VENDOR DSG, FAB & DELIVER - 480V MCC	3AUG06	31JAN07
24D0520	RELAY & PANEL - SPEC, REVIEW, BID & AWARD	3NOV05	3MAY06
24D0540	FAB & DELIVER PROTECTIVE RELAYS & CONTROL PANEL	4MAY06	10JAN07
24E0565	600V PWR & CTRL CABLE - SPEC, REVIEW, BID & AWARD	2MAY05	16SEP05
24E0580	FAB & DELIVER 600V POWER & CONTROL CABLE	19SEP05	6JAN06
24E0545	POWER CABLE - SPEC, REVIEW, BID & AWARD	2MAY05	2SEP05
24E0560	FAB & DELIVER POWER CABLE	5SEP05	10MAR06
80A0585	SWITCHYARD BREAKERS - SPEC, REVIEW, BID & AWARD	20DEC05	5JUN06
80A0615	SWITCHYARD EQPT - SPEC, REVIEW, BID & AWARD	20DEC05	5JUN06
80A0610	VEND DSG, FAB & DELIVER SWITCHYARD BRKRS	6JUN06	5FEB07
80A0635	VEND DSG, FAB & DELIVER SWITCHYARD EQPT	6JUN06	15JAN07



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NEW SITE - STEAM UNIT ST-1
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Sheet 3 of 3

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APPENDIX G

AIR QUALITY MODELING

Air Quality Screening Analysis

for the

Central Maui Generation Project

Prepared for
Maui Electric Company, Limited

Prepared by
Jim Clary & Associates

November 15, 1995

JCA Project 94-33

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APPENDICES

1 Description of the Existing Source Inventory

Executive Summary

This air quality screening analysis will assist Maui Electric Company, Limited (MECO) in the selection of a preferred site for a nominal 232 megawatt (MW) electrical power generation facility. This study provides a comparative analysis of three candidate sites located in the Central Maui Valley.

Factors used in evaluating and selecting the best site are:

- Minimum stack height,
- Significant impact, and
- Required changes in the existing source inventory.

A summary of the results follows:

- The minimum stack height is the height at which emissions from the new combustion turbines only (no existing sources) do not cause any air quality violations. The minimum stack height for Site A-2 is 105 feet. The minimum stack heights for the other sites are higher: 150 feet for D-1, and 180 feet for C-3.
- At equal stack heights, Site A-2 is significant for fewer pollutants and averaging periods and, thus, should be easier to permit.
- Considering the existing source inventory, a 232 MW plant modeled compliance at site A-2 only. Compliance at site A-2 was achieved with a stack height of 150 feet. Sites D-1 and C-3 will require changes in the existing source inventory for 232 MW even with the maximum allowable stack height of 210 feet. This requirement is not a fatal flaw, as there will be some significant changes in the existing source inventory between this report and the time an air permit is prepared.

Site A-2 is the best site, followed in order by sites D-1 and C-3. Site A-2 is the only site that models compliance with the existing emission inventory. Fatal flaws were not found for any candidate site. However, changes in the existing emission inventory must be made for sites D-1 and C-3.

The results of this screening study may be used in determining a recommended stack height for a 232 MW plant at three of the sites. The recommended stack heights are 150 feet for site A-2, and a conditional recommendation of 210 feet for sites D-1 and C-3.

1.0 Introduction

This introduction provides information on the purpose of the air quality screening analysis, a description of the new generating units, locations of the candidate sites and methodology for site recommendation, and a discussion of several uncertainties associated with air quality modeling.

1.1 Purpose of the Air Quality Screening Analysis

The purpose of this air quality screening analysis is to assist Maui Electric Company, Limited (MECO) in the selection of a preferred site for a nominal 232 MW electrical power generation facility. This study provides a comparative analysis of three candidate sites identified as important to MECO. Candidate Sites A-2, C-3, and D-1 are located in the Central Maui Valley. This air quality analysis is intended to supplement the existing base of knowledge and information used for site selection.

1.2 New Generating Units Description

MECO proposes to design, construct, and operate a nominal 232 MW electrical generation facility. The 232 MW generating units are four diesel oil-fired nominal 58 MW dual-train combined cycle combustion turbine units, exhausted through four Good Engineering Practice (GEP) two-flue stacks. In addition, the analysis includes a single 26.9 MW diesel unit, proposed as a possible future generating unit. The proposed diesel unit, however, is not considered in the comparison for site recommendation because of its minimal air quality impact.

1.3 Candidate Sites

This air quality analysis is an evaluation of three candidate sites, which have been identified in prior MECO studies (e.g., Dames & Moore, 1995, and Belt Collins, 1993b) as worthy of further evaluation. Candidate Sites A-2, C-3, and D-1 are illustrated in Figure 1.3-1.

Site A-2 is generally located north of Waikapu Road, approximately 1500 ft west of Pulehu Road. UTM coordinates for this site are 768.3 km east and 2307.6 km north.

Site C-3 is located approximately 1.5 miles northeast of the town of Kihei. The site is just west of Upper Kihei Road. Of the three sites, it is farthest south in Central Maui, located approximately 3.3 miles south-southwest of a central location for Sites A-2, and D-1. UTM coordinates for this site are 766.6 km east and 2302.6 km north.

Site D-1 is located at the northwest quadrant of Pulehu Road and Lowrie Ditch Road. UTM coordinates for this site are 769.7 km east and 2306.4 km north.

1.4 Uncertainties Associated with the Assessment

The Central Maui facility will not reach 232 MW until well after the year 2000, introducing some degree of uncertainties for this study. For example, it is not possible to state that the last 58 MW addition in the year 2010 will meet all air quality regulations that will be in effect in 2010. A discussion of each of these uncertainties follows:

Emission parameters. The first uncertainty associated with the assessment of future air quality is the question of emission parameters. Emission inventories are subject to change year after year. Questions regarding emission sources require careful consideration and sometimes complex engineering solutions. Dispersion model computer programs may accept input data requirements of three principal source types: stack, volume, and area. All of these potential source types need consideration with respect to the calculated emission parameters, which may change from year to year. Associated with an existing source inventory, state and federal air quality regulations do not allow for the reservation of air space for future permitting related to a new facility or modification to an existing facility.

New standards. Another uncertainty for future air quality analyses is the inclusion of additional air quality standards for pollutants. The following examples illustrate that the regulated community may expect changing and/or new requirements to control environmental pollution.

Recently the U.S. EPA solicited comments on the possible need to adopt additional regulatory measures to address short-term peak SO_2 exposures and thereby further reduce the health risk to exercising asthmatic individuals. The alternatives under consideration include:

- Revising the existing NAAQS by adding a new five-minute standard of 0.60 ppm, 1 expected exceedance.

- Establishing a new regulatory program under Section 303 of the Clean Air Act to supplement the protection provided by the existing NAAQS.

- Augmenting implementation of the existing standards by focusing on those sources or source types likely to produce high five-minute peak SO_2 concentrations.

The regulated community has seen the U.S. EPA promulgate a number of regulations within the past few years. For example, the EPA promulgated PSD increments for nitrogen dioxide with revisions to 40 CFR Part 51 effective October 17, 1989, and revisions to 40 CFR Part 52 effective November 19, 1990.

Regulatory models. Still another uncertainty is associated with the ever-changing dispersion models. The current Industrial Source Complex (ISC2) dispersion models are restructured and reprogrammed versions of the original ISC models described in the *ISC Dispersion Model User's Guide - Second Edition (Revised)* (EPA, 1992). The original user's guides are dated December 1979; and the first use of the models outside the U.S. EPA took place in early 1980 (Bowers, 1979). Almost immediately the models came into wide use; and by summer 1980 they had supplanted CRSTER, MPTER, and CDM for most regulatory applications.

The models have been updated a number of times since they were released. For example, the choice of Briggs' urban coefficients was added in the mid 1980's. In 1986 the Schulman-Scire downwash algorithm was added to partially replace the Huber-Snyder algorithm. Changes made in 1990 corrected the wind speed calculation for sources less than anemometer height. The current versions of ISCST2 and ISCLT2 are 93109. The models were reprogrammed to improve the overall quality of the computer code, to improve the user interface, and to improve the end user documentation of the models.

Any regulatory application of the ISC2 models should conform to the guidance set forth in 40 CFR Part 51, Appendix W (Guideline on Air Quality Models [Revised]), including the most recent supplements to the guideline.

In addition to the ISC2 models for simple and intermediate terrain modeling, complex terrain models have also changed considerably over time. The model used in the Central Maui analysis for complex terrain, as well as simple and intermediate terrain, is the Integrated Gaussian Model (IGM), version 93334. IGM is intended to replicate the Complex I, RTDM, and SHORTZ models for complex terrain and to implement the EPA intermediate terrain procedure.

2.0 Methodology of the Air Quality Impact Assessment

2.1 General Approach

The Integrated Gaussian Model, IGM, was used to determine the air quality impacts. The maximum and highest second-high predicted concentrations were used to evaluate PSD Class II increment consumption and to compare with the National Ambient Air Quality Standards/State Ambient Air Quality Standards (NAAQS/SAAQS). The worst-case combustion turbine configurations (100% operating load for SO_2 and 25% for PM_{10} and NO_x) were used in the analysis. All modeling was performed in accordance with current EPA modeling guidance (CFR, 1994).

Several assumptions were made in the analysis. They are summarized below:

- An exceedance of 80% of the any applicable air quality standard is considered as non-compliance for the purposes of this study. This 80% level is the informal Hawaii Department of Health (DoH) rule. When impacts exceed 80% of a standard, DoH must increase their level of review of the air quality analysis in a permit application. In addition to the informal DoH rule, the uncertainties discussed in section 1.4 justify the use of this 80% level.

- Future generating unit stack heights of 105 and 150 feet use the 37-meter transport wind speed and direction.

- Future generating unit stack heights of 180 and 210 feet use the 64-meter transport wind speed and direction.

- The significant impact analysis includes one 58 MW unit addition.

- The existing source inventory analysis is restricted to receptors and hours where one 58 MW unit addition is significant. This is the current EPA/DoH policy.

- The PSD increment consumption analysis for the existing source inventory uses allowable emission rates for all sources (recent actual emissions data are not available).

- The limiting factor at each site will be either PSD Class II increments or the NAAQS/SAAQS.

Factors used in evaluating and selecting the best site are the following:

- *Minimum stack height analysis.* The analysis determines the minimum stack height required for a 232 MW plant considering only the combustion turbines. This minimum stack height is the starting point for the other studies. The addition of existing sources can only increase the required stack height.

- *Significant impact of a single 58 MW unit.* The analysis considers the pollutants for which a 58 MW unit is significant and is conducted per stack height for each candidate site to determine each candidate site's significant pollutants and averaging periods. Generally, the smaller the number of significant impacts, the easier a modeling study for a permit.

- *Pollutants for which changes in the source inventory are required to attain 80% of the standards for the specified number of units.* The analysis is conducted at the candidate stack height of 180 feet for each candidate site. The analysis is done to compare modeling results with 80% of the standards. If the results are above this threshold, changes per pollutant are therefore required in the total sources inventory to bring the results into compliance with the 80% requirement.

The results of this comparison will aid in the identification of a preferred site.

2.2 Air Quality Model Selection

The choice of appropriate dispersion modeling methods for evaluating the air quality impacts of the new generating units is governed by the EPA's modeling guidelines and the topography of the site area. The three proposed sites are located in the Central Maui Valley. To the northwest of the sites, the terrain gently slopes downward toward the center of the valley. The terrain to the southeast of the sites abruptly rises towards Haleakala. There are no significant terrain features (e.g., cliffs, bluffs, hills, etc.) in the immediate area of any site.

Different modeling methods are required for evaluating impacts at receptors in these two terrain areas. Ground-level concentration impacts at receptor locations with elevations equal to or lower than the lowest stack top may be evaluated by means of the EPA Guideline Model ISCST2 (formerly ISCST). Receptors at elevations above the final heights attained by pollutant plumes released to the atmosphere require the use of a model capable of addressing the effects of elevated terrain. The EPA guideline model RTDM is suitable for modeling impacts at these receptors. No EPA-approved model is specifically designed to address impacts at receptors in "intermediate" terrain, i.e., at elevations above stack top, but below plume height. 40 CFR Part 51, Appendix

W (Guideline on Air Quality Models [Revised]), specifies that impacts at intermediate receptors are to be calculated by both simple terrain and complex terrain dispersion algorithms (i.e., ISCST2 and RTDM), with the higher of the two values retained for each hour of the modeling period for each receptor (CFR, 1994).

IGM, a dispersion model developed by United Engineers & Constructors, is designed to incorporate this guidance on intermediate terrain. IGM employs a decision tree to determine the appropriate dispersion algorithm for each hour and each source receptor, pair, based on computed plume heights for all modeled sources. Results for individual sources are summed at each receptor, and multiple hour averages are constructed using the appropriate concentration values determined for consecutive hours. The model is functionally equivalent to, but more computationally efficient than, EPA's POSTIT processor program. (Note: EPA has not updated the POSTIT program for ISCST2.)

2.3 Source Information

Two type of sources, the future generating units and existing sources, are considered.

2.3.1 Candidate Site Locations and Elevations

The locations of the future generating units are discussed above in Section 1.3 and illustrated in Figure 1.3-1. In addition, Table 2.3.1-1 is a summary of the stack locations and elevations for proposed Sites A-2, C-3, and D-1. The locations and elevations are important model input.

Table 2.3.1-1. Stack Locations and Elevations for Proposed Sites

Site	UTM East (m)	UTM North (m)	Elevation (ft)	Elevation (m)
A-2	768,306.1	2,307,571.4	341.1	103.96
C-3	766,551.0	2,302,571.4	229.3	69.90
D-1	769,693.9	2,306,408.2	445.9	135.91

2.3.2 New Generating Unit Source Parameters and Emission Rates

The model-predicted concentrations include the potential emission rates for the proposed combined cycle operations. Included in a separate air quality analysis is a single 26.9 MW diesel unit. Its model input parameters are a ratio from Maalaea M13 Unit (12.5 MW). Although a black start unit is not included in the analysis, it is expected to have negligible impacts. Table 2.3.2-1 is a summary of the potential emission data used in the air quality analysis for one 58 MW diesel train combustion turbine. CO is not expected to be a limiting pollutant and is not considered in the analysis. Four stack heights are analyzed - 105 ft, 150 ft, 180 ft, and 210 ft.

Table 2.3.2-1. Source Emissions and Stack Data

For One 58 MW Dual Train Combined Cycle Combustion Unit and One Diesel Unit

Operation and Load	Stack Height*	Exit Velocity (m/s)	Stack Diameter (m)	Exit Temperature (K)	Emissions (g/s)		
					NO_x	SO_2	PM/PM_{10}
CT-Combined Cycle							
100%	varies	20.0	2.44	427	NA	27.72	NA
25%	varies	10.8	2.44	414	10.66	NA	4.96
26.9 MW Diesel Unit (Parameters from Maalaea M13 Unit (12.5 MW)							
100%	varies	34.8	2.04	644	69.44	14.74	10.61

* Stack height analyzed at 105 ft, 150 ft, 180 ft, and 210 ft.

2.3.3 Good Engineering Practice (GEP) Discussion

40 CFR 51 Section 100 (ii) (1) and (2) regulates GEP with respect to stack heights to insure that excessive concentrations do not occur as a result of atmospheric downwash created by the source itself, nearby structures, or nearby terrain obstacles (CFR, 1994). According to the guidance, GEP stack height means the greater of:

1 65 meters, measured from the ground-level elevation at the base of the stack.

2 A formula value height, $H_{GEP} = H + 1.5\ L$, where H is the height of nearby structure(s) and L is the lesser dimension, height or projected width, of nearby structures.

3 Height demonstrated by a fluid model or a field study approved by the EPA, State, or local control agency.

The use of stack height credit in excess of GEP stack height or credit resulting from any other dispersion technique is prohibited in the development of emission limitations by 40 CFR 51.118 and 40 CFR 51.164.

Based upon previous MECO analyses and the fact that no candidate stack height exceeds 65 meters, a GEP analysis is not required for the current analysis.

2.3.4 Existing Source Inventory Parameters

Tables 2.3.4-1 and 2.3.4-2 are summaries of the inventoried emissions data of non-project sources used in the PSD and NAAQS/SAAQS analyses, respectively. These sources were added to the project sources to determine total impact. A description of the existing source inventory is included in Appendix 1. Sources west of the West Maui mountains were excluded.

2.4 Meteorological Data

Two MECO monitoring stations provided the required hourly meteorological data: Tower 251, located near proposed Sites A-2 and D-1; and Tower 261, located near Site C-3. The data collection period was from February 1994 through January 1995. These data were collected according to EPA's PSD monitoring guidelines and the monitoring plan developed for this project (Clary, 1993). Hourly stability classes were determined from the standard deviation of the horizontal wind direction (sigma theta), using the Meteorological Processor for Regulatory Models (MPRM) as specified in 40 CFR Part 51, Appendix W (CFR, 1994). Hourly mixing heights were obtained from MPRM using Lihue monthly average mixing height data (averaged from 1985-1989) and the MECO surface data.

Figures 2.4-1a through 2.4-1d are annual wind roses for the two levels of data from the two MECO monitoring stations. These figures include a frequency distribution of stability classes.

The use of on-site data allows the use of highest second-high predicted concentration data whenever appropriate for comparisons with short-term averaging periods.

2.5 Receptor Grids

A number of different model receptor grids are used in completing the air quality analysis. Because of the distance between proposed Site C-3 and the other sites, separate receptor grids are used for Site C-3. A fine grid is used in the areas of expected maximum concentrations (i.e., near the facility and plume impact in the terrain).

The receptor grids contain several different receptor grid densities, as defined below in Tables 2.5-1 and 2.5-2.

Table 2.5-1. Base Grid Description

Grid Density Spacing (m)	Minimum East UTM (m)	Maximum East UTM (m)	Minimum North UTM* (m)	Maximum North UTM* (m)
Sites A-2, D-1				
200	763,000	775,000	301,000	313,400
100	767,300	770,700	305,400	309,400
Site C-3				
200	761,500	771,500	297,500	307,500
100	765,500	767,500	301,500	303,500

* USGS north coordinates without leading digit (e.g., 301,000 is 2,301,000 m UTM north).

Receptor elevations are derived from the USGS 30-meter topographic data. The base grid locations used in the analysis are plotted in Figures 2.5-1a and 2.5-1b. To address maximum concentrations due to plume impact in the terrain, a denser grid is used. As seen in Figures 2.5-2a and 2.5-2b, the additional receptor grids for all terrain above 200 meters for Sites A-2, and D-1, as well as terrain above 134 meters for Site C-3, also contain several different receptor grid densities in the following table:

Table 2.5-2. Elevated Terrain Grid Description

Grid Density Spacing (m)	Minimum East UTM (m)	Maximum East UTM (m)	Minimum North UTM* (m)	Maximum North UTM* (m)
Sites A-2, D-1				
100	763,000	775,000	301,000	313,500
50	766,300	771,700	304,400	301,400
25	767,350	770,650	305,450	309,350
Site C-3				
100	761,500	771,500	297,500	307,500
50	764,500	768,500	300,500	304,500
25	765,500	767,500	301,500	303,500

* USGS north coordinates without leading digit (e.g., 301,000 is 2,301,000 m UTM north).

Two grids are identified for each site grouping. Grid 1 for Sites A-2, and D-1 includes receptors below 200 meters above mean sea level (amsl) elevations. Receptor locations for this grid are displayed in Figure 2.5-1a. Grid 1 for Site C-3 includes receptors below 134 meters above mean sea level (amsl) elevations. Receptor locations for this grid are displayed in Figure 2.5-1b. Receptor Grid 2 for Sites A-2, and D-1 consists of all receptors at or above 200 meters. These receptor locations are shown in Figure 2.5-2a. Receptor Grid 2 for Site C-3 consists of all receptors at or above 134 meters. These receptor locations are shown in Figure 2.5-2b. Grids 1 and 2 are used in all modeling analyses.

A coarse grid for each site grouping, Grid 3, is used in addition to Grids 1 and 2. As seen in Figures 2.5-3a and 2.5-3b, these grids extend from the edges of Grids 1 and 2 to 25 kilometers from the source. Receptor elevations are derived from the USGS 30-meter and 3-arc second topographic data. Grid 3 is used in all modeling analyses.

Table 2.5-3. Coarse Grid Description

Grid Density Spacing (m)	Minimum East UTM (m)	Maximum East UTM (m)	Minimum North UTM* (m)	Maximum North UTM* (m)
Sites A-2, D-1				
1000	743,000	795,000	281,000	333,000
Site C-3				
1000	741,500	791,500	277,500	327,500

* USGS north coordinates without leading digit (e.g., 281,000 is 2,281,000 m UTM north).

3.0 Results of the Air Quality Impacts Assessment

3.1 Fatal Flaw Evaluation

Fatal flaws were not found for any candidate site. Based on the future generating units alone, all sites are capable of 232 MW. A-2 is the only site that will not require changes in the existing emission inventory to attain compliance with 80% of the air quality standards. The other two sites, D-1 and C-3, do not attain compliance with 80% of the standard with the existing emission inventory. However, because of the uncertain nature of the existing source inventory this requirement is not considered a fatal flaw.

3.2 Comparative Site Analysis

The candidate site combustion turbine comparison is based on the three factors described in section 2.1 of this report. The results of the diesel unit analysis are also discussed.

3.2.1 Minimum Stack Height Analysis

The minimum stack height required for 232 MW was determined for each site. The minimum stack height results are shown in Tables 3.2.1-1 and 3.2.1-2. At Site C-3 the minimum stack height is 180 ft. With 150 foot stacks, four units at C-3 consume 93.8% of the 24-hour SO_2 increment. The 24-hour PM_{10} standard is the limiting standard at sites D-1 and A-2. With 105 foot stacks, the 24-hour SO_2 increment consumption at site D-1 (99.6%) is almost double the value at site A-2 (56.2%). These heights are the minimum height; existing source impacts may require higher stacks.

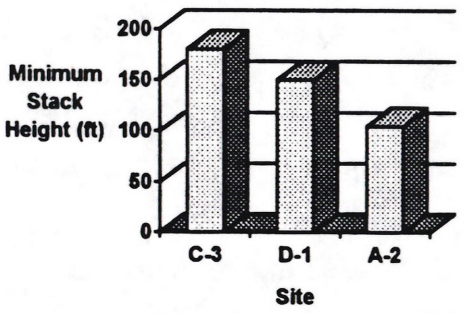


Table 3.2.1-1. Maximum Increment Consumption - CTs Only

Site	Stack Height (ft)	Number of 58 MW Units	Limiting Increment	Maximum Increment Consumption
A-2	105	4	PM_{10} 24-hr	56.2%
D-1	105	4	PM_{10} 24 hr	96.6%
	150	4	PM_{10} 24 hr	59.5%
C-3	150	4	SO_2 24 hr	93.8%
	180	4	PM_{10} 24-hr	73.4%

Table 3.2.1-2. Minimum Stack Height Required for 232 MW Plant

	Site		
	C-3	D-1	A-2
Minimum Stack Height (ft)	180	150	105

3.2.2 Significant Impact Analysis

The second factor for permitting is that the sources remain insignificant. If the project is insignificant, modeling with existing sources is not required. The significant impact analysis determines each candidate site's significant pollutants & averaging periods. A comparison can be made by the number of significant pollutants at each site (i.e., the fewer the number of significant pollutants, the more likely the permitting). The significant pollutants & averaging periods are shown in Table 3.2.2-1. Site C-3, with a stack height of 180 ft, will be significant for SO_2 (3-hr, 24-hr, and annual) and PM_{10} (24-hr). These pollutants & averaging periods will need to be modeled with the existing source inventory to show compliance with the PSD increments and NAAQS/SAAQS. The normalized significance areas for all sites are shown in Figures 3.2.2-1 though 3.2.2-12. In these figures, areas greater than one indicate significance for any pollutant; areas less than one are insignificant.

Table 3.2.2-1. Significant Pollutants & Averaging Periods

Site	Stack Height (ft)			
	105	150	180	210
C-3	Not Applicable; Below minimum stack height	Not Applicable; Below minimum stack height	SO_2 (3-hr, 24-hr, Annual), PM_{10} (24-hr)	SO_2 (3-hr, 24-hr), PM_{10} (24-hr)
D-1	Not Applicable; Below minimum stack height	SO_2 (3-hr, 24-hr)	SO_2 (3-hr, 24-hr), PM_{10} (24-hr)	SO_2 (3-hr, 24-hr)
A-2	SO_2 (3-hr, 24-hr, Annual), NO_X (Annual)	SO_2 (3-hr, 24-hr)	SO_2 (3-hr, 24-hr)	SO_2 (3-hr, 24-hr)

3.2.3 Existing Source Inventory Analysis

For each of the significant pollutants shown in Table 3.2.2-1, an analysis with the existing source inventory is required for permitting. Thus, a complete analysis is performed with the existing source inventory for each candidate site. Table 3.2.3-1 indicates the pollutants which require changes in the inventory to attain 80% of the standards. This table includes the number of 58 MW units requiring changes. For example, the analysis shows that at Site C-3 with 210 foot stacks, changes will be required in the current SO_2 inventory when permitting the first 58 MW unit. The analysis also shows that at Site C-3 changes will be required in the current PM_{10} inventory when permitting the fourth combustion turbine unit. Site A-2 models compliance with all standards with 150-foot stacks. Sites D-1 and C-3 do not model compliance, indicating that changes are required in the existing emission inventory for the two sites.

Table 3.2.3-1. Pollutants for Which Changes in the Inventory Are Necessary To Attain 80% of the Standards for the Specified Number of Units

Site	Stack Height (feet)	Pollutant (Number of Units)	Comments
C-3	210	SO_2 (1), PM_{10} (4)	With one unit, 177.5% of the 24-hr SO_2 increment is consumed.
D-1	210	SO_2 (1)	With one unit, 117.0% of the 24-hr SO_2 increment is consumed.
A-2	150	SO_2 (>4)	With four units, 78.8% of the 24-hr SO_2 increment is consumed.

3.2.4 Diesel Units Analysis

A comparative modeling analysis was performed for a 26.9 MW diesel unit at each site. Results indicate minimal impacts from the diesel unit at all candidate sites and a difference of only 5% of the limiting standard between sites. Therefore, the diesel unit analysis will not be considered in the comparison for site recommendation.

4.0 Conclusions

This section describes the relative rankings of the three candidate sites followed by the recommended stack heights.

4.1 Site Ranking

These rankings and recommendations are provided to assist MECO in the selection of a preferred site for a proposed 232 MW facility.

As noted in section 2.1 of this report, factors used in evaluating and ranking the sites are:

- Minimum stack height,
- Significant impact, and
- Pollutants for which changes in the source inventory are required to attain 80% of the standards for the specified number of units.

Based upon these factors, the following conclusions can be made:

- Site A-2 requires the minimum stack height considered (105 feet) for the proposed 232 MW facility. The other Pulehu Road sites require a higher minimum stack height: 150 feet for D-1. Site C-3 requires a minimum of 180 feet.
- At equal stack heights, Site A-2 is significant for fewer pollutants / averaging periods.
- Site A-2 is the only site that will not require changes in the existing source inventory for 232 MW.

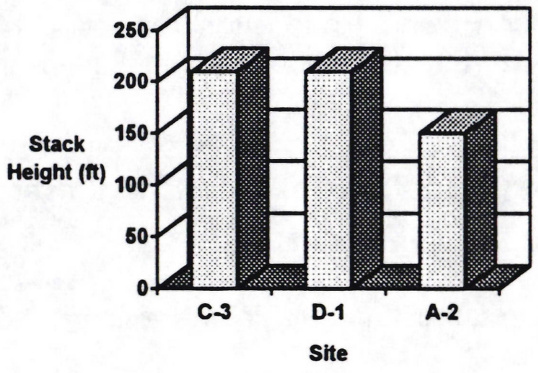
Following the relative evaluation of each candidate site as presented above, the site rankings are determined for each of the three criteria (minimum stack height, significant impact, and required changes in existing source inventory) on the basis of a numerical scale of 1 to 3 with 1 = most favored, 2 = favored, and 3 = least favored. Based on Table 4.1-1, Site A-2 is the most favored for the proposed project.

Table 4.1-1. Site Ranking Based on Air Quality Screening Analysis

	Site		
Criteria	A-2	C-3	D-1
Minimum Stack Height	1	3	2
Significant Impact	1	3	2
Required Changes in Existing Source Inventory	1	3	2
Total (Lowest value is best.)	3	9	6
Site Rank	1st	3rd	2nd

Scoring: 1 = most favored; 2 = favored, 3 = least favored

Site A-2 is the best site, followed in order by sites D-1 and C-3. Fatal flaws were not found for any candidate site. With the exception of site A-2, all sites will require changes in the existing source inventory for 232 MW. This requirement is not a fatal flaw, as there will be some significant changes in the existing source inventory between this report and the time an air permit is prepared.



4.2 Stack Height Recommendations

In order to minimize the visual impact of a plant, it is desirable to minimize the stack height. This must be balanced by air quality considerations; the stack height must be sufficient to allow the plant to comply with all applicable air quality standards. This section describes the process used to determine a recommended stack height and the recommended stack heights for sites A-2, D-1 and C-3.

Table 4.2-1. Recommended Stack Heights

	Site		
	C-3	D-1	A-2
Recommended Stack Height (ft)	210	210	150

4.2.1 Site A-2

The minimum stack height is 105 feet for A-2. However, due to the uncertainties described in section 1.4, the recommended stack height should be, at a minimum, increased to the next stack height increment of 150 feet. At 105 feet, there are significant impacts for both SO_2 and NO_2. At 150 feet, there is still a significant SO_2 impact. However, with a stack height of 150 feet, modeling using the existing SO_2 emission inventory shows compliance with a 232 MW plant. Therefore, the recommended stack height for site A-2 is 150 feet.

4.2.2 Site D-1

The minimum stack height is 150 feet for D-1. However, due to the uncertainties described in section 1.4, the recommended stack height should be, at a minimum, increased to the next stack height increment of 180 feet. At 180 feet, the plant is significant for SO_2 and PM_{10}. At a stack height of 180 feet, compliance with the PSD increments cannot be shown with the existing emission inventory for the first 58 MW addition. Therefore, the stack height must be increased to the maximum allowed height of 210 feet. The 210 foot recommendation is qualified, as compliance with the air quality standards cannot be shown for the first 58 MW. Permitting at D-1 will require changes in the existing emission inventory for the initial 58 MW unit.

4.2.3 Site C-3

The minimum stack height is 180 feet for C-3. However, due to the uncertainties described in section 1.4, the recommended stack height should be, at a minimum, increased to the next stack height increment of 210 feet. At 210 feet, the plant is significant for SO_2 and PM_{10}. At a stack height of 210 feet, compliance with the PSD increments cannot be shown with the existing emission inventory for the first 58 MW addition. However, 210 feet is the maximum stack height allowed for modeling. Thus,

the 210 foot recommendation is qualified, as compliance with the air quality standards cannot be shown for the first 58 MW. Permitting at C-3 will require changes in the existing emission inventory for the initial 58 MW unit.

4.3 Comparison of Sites A-2 and D-1

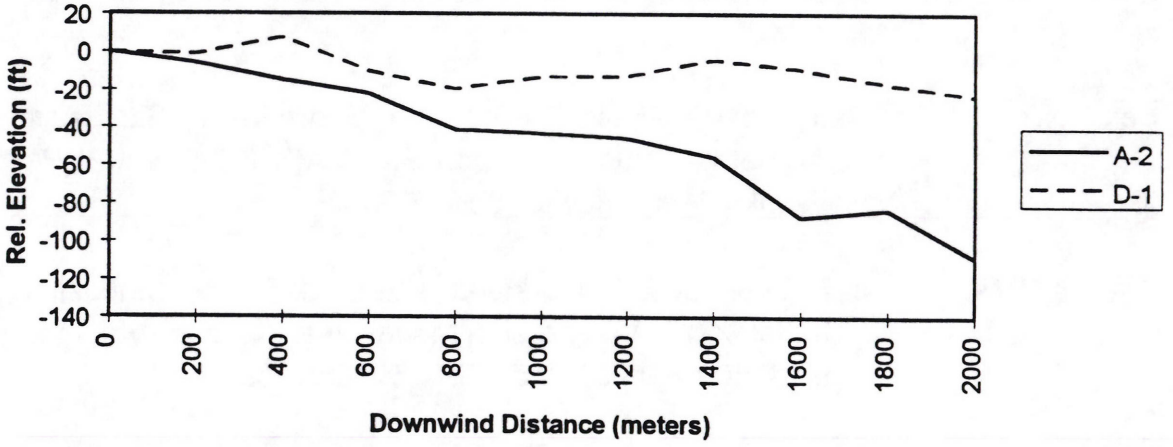
According to an earlier siting study (Belt Collins, 1993a) site D-1 is better than site A-2 for air quality. This modeling, using site-specific, stack-top meteorological data and refined receptor grids, determined that site A-2 is more favorable than site D-1. This section addresses the reasons for site A-2's higher air quality ranking.

The controlling pollutant and averaging period for the minimum 105-foot stack height is the PM_{10} 24-hour average. This pollutant and averaging period was found to be the most restrictive because it resulted in the consumption of the greatest percentage of the available increment and for purposes of this section will be referred to as the "controlling pollutant". A 232 MW plant with 105-foot stacks at site A-2 consumes less than 80% of the available increment. The identical 232 MW plant at site D-1 will consume more than 80% of the available increment.

A detailed study was made of the day containing the controlling pollutant. Impacts on the remaining 364 days have no impact on the site ranking, as the concentrations on those days were less than the controlling pollutant. This study concluded that the interaction of the plumes with the terrain is major reason for the lower controlling concentration at site A-2. The wind direction producing the controlling concentration transports the plumes into more favorable (i.e., lower) terrain at site A-2 than at site D-1.

This phenomenon is illustrated in the figure below. (The relative height shown in this figure is the terrain height relative to the stack base elevation.) The terrain at site D-1 is relatively flat while site A-2 terrain slopes downward at a more rapid rate. In effect, site A-2 gets a stack height advantage equal to the difference between the two relative terrain heights at a given downwind distance. At the point of maximum impact, the relative terrain at site A-2 is 48 feet lower that the terrain at site D-1. This terrain advantage is reflected in the 40-foot difference in the minimum stack heights at the two sites.

Relative Elevations Versus Downwind Distance



In summary, A-2 is preferred over D-1 because of the wind direction causing the controlling concentration. On that day, the plumes from the A-2 site travel over terrain that slopes downward at a more rapid rate than the plumes from site D-1.

5.0 References

Belt Collins 1993a Belt Collins Hawaii, MECO Central Maui Siting Study, ;June 29, 1993.

Belt Collins 1993b Belt Collins Hawaii, Phase I Preliminary Site Assessment, Alternative Puunene Airport Site, TMK 3-8-04: 02 (Portion of), Wailuku, Maui, Hawaii, July 1993.

Bowers 1979. J. F. Bowers, J. R. Bjorkland, and C. S. Cheney, Industrial Source Complex (ISC) Dispersion Model User's Guide, Volumes I and II, EPA-450/4-79-030 and 4-79-031, respectively.

CFR 1994. Code of Federal Regulations, Part 51, Appendix W - Guideline on Air Quality Models (Revised), EPA Document Number EPA-450/2-78-027R.

CFR1994. Code of Federal Regulations, Part 51, Section 100 (ii) (1) and (2), Good Engineering Practice (GEP).

Clary 1993. J. C. Clary, Monitoring Plan for a Proposed Future Central Maui Generation Station, BEE Consulting Services, October 22, 1993.

Dames & Moore 1995. Environmental Screening and Siting Report for the Central Maui Generation , April 8, 1995.

EPA 1992. User's Guide for the Industrial Sources Complex (ISC2) Dispersion Models, Volume I, EPA-450/4-92-008a, March 1992.

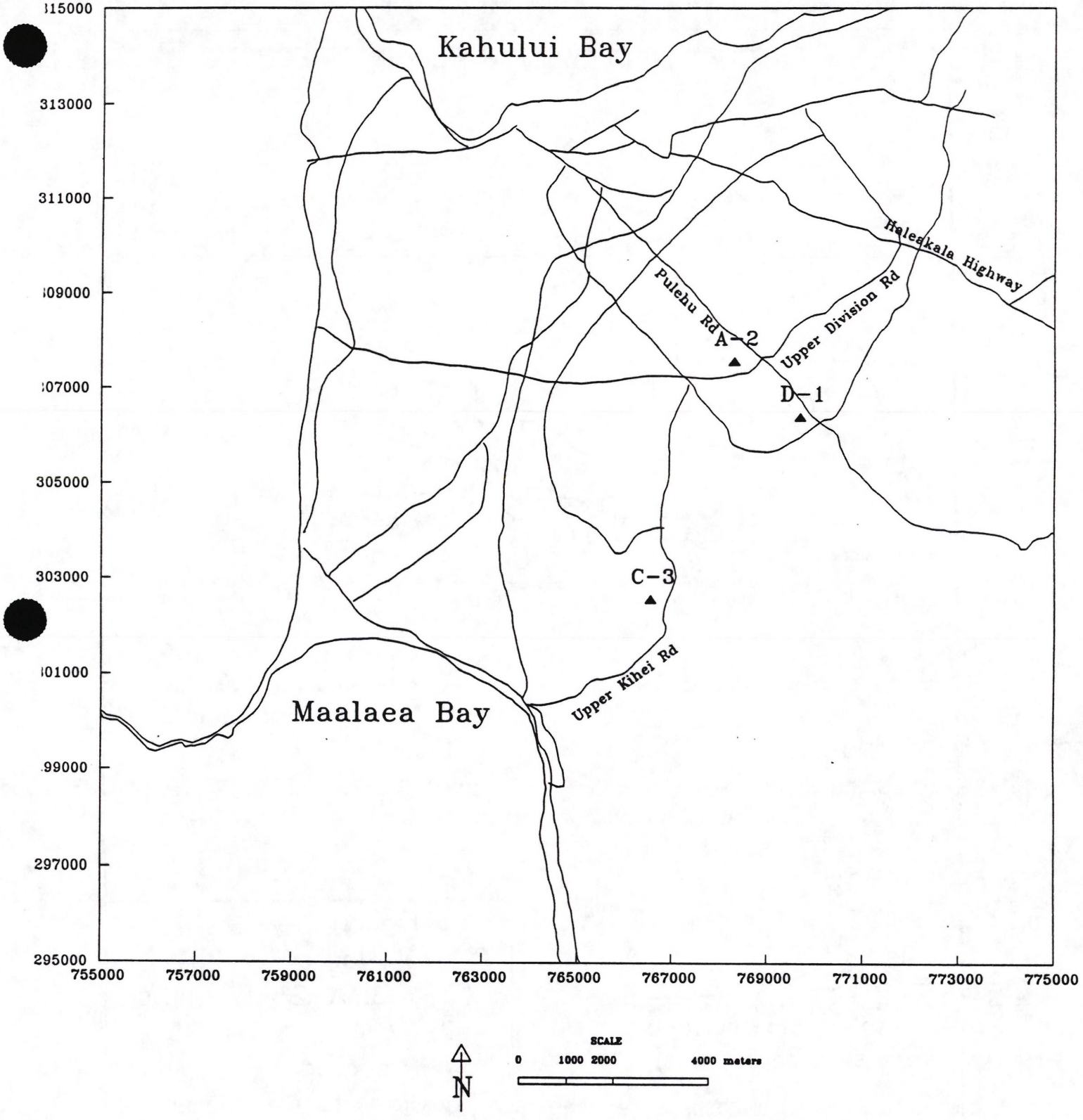


Figure 1.3-1
Candidate Site Locations
Central Maui, Island of Maui, Hawaii

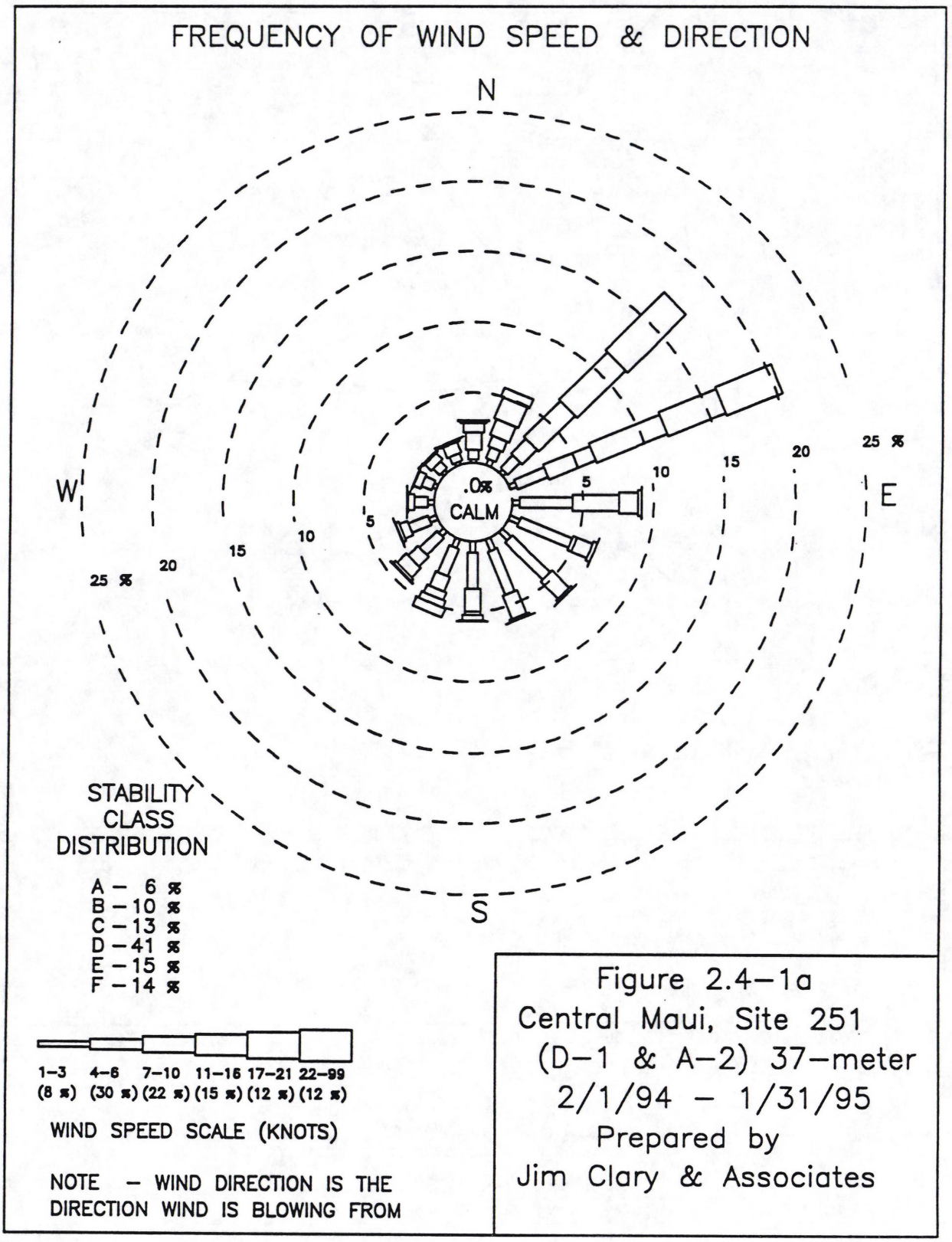


Figure 2.4–1a
Central Maui, Site 251
(D–1 & A–2) 37–meter
2/1/94 – 1/31/95
Prepared by
Jim Clary & Associates

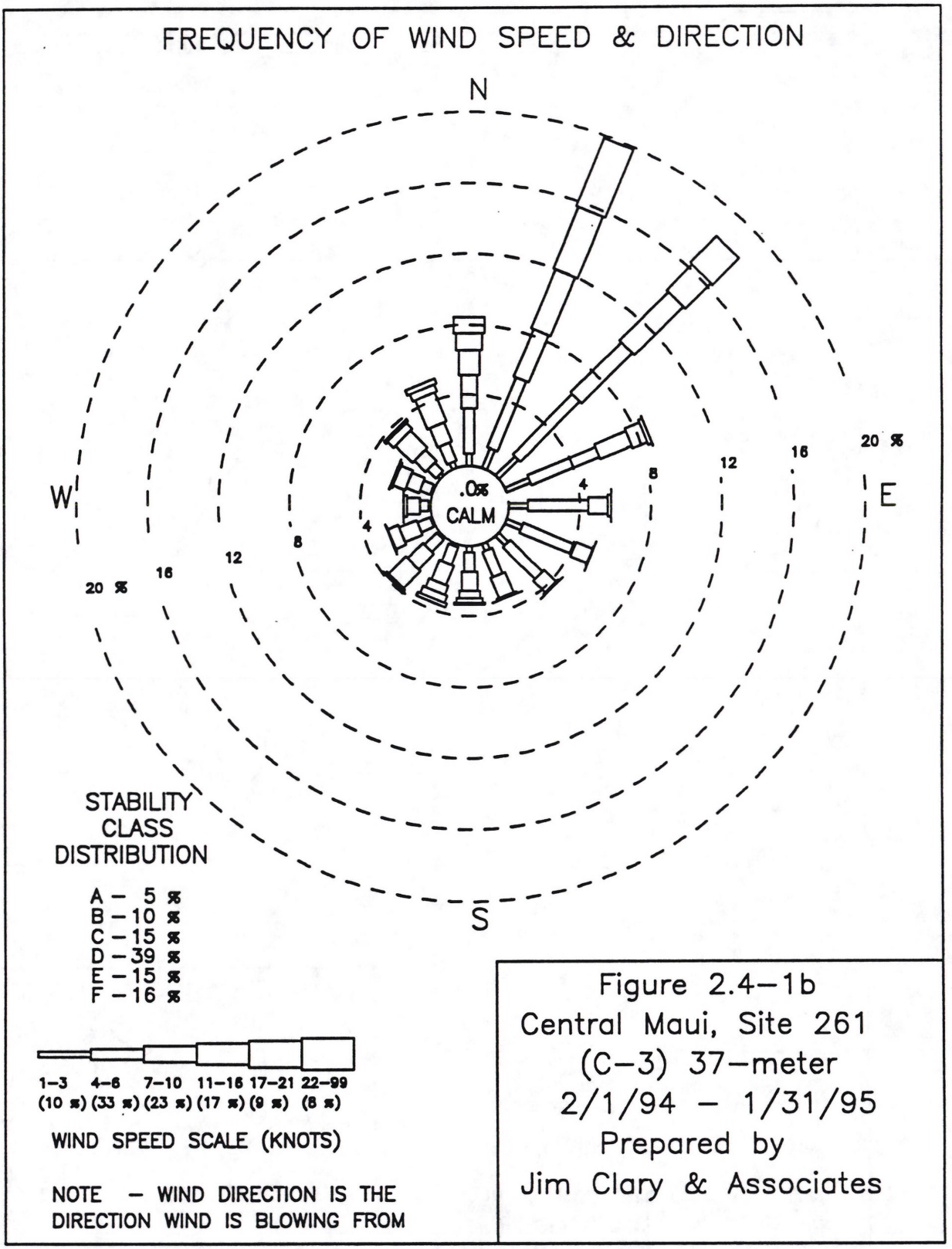


Figure 2.4–1b
Central Maui, Site 261
(C–3) 37–meter
2/1/94 – 1/31/95
Prepared by
Jim Clary & Associates

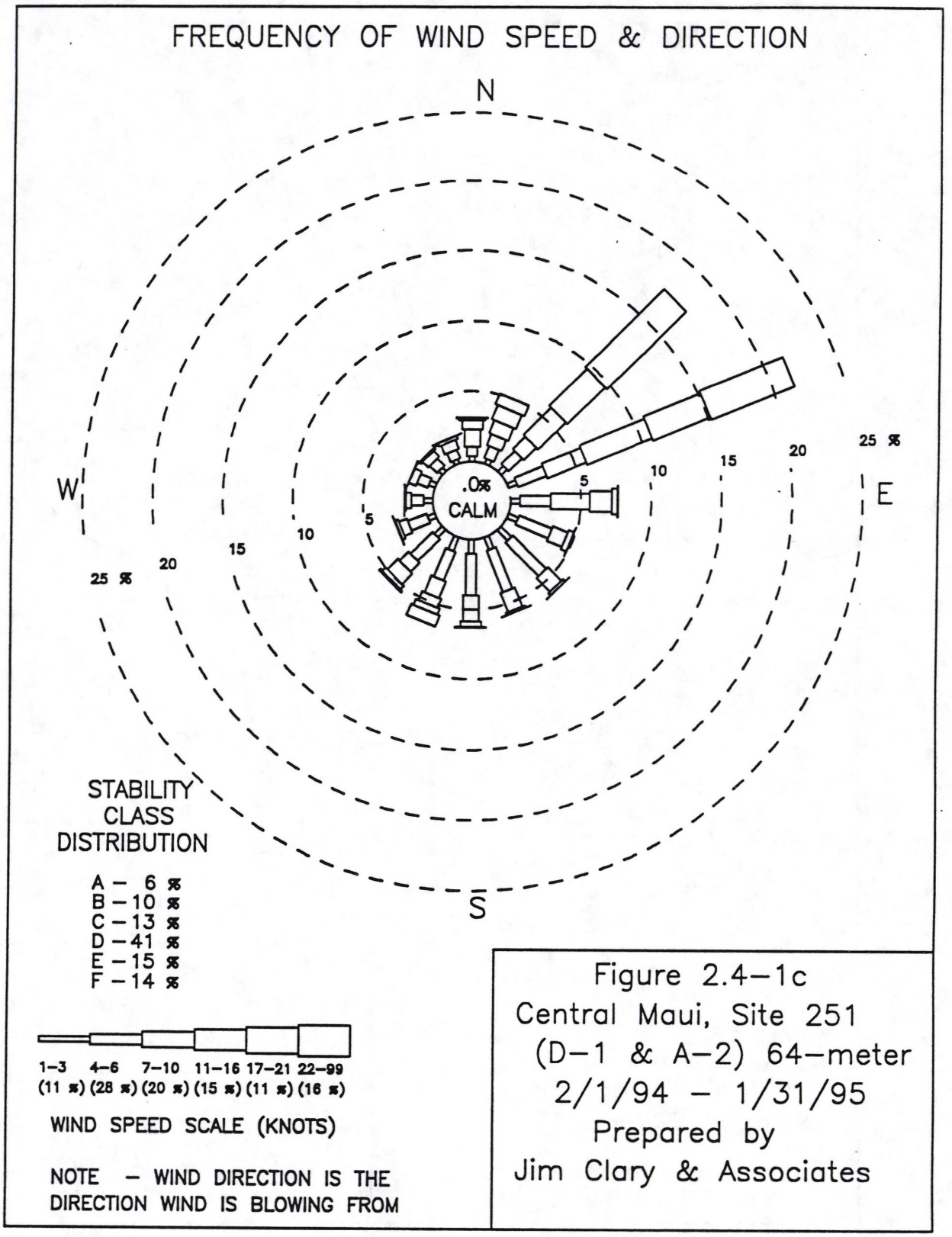


Figure 2.4–1c
Central Maui, Site 251
(D–1 & A–2) 64–meter
2/1/94 – 1/31/95
Prepared by
Jim Clary & Associates

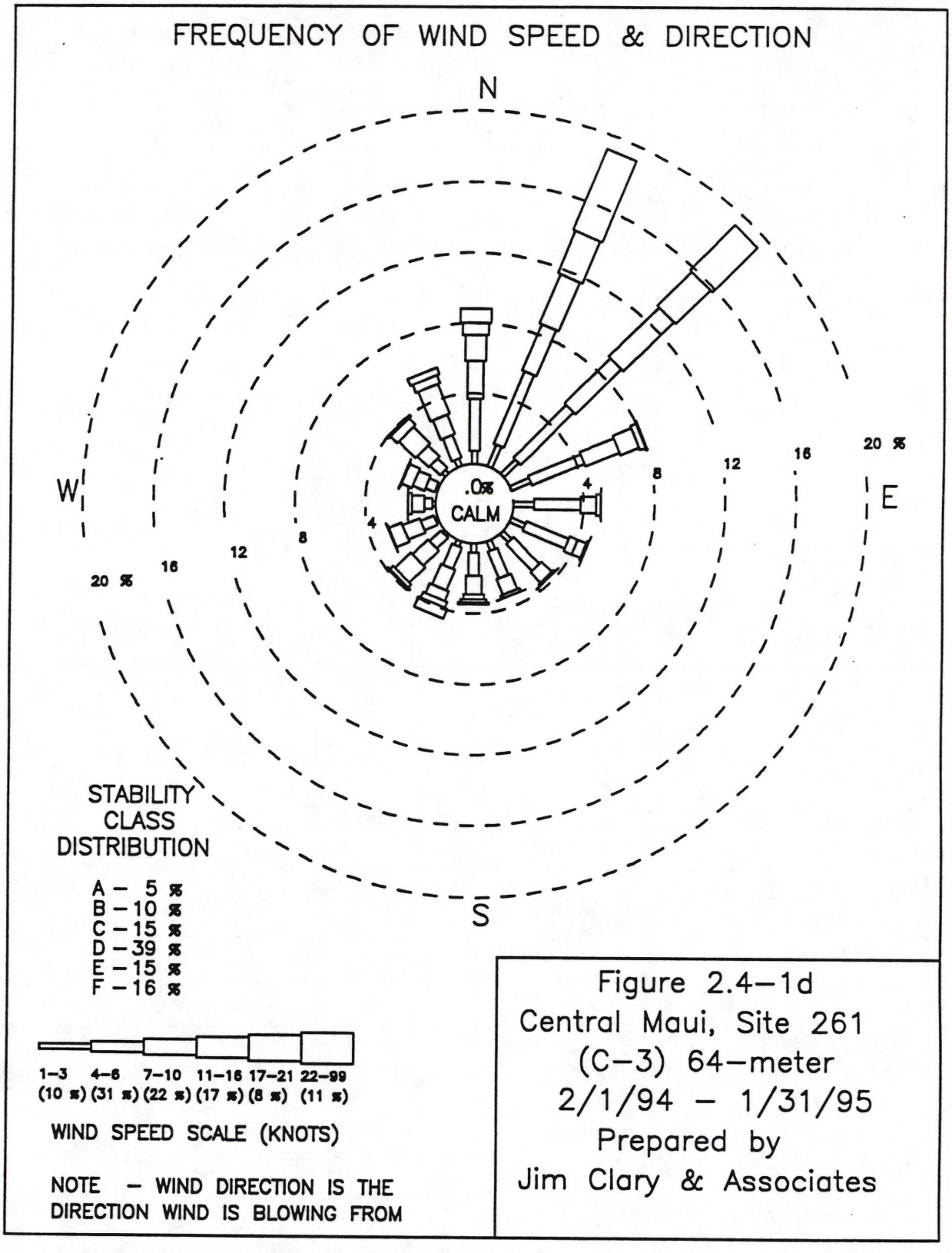


Figure 2.4–1d
Central Maui, Site 261
(C–3) 64–meter
2/1/94 – 1/31/95
Prepared by
Jim Clary & Associates

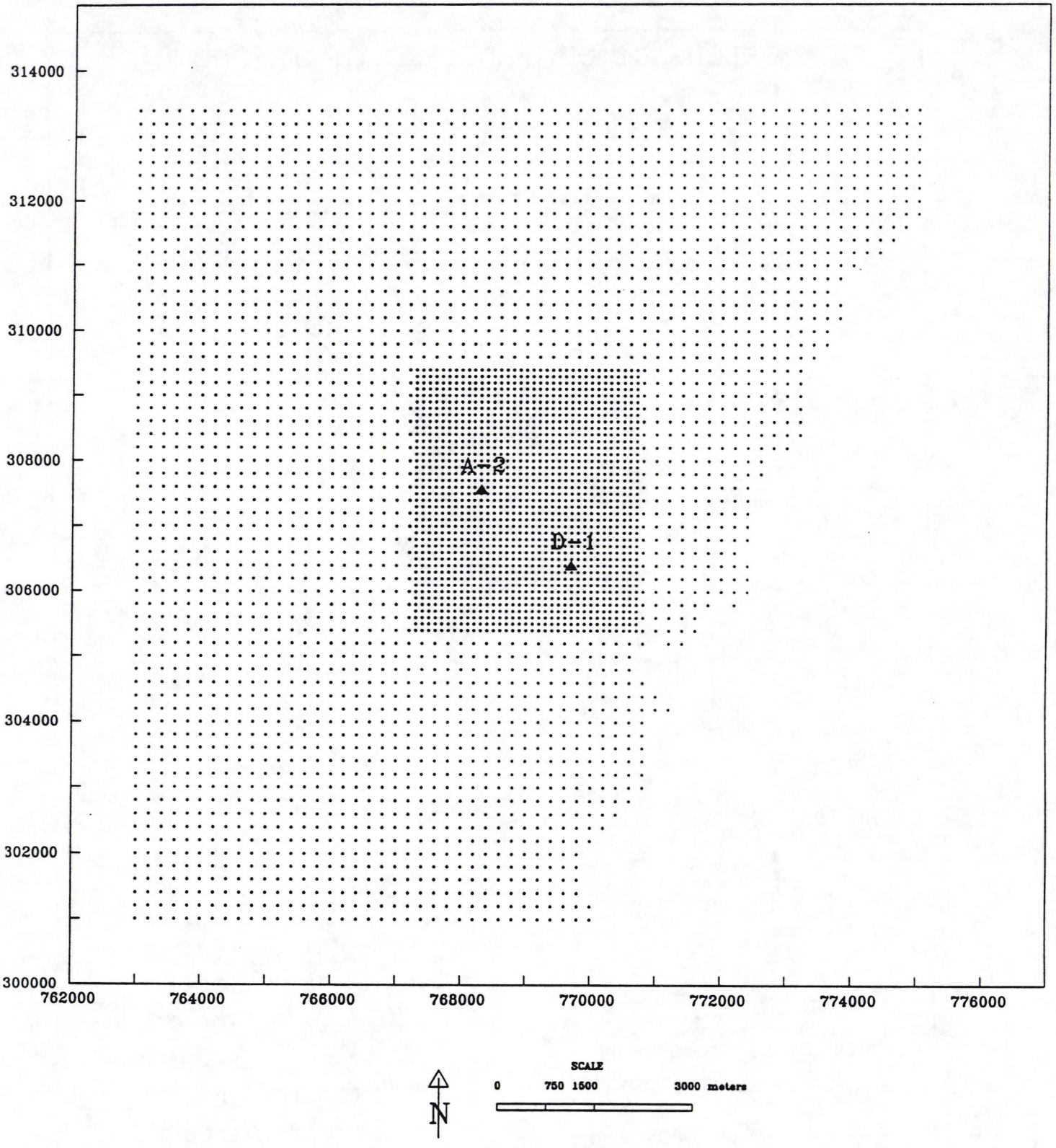


Figure 2.5-1a
Receptor Grid Locations: Grid 1, Base Grid
Central Maui, Sites A-2 and D-1
Island of Maui, Hawaii

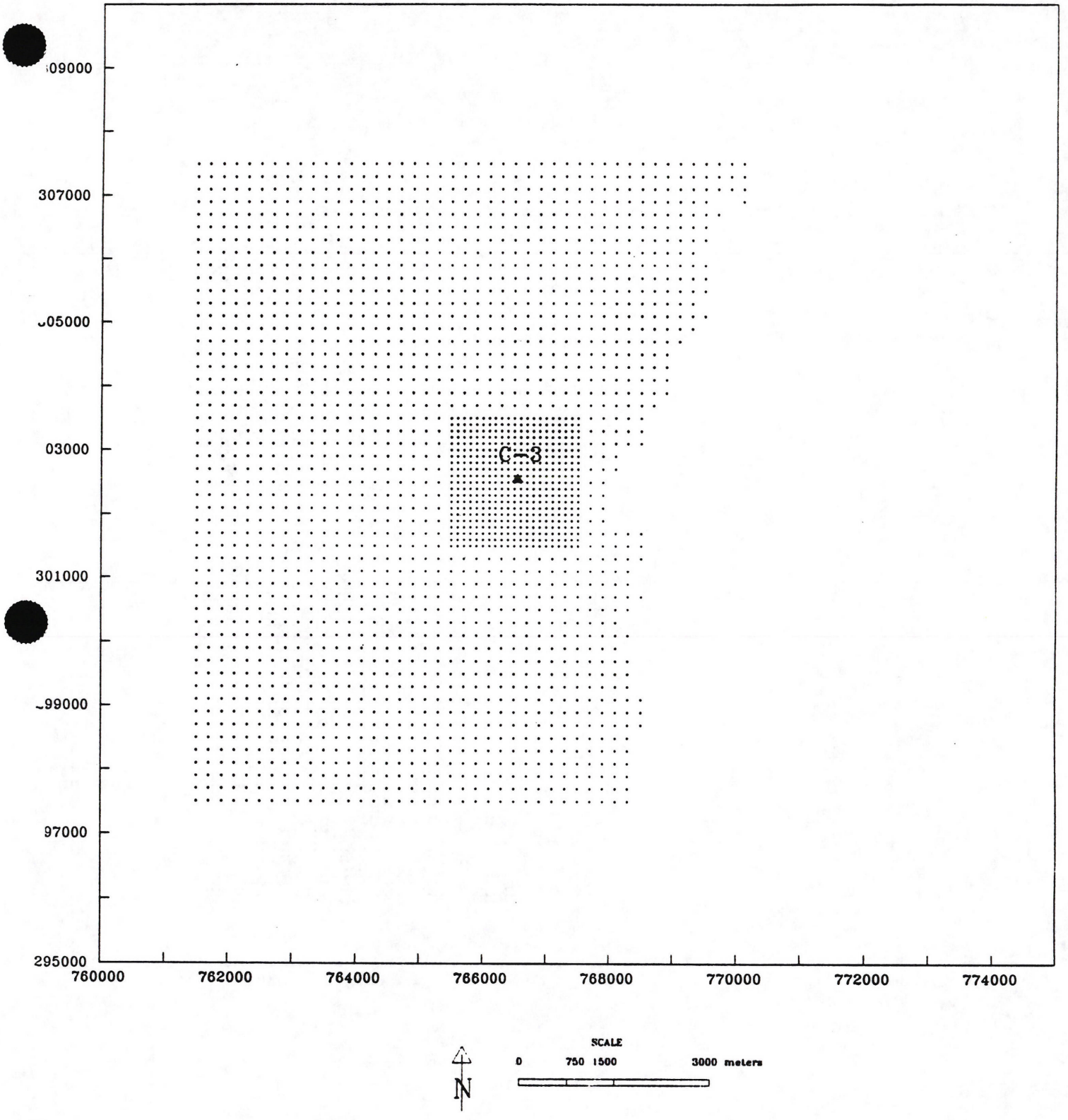


Figure 2.5-1b
Receptor Grid Locations: Grid 1, Base Grid
Central Maui, Site C-3, Island of Maui, Hawaii

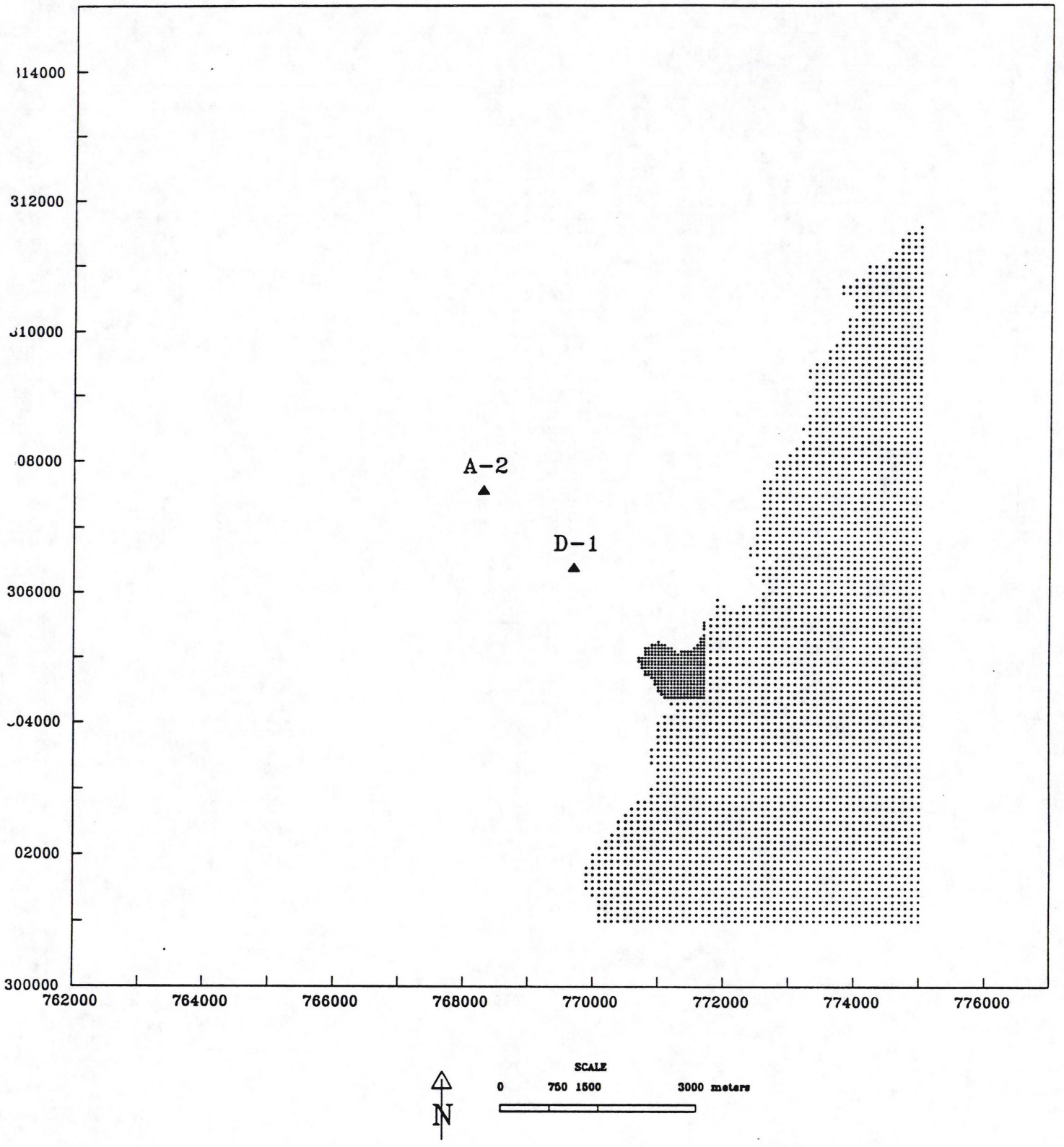


Figure 2.5-2a
Receptor Grid Locations: Grid 2, Terrain Grid
Central Maui, Sites A-2 and D-1
Island of Maui, Hawaii

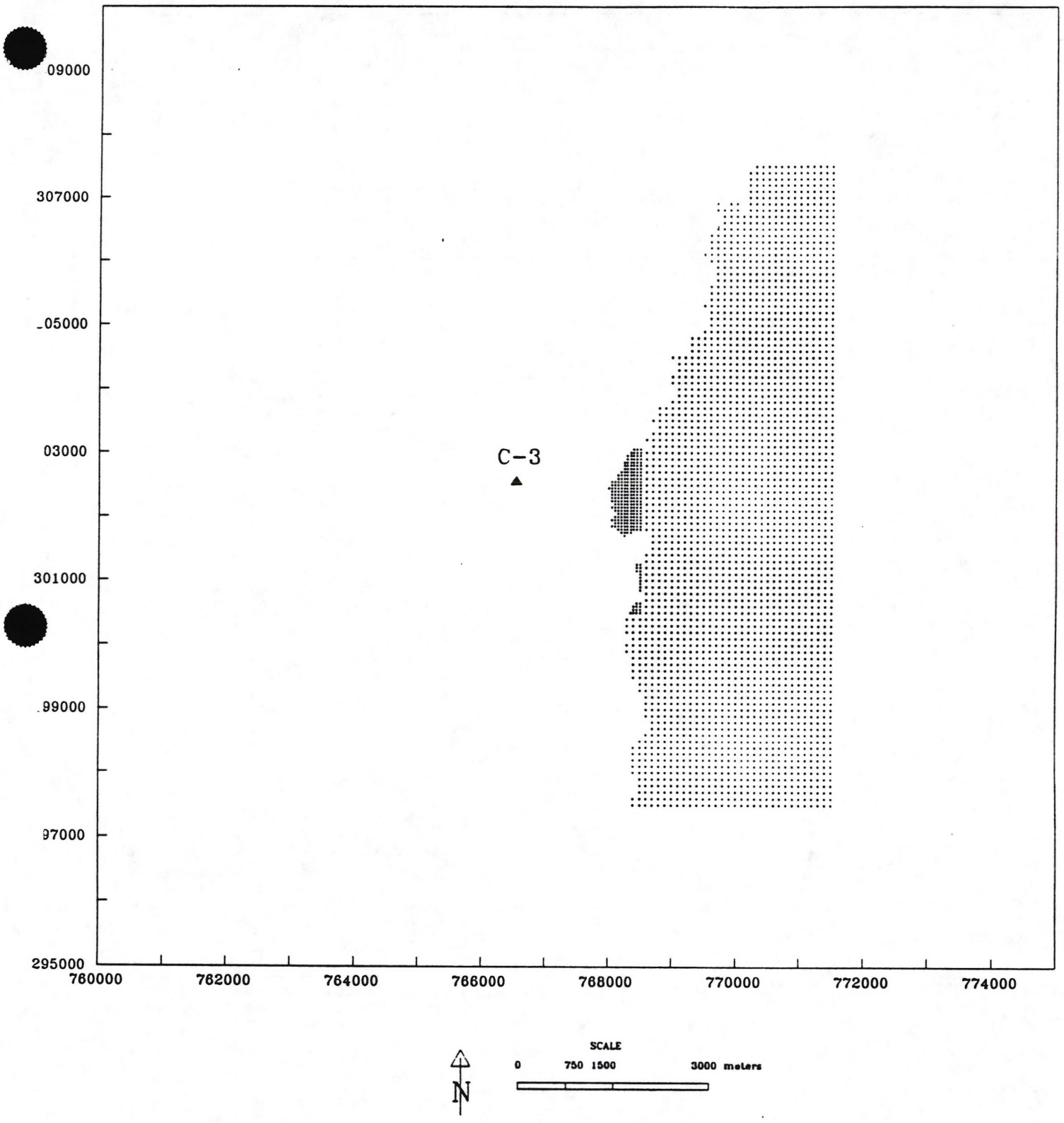


Figure 2.5-2b
Receptor Grid Locations: Grid 2, Terrain Grid
Central Maui, Site C-3, Island of Maui, Hawaii

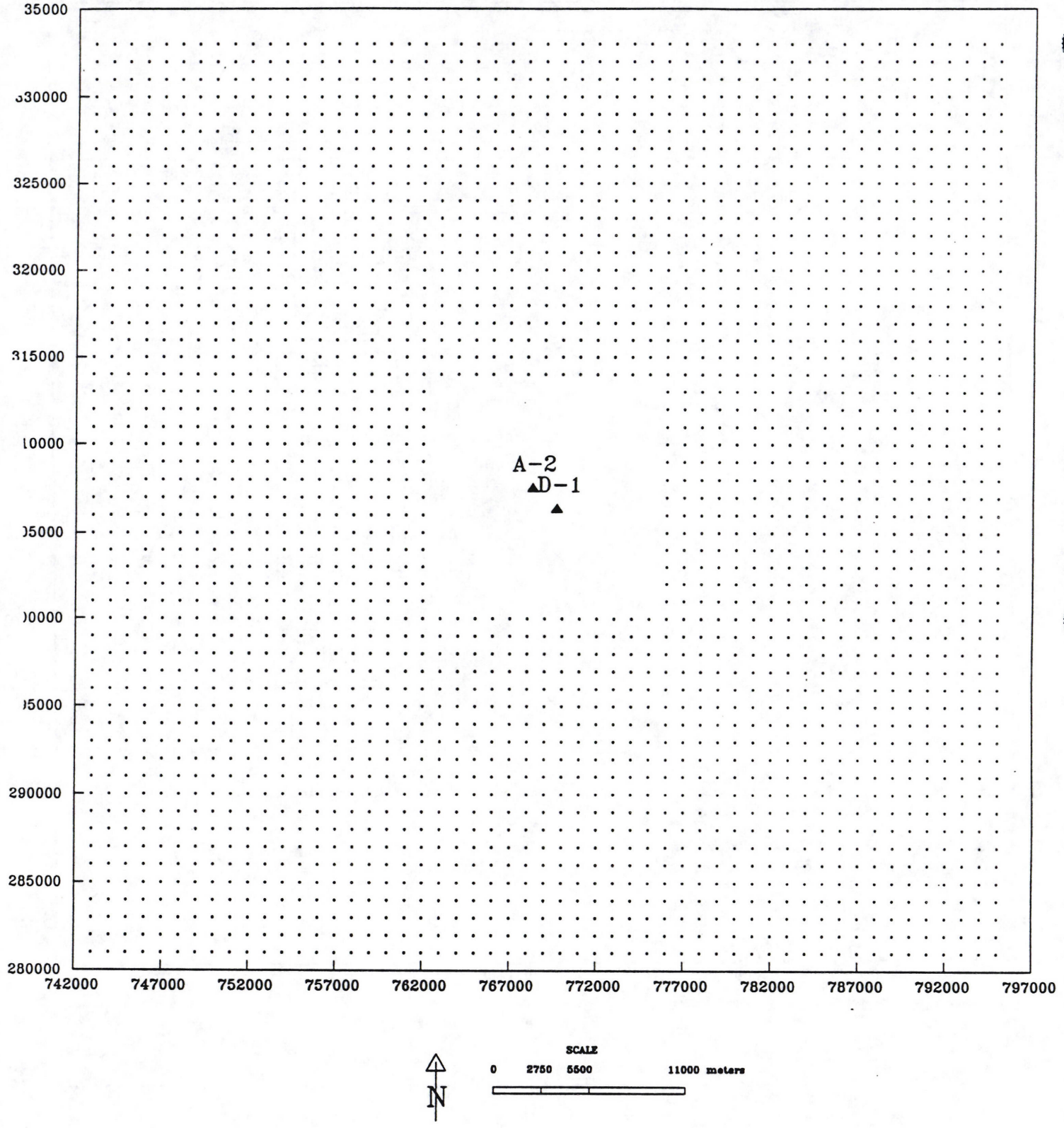


Figure 2.5-3a
Receptor Grid Locations: Grid 3, Coarse Grid
Central Maui, Sites A-2 and D-1
Island of Maui, Hawaii

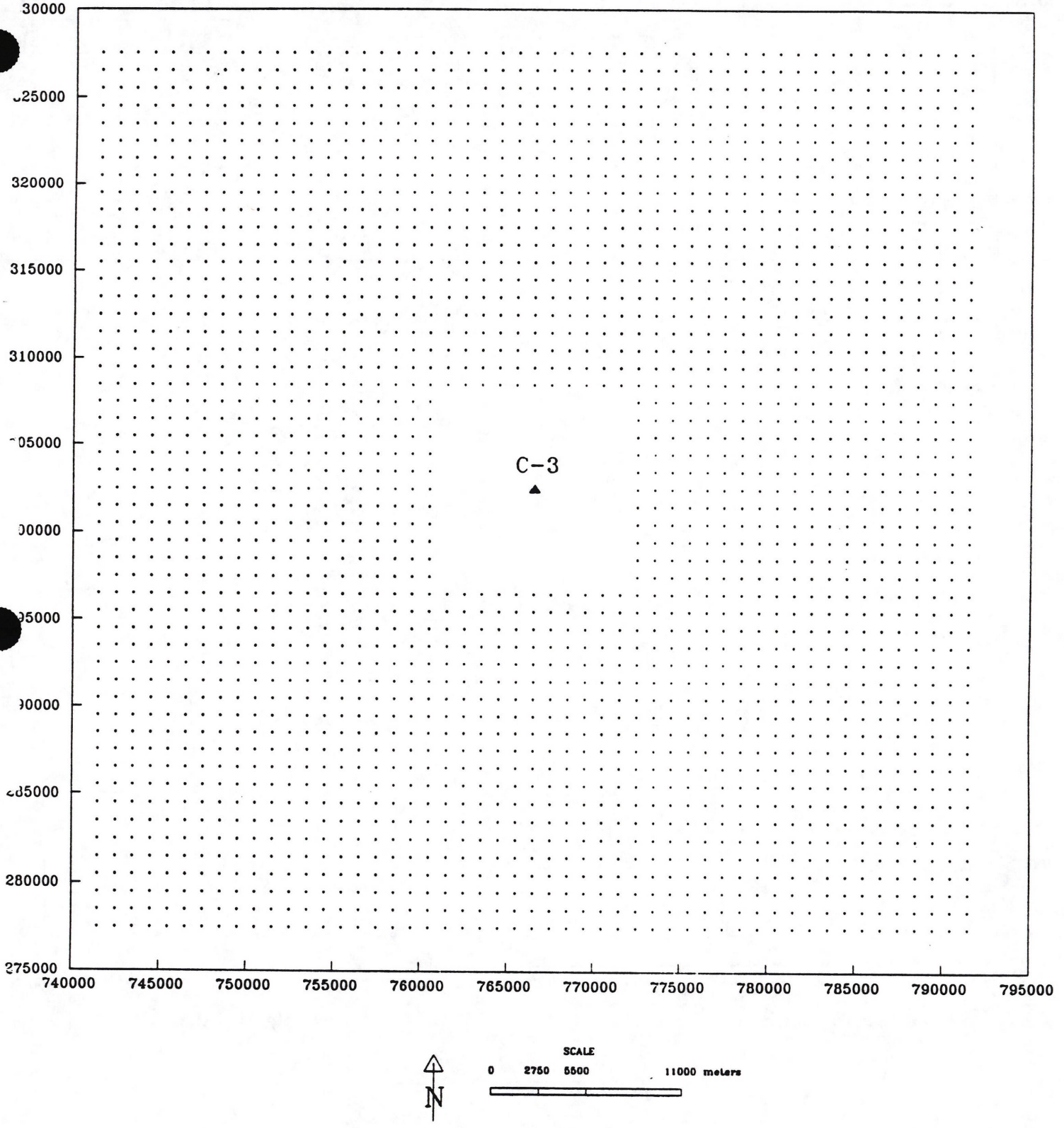


Figure 2.5-3b
Receptor Grid Locations: Grid 3, Coarse Grid
Central Maui, Site C-3, Island of Maui, Hawaii

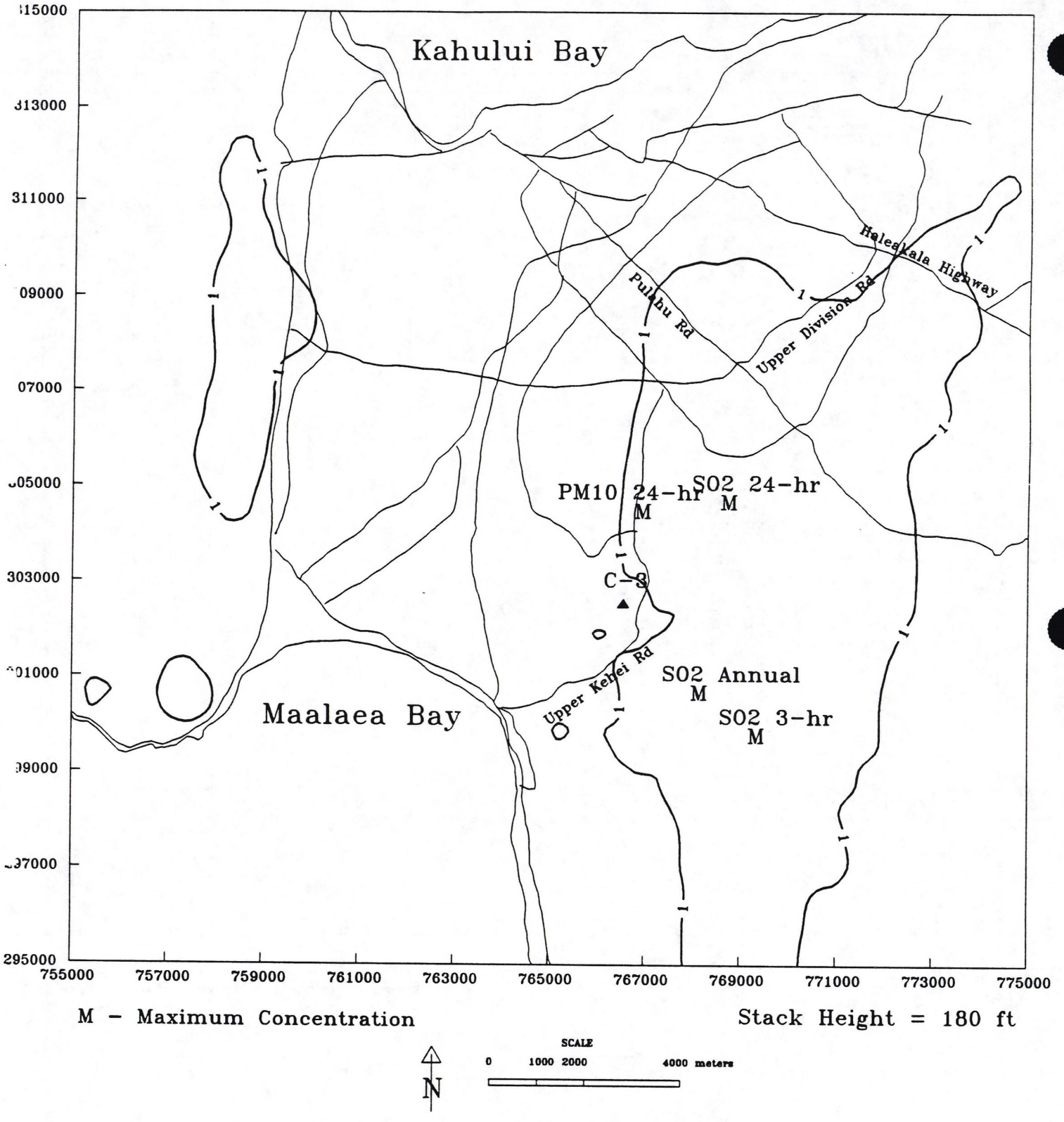


Figure 3.2.2-1
Significance for Any Pollutant (Normalized)
Central Maui, Site C-3, Island of Maui, Hawaii

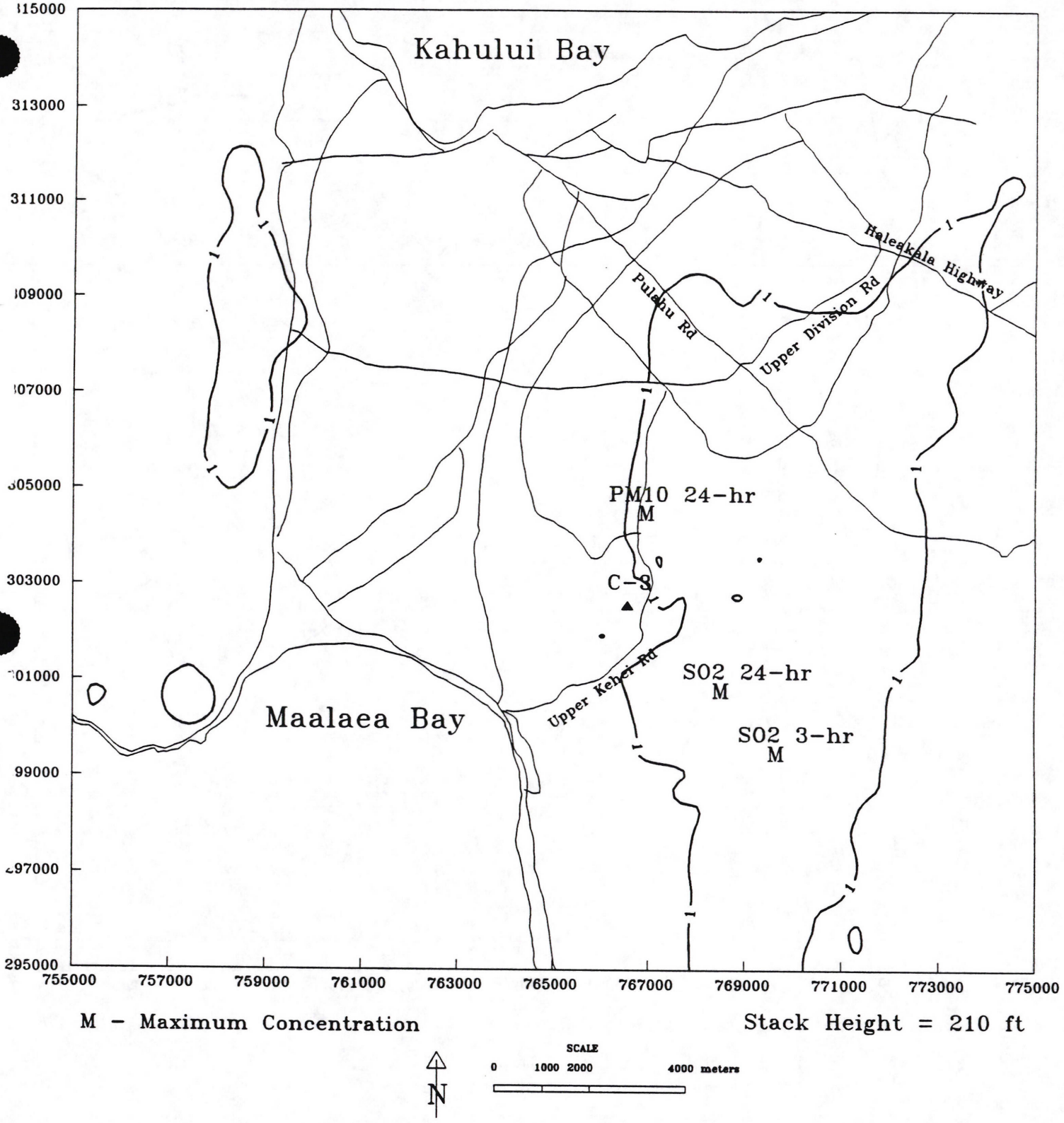


Figure 3.2.2-2
Significance for Any Pollutant (Normalized)
Central Maui, Site C-3, Island of Maui, Hawaii

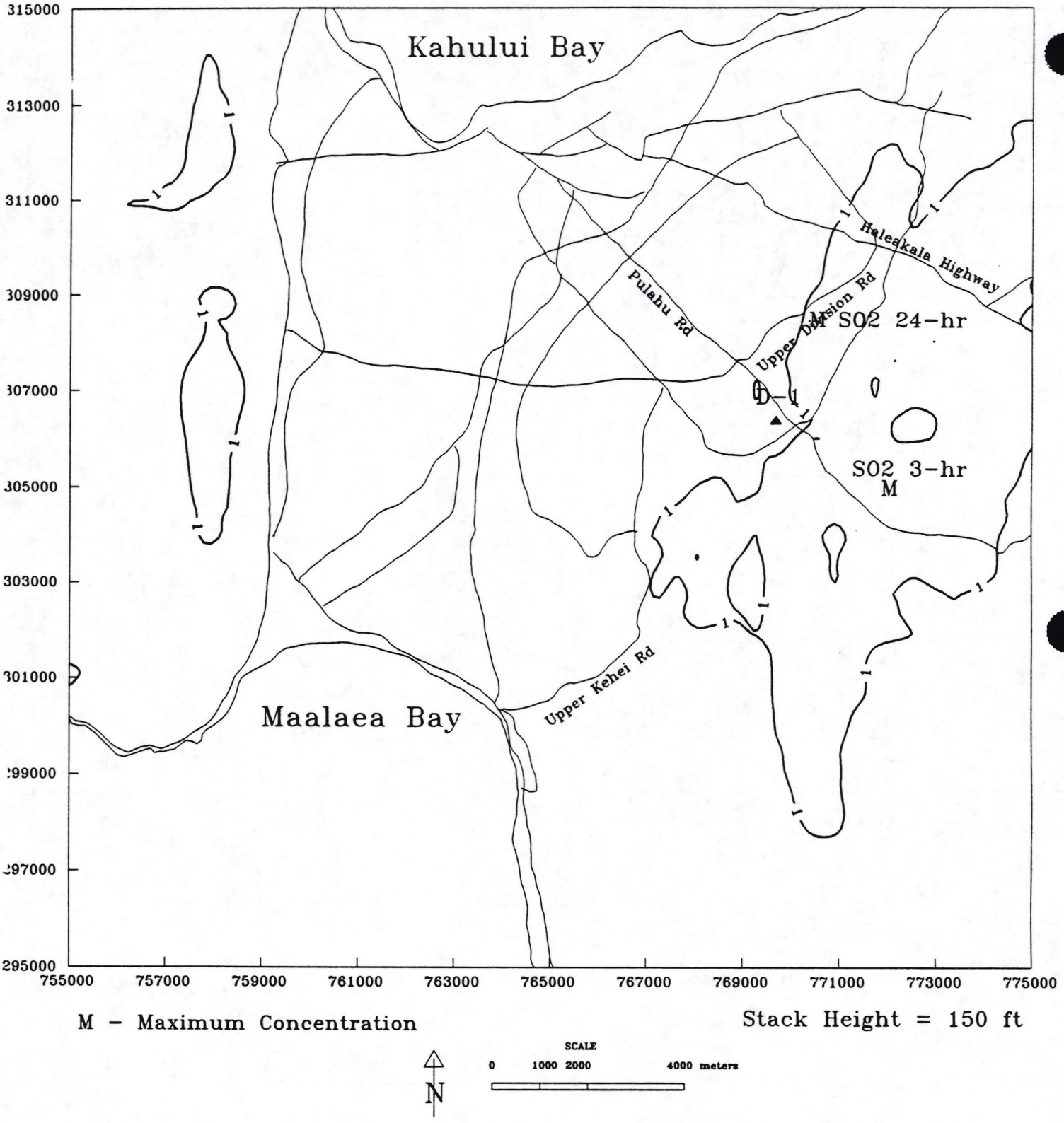


Figure 3.2.2-3
Significance for Any Pollutant (Normalized)
Central Maui, Site D-1, Island of Maui, Hawaii

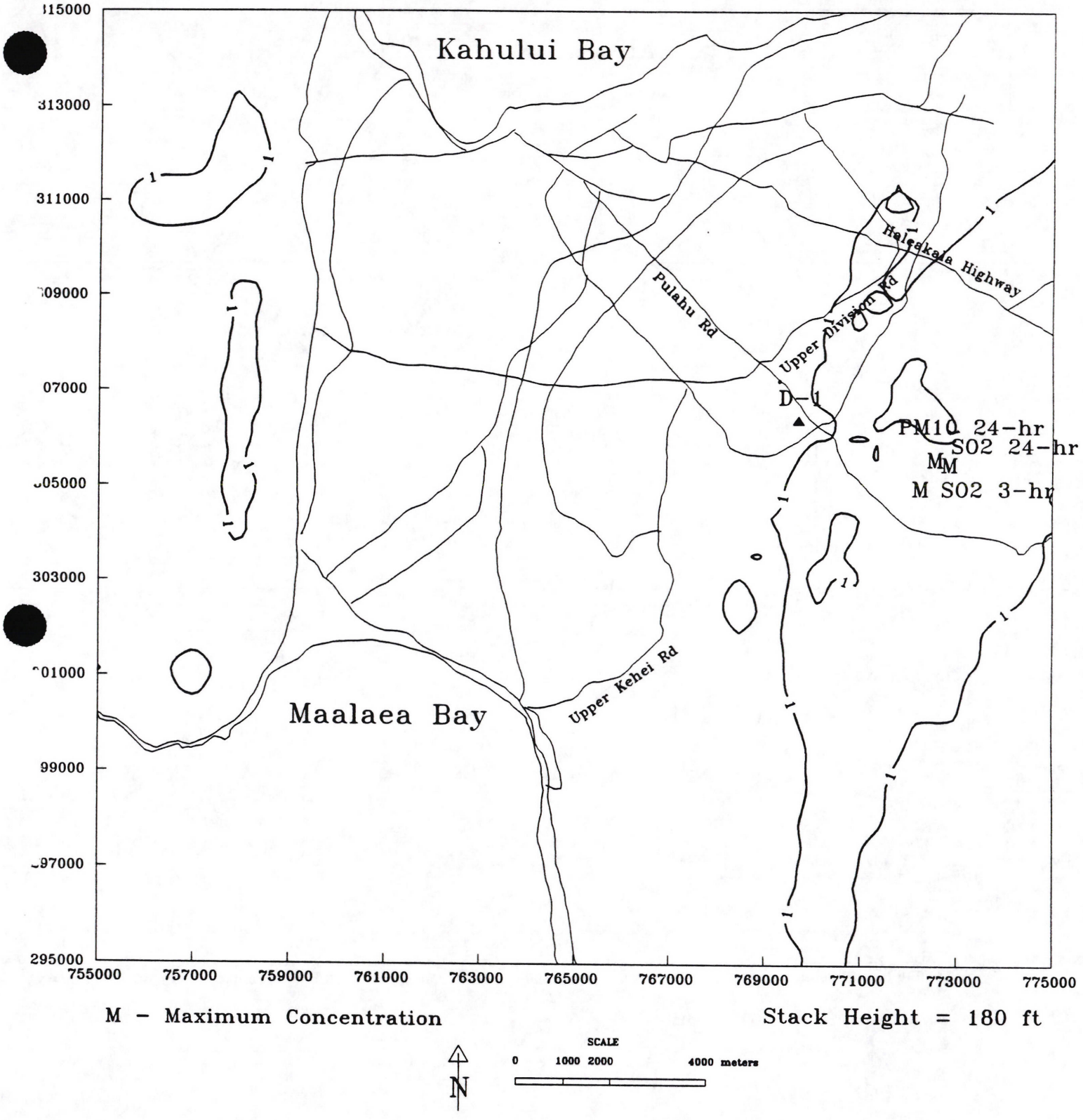


Figure 3.2.2-4
Significance for Any Pollutant (Normalized)
Central Maui, Site D-1, Island of Maui, Hawaii

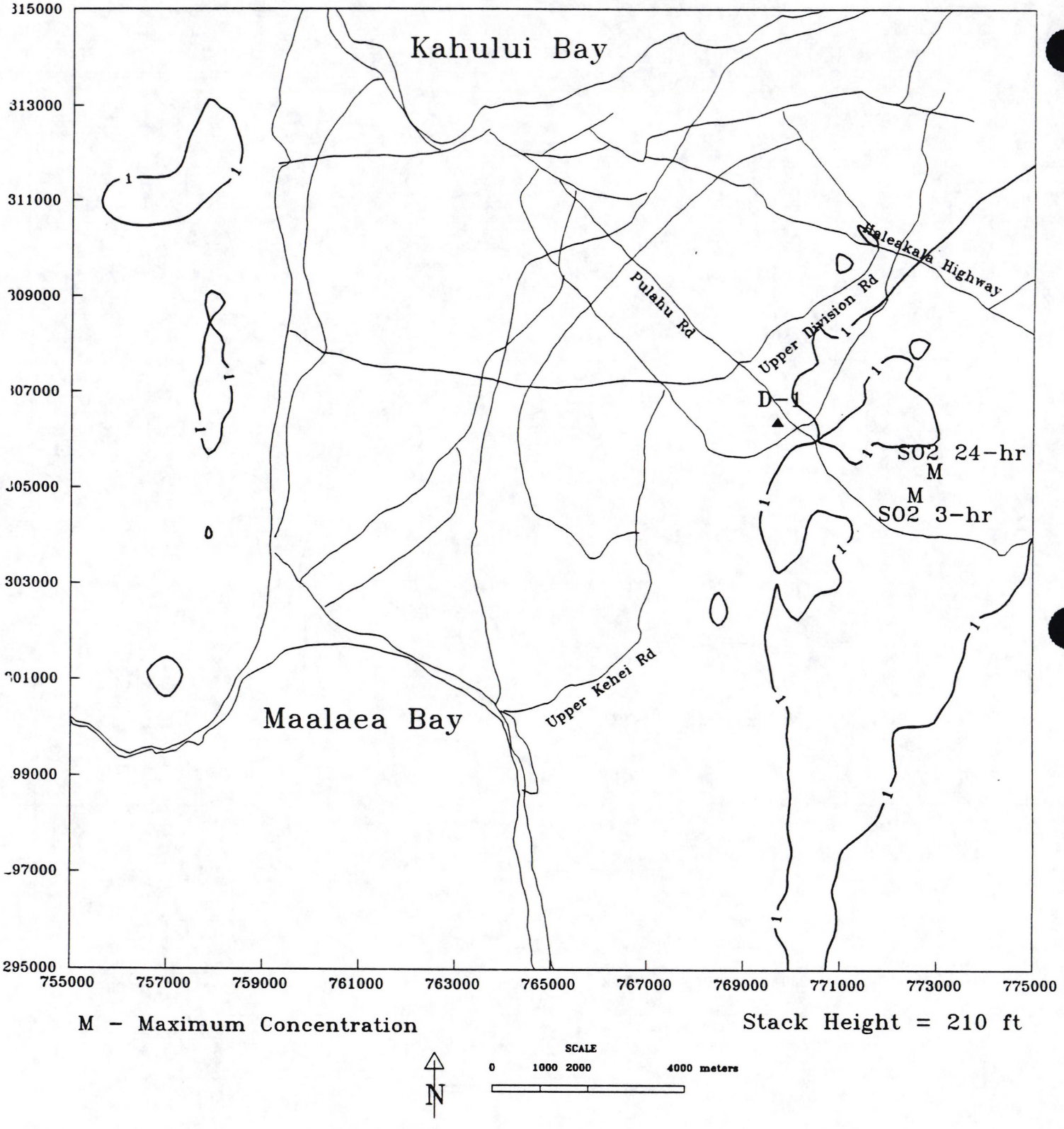


Figure 3.2.2-5
Significance for Any Pollutant (Normalized)
Central Maui, Site D-1, Island of Maui, Hawaii

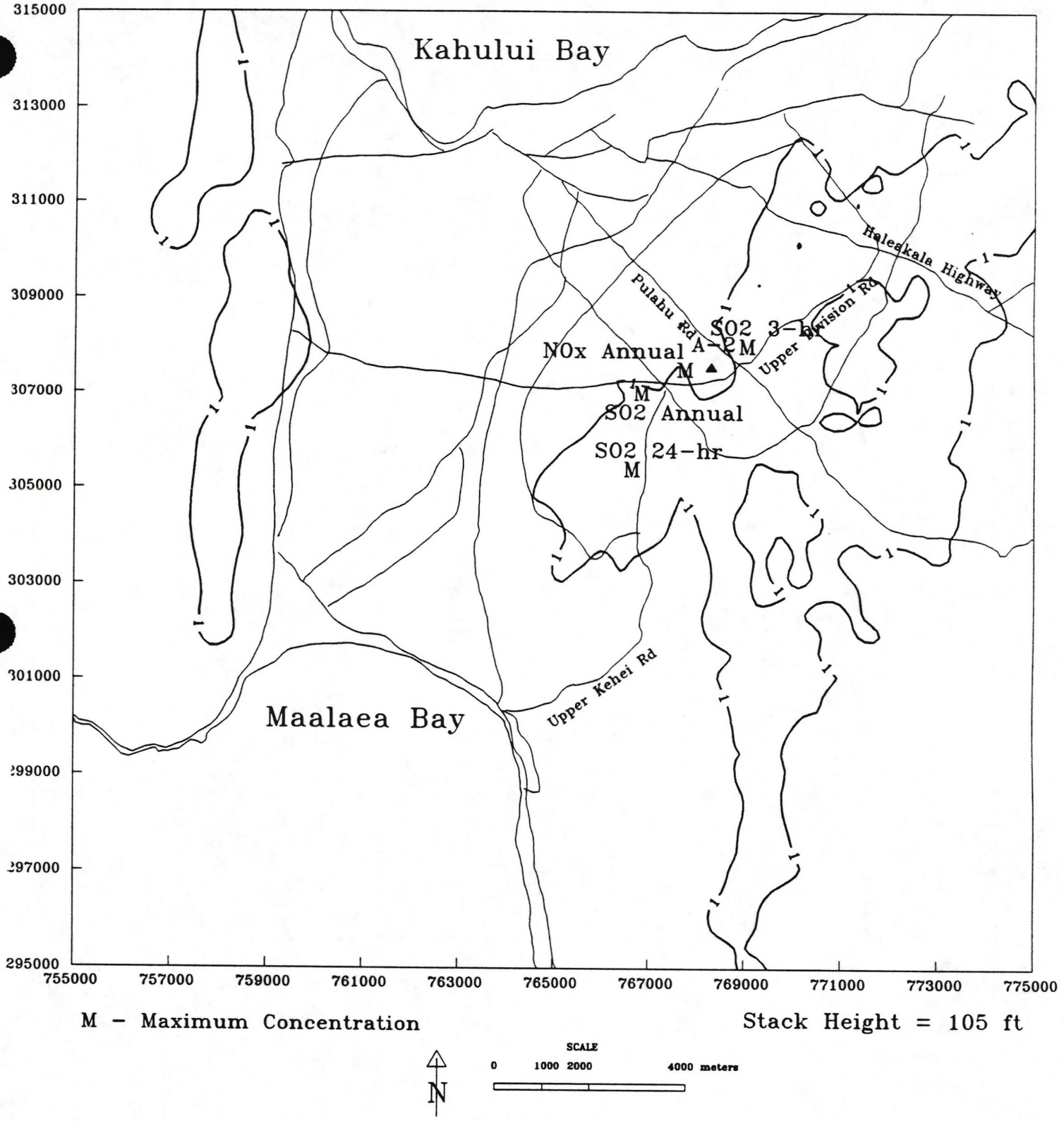


Figure 3.2.2-6
Significance for Any Pollutant (Normalized)
Central Maui, Site A-2, Island of Maui, Hawaii

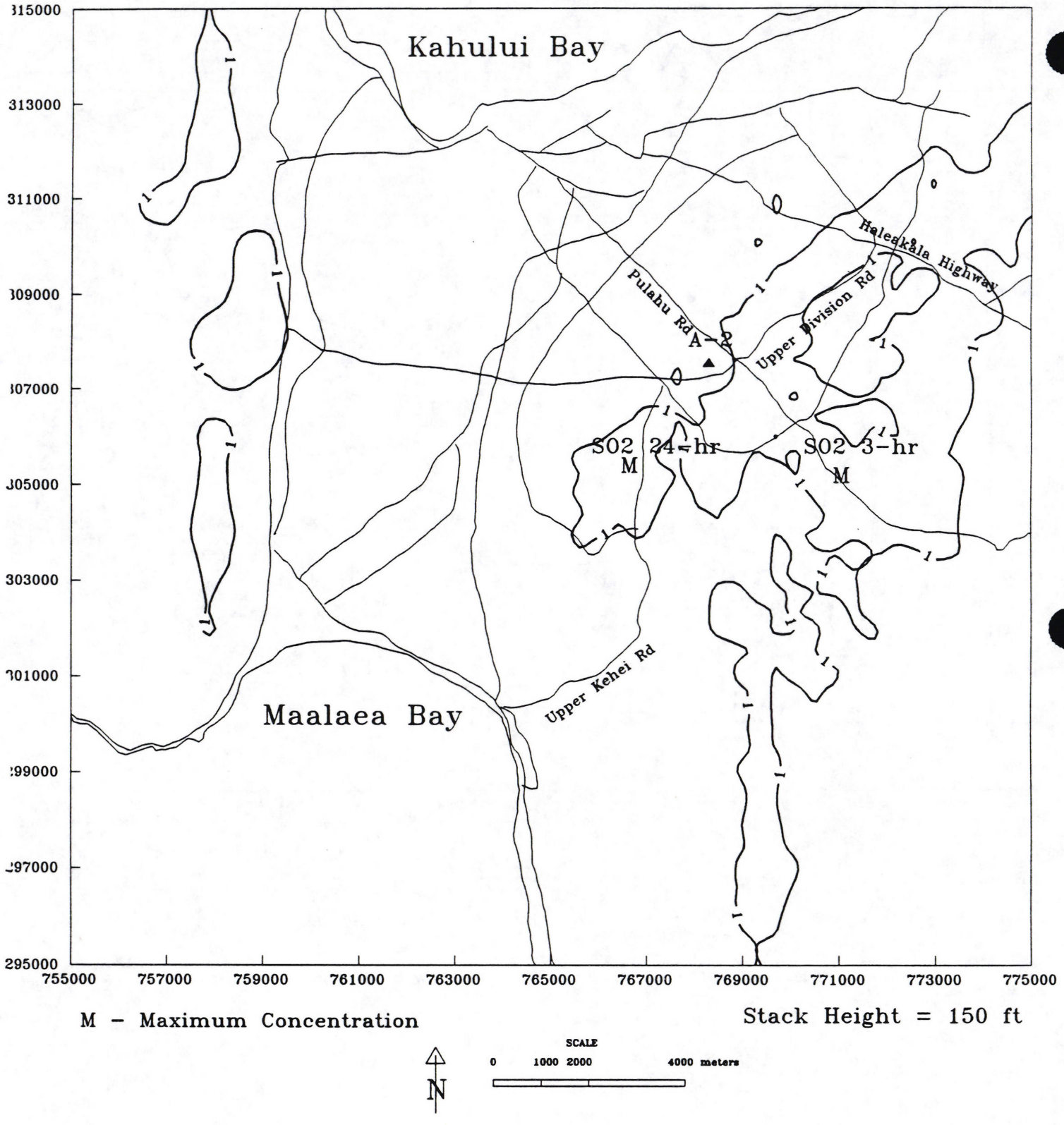


Figure 3.2.2-7
Significance for Any Pollutant (Normalized)
Central Maui, Site A-2, Island of Maui, Hawaii

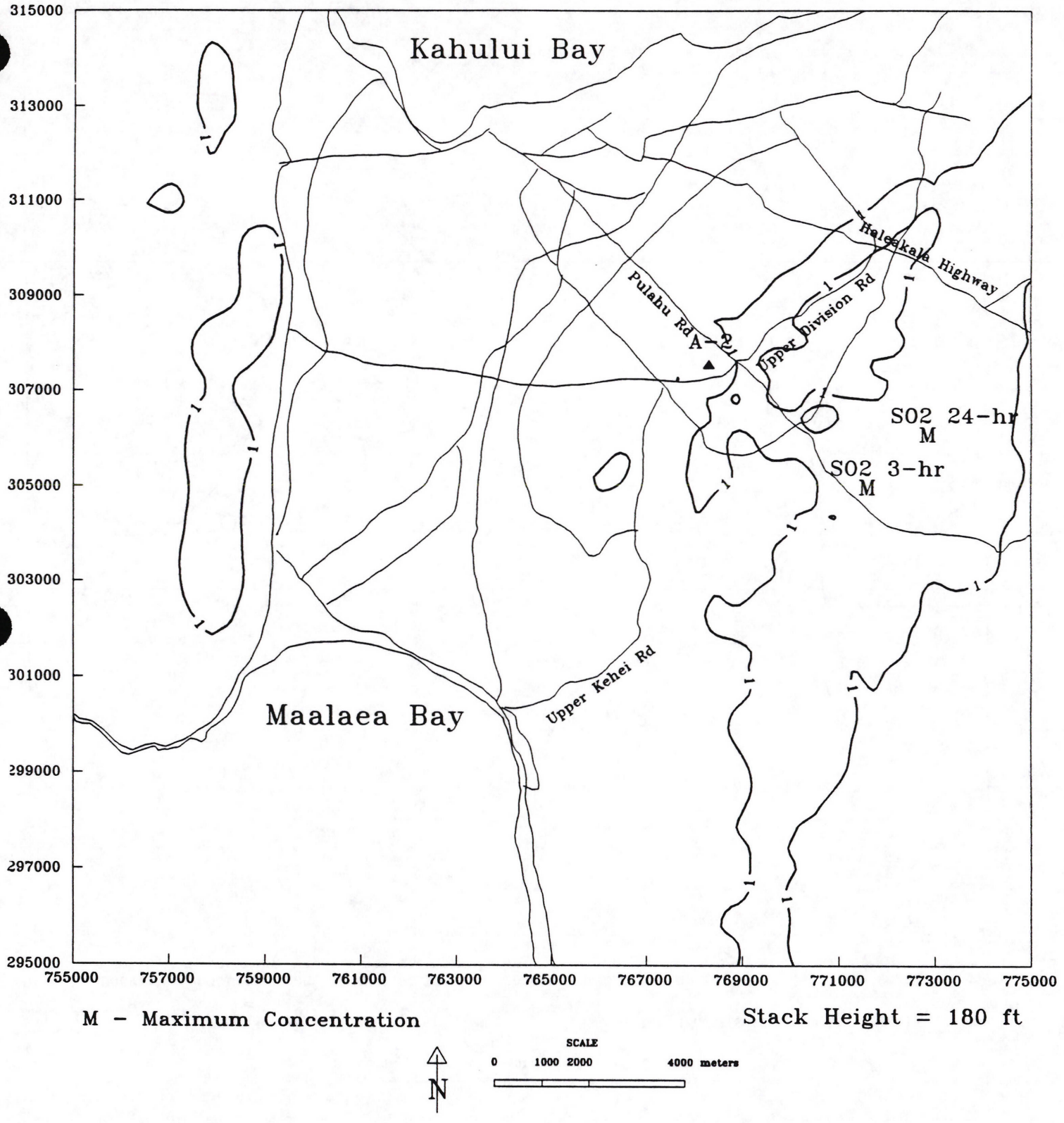


Figure 3.2.2-8
Significance for Any Pollutant (Normalized)
Central Maui, Site A-2, Island of Maui, Hawaii

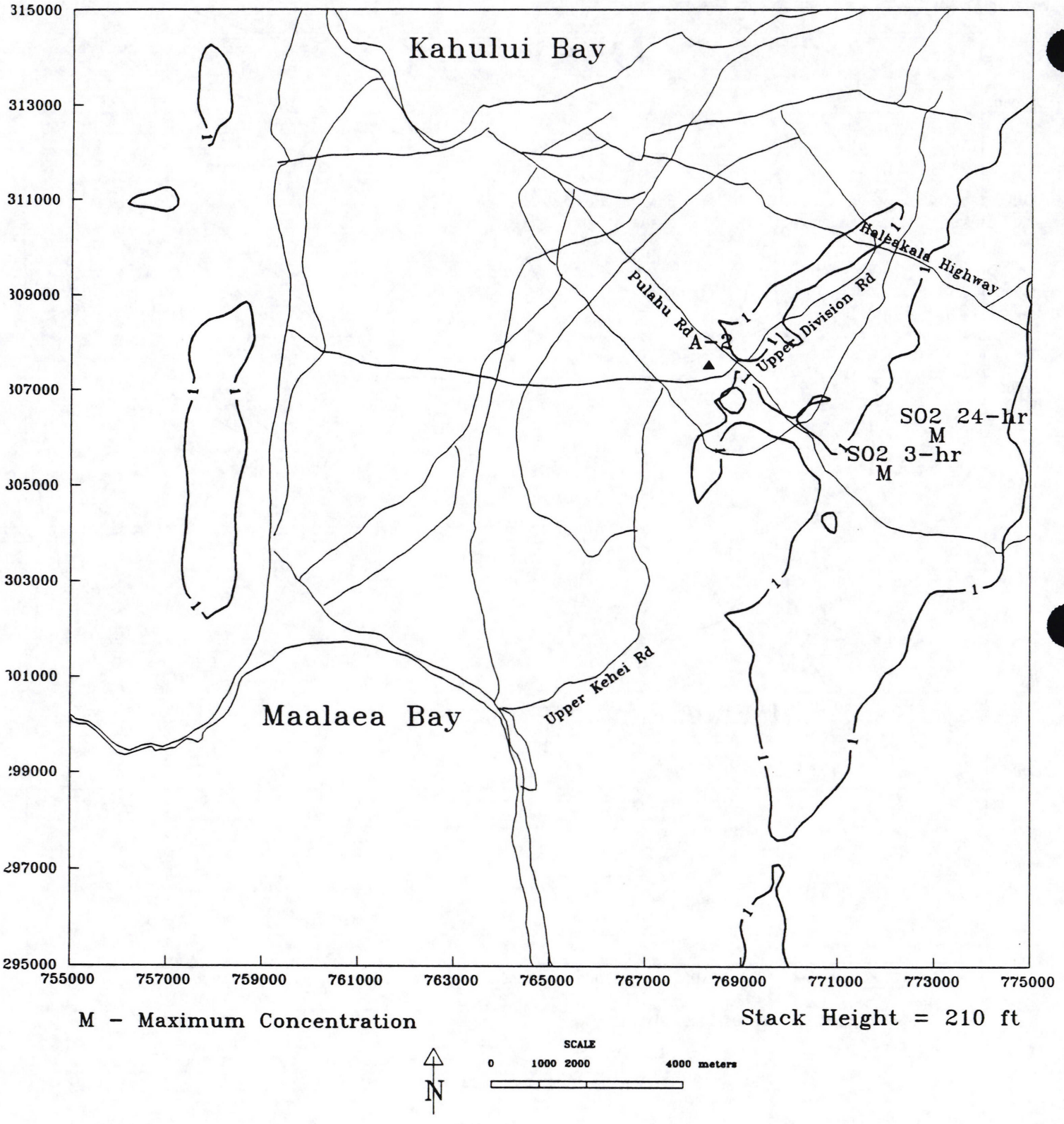


Figure 3.2.2-9
Significance for Any Pollutant (Normalized)
Central Maui, Site A-2, Island of Maui, Hawaii

APPENDIX 1

DESCRIPTION OF THE EXISTING SOURCE INVENTORY

Existing Sources Inventory

General Notes:

1. Source emission rates and parameters are primarily from the Covered Source Applications, Form S-1. Additional information is supplemented from the Trinity Inventory and other information sources (such as current permit applications, maps, USGS terrain data, etc.) as needed.
2. The Trinity Inventory is used to determine if a source consumes increment.
3. Source elevations are derived from USGS 30-meter terrain data.
4. Locations are in Old Hawaiian UTMs (meters).

Ameron HC&D

- Trinity, S-1 form and map did not match. Used map for location.
- Used S-1 parameters with map locations.
- Collocated sources as in S-1 form: Unit 1 (Primary Crusher), Stock Piles, Unit 2, Unit 3.
- Locations determined by Ameron HC&D Camp 10 Quarry General Site Plan.

Hawaiian Bitumuls & Paving Co.

- Trinity, S-1 form and map did not match. Used map for location.
- Used S-1 parameters with map locations.
- Locations determined by Ameron HC&D Camp 10 Quarry General Site Plan.

Grace Pacific Co.

- Trinity, S-1 form and map did not match. Used map for location.
- Used S-1 parameters with map locations.
- Locations determined by Ameron HC&D Camp 10 Quarry General Site Plan.

Hawaiian Cement - Puunene Quarry

- Trinity inventory did not match S-1 form and map. Used map for location.
- Used S-1 parameters with map locations.

Hawaiian Cement - Puunene Dry Ready Mix

- Trinity inventory did not match S-1 form and map. Used map for location.
- Used S-1 parameters with map locations.

Hawaiian Cement - Kihei

- Trinity inventory did not match S-1 form and map. Used map for location.
- Used S-1 parameters with map locations.

Hawaiian Cement - Honokowai

- Located on other side of West Maui Mountains - source not used in Central Maui inventory.

Existing Sources Inventory (Cont.)

Maui Pineapple

- Trinity, S-1 form and map did not match. Used map for location.
- Used S-1 parameters with map locations.

Pioneer Mill

- Located on other side of West Maui Mountains - source not used in Central Maui inventory.

Lahaina Wastewater Reclamation Facility

- Located on other side of West Maui Mountains - source not used in Central Maui inventory.

Wailuku-Kahului Wastewater Reclamation Facility

- No map available, used S-1 form locations and parameters.

HC&S - Paia

- Used most recent data (10/94 permit application).
- Used map for location.
- Source parameters based on S-1 form, coal/oil firing (worst case).

HC&S - Puunene

- Used map for location.
- Diameter and stack height not provided in application.
    - Diameter calculated from exit velocity and flow rate.
    - Stack height determined from Trinity inventory. Used rank by SO_2 emissions for match.

MECO - Maalaea

- Source locations and parameters from the M17/M19 PSD permit application.

MECO - Kahului

- Source locations and parameters from S-1 form.

Goodfellow Brothers

- Applied for temporary permit for their equipment. Location is expected to vary. Could change between islands. Source not used in Central Maui inventory.

Sources from Trinity Inventory (covered source application not required):

- DAGS Maui Memorial Hospital
- PRI Energy Systems
    - Changed location 35 meters to south to obtain derived elevation greater than zero.
- Borthwick Mortuaries
- Ameron HC&D- Kihei
- R & M Service Co.

Table 2.3.4-1

SOURCE OPERATIONS, EMISSIONS DATA, LOCATIONS, AND BASE ELEVATIONS FOR NON-CENTRAL MAUI SOURCES USED IN PSD AIR QUALITY MODELING ANALYSIS

	Source Emissions (g/s)											
Source ID	SO2	NOx	PM10	CO	UTM East (m)	UTM North (m)	Base Elevation amsl (ft)	Stack Height (m)	Stack Temp (K)	Exit Velocity (m/s)	Stack Diam (m)	Source Width (m)
Ameron HC&D												
AHCD_G1	0.20	1.85	0.13	0.40	768,224.0	309,000.0	239.0	5.2	818.0	68.90	0.15	n/a
AHCD_BH1	0.0	0.0	0.04	0.0	768,061.0	309,592.0	192.0	15.2	303.0	357.00	0.30	n/a
AHCD_BH2	0.0	0.0	0.04	0.0	768,061.0	309,592.0	192.0	15.2	303.0	357.00	0.30	n/a
AHCD_BH4	0.0	0.0	0.04	0.0	768,510.0	309,245.0	247.0	15.2	303.0	357.00	0.30	n/a
AHCD_BH5	0.0	0.0	0.04	0.0	768,510.0	309,245.0	247.0	15.2	303.0	357.00	0.30	n/a
AHCD_L1	0.0	0.0	1.13	0.0	768,224.0	309,000.0	239.0	1.8	n/a	n/a	n/a	3
AHCD_L2	0.0	0.0	1.13	0.0	768,633.0	309,245.0	249.0	3.7	n/a	n/a	n/a	3
AHCD_CR1	0.0	0.0	5.29	0.0	768,224.0	309,000.0	239.0	1.0	n/a	n/a	n/a	3
AHCD_CR2	0.0	0.0	4.50	0.0	768,633.0	309,245.0	249.0	5.5	n/a	n/a	n/a	3
AHCD_CR3	0.0	0.0	24.48	0.0	768,633.0	309,245.0	249.0	4.6	n/a	n/a	n/a	1.5
AHCD_AS1	0.0	0.0	3.02	0.0	768,633.0	309,245.0	249.0	12.2	n/a	n/a	n/a	5.5
AHCD_FS1	0.0	0.0	0.01	0.0	768,633.0	309,245.0	249.0	3.4	n/a	n/a	n/a	15.1
AHCD_BH3	0.0	0.0	0.01	0.0	768,061.0	309,592.0	192.0	6.0	n/a	n/a	n/a	0.3
AHCD_AS2	0.0	0.0	0.15	0.0	768,061.0	309,592.0	192.0	6.0	n/a	n/a	n/a	0.3
AHCD_BH6	0.0	0.0	0.01	0.0	768,510.0	309,245.0	247.0	6.0	n/a	n/a	n/a	0.3
AHCD_AS3	0.0	0.0	0.15	0.0	768,510.0	309,245.0	247.0	6.0	n/a	n/a	n/a	0.3
Ameron HC&D, Kihei												
AHCD_986	0.0	0.0	2.31	0.0	764,384.0	300,745.0	32.0	1.0	n/a	n/a	n/a	25
Hawaiian Bitumuls & Paving Co.												
HBPC_1	0.88	1.02	0.75	1.08	766,837.0	309,633.0	168.0	10.7	338.5	9.78	1.22	n/a
Grace Pacific Co.												
GPC_BH1	0.03	0.68	0.43	0.72	768,031.0	309,204.0	226.0	5.3	415.0	27.09	0.77	n/a
GPC_D1	0.35	2.09	0.05	0.55	768,031.0	309,204.0	226.0	2.3	705.0	199.45	0.11	n/a
GPC_D2	0.35	2.09	0.05	0.55	768,031.0	309,204.0	226.0	2.3	705.0	199.45	0.11	n/a
GPC_F1	0.0	0.0	0.74	0.0	768,031.0	309,204.0	226.0	1.0	n/a	n/a	n/a	15
Hawaiian Cement, Kihei												
HC_K6	0.0	0.0	0.01	0.0	765,880.0	295,096.0	33.0	15.0	303.0	1.92	0.40	n/a
HC_KA1	0.0	0.0	1.48	0.0	765,880.0	295,096.0	33.0	1.0	n/a	n/a	n/a	15
Hawaiian Cement, Puunene Quarry & Dry Ready Mix												
HC_P7	0.0	0.0	0.09	0.0	765,327.0	304,348.0	180.0	15.0	303.0	15.24	0.49	n/a
HC_P16	0.0	0.0	0.12	0.0	765,319.0	304,403.0	180.0	15.0	303.0	15.24	0.89	n/a
HC_P6	0.0	0.0	0.04	0.0	765,194.0	304,433.0	171.0	6.1	303.0	1.71	0.60	n/a
HC_PA1	0.0	0.0	3.47	0.0	765,415.0	304,362.0	192.0	1.0	n/a	n/a	n/a	15
HC_PA2	0.0	0.0	1.63	0.0	765,327.0	304,348.0	180.0	1.0	n/a	n/a	n/a	15
HC_PA3	0.0	0.0	4.69	0.0	765,311.0	304,400.0	179.0	1.0	n/a	n/a	n/a	15
HC_PA4	0.0	0.0	4.33	0.0	765,200.0	304,400.0	170.0	1.0	n/a	n/a	n/a	15
Maui Pineapple												
MPC_D1	0.58	2.37	0.14	0.14	762,531.0	312,122.0	20.0	22.9	608.0	33.29	0.46	n/a
MPC_D2	0.58	2.37	0.14	0.14	762,531.0	312,122.0	20.0	22.9	608.0	33.29	0.46	n/a
MPC_D3	0.88	3.49	0.21	0.20	762,531.0	312,122.0	20.0	22.9	603.0	40.78	0.51	n/a
MPC_D4	0.88	3.49	0.21	0.20	762,531.0	312,122.0	20.0	22.9	603.0	40.78	0.51	n/a
MPC_S1	17.61	3.41	0.19	0.15	762,469.0	311,980.0	25.0	22.9	599.0	8.54	1.79	n/a
HC&S, Paia												
HCS_PA1	75.68	21.48	4.33	30.34	772,600.0	314,200.0	164.0	36.7	330.4	5.62	3.28	n/a
HC&S, Puunene												
HCS_PN1A	48.49	5.63	0.0	0.0	764,633.0	309,673.0	89.0	36.6	330.4	7.51	3.96	n/a
HCS_PN1B	0.0	0.0	3.82	18.70	764,633.0	309,673.0	89.0	36.6	344.8	8.01	3.96	n/a
HCS_PN2A	48.49	5.63	0.0	0.0	764,633.0	309,673.0	89.0	45.7	330.4	7.51	3.96	n/a
HCS_PN2B	0.0	0.0	3.82	18.70	764,633.0	309,673.0	89.0	45.7	344.8	8.01	3.96	n/a
HCS_PN3A	48.49	5.63	0.0	0.0	764,633.0	309,673.0	89.0	46.9	323.3	12.71	3.66	n/a
HCS_PN3B	0.0	0.0	3.14	51.24	764,633.0	309,673.0	89.0	46.9	332.9	13.29	3.66	n/a
DAGS Maui Memorial Hospital												

Table 2.3.4-1

SOURCE OPERATIONS, EMISSIONS DATA, LOCATIONS, AND BASE ELEVATIONS FOR NON-CENTRAL MAUI SOURCES USED IN PSD AIR QUALITY MODELING ANALYSIS

	Source Emissions (g/s)											
Source ID	SO2	NOx	PM10	CO	UTM East (m)	UTM North (m)	Base Elevation amsl (ft)	Stack Height (m)	Stack Temp (K)	Exit Velocity (m/s)	Stack Diam (m)	Source Width (m)
DMMH_502	0.24	0.68	1.74	0.0	761,184.0	311,445.0	102.0	6.1	1255.4	7.50	0.70	n/a
Borthwick Mortuaries												
BM_501	0.0	0.0	0.03	0.0	760,234.0	310,785.0	213.0	2.8	1089.3	8.02	0.51	n/a
MECO, Maalaea												
M1-M3_ABL	4.56	37.11	1.08	13.32	760,468.0	302,395.0	15.0	13.7	677.6	37.00	0.64	n/a
M4-M7_ABL	12.24	148.16	3.32	39.84	760,501.0	302,373.0	15.0	14.6	711.9	44.20	0.81	n/a
M8-M9_ABL	6.26	56.62	2.82	19.92	760,510.0	302,345.0	15.0	13.4	722.0	69.80	0.71	n/a
M10-M13_ABL	25.52	291.68	3.28	25.36	760,585.0	302,325.0	15.0	36.6	644.3	34.80	1.39	n/a
X1-X2_ABL	2.96	8.62	0.94	8.88	760,623.0	302,384.0	15.0	18.3	677.6	37.00	0.63	n/a
M14-M16_25%	0.0	10.66	4.96	119.84	760,650.0	302,353.0	15.0	36.6	414.0	10.80	2.44	n/a
M14-M16_100%	27.72	0.0	0.0	0.0	760,650.0	302,353.0	15.0	36.6	427.0	20.00	2.44	n/a
M17-M19_25%	0.0	10.66	4.96	119.84	760,719.0	302,423.0	15.0	36.6	414.0	10.80	2.44	n/a
M17-M19_100%	27.72	0.0	0.0	0.0	760,719.0	302,423.0	15.0	36.6	427.0	20.00	2.44	n/a
MBS_ABL	0.33	0.08	0.05	0.53	760,650.0	302,353.0	15.0	36.6	724.8	57.40	0.25	n/a

Table 2.3.4-2

SOURCE OPERATIONS, EMISSIONS DATA, LOCATIONS, AND BASE ELEVATIONS FOR NON-CENTRAL MAUI SOURCES USED IN NAAQS/SAAQS AIR QUALITY MODELING ANALYSIS

	Source Emissions (g/s)											
Source ID	SO2	NOx	PM10	CO	UTM East (m)	UTM North (m)	Base Elevation amsl (ft)	Stack Height (m)	Stack Temp (K)	Exit Velocity (m/s)	Stack Diam (m)	Source Width (m)
Ameron HC&D												
AHCD_G1	0.20	1.85	0.13	0.40	768,224.0	309,000.0	239.0	5.2	818.0	68.90	0.15	n/a
AHCD_BH1	0.0	0.0	0.04	0.0	768,061.0	309,592.0	192.0	15.2	303.0	357.00	0.30	n/a
AHCD_BH2	0.0	0.0	0.04	0.0	768,061.0	309,592.0	192.0	15.2	303.0	357.00	0.30	n/a
AHCD_BH4	0.0	0.0	0.04	0.0	768,510.0	309,245.0	247.0	15.2	303.0	357.00	0.30	n/a
AHCD_BH5	0.0	0.0	0.04	0.0	768,510.0	309,245.0	247.0	15.2	303.0	357.00	0.30	n/a
AHCD_L1	0.0	0.0	1.13	0.0	768,224.0	309,000.0	239.0	1.8	n/a	n/a	n/a	3
AHCD_L2	0.0	0.0	1.13	0.0	768,633.0	309,245.0	249.0	3.7	n/a	n/a	n/a	3
AHCD_CR1	0.0	0.0	5.29	0.0	768,224.0	309,000.0	239.0	1.0	n/a	n/a	n/a	3
AHCD_CR2	0.0	0.0	4.50	0.0	768,633.0	309,245.0	249.0	5.5	n/a	n/a	n/a	3
AHCD_CR3	0.0	0.0	24.48	0.0	768,633.0	309,245.0	249.0	4.6	n/a	n/a	n/a	1.5
AHCD_AS1	0.0	0.0	3.02	0.0	768,633.0	309,245.0	249.0	12.2	n/a	n/a	n/a	5.5
AHCD_FS1	0.0	0.0	0.01	0.0	768,633.0	309,245.0	249.0	3.4	n/a	n/a	n/a	15.1
AHCD_BH3	0.0	0.0	0.01	0.0	768,061.0	309,592.0	192.0	6.0	n/a	n/a	n/a	0.3
AHCD_AS2	0.0	0.0	0.15	0.0	768,061.0	309,592.0	192.0	6.0	n/a	n/a	n/a	0.3
AHCD_BH6	0.0	0.0	0.01	0.0	768,510.0	309,245.0	247.0	6.0	n/a	n/a	n/a	0.3
AHCD_AS3	0.0	0.0	0.15	0.0	768,510.0	309,245.0	247.0	6.0	n/a	n/a	n/a	0.3
Ameron HC&D, Kihei												
AHCD_986	0.0	0.0	2.31	0.0	764,384.0	300,745.0	32.0	1.0	n/a	n/a	n/a	25
Hawaiian Bitumuls & Paving Co.												
HBPC_1	0.88	1.02	0.75	1.08	766,837.0	309,633.0	168.0	10.7	338.5	9.78	1.22	n/a
Grace Pacific Co.												
GPC_BH1	0.03	0.68	0.43	0.72	768,031.0	309,204.0	226.0	5.3	415.0	27.09	0.77	n/a
GPC_D1	0.35	2.09	0.05	0.55	768,031.0	309,204.0	226.0	2.3	705.0	199.45	0.11	n/a
GPC_D2	0.35	2.09	0.05	0.55	768,031.0	309,204.0	226.0	2.3	705.0	199.45	0.11	n/a
GPC_F1	0.0	0.0	0.74	0.0	768,031.0	309,204.0	226.0	1.0	n/a	n/a	n/a	15
Hawaiian Cement, Kihei												
HC_K6	0.0	0.0	0.01	0.0	765,880.0	295,096.0	33.0	15.0	303.0	1.92	0.40	n/a
HC_KA1	0.0	0.0	1.48	0.0	765,880.0	295,096.0	33.0	1.0	n/a	n/a	n/a	15
Hawaiian Cement, Puunene Quarry & Dry Ready Mix												
HC_P7	0.0	0.0	0.09	0.0	765,327.0	304,348.0	180.0	15.0	303.0	15.24	0.49	n/a
HC_P16	0.0	0.0	0.12	0.0	765,319.0	304,403.0	180.0	15.0	303.0	15.24	0.89	n/a
HC_P6	0.0	0.0	0.04	0.0	765,194.0	304,433.0	171.0	6.1	303.0	1.71	0.60	n/a
HC_PA1	0.0	0.0	3.47	0.0	765,415.0	304,362.0	192.0	1.0	n/a	n/a	n/a	15
HC_PA2	0.0	0.0	1.63	0.0	765,327.0	304,348.0	180.0	1.0	n/a	n/a	n/a	15
HC_PA3	0.0	0.0	4.69	0.0	765,311.0	304,400.0	179.0	1.0	n/a	n/a	n/a	15
HC_PA4	0.0	0.0	4.33	0.0	765,200.0	304,400.0	170.0	1.0	n/a	n/a	n/a	15
Maui Pineapple												
MPC_D1	0.58	2.37	0.14	0.14	762,531.0	312,122.0	20.0	22.9	608.0	33.29	0.46	n/a
MPC_D2	0.58	2.37	0.14	0.14	762,531.0	312,122.0	20.0	22.9	608.0	33.29	0.46	n/a
MPC_D3	0.88	3.49	0.21	0.20	762,531.0	312,122.0	20.0	22.9	603.0	40.78	0.51	n/a
MPC_D4	0.88	3.49	0.21	0.20	762,531.0	312,122.0	20.0	22.9	603.0	40.78	0.51	n/a
MPC_S1	17.61	3.41	0.19	0.15	762,469.0	311,980.0	25.0	22.9	599.0	8.54	1.79	n/a
Wailuku-Kahului Wastewater Reclamation Facility												
WWRF_1	0.60	1.05	0.12	0.37	764,000.0	313,000.0	5.0	7.3	791.0	49.00	0.15	n/a
WWRF_2	0.03	1.25	0.09	0.27	764,000.0	313,000.0	5.0	7.3	787.0	90.00	0.15	n/a
WWRF_3	0.03	1.25	0.09	0.27	764,000.0	313,000.0	5.0	7.3	769.0	54.00	0.15	n/a
HC&S, Paia												
HCS_PA1	75.68	21.48	4.33	30.34	772,600.0	314,200.0	164.0	36.7	330.4	5.62	3.28	n/a
HC&S, Puunene												
HCS_PN1A	48.49	5.63	0.0	0.0	764,633.0	309,673.0	89.0	36.6	330.4	7.51	3.96	n/a
HCS_PN1B	0.0	0.0	3.82	18.70	764,633.0	309,673.0	89.0	36.6	344.8	8.01	3.96	n/a
HCS_PN2A	48.49	5.63	0.0	0.0	764,633.0	309,673.0	89.0	45.7	330.4	7.51	3.96	n/a

Table 2.3.4-2

SOURCE OPERATIONS, EMISSIONS DATA, LOCATIONS, AND BASE ELEVATIONS FOR NON-CENTRAL MAUI SOURCES USED IN NAAQS/SAAQS AIR QUALITY MODELING ANALYSIS

	Source Emissions (g/s)											
Source ID	SO2	NOx	PM10	CO	UTM East (m)	UTM North (m)	Base Elevation amsl (ft)	Stack Height (m)	Stack Temp (K)	Exit Velocity (m/s)	Stack Diam (m)	Source Width (m)
HCS_PN2B	0.0	0.0	3.82	18.70	764,633.0	309,673.0	89.0	45.7	344.8	8.01	3.96	n/a
HCS_PN3A	48.49	5.63	0.0	0.0	764,633.0	309,673.0	89.0	46.9	323.3	12.71	3.66	n/a
HCS_PN3B	0.0	0.0	3.14	51.24	764,633.0	309,673.0	89.0	46.9	332.9	13.29	3.66	n/a
DAGS Maui Memorial Hospital												
DMMH_502	0.24	0.68	1.74	0.0	761,184.0	311,445.0	102.0	6.1	1255.4	7.50	0.70	n/a
PRI Energy Systems												
PRI_517	0.0	0.05	0.0	0.0	762,290.0	312,515.0	9.0	11.3	410.9	2.77	0.09	n/a
PRI_518	0.0	0.05	0.0	0.0	762,290.0	312,515.0	9.0	11.3	410.9	2.77	0.09	n/a
PRI_519	0.0	0.05	0.0	0.0	762,290.0	312,515.0	9.0	11.3	410.9	2.77	0.09	n/a
PRI_520	0.0	0.05	0.0	0.0	762,290.0	312,515.0	9.0	11.3	410.9	2.77	0.09	n/a
R&M Service Co.												
RM_521	0.0	0.02	0.0	0.0	759,504.0	308,545.0	410.0	3.7	449.8	2.59	0.30	n/a
RM_54	0.0	0.0	0.20	0.0	759,504.0	308,545.0	410.0	1.0	n/a	n/a	n/a	100
Borthwick Mortuaries												
BM_501	0.0	0.0	0.03	0.0	760,234.0	310,785.0	213.0	2.8	1089.3	8.02	0.51	n/a
MECO, Maalaea												
M1-M3_ABL	4.56	37.11	1.08	13.32	760,468.0	302,395.0	15.0	13.7	677.6	37.00	0.64	n/a
M4-M7_ABL	12.24	148.16	3.32	39.84	760,501.0	302,373.0	15.0	14.6	711.9	44.20	0.81	n/a
M8-M9_ABL	6.26	56.62	2.82	19.92	760,510.0	302,345.0	15.0	13.4	722.0	69.80	0.71	n/a
M10-M13_ABL	25.52	291.68	3.28	25.36	760,585.0	302,325.0	15.0	36.6	644.3	34.80	1.39	n/a
X1-X2_ABL	2.96	8.62	0.94	8.88	760,623.0	302,384.0	15.0	18.3	677.6	37.00	0.63	n/a
M14-M16_25%	0.0	10.66	4.96	119.84	760,650.0	302,353.0	15.0	36.6	414.0	10.80	2.44	n/a
M14-M16_100%	27.72	0.0	0.0	0.0	760,650.0	302,353.0	15.0	36.6	427.0	20.00	2.44	n/a
M17-M19_25%	0.0	10.66	4.96	119.84	760,719.0	302,423.0	15.0	36.6	414.0	10.80	2.44	n/a
M17-M19_100%	27.72	0.0	0.0	0.0	760,719.0	302,423.0	15.0	36.6	427.0	20.00	2.44	n/a
MBS_ABL	0.33	0.08	0.05	0.53	760,650.0	302,353.0	15.0	36.6	724.8	57.40	0.25	n/a
MECO, Kahului												
K1	26.09	6.83	4.56	0.78	763,673.0	313,143.0	12.0	56.4	450	11.00	1.20	n/a
K2	26.09	6.83	4.56	0.78	763,673.0	313,143.0	12.0	56.4	422	10.90	1.20	n/a
K3	47.73	13.38	17.40	1.44	763,673.0	313,143.0	12.0	56.4	436	12.20	1.50	n/a
K4	50.23	15.30	12.12	1.51	763,673.0	313,143.0	12.0	56.4	433	12.60	1.70	n/a

APPENDIX H

PUBLIC AND AGENCY CONSULTATION

TABLE OF CONTENTS

MEETING OR DOCUMENT	DATE
KIHEI COMMUNITY ASSOCIATION GENERAL COMMUNITY MEETING	MAY 16, 1995
KULA COMMUNITY ASSOCIATION BOARD MEETING	JUNE 1, 1995
KIHEI COMMUNITY ASSOCIATION GENERAL COMMUNITY MEETING	JUNE 20, 1995
PAIA COMMUNITY ASSOCIATION GENERAL MEMBERSHIP MEETING	JUNE 22, 1995
KIHEI COMMUNITY ASSOCIATION PETITION	JUNE 27, 1995
PUKALANI COMMUNITY ASSOCIATION GENERAL COMMUNITY MEETING	JUNE 29, 1995
SOUTH MAUI TIMES NEWS ARTICLE CONCERNING THE NEW GENERATION SITE	JUNE 30,1995
MAUI NEWS LETTERS TO THE EDITOR "DON'T POLLUTE PUKALANI"	JULY 11, 1995
PA'IA MAIN STREET ASSOCIATION LETTER TO T. JEZIERNY	AUGUST 1, 1995
COUNTY OF MAUI MAYOR'S MEETING MECO's NEW SITE GENERATION SITE PRESENTATION	AUGUST 15, 1995
KULA FARMERS/MAUI FARM BUREAU MEETING	AUGUST 15, 1995
KULA COMMUNITY ASSOCIATION MEETING	AUGUST 17, 1995
MAKAWAO MAIN STREET ASSOCIATION GENERAL COMMUNITY MEETING	AUGUST 23, 1995
MAUI COUNTY PLANNING COMMISSION MECO's NEW GENERATION SITE PRESENTATION	OCTOBER 10, 1995
MAUI COUNCIL, COMMITTEE OF THE WHOLE MECO's NEW GENERATION SITE PRESENTATION	NOVEMBER 2, 1995
KAHULUI TOWN ASSOCIATION MEETING	NOVEMBER 14, 1995

KIHEI COMMUNITY ASSOCIATION
GENERAL COMMUNITY MEETING
MAY 16, 1995

MECO New Site N1
GENPP 1-2
YA/G

MEMORANDUM

Hawaiian Electric Company, Inc.

May 25, 1995

Subject: Kihei Community Association Meeting
MECO's New Generation Site Presentation

Date: May 16, 1995
Time: 7:30 p.m.
Place: Kihei Elementary School Cafeteria

Present:

MECO
T. Jezierny
E. Reinhardt
N. Shinyama
S. Kiyonaga
D. Hayashi

HECO
K. Kusaka
S. Seu

ABHI
Mercer Vicens

Kihei Community Association
Approximately 21 members
Tom Morrow
Avery Chumbluy

I. Purpose of the Meeting:

A. Present to the association the three generation sites that MECO is investigating for the next generation site. See attached fact sheet.

II. Issues:

The following items are questions or issues that were discussed during the presentation:

A. *Q.* Is the forecast based on population growth?
A. The forecast is based on electrical load growth. The forecast for this year is 4% load growth; for the last 10 years the growth has been 6% (due to hotels). Future growth is estimated at 2 to 3% annually and is due to more residential growth.

B. Q. What is the gas turbine size?
A. 20 MW

C. Q. Can the gas turbine use alternate fuel?
A. The gas turbine is designed to burn many types of fuel such as methane, natural gas or a byproduct of sugar cane. When alternate fuels become available, it could be adapted to the combustion turbine.

D. Q. What are the health effects of the new generating facility; emission from the stack and EMF?
A. Emission from the units: A DOH toxicologist testified in the Maalaea 17 Change in Zoning hearing that there would not be a problem living 50 ft. from the plant.
EMF: An article in the May 14, 1995 Advertiser (attachment), reported that the American Physical Society study showed that there was no evidence that EMF causes cancer.

E. Q. What area does the Maalaea Power Plant provide service?
A. The power plants are all tied together in a grid, therefore provide electricity through out Maui.

F. Q. What is the elevation of the new power plant (C-3)?
A. Approximately 200 ft.

G. Q. What will be the height of the stacks?
A. The stack height could range from 120 ft. to 200 ft. The stack height at Maalaea is approximately 120 ft.

H. Q. Can trees be planted to hide the power plant?
A. MECO has contacted an arborist to help select trees that can grow as high as 100 ft. and would withstand the natural elements, however we have not been successful in determining a species. Any help from the community would be appreciated.

I. Q. What will the noise level be at the plant?
A. The new plant will be designed to meet Oahu noise standard which is 70 dBA at the property line. Maui does not have a noise regulation, therefore the Oahu regulation will be used as a guideline.

J. Q. What is the price difference between the fallow land and cane land?
A. (Mercer Vincens answered this question) ABHI believes that the C-3 site is the best site for the power plant since the land is fallow and is immediately available, it is located in the Puunene area which is proposed for industrial use, and the other two sites (D-1, A-2) are in the middle of the cane fields and would disrupt cane production and harvest. Installing a power plant at the D-1 or A-2 sites would also be considered spot zoning.

K. Q. Is the Puunene site at Puunene?
A. The C-3 site that is referenced as the Puunene site was named after the Puunene airport. The C-3 site is actually closer to Kihei and not the Puunene community.

L. Q. What is MECO's first choice for the next generation site?
A. MECO has not made a decision. MECO decision would be based on studies and community inputs.

M. Q. Since community members were only told today that MECO was going to provide a presentation and since public input will be a large input into the decision, can MECO come back and give another presentation?
A. Yes, MECO will provide another presentation at the next Kihei Community Association meeting. (Tentatively scheduled for June 20, 1995.)

N. Q. What is the actual cost of the new generation site?
A. The infrastructure cost will be between $12-15 million and another $120 million for the dual train combined cycle unit.

Comments:

- Kihei is directly down wind of the proposed power plant site (C-3) and the emission would be right in their face. People in North Kihei have more respiratory problems possibly due to being down wind of the cane burning. Prefer MECO select the A-2 or D-1 sites.

- Anything to improve rolling blackouts would be good.

Kenji C. Kusaka
Project Manager

kck
attachments

cc. HECO & MECO Attendees
M. Yuen
B. Christianson (SWEC)

MECO'S NEW GENERATION SITE
FACT SHEET

WHAT:
MECO needs to establish a new power plant site for generating unit additions in 2004 and beyond.

WHY:
After this next Maalaea generation addition (1996 - 2000), the Maalaea Plant property will not be expanded. Expansion of MECO's Kahului Plant is unlikely due to property limitations, tsunami zone restrictions, etc.

TO BE INSTALLED:
- Required Acreage: Approximately 50 Acres (including buffer zone).
- Type of Equipment and Structures Proposed:
  a) Four (4) Dual Train Combined Cycle Units (Gas turbines, steam turbines, heat recovery steam generators, stacks, air cooled condensers. Gas turbines are fuel flexible; combined cycle units are most efficient in the State of Hawaii.)
  b) Fuel Tanks & Berm
  c) Fire Protection System
  d) Switchyard
  e) Administration Offices
  f) Maintenance Shop
  g) Warehouses/Storage Area
  h) Water Treatment Facility
  i) Wastewater Treatment Facility
- Related Facility: T&D Baseyard (Potential)
- Generation Capacity: Approximately 232 MW over 30+ years.

WHERE:
- Two sites identified in the Siting Study:
  1) Pulehu Road, one mile mauka of the landfill (Sites D-1 & A-2).
  2) Puunene, one mile southeast of the Maui Airport (Site C-3)

- Distance to the nearest community:
  a) Kihei (C-3): 1.5 Miles
  b) Pukalani (D-1): 2.7 Miles
  c) Puunene (A-2) 2.1 Miles

WHEN:

- Site Selection Target Date: August 31, 1995
- Site Acquisition Target Date: December 31, 1995
- Forecasted Operation Date of the first unit: January 2004

HOW:

- Over 20 Federal, State and County permits required to permit the land and install the generating unit.
- Requires an Environmental Assessment or Environmental Impact Statement which will consider impacts including, but not limited to:
  a) Natural resources
  b) Cultural resources
  c) Archaeological resources
  d) Effects on economic/social welfare
  e) Effect on economic/social activities
  f) Effect on rare, threatened, or endangered species of animal or plant life or habitat
  g) Effect on air quality
  h) Effect on water quality
  i) Effect on noise levels
  j) Effect on traffic
  k) Effect on environmentally sensitive areas
  l) Effect on natural and man-made resources
  m) Effect on scenic and open resources
  n) Provision of facilities and improvements important to state economy
  o) Hazards to life and property from natural hazards, including tsunamis, flooding, erosion, etc.
  p) Consistency with Land Use Plans, Policies, and Controls
- Number of new jobs at the Plant: Initially 10 - 12 with installation of the first combined cycle plant, expanding to 42.
- Construction jobs to be created: 50 - 60 during peak construction period.

COMMUNITY MEETINGS:

1) Kihei Community Association, General Community Meeting
   May 16, 1995, 7:30 PM, Kihei Elementary School Cafeteria
2) Kula Community Association, Association Board
   June 1; 1995, 6:00 PM, Kula Elementary School Library
3) Kihei Community Association, General Community Meeting
   (Follow-up Presentation)
   June 20, 1995, 7:30 PM, Haggai Institute (Formerly Maui Sun Hotel)
4) Paia Main Street Association, General Membership Meeting
   June 22, 1995, 6:30 PM, Paia Community Center
5) Pukalani Community Association, General Community Meeting
   June 29, 1995, 7:00 PM, Pukalani Community Center
6) Makawao Main Street Association (Date Pending)
7) Kahului Town Association (Date Pending)
8) Update Maui County Council (Date Pending)

CONTACT:

To answer any questions, please contact Ed Reinhardt at 871-2364 or Neal Shinyama at 871-2341.

(File: FACTSHT.DOC, REV. 4, June 26, 1995: Revised to Paia Main Street Association, added Contact, and revised Pukalani mtg. date.)

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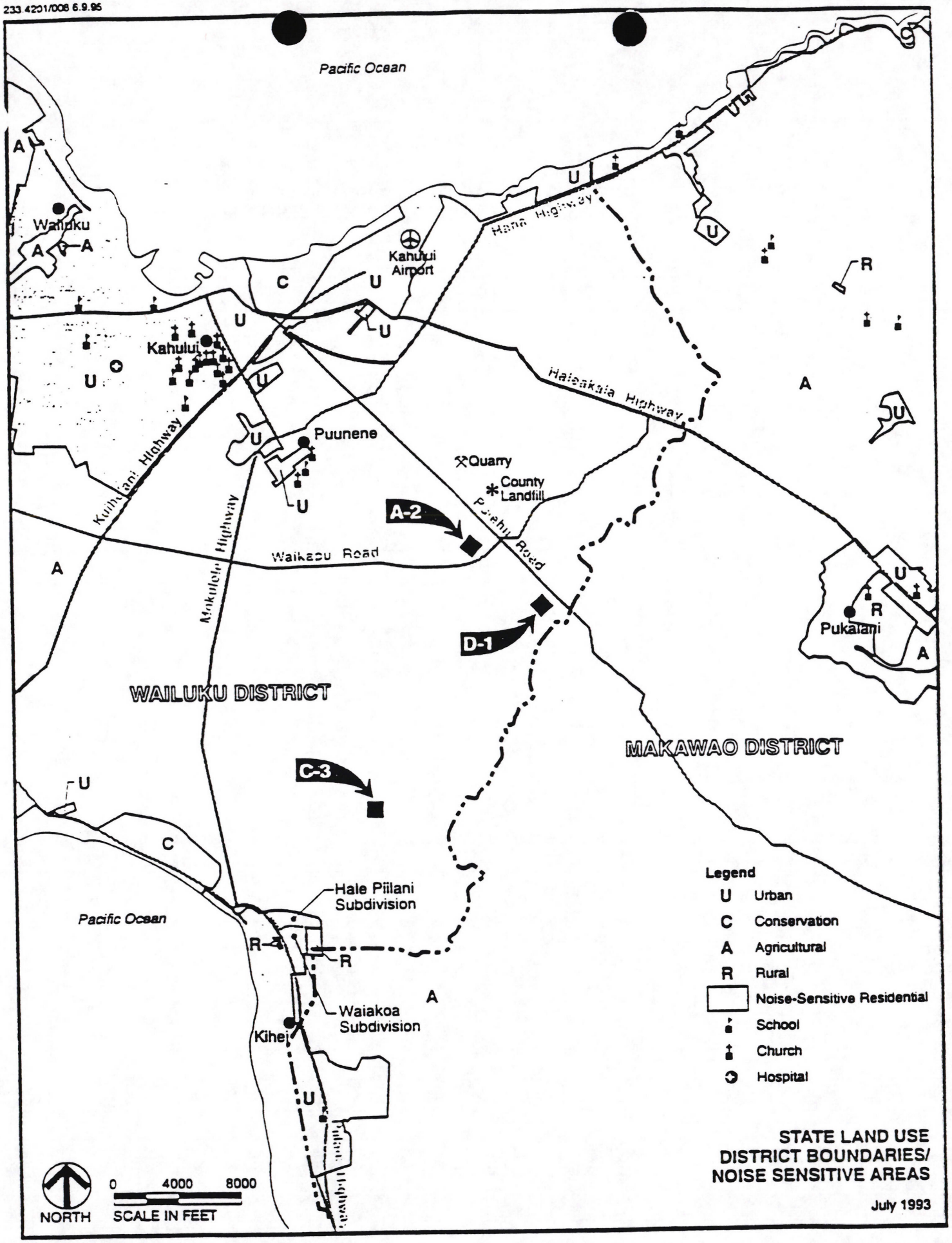

STATE LAND USE
DISTRICT BOUNDARIES/
NOISE SENSITIVE AREAS

July 1993

KULA COMMUNITY ASSOCIATION
ASSOCIATION BOARD MEETING
JUNE 1, 1995

MEMORANDUM

Hawaiian Electric Company, Inc.
June 2, 1995

Subject: Kula Community Association Meeting
MECO's New Generation Site Presentation

Date: June 1, 1995
Time: 6:00 p.m.
Place: Kula Elementary School Library

Present:

MECO
T. Jezierny
E. Reinhardt
N. Shinyama
S. Kiyonaga
D. Hayashi

HECO
K. Kusaka
S. Seu
M. Yuen

ABHI
Mercer Vicens

Kula Community Association
Approximately 6 members
Robert Monden
Chris Halford

I. Purpose of the Meeting:

A. Present to the association the three generation sites that MECO is investigating for the next generation site. See attached fact sheet.

II. Issues:

The following items are questions or issues that were discussed during the presentation:

A. Q. How does MECO select a power plant site? Is it where power is needed or close to the fuel supply?
A. MECO looks at many factors in selecting a site. We look at electrical load distribution, fuel, transmission, air quality, flora & fauna. The major factor that determined the area of the new sites was air quality requirements.

B. *Q.* What does the air line shows (air quality map)?
A. The area surrounding D1 shows that that area is moderately difficult to permit a power plant. Outside that area shows an area more difficult to permit. Outside that area will be very difficult to permit a power plant. Flat terrain provides more of a chance to disperse the emissions compared to a hilly area.

C. *Q.* Explain the UIC Line.
A. The UIC line is a boundary developed through studies by the DOH to help with the permitting process for Underground Injection Wells. If a well is located below (makai) the UIC line, it is easier to permit an injection well since the drinking water table would not be affected. If the well is located above the UIC line, it still is possible to install an injection well however the permitting process could take at least two years since there are more opportunities for the drinking water table to be affected.

D. *Q.* What is being injected in the UIC wells?
A. MECO is taking water out of the ground, using it in our process, then reinjecting what is not used back into the ground. While the naturally occurring substances in the water may be more concentrated when reinjected, we would not be disposing of any chemicals or other such materials in the reinjection wells.

E. *Q.* Is the Kahului plant dispersing the emissions properly?
A. It is being dispersed properly. The older units have higher emissions limits than the newer units. For example; the older diesel units disperse 600 PPM of Nox compared to the new combustion turbines that emit only 42 PPM of Nox. Also, the Kahului plant burns medium sulfur (black) oil vs. the combustion turbines that burn diesel oil.

F. *Q.* Is MECO looking at alternate energy?
A. MECO is presently negotiating with VEDCO for a waste to energy plant which is planned to be operational in 1997. Also, MECO is negotiating with two wind farm companies for up to 20 MW of capacity.

G. *Q.* What is the status of the geothermal project for Maui?
A. The geothermal project is dead. No developer is willing to take the risk in developing geothermal and the County does not have any Rules and Regulations for a geothermal facility.

H. *Q.* Does MECO have a preference on a generation site?
A. MECO does not have a preference. However, if you look at the sites from an air quality perspective, A-2 is the better site.

<u>Comments</u>:

- Robert Monden: Farmers may be concern with sulfur emissions. The Omaopio farmers were complaining that chemicals (insecticide and fertilizers) from the sugar

fields were affecting their crops. (For the next presentation, Robert Monden will invite the United Farm Bureau.)

- Mercer Vincens, ABHI: Speaking for ABHI, the Puunene site (C-3) is the better site due to: 1) the land is immediately available, 2) the area adjacent ot the Puunene site is being proposed for industrial use, 3) the county is looking at installing a wastewater plant there, 4) 50 acres in the middle of cane land will disrupt HC&S operations every 2 years when HC&S needs to burn the cane, harvest, and cultivate, 5) the location is far away from the Kihei Community, and 6) it would be an economical hardship for HC&S when 50 acres of prime sugar cane land is taken away.

- Member of Kula Community: MECO should not take agriculture land from HC&S.

- The next community meeting may be scheduled for July 20, 1995. If a meeting cannot be set in July, the next community meeting will be held in September.

- Kula Community Association will contact Neal Shinyama if they have any questions or when they have scheduled the next meeting.

Kenji C. Kusaka
Project Manager

kck
attachment

cc. HECO & MECO Attendees
Bob Christianson-Stone & Webster Engineering Corporation

KIHEI COMMUNITY ASSOCIATION
GENERAL COMMUNITY MEETING
JUNE 20, 1995

MEMORANDUM

Hawaiian Electric Company, Inc.

July 7, 1995

Subject: Kihei Community Association Meeting
MECO's New Generation Site Presentation

Date: June 20, 1995
Time: 7:30 p.m.
Place: Haggai Institute

Present:

MECO
T. Jezierny
E. Reinhardt
S. Kiyonaga
N. Shinyama

HECO
K. Kusaka
J. Clary
S. Seu

ABHI
Mercer Vicens (Absent)

Kihei Community Association
Approximately 27 members
J. Muller

I. Purpose of the Meeting:

A. Present to the association the three generation sites that MECO is investigating for its next generation site. See attached fact sheet.

II. Issues:

The following items are questions or issues that were discussed during the presentation:

A. Q. What items are ABHI considering between the three power plant sites?
A. ABHI is considering the use of the land. Sites A-2 and D-1 are in cane land and C-3 is fallow. Asking price will be different for the land.

B. Q. What are the factors in selecting a site?
A. MECO looks at air quality modeling, cost of land and infrastructure, the location of the UIC line, permitting, community inputs, the landowner input, and the County Council.

C. Q. Will MECO utilize once through cooling?
A. No, purified water will be used in a closed loop system. The water will be converted to steam in the HRSG, the steam will drive the steam turbine to generate electricity, then the steam will be cooled back to water by the air cooled condenser; which would then be used again in the HRSG.

D. Q. How much power is MECO getting from the sugar mill?
A. MECO receives 16 MW of power from HC&S which is approximately 10% of the system. Before 1948, the sugar industry provided 100 % of the power.

E. Q. How reliable will the sugar plantation be 5 to 10 years from now?
A. Unknown due to the farm bill. Presently, the reliability from the sugar plantation is outstanding.

F. Q. Can the combustion turbine burn bagasse?
A. Presently, there is a pilot bagasse gasification plant at Paia. If the gasification plant can increase the energy potential from bygasse by 40%, the gas (after filtering) can be used in the combustion turbines. (Modifications to the existing combustion turbines must be implemented to allow the existing combustion turbines to burn any fuels other than diesel.)

G. Q. How much more costly is hydroelectric?
A. There has been public opposition to hydroelectric power, in Kauai and Maui, and would be more costly.

H. Q. How much does MECO pay HC&S for electricity?
A. Approximately $5 million for energy and $2 million for capacity per year.

I. Q. Does the Puunene Plant (HC&S) need to meet the same air quality at MECO?
A. Newer units such as Maalaea 14-16 have more stringent regulations than the older units such as the Puunene Plant.

J. Q. Does agriculture have exceptions to the air regulations?
A. We are not aware of any exceptions.

K. Q. Why can the Puunene Plant operate and produce all that black smoke? Is it a malfunction?
A. The air permit allows for higher opacity of up to an aggregate of no more than 6 minutes per hour to correct any malfunctions. The reason for the black smoke at Puunene is probably due to feeder malfunction or high moisture content in the bagasse. During those periods, fuel oil is fed to the boiler to keep the process going. When the fuel oil is injected into the boiler, black smoke occurs until adjustment can be made with the fuel/air mixture.

L. Q. How many stacks are there at Maalaea and how high will the new stack be?
A. There will be a total of three tall stacks after the expansion and the new stack height will be 120 ft.

M. Q. What kind of emissions will be coming out of the stack?
A. SO2, Nox, particulate, CO, CO2, and trace amounts of metals. This is not an all-inclusive list.

N. Q. How stable is the biomass gassifier project?
A. Not sure. There are three phases planned for the project. The third phase plans to produce ethanol. If that is successful, that fuel can be utilized by the combustion turbine.

O. Q. Where does HC&S prefer MECO to go for the new site?
A. C-3 since it is fallow land and not in cane use.

P. Q. Where does MECO want to install the new plant?
A. MECO does not have a preference.

Q. Q. Who will operate the trash/energy plant?
A. Probably private investors.

R. Q. How full is the landfill?
A. We do not know the answer.

S. Q. Is the Maalaea plant in the Tsunami Zone?
A. No, the FEMA maps, the Corps of Engineers, and the Civil Defense maps show that the Maalaea Power Plant is not in a Tsunami area.

T. Q. How does MECO get fuel to Maalaea?
A. Fuel is trucked to the plant.

U. Q. Are there plans to ship fuel to Maalaea Harbor?
A. No

V. Q. Will fuel be trucked to the new plant?
A. Yes; there is also a possibility of installing a pipe line if it's feasible.

W. Q. Since ABHI has agreed to a land appraiser, does that mean the land will be sold by ABHI?
A. No, ABHI has the final say and there may be a possibility that the land would need to be condemned.

X. Q. How far is C-3 from Mokulele Highway?
A. Approximately 2 miles.

Y. Q. How does the C-3 plant relate to the Puunene airport land use?
A. The C-3 site is just outside the 250 acre project district 10 proposal.

Z. Q. Can you move it into the project district 10 area?
A. If we move the site, we would need to collect meteorological data again for one year.

AA. Q. What is the status of the geothermal project to send electricity from the Big Island?
A. The project is dead.

BB. Q. What is the affect of noise from the power plant?
A. The new power plant will be designed to Oahu Standards since Maui does not have a standard. The standard will be 70 DBA at the property line.

CC. Q. Who really knows about air quality? The State of Hawaii Health Department does not know.
A. The air quality standards are designed to protect humans, plants and animals. The Federal government identifies the pollutants, collect health effect data, and conduct studies. Every 5 years the EPA updates the information. The State then has the ability to make the standards more stringent such as NO2 emissions in Hawaii. A DOH toxicologist has testified that people can live 50 ft. from the power plant with no ill affects.

DD. Q. Why are they having problems on geothermal emissions?
A. The standards for the geothermal were being established when the plant was being installed. Geothermal emission standards are different from combustion turbines.

EE. Q. What part of Maui will the new plant serve?
A. All the whole island is tied together in a grid. So the new plant will serve all Maui.

FF. Q. Have studies been done to convert to solar power vs. installing new generation?
A. MECO has submitted 4 conservation programs. The residential program is a rebate program. Predicted energy saving for the first year is 1.6 MW, after 5 years savings will be 12 MW.

GG. Q. Can the refuse to energy plant defer the final phase of Maalaea?
A. Yes, if the plant is reliable.

Comments:

- C-3 site is close to Kihei and would have the most impact on us. A-2 site would be the best since it's close to the landfill.
- A-2 site would be better since it's closer to the harbor and fuel supply.
- Jack Muller: ABHI stated that if MECO wants a specific location, they will not fight them. ABHI will try to influence MECO on the location, but MECO would need to make the final choice.

Kenji C. Kusaka
Project Manager

kck
attachments

cc. HECO & MECO Attendees
M. Yuen
B. Christianson (SWEC)

MECO'S NEW GENERATION SITE FACT SHEET

WHAT:

MECO needs to establish a new power plant site for generating unit additions in 2004 and beyond.

WHY:

After this next Maalaea generation addition (1996 - 2000), the Maalaea Plant property will not be expanded. Expansion of MECO's Kahului Plant is unlikely due to property limitations, tsunami zone restrictions, etc.

TO BE INSTALLED:

- Required Acreage: Approximately 50 Acres (including buffer zone).
- Type of Equipment and Structures Proposed:
  a) Four (4) Dual Train Combined Cycle Units (Gas turbines, steam turbines, heat recovery steam generators, stacks, air cooled condensers. Gas turbines are fuel flexible; combined cycle units are most efficient in the State of Hawaii.)
  b) Fuel Tanks & Berm
  c) Fire Protection System
  d) Switchyard
  e) Administration Offices
  f) Maintenance Shop
  g) Warehouses/Storage Area
  h) Water Treatment Facility
  i) Wastewater Treatment Facility
- Related Facility: T&D Baseyard (Potential)
- Generation Capacity: Approximately 232 MW over 30+ years.

WHERE:

- Two sites identified in the Siting Study:
  1) Pulehu Road, one mile mauka of the landfill (Sites D-1 & A-2).
  2) Puunene, one mile southeast of the Maui Airport (Site C-3)

- Distance to the nearest community:
  a) Kihei (C-3): 1.5 Miles
  b) Pukalani (D-1): 2.7 Miles
  c) Puunene (A-2) 2.1 Miles

WHEN:

- Site Selection Target Date: August 31, 1995
- Site Acquisition Target Date: December 31, 1995
- Forecasted Operation Date of the first unit: January 2004

HOW:

- Over 20 Federal, State and County permits required to permit the land and install the generating unit.
- Requires an Environmental Assessment or Environmental Impact Statement which will consider impacts including, but not limited to:
  a) Natural resources
  b) Cultural resources
  c) Archaeological resources
  d) Effects on economic/social welfare
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  n) Provision of facilities and improvements important to state economy
  o) Hazards to life and property from natural hazards, including tsunamis, flooding, erosion, etc.
  p) Consistency with Land Use Plans, Policies, and Controls
- Number of new jobs at the Plant: Initially 10 - 12 with installation of the first combined cycle plant, expanding to 42.
- Construction jobs to be created: 50 - 60 during peak construction period.

COMMUNITY MEETINGS:

1) Kihei Community Association, General Community Meeting
   May 16, 1995, 7:30 PM, Kihei Elementary School Cafeteria
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To answer any questions, please contact Ed Reinhardt at 871-2364 or Neal Shinyama at 871-2341.

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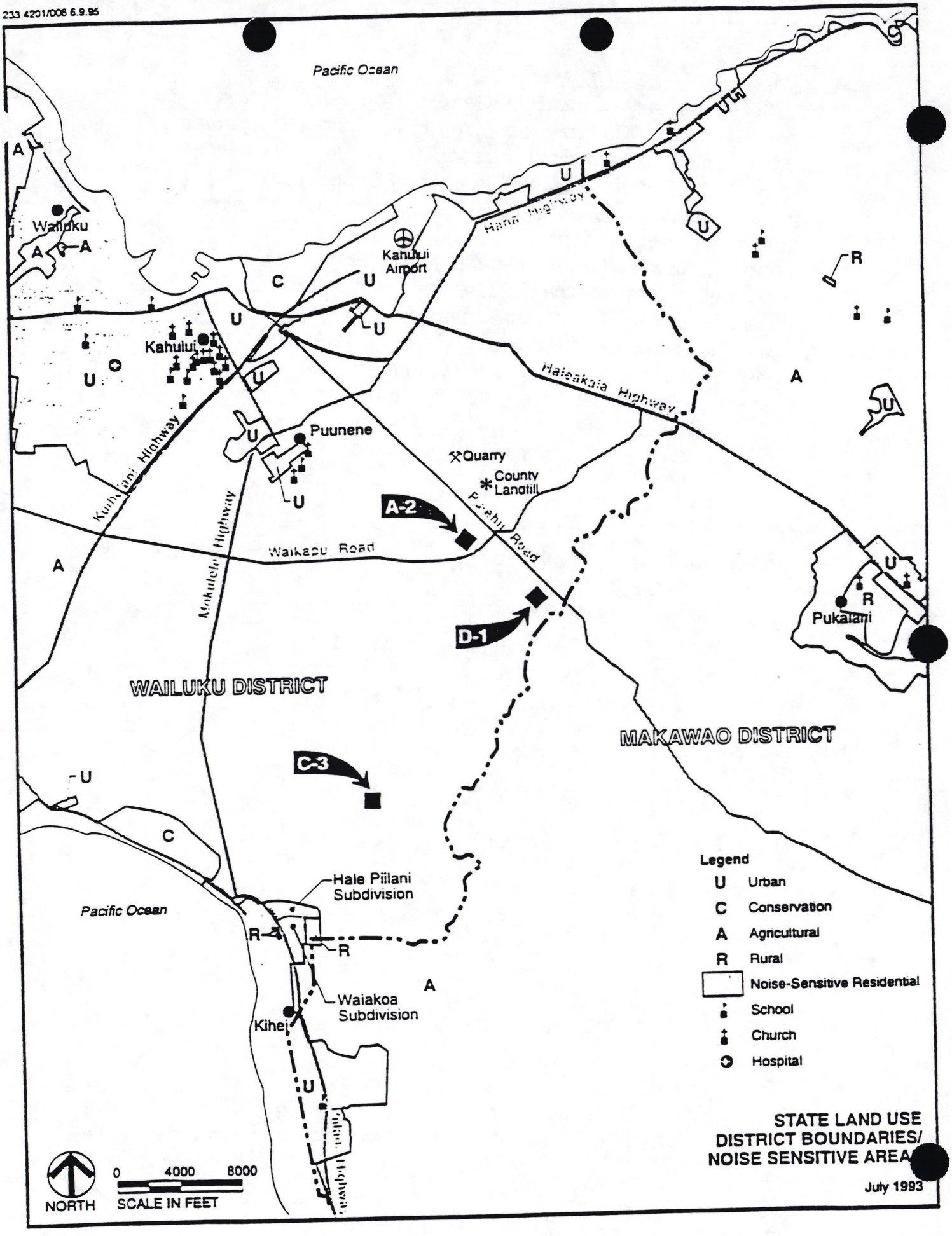

PAIA COMMUNITY ASSOCIATION
GENERAL MEMBERSHIP MEETING
JUNE 22, 1995

MEMORANDUM

Hawaiian Electric Company, Inc.

July 7, 1995

Subject: Paia Community Association Meeting
MECO's New Generation Site Presentation

Date: June 22, 1995
Time: 6:30 p.m.
Place: Paia Community

Present:

MECO
T. Jezierny
E. Reinhardt
S. Kiyonaga

HECO
K. Kusaka
J. Clary
S. Seu

ABHI
Mercer Vicens

Paia Community Association
Approximately 26 members

I. Purpose of the Meeting:

A. Present to the association the three generation sites that MECO is investigating for its next generation site. See attached fact sheet.

II. Issues:

The following items are questions or issues that were discussed during the presentation:

A. Q. What is MECO planning to do with the transformer station in Paia?
A. MECO plans to move the substation within the next 2 to 5 years. MECO is presently in discussion with HC&S to relocate the substation. The design and the purchase of the land still need to be done.

B. Q. What type of service does MECO provide to measure EMF?
A. MECO provides free of charge testing of EMF. MECO will measure EMF in your home. Phone Number to call for this service is 871-2364.

C. Q. Are there any studies about EMF?
A. There are many studies and there are conflicts in the results. The EPA and DOH studies cannot identify health affects from EMF.

D. Q. What are major contributors to EMF in the homes?
A. Hair dryers, electric clock, and black & white TVs.

E. Q. Does the County have a program for residents to go to solar power?
A. We are not aware of any programs. MECO has lobbied for the County to adopt the Hawaii Energy Code. It requires solar heating and energy efficient construction of home. Maui has not adopted the code.

F. Q. Does MECO or the State have a proposal for solar power?
A. MECO has submitted proposal for solar heating, which needs to be approved by the PUC. The State has a 35% tax credit for solar energy projects.

G. Q. What percent of electrical demand is from residential?
A. Approximately 40% is residential.

H. Q. Are there any demand side management program?
A. There was a rebate program for energy efficient florescent bulbs. Was successful in the residential market but moderately successful in the commercial market. There may be a rebate program for solar hot water heaters if it is approved by the PUC.

I. Q. Will there be any new power lines through Paia?
A. When the substation at Paia is relocated, a new transmission line will be installed. However, the corridor for the new transmission line would most likely follow the existing HC&S transmission line.

J. Q. Does MECO have a display room for the energy efficient florescent bulbs?
A. Yes, in MECO's main office lobby in Kahalui.

K. Q. Are there any florescent flood lights?
A. Not aware of any florescent flood lights.

L. Q. Are there any plans for underground wiring?
A. Normal practice, following PUC guidelines, is to install overhead lines vs. underground since it is more practical and the cheapest. Undergrounding wires could cost 6 to 8 times more than an overhead line, and the rate payers would end up paying for it.

Comments:

- Mercer Vincens: ABHI prefers MECO construct the new power plant at C-3. It's an open field, fallow, and the area is proposed for industrial use. A-2 and D-1 are on agricultural land and the plant would have a long term adverse affect on production of cane; harvesting, cane fire, and dust. McBride Sugar just announced today that they will going out of the sugar business, affecting over 200 employees. They were losing $6 million per year. ABHI is looking for the best solution and will give a site at a reasonable cost.

- Haiku Resident: Supports agriculture and Maui needs to keep the greenery in this part of the land. MECO needs to go South.

Kenji C. Kusaka
Project Manager

kck
attachments

cc. HECO & MECO Attendees
M. Yuen
B. Christianson (SWEC)

MECO'S NEW GENERATION SITE FACT SHEET

WHAT:

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WHY:

After this next Maalaea generation addition (1996 - 2000), the Maalaea Plant property will not be expanded. Expansion of MECO's Kahului Plant is unlikely due to property limitations, tsunami zone restrictions, etc.

TO BE INSTALLED:

- Required Acreage: Approximately 50 Acres (including buffer zone).
- Type of Equipment and Structures Proposed:
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  i) Effect on noise levels
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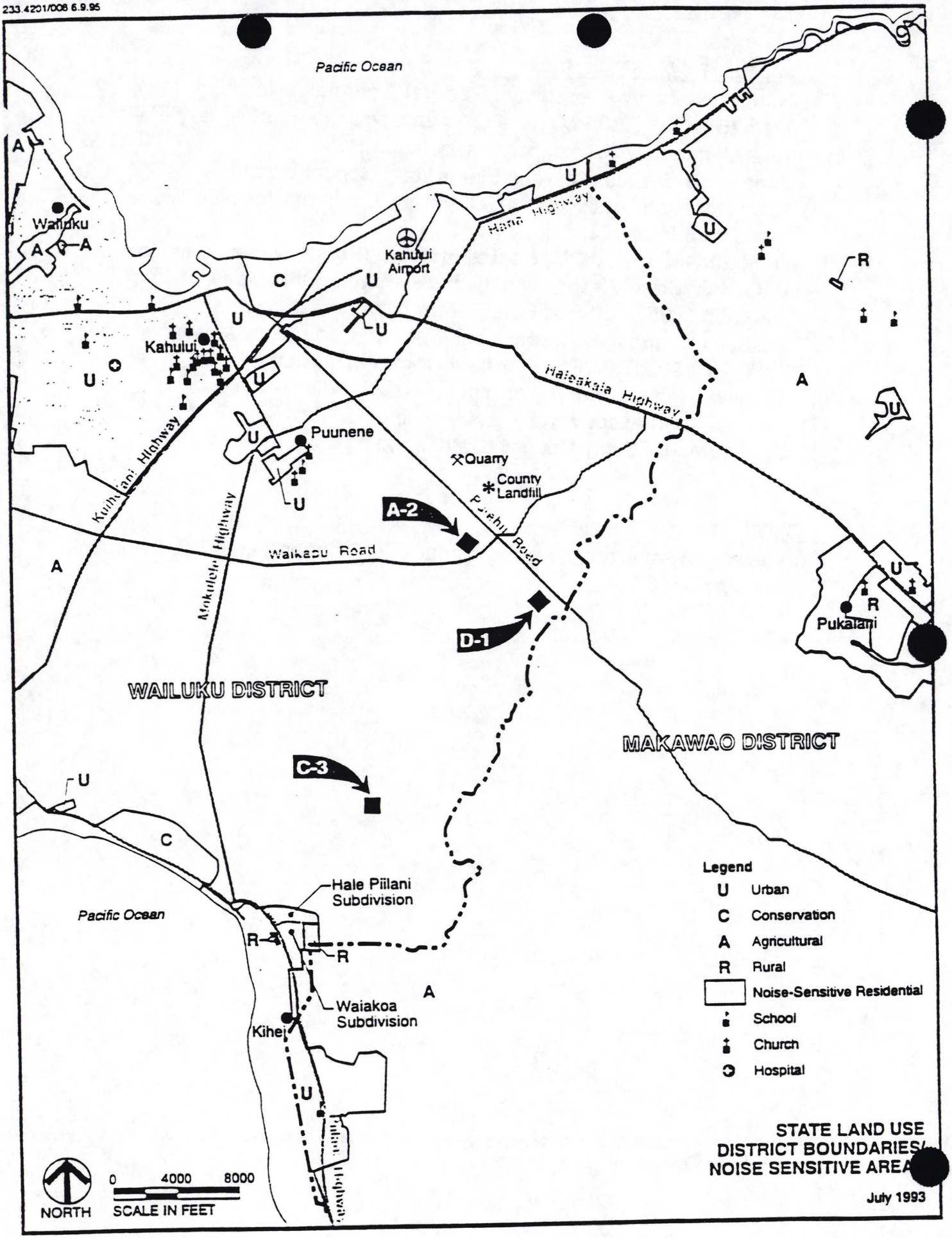
Pacific Ocean
Wailuku
Kahului Airport
Hana Highway
Kahului
Haleakala Highway
Puunene
Quarry
County Landfill
Kuihelani Highway
Mokulele Highway
Pulehu Road
Waiakoa Road
A-2
D-1
C-3
Pukalani
WAILUKU DISTRICT
MAKAWAO DISTRICT
Hale Piilani Subdivision
Waiakoa Subdivision
Kihei
Pacific Ocean
Legend
U Urban
C Conservation
A Agricultural
R Rural
Noise-Sensitive Residential
School
Church
Hospital
NORTH
0 4000 8000
SCALE IN FEET
STATE LAND USE DISTRICT BOUNDARIES/ NOISE SENSITIVE AREA
July 1993

KIHEI COMMUNITY ASSOCIATION
PETITION DATED JUNE 27, 1995

FILE

MECO NEW SITE N1
GENPP 1-2

Post Office Box 662

KIHEI COMMUNITY ASSOCIATION
KCA

Kihei, Maui 96753

June 27, 1995

MAUI COUNTY COUNCIL
The Honorable Alice Lee, Chairperson and all Council Members

RE: Maui Electric Co.'s 3 proposed Maui Expansion sites:

Dear Chairperson Lee and All Council Members:

The Maui Electric Co., has made 2 presentations to the **KIHEI COMMUNITY ASSOCIATION** at General meetings in the last month. They discussed 3 proposed sites for the doubling of their to-be-developed Maalaea site by the year 2004. We understand their specific site selection is to place this August.

They have been very forthcoming and cooperative in their presentation of the various factors which will influence their decision. After hearing the facts and the Kihei public's input, the **KIHEI COMMUNITY ASSOCIATION** strongly requests the following:

The C-3 site, 1 1/2 miles from our HALE PIILANI residential subdivision be eliminated from consideration and that the site A-2 be selected. This site is nearest the source of their fuel from the Kahului harbor, farthest away from any residential site being considered and the power plant development at this location would be compatible with the multi-uses proposed by the County of Maui and the State of Hawaii in the mid-island Puunene area.

Enclosed is a **Petition signed by approximately 100 residents of Hale Piilani** requesting the A-2 site be selected. It should be noted that the proposed new *Kihei Montessori O'Keiki School* and an expanded *Hale Piilani Park* are to be developed in the immediate vicinity of *Hale Piilani and would be impacted by site C3.*

We are very grateful for MECO's efforts to bring us into the dialog process regarding their site selection.

Respectfully submitted,

Carla M. Flood, President
KIHEI COMMUNITY ASSOCIATION

cc: Tom Jezeirny, President, MECO
Karl Wenger, Hale Piilani Homeowners Ass'n.

copies: ER
SKK
DH
Scott
Kenji
Chubby Vice

PUKALANI COMMUNITY ASSOCIATION
GENERAL COMMUNITY MEETING
JUNE 29, 1995

MEMORANDUM

Hawaiian Electric Company, Inc.

July 12, 1995

Subject: Pukalani Community Association Meeting
MECO's New Generation Site Presentation

Date: June 29, 1995
Time: 7:00 p.m.
Place: Pukalani Community Center

Present:

MECO
T. Jezierny
N. Shinyama
J. Williams
E. Reinhardt
D. Hayashi

HECO
K. Kusaka
S. Seu

ABHI
Mercer Vicens

Pukalani Community Association
Approximately 15 members
Kula Community- approximately 6 members
Tom Monden

I. Purpose of the Meeting:

A. Present to the association the three generation sites that MECO is investigating for its next generation site. See attached fact sheet.

II. Issues:

The following items are questions or issues that were discussed during the presentation:

A. Q. What are the effects of ethylene emissions from the plant?
A. Ethylene is not one of the emissions monitored by the air quality standards. On the Big Island, HELCO did conduct a study on the effects of ethylene on orchids. The study however was inconclusive. After the study, University of Hawaii Professors were contacted, however very little information was obtained. MECO would like to meet with anyone who has more information on ethylene.

Response: Ethylene causes the flower bloom to fall off early for cucumber, zucchini, and squash. Ethylene is also used to ripen fruits such as bananas.

B. Q. What are the effects of soot?
A. Soot is known as particulate matter in the air quality standards and is monitored. The combustion turbine is the cleanest burning plant on Maui. Its emissions are lower than the boilers and diesel engines. If you look at the Kahului (boilers) stack and the diesel engine stack (closest to Maalaea Community), you can see the plume. If you look at the CT stack, next to the diesel stack at Maalaea, it's clear. The CT stack is 90% cleaner. Also, the fuel burned in the CT is cleaner.

C. Q. What type of fuel does MECO burn?
A. At the Kahului Power plant, MECO uses #6 oil. For the diesel engine and the CTS, MECO uses #2 distillate or .4% low sulfur diesel oil.

D. Q. Can the combustion turbines burn biomass fuel?
A. Yes, the combustion turbine is very flexible in the types of fuel it can burn; biomass or fossil fuel. When alternate fuels become available, the combustion turbines will be able to burn them.

E. Q. Are you familiar with the Maui Vortex? You cannot measure it with one weather tower.
A. We are not familiar with the Maui Vortex and would appreciate any information people have. MECO will follow up and look into the Maui Vortex issue. Concerning the weather tower, MECO gathers one year of meteorological data and inserts that data in a computer model, approved by the EPA, to determine the worst case scenario at ground level for emission. The computer model also looks at the terrain and the emissions to calculate the worst case. Once the worst case is known, it is compared to the standards to see if there are any violation. If the worst case scenario passes, then the modeling is accepted.

F. Q. Why did the Maalaea Community Association oppose the expansion at Maalaea?
A. The Maalaea Community Association opposed the expansion because they felt that the plant was too close to Kealia Pond National Wildlife Refuge (KPNWR) and that the plant was vulnerable to tsunami and hurricane surges. MECO contested the Maalaea Community Association arguments by stating that the permits being submitted were being reviewed by agencies protecting KPNWR and that studies conducted by consultants concluded that storm surge from a Hurricane Iniki force winds would not affect the Maalaea Power Plant.

G. Q. Why can't you expand at Maalaea?
A. We do not want to expand at Maalaea because we are very close to air emission limits at Maalaea, the plant would be getting closer to KNWR, and ABHI has plan to install a golf course just north of the Maalaea Power Plant property.

H. Q. What did the Kihei Community say about the new sites?
A. Essentially, the C-3 site is lousy and that the A-2 site was the best. They were concerned about noise, visual impact, and emissions. They also mentioned that the Hale Piilani subdivision was initiating a petition protesting the C-3 site.

I. Q. Where does MECO want to go?
A. MECO has not determined a site. MECO is still open minded on the sites. From an air quality perspective, A-2 is the best followed by D-1 then C-3.

J. Q. How much noise will generate from the plant?
A. The plant will be designed to Oahu Standards since Maui County does not have a standard. The noise level will be 70 decibels at the property line.

K. Q. Does the plant have a smell?
A. At Maalaea Power Plant you will be able to smell the plant due to the diesel units and the shorter stacks. For the combustion turbine, with the higher stack, the smell will be dispersed and eliminated.

L. Q. Isn't the C-3 site better since the land is cheaper?
A. The land would be cheaper since it is fallow and not in cane use, however it is more expensive to install transmission lines and roadways to the C-3 site.

M. Q. How did MECO come up with two sites on Pulehu Road?
A. Actually there were three sites MECO was investigating at Pulehu Road. MECO conducted a preliminary site assessment at the three sites to ensure that there were no fatal flaws to prevent a power plant from being built. From that site assessment study, it concluded that A-2 site was the best site, however recommended that MECO also consider air quality before picking a final site. From a previous study, it was determined that D-1 was located in the best air quality area, therefore A-2 and the D-1 sites were kept for further consideration.

N. Q. How can MECO make a decision on a site by August 31, 1995 if it doesn't have all the information?
A. The August 31, 1995 date was a schedule that MECO provided to the County Council on determining the new site. The August 31, 1995 is not a dead set date. If additional information becomes available and MECO needs to review it, the date could move.

Comments:

- Mercer Vincens: ABHI prefers MECO construct the new power plant at C-3. It's an open field, fallow, cheaper, and the area is proposed for industrial use. A-2 and D-1 are on agricultural land and the plant would have a long term adverse affect on production. ABHI will negotiate with MECO to come up with a solution best for the communities.

- Loss of 50 acres of cane land is a very important factor in determining the new site. Not easy to get ag. land now days.

Kenji C. Kusaka
Project Manager

kck
attachment

cc. HECO & MECO Attendees
M. Yuen
B. Christianson (SWEC)

MECO'S NEW GENERATION SITE
FACT SHEET

WHAT:

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WHY:

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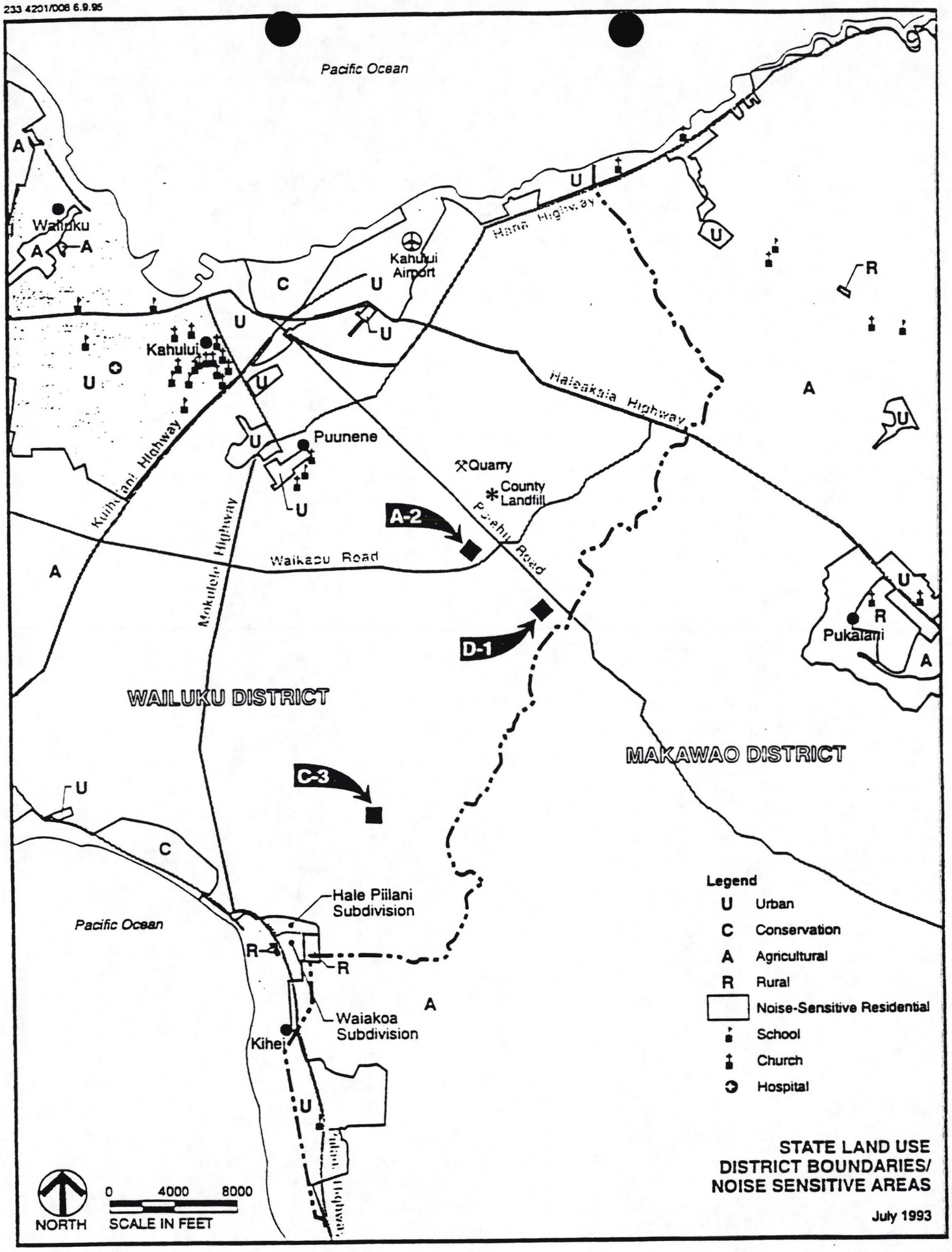

SOUTH MAUI TIMES NEWS ARTICLE
CONCERNING THE NEW GENERATION SITE
DATED JUNE 30,1995

MECO LOOKS AT NEW GENERATION SITES

Growth fuels energy needs

Site close to Kihei is added to the mix

By Gene Thompson

KIHEI

Siting of future electric generating plants was the subject of a recent general meeting of the Kihei Community Association. Tom Jeziemy, President of Maui Electric Company, made the presentation.

Since the three proposed sites are in the general area of one or another of Maui's communities, including Kihei, Maui Electric is contacting communities in Central, South and Upcountry Maui. The objective of the presentations is to get community input before Maui Electric makes its case to the county administration and council.

Additional generating facilities at the Maalaea plant, the last to be added there, are expected to be in place by 2,000. However, in addition to the output of the Maalaea plant, MECO's figures indicate an additional 58 megawatts of power will be needed starting in 2004.

The generating sites new under consideration are all on A & B land: two near Pulehu Road in the general area of the county landfill and one closer t Kihei, about one and a half miles from the Mokulele/Piilani intersection and the north boundary of the Hale Piilani subdivision.

The generating units at the new facilities will all be gas turbines. Steam will be condensed by a closed system air cooling system rather than water. The combined cycle units can use a variety of fuels and are considered the most efficient in the state.

Maui Electric is also looking into a variety of proposals for alternative means of generating electricity. Should any of these prove workable, plans for the gas turbine installations would be altered. Under consideration are

See EVEN on Page 2

Even wind power would be considered

From Page One

proposals for 20 to 40 wind machines. Although wind is abundant on Maui, winds are variable and require backup capacity.

Another proposal is to use wastes from the county landfill as fuel for steam production. Such a plant, if built, would be located near the landfill. (Strong objections were raised when garbage-to-energy was proposed several years ago.)

Yet another possibility is gasification of plant material, mainly bagasse and other organic sugar cane wastes. Testing is presently going on at the mill in Paia. But whether the product would be feasible for electric generation remains to be seen.

Target dates, according Jeziemy, are August 31, 1995 for site selection; site acquisition by the end of the year and startup of the first unit by January 2004.

Karl Wenger, a resident of Hale Piilani, asked about noise and air emission effects on Hale Piilani, where the plant location closest to Kihei to be selected.

Jeziemy replied that although Maui County does not have a noise statue, the standards used on Oahu have been used to determine noise impacts for the proposed new installations. Air quality standards are in place to protect human health, the environment and buildings. Power plan emissions are continually monitored and the data must be reported to the Department of Health.

Feeling that the generating site closest to Kihei might pose problems for the community, two suggestions came from the audience that the Pulehu Road sites would be the best choices.

E. REINHARDT

South Maui Times 6-30-95

MAUI NEWS LETTERS TO THE EDITOR
"DON'T POLLUTE PUKALANI
DATED JULY 11, 1995

Letters

Misplaced police?

I drove into Makawao town Thursday morning and immediately noticed two police officers, citation books in hand, walking down the street. I figured they were there "to protect and to serve"; my cynical friend next to me said they needed to raise some extra money.

A few minutes later we met with work associates who told us of a strange happening that just occurred. They said the officers in question were issuing seatbelt tickets, which is a little oppressive, but "it's the law."

What was strange, though, was that while the one officer dealt with the law breaker, his partner stood w[illegible]ing, then a lone officer drove up and joined the sc[illegible], and then another car with more officers joined the scene.

What a heinous case of seatbelt infraction it must have been to require five of Maui's finest to attend it. Who is determining what these county servants' priorities are? They certainly aren't able to determine for themselves.

Francis Spalluto
Haiku

Letters self-serving

I'm very tired of whining trial lawyers writing self-serving Letters to the Editor employing every devious tactic from slanderous remarks about our legislators to threats of losing our civil rights.

Get real! The people of Hawaii need relief from outrageous insurance costs. They don't need continual multimillion-dollar settlements, a large percentage of [illegible]h line the pockets of the loudest (only?) oppo[illegible] of insurance and tort reform. Check the background of these opponents and you'll likely find an attorney in there somewhere.

Barry Brown
Mahinahina

Don't pollute Pukalani

At this time, the electric company is considering sites for a large new power plant and baseyard.

Certain important concerns should not be ignored regarding this proposal and its proximity to residential areas (namely, Pukalani). The proposed site is a mere 2.7 miles from the quiet, peaceful Pukalani residences. I'm wondering why Maui Electric Co. even considers such close proximity when other acreage is available.

People don't wish to be disturbed by the resultant noise and air pollution. Harmful emissions will pollute this precious air we all must breathe. There are levels regarding emissions but, realistically, emissions (however small) still pollute the air and are an ever-present threat to the health of innocent residents. There exist many carcinogens. Emissions definitely warrant careful, detailed, in-depth series of studies. We are all susceptible to differing levels of carcinogens.

There was strong opposition to MECO's expansion proposal (Maalaea site) and rightly so. No one really wants to be subject to irritating continuous noise. The imminent threat of potential lung diseases and/or cancer exists. Emissions harm plants, crops and animals. Despite the strong Kihei opposition, I understand MECO was still able to have that expansion approved. One wonders how this was facilitated.

MECO needs to be extremely sensitive to people's health and to all negative effects of generating units on the general populace and our precious environment.

I hope others have similar feelings and will voice or write their opinions to the proper authorities or MECO before it's too late.

Ann Hulyk
Pukalani

Liability laws can hurt

This is in regard to the legislation concerning liability for injuries caused by automobile accidents as well as the effects this will have on other injuries such as those caused on the job.

These new laws can be detrimental to the victim of such accidents but of course very cost-effective for insurance and big business. I was faced with a dilemma and forced to see the truth.

I managed a retail store for five years. I fell off the loading dock in June of 1994 and hurt my back, but I continued to work to set an example to other employees.

Due to injuries not properly looked after, my job performance suffered to the point that I was demoted, humiliated and my reputation tarnished. I sought medical attention and was advised not to return to work until properly diagnosed and treated for my injuries.

In the meantime the company has refused responsibility. I now face ruin, and cannot return to work anywhere. I'm financially incapacitated and the company denies my rights to workers' compensation benefits. I have exhausted all temporary disability insurance benefits, which weren't enough to cover my expenses. I have sold everything I own and am being forced to apply for public aid.

I have been living a nightmare that any one of you could tomorrow be faced with. It's been a year since my accident and the quality of my life is not even 10 percent of what it used to be before my accident.

So what I'm asking is for you the voter, taxpayer, consumer to be more sensitive and educated to these politicians' rhetoric as well as to be sensitive to the places you choose to spend your money. Together we can fight the injustices.

Neftali Reyes Jr.
Kihei

Damien's dignity

To credit Father Damien with only helping the Hawaiian people is to tell but part of the story.

The real test of his humanity was that in the midst of a feeding frenzy of deception and greed over how to cheat the old ones out of their land, he kept his dignity and honor.

And he did it at a time when lesser men, the haoles, were trading their honesty and pride for land.

He was man enough, indeed, head and shoulders above the "small five," to hold on to his goodness in the face of evil run wild. God bless him.

Jim Hylkema
Kihei

No, [illegible] Not just that mu[illegible] wrong. We all know that, e[illegible] sorry few of us who go ahea[illegible] anyway.

Rather, and more interestin[illegible] capital punishment may not b[illegible] the statistics have it cracked u[illegible]

The numbers are overwh[illegible] Depending upon the sea[illegible] whether, that is, we are hy[illegible] about crime or really, really h[illegible] — the support for the death [illegible] runs anywhere from 100 pe[illegible] up.

That is, except right now i[illegible] S. C., the small town wher[illegible] lived, strapped her two little [illegible] car seats and drove them into [illegible] drown.

It's hard to think of killin[illegible] likely to get the public bloo[illegible] — and the more so when you [illegible] ber that Smith coolly kept up [illegible] ing scam that her children h[illegible] carried off in a carjacking, e[illegible] ing on cue for the TV camera[illegible]

What is more, she did al[illegible]



Government needs to be more efficient

It was good to [illegible] lea[illegible]



ers; inefficiency means it takes more tax dollars to provide the same service [illegible] were more efficient [illegible]

convened by the Department of Education to find out why there aren't enough classrooms. While public bu[illegible]

Speaking of contracts, at the other end, state bureaucrats have been known to play it by the books. In one instance, [illegible]

PA'IA MAIN STREET ASSOCIATION LETTER
TO T. JEZIERNY
DATED AUGUST 1, 1995



PĀ'IA MAIN STREET ASSOCIATION

1896-1996

1995 AUG -7 PM 2:21

FILE MECO NEW SITE
GENPP 1-2

XC:
E. Reinhardt
S. Kiyonaga
D. Hayashi
K. Kusaka
N. Shinyama
S. Kealoha
S. Seu

August 1, 1995

To: Tom Jezierny
President
Maui Electric Company, Ltd.
P.O. Box 398
Kahului, HI 96732

From: Cliff Green
Chairman
Pa'ia Main Street Association

Subject: MECO's new power generation site

Our thanks to you and your staff for attending the Pa'ia Main Street Association's General Town Meeting last June 22, 1995 at the Pa'ia Community Center and for sharing information regarding MECO's plans for a new power generation plant on Maui. Attendees also appreciated the opportunity to ask specific questions in areas of their concern.

The Pa'ia Main Street Association Board of Directors discussed your information sheets and maps at the last board meeting July 16, 1995. We understand that with the present rate of growth on our island that it is not too early to begin planning for the new generation site. And even though we would hope that the need for the new site would be off-set by the public use of alternative forms of energy and energy conservation, we realize your plans are prudent.

Our board would like to keep as much agricultural land in production as possible and support your proposed "C-3" plant site in the old Pu'unene Airport industrial area on the island's central plain. Geographic growth projections show this site to be closest and most serviceable to the areas of largest growth and future need on the island as well.

Thank you again for your effective communications with our community and for the opportunity to share our opinions.

Aloha,

Cliff Green

Cliff Green

P.O. BOX 995, PĀ'IA, MAUI, HI 96779-0995

KULA FARMERS/MAUI FARM BUREAU MEETING
MINUTES DATED AUGUST 15, 1995

Record of Meeting
(Revised 8/29/95)

New Central Maui Power Plant
Impacts of Ethylene Emissions on Farms

Meeting Date: August 15, 1995

Meeting Location: MECO Boardroom, Kahului Maui

Attendees: MECO
S. Kiyonaga
E. Reinhardt
N. Shinyama

HECO
K. Kusaka
S. Seu

University of Hawaii
Dr. Robert Paull, Plant Physiologist
James Tavares, Maui Extension Agent

Maui Farm Bureau/Kula Farmers
Kenneth Okamura
Takeo Miyaguchi

Recorder: S. Seu

Items of Discussion:

1. Ethylene, general information
Dr. Paull briefed the group on ethylene and its effects on plants. Ethylene, a hydrocarbon, is a byproduct of combustion. Common sources include cars, fires, machinery, cigarettes...any combustion process. It's impacts on plant tissue depend on the amount of exposure (a function of ethylene concentration and exposure duration) and on the sensitivity of the plant species to ethylene.

To date, research has focused on the long term exposure effects of ethylene; there is no data for short term dosages. Documented plant responses to high doses of ethylene, described by Dr. Paull as being on the order of 100 parts per million (ppm) include leaf drop, leaf bending, and premature plant aging. There are no indications that there are cumulative effects of ethylene on plants, since the plants themselves metabolize ethylene and no accumulation occurs. Little data are available on the combinatory effects of ethylene and other pollutants.

2. Available MECO/HELCO emissions data
S. Seu reported that 1994 stack tests of Maalaea Unit 16 showed ethylene concentrations of less than 0.2 ppm. Dr. Paull, who was involved in an impact assessment of ethylene emissions from HELCO's Keahole Generating Station, commented that in the Keahole study, it was shown there was an approximate 10,000:1 dilution ratio between the stack and the predicted impact area. Thus, if similar dilution occurred at the new central Maui power plant, one would expect ground level ethylene concentrations from the power plant of much less than a part per billion. Paull mentioned that regular ambient urban ethylene concentrations typically ranged between 0.1 and 0.5 ppm. Paull also stated that on a monthly basis, roughly 24 ground level ethylene exposures of about 15 minutes duration each were measured from the existing Keahole power plant. These exposure durations and frequencies are much less than what has been studied by the scientific community.

Dr. Paull stated that if conditions at the new Maui site were similar to that of Keahole, he would not expect significant impacts due to ethylene from the generating units. However, to truly assess potential ethylene impacts, dilution ratios and exposure frequencies need to be determined specifically for the new Maui power plant, and comparisons would need to be made to baseline ethylene data for the area. K. Okamura asked if there was baseline ethylene data available. Dr. Paull responded "no", that data would need to be collected.

3. Ambient ethylene monitoring program
Dr. Paull suggested that he, with the help of J. Tavares, could conduct a simple ambient ethylene monitoring study for the Kula area, at no cost to the farmers or MECO. Existing equipment could be used, and data samples could be taken on a regular basis as well as during unusual conditions. S. Seu mentioned that it would be useful for whoever was collecting the data to keep a log book of the sample dates, in which unusual conditions could be noted such as sugar cane burning, heavy traffic, Kona winds, etc.

Dr. Paull and J. Tavares agreed that they would draft an ethylene monitoring plan for review by both MECO and the Farm Bureau. E. Reinhardt offered MECO's assistance to Paull, and stated that whatever the UH decided MECO's role would be in the data gathering, MECO at a minimum would like to be kept in the loop. S. Seu was identified as the MECO point of contact.

4. Discussion of ethylene impacts in the Environmental Assessment (EA) or Environmental Impact Statement (EIS)
K. Okamura asked what would be the mechanism whereby ethylene impacts would enter into the power plant design decision making. MECO responded that the proper place to address ethylene would be in the EA or EIS. Although the usual focus of an EA/EIS is on regulated criteria pollutant impacts, it would be appropriate to include a study of ethylene impacts. It was mentioned that the

HELCO Keahole EIS contained such an analysis. MECO anticipates beginning preparation of the EA/EIS in 1996, and will include the ethylene study.

5. Other topics

K. Okamura summarized that his two main concerns over the new Maui power plant were the effect of the emissions on crops and increased traffic due to fuel deliveries. Mr. Okamura asked how many fuel truck deliveries would be made. MECO responded that at the Maalaea plant, there are roughly 24 fuel truck deliveries per day. For the new power plant, Alexander and Baldwin would probably not allow cane roads to be used due to potential interference with sugar cane truck operations and liability.

T. Miyaguchi stated his main concerns were on the effects of the Maui Vortex, especially regarding recirculation of sulfur compounds. S. Seu stated that while MECO did not yet have enough information on the Maui Vortex, it is assumed that all three candidate sites would be affected. Mr. Okamura asked if air quality impacts would be therefore be the same at all the candidate sites. S. Seu explained that preliminary air quality studies have shown that site A-2 would have less air quality impacts than the other sites. Regarding the effects of sulfur dioxide on plants, the ambient air quality standards are protective of plants and animals. Nevertheless, MECO would look to Dr. Paull for additional information on sulfur dioxide. Mr. Miyaguchi mentioned that the Kula farmers are concerned, and wished to be kept informed of all information as it becomes available.

MECO suggested the Kula farmers and the Farm Bureau tour the Maalaea Generating Station to familiarize themselves with what is being proposed for the new generating station. The combustion turbines are the most efficient units in the MECO system. K. Okamura will follow up with S. Kiyonaga on the plant tour.

<u>Action Items</u>

1. Dr. Paull and J. Tavares are to develop an ethylene monitoring plan for MECO and the Farm Bureau to review. Once acceptable to everyone, Paull and Tavares are to monitor baseline ambient ethylene in the Kula area, with assistance as necessary from MECO and the farmers.

2. MECO is to include analysis of ethylene impacts in the EA/EIS for the new Central Maui power plant. The baseline ethylene data will be used in the study.

3. MECO will obtain more detailed information on sulfur dioxide effects on plants from Dr. Paull. This information will be shared with the farmers.

4. Farmers are to tour the Maalaea Generating Station.

COUNTY OF MAUI
MAYOR'S MEETING
MECO's NEW SITE GENERATION SITE PRESENTATION
AUGUST 15, 1995

MECO New Site N1
GENPP 1-2
YA/G

MEMORANDUM

Hawaiian Electric Company, Inc.

August 21, 1995

Subject: County of Maui, Mayor's Meeting
MECO's New Generation Site Presentation

Date: August 15, 1995
Time: 10:00 am
Place: Mayor Lingle's Office

Present:

MECO
T. Jezierny
E. Reinhardt
S. Kiyonaga
N. Shinyama

HECO
K. Kusaka
S. Seu
W. Bonnet

ABHI
Mercer Vicens

County of Maui
Mayor Linda Crockett Lingle
David Blane
George Kaya
Clayton Yoshida

I. Purpose of the Meeting:

A. Present to the Mayor the three generation sites that MECO is investigating for its next generation site. See attached fact sheet.

II. Issues:

The following items are questions or issues that were discussed during the presentation:

A. Q. Will there be more sites proposed later, other than the three proposed?
A. No, other sites have been discarded due to zoning, land issues, and permitting.

B. Q. What is the major difference between A-2 and D-1?
A. With existing permit requirements and existing source inventory, MECO can install 232 MW of generation at A-2 and only 58 MW of generation at D-1. This is due to differences in terrain at the two sites.

C. *Q.* Can the air modeling be challenged on a factual base?
A. Yes, even though the air modeling is approved by the EPA, anyone can challenge the air model since they will argue that each site is unique and that the air modeling cannot simulate the exact condition. HELCO is presently experiencing this situation.

D. *Q.* How high of a stack can MECO build to support 232 MW of generation at D-1 and C-3?
A. The regulation allows a maximum stack height of 210 feet. The modeling calculation for D-1 and C-3 were with 210 ft. stack heights.

E. *Q.* What is the height of Maalaea stacks?
A. Maalaea stacks are approximately 120 feet.

F. *Q.* When DOH reviews the air permit, at what point in time does the department consider the existing source inventory valid?
A. When the DOH deems the air permit application complete.

G. *Q.* How much water will the plant require?
A. Approximately 200,000 gal/day/unit.

H. *Q.* How much generation is there at Maalaea?
A. 163 MW.

I. *Q.* What is the cost for the next generating unit at the new site?
A. For one dual train combined cycle unit, it will be approximately $130 million.

J. *Q.* The C-3 site, where is it with reference to the Puunene Airport Area Master Plan?
A. The C-3 site is located just south of the area. (MECO will meet with the Planning Director later to identify the site on the County map.)

K. *Q.* Was the A-2 site proposed in the Community Plan?
A. No, it was not proposed in the Community Plan.

General Comments:

- Mayor Lingle: Maui County does not want to get into the same situation as the Big Island. We need to be up front and open with the Public. Need to inform the Public that MECO has condemnation rights.

- Mercer Vincens: ABHI prefers the C-3 site as the next generation site since it is laying barren and least expensive. D-1 should be eliminated since it is in a dormant air area and would affect the communities close by. C-3 and A-2 sites are still negotiable. HC&S has been talking to VEDCO to install a waste to energy plant at the landfill to slow down the process of converting agricultural land to landfill. Dick Cameron does not oppose the A-2 site. The designation of Pulehu Road and Hansen road area as an industrial park is a possibility.

- David Blane: Presently do not have a feeling which site is better. A-2 site looks good from the perspective that it is close to the dump. Maui County needs to integrate an energy park; geographically centered away from everyone.

- Mayor Lingle: From a cost perspective, A-2 site looks the best. It meets the air modeling requirements and there is an existing road. Land cost is a non issue since MECO will need to buy the land where ever it chooses and is minor to the cost of the plant. Additionally, it seems obvious A-2 is preferable since it is permittable for 232 MW versus 58 MW at C-3 and D-1.

Kenji C. Kusaka

Kenji C. Kusaka
Project Manager

kck
attachments

cc. HECO & MECO Attendees
M. Yuen
B. Christianson (SWEC)

MECO's CENTRAL MAUI SITING REVIEW GENERATION ADDITION PROJECT

FACT SHEET

MAUI ELECTRIC COMPANY, LIMITED

July 1995

A. *SITE LOCATIONS (map attached)*

- **Site C-3: Puunene, one mile southeast of the Maui Airport**
- **Site A-2: Pulehu Road, one quarter mile southeast of the Central Maui Landfill along Pulehu Road**
- **Site D-1: Pulehu Road, one mile southeast of the A-2 site along Pulehu Road**

B. *SITE CHARACTERISTICS*

Ownership

- **All Sites** — **Alexander & Baldwin Hawaii, Inc.**

Sugar Crop Impact

- **Site C-3** — **property is not in cane use**
- **Sites A-2 and D-1** — **property is in cane use**

Land Cost Appraisal (including line corridors, roadway)

- **Site C-3** — **least cost**
- **Site A-2** — **highest cost**
- **Site D-1** — **higher than C-3, lower than A-2**

Air Quality (based on current Maui emissions data)

- **Site C-3** — **permittable for less than 58 mw, requires maximum allowable stack height of 210 feet**
- **Site A-2** — **permittable for 232 mw, requires 150 feet stack**
- **Site D-1** — **permittable for less than 58 mw, requires maximum allowable stack height of 210 feet**

Groundwater

- **Site C-3 and A-2** — **below Underground Injection Control line**
- **Site D-1** — **above Underground Injection Control line, may require additional land for evaporation ponds**

Noise

- **All Sites** — **no impact to surrounding area**

Aesthetics (impairment of scenic views)

- **Site C-3** — **stack will be visible from Hale Piilani residential subdivision and the Kula community.**
- **Site A-2 and D-1** — **stack will be visible from the Kula and Pukalani communities, with a lesser visible impact from the A-2 site due to lower stack heights.**

Biology (presence of endangered species)

- All Sites — no impact

Cultural Resources (suspected State or Federal historic or archaeological resources)

- All Sites — no impact

Natural Hazard (issue of flooding, earthquake, and extreme winds)

- All Sites — no significant risks

C. ENGINEERING CONSIDERATIONS

Geotechnical (subsurface conditions, for ease of excavating and grading the site)

- All Sites — all sites are equal

Transmission Facilities

- Site C-3 — two miles of transmission lines required for initial installation
- Site A-2 and D-1 — quarter mile transmission line required for initial installation

Fuel Delivery

- All Sites — fuel trucking costs are equal for all sites

Traffic/Transportation

- Site C-3 — two miles of roadway required to access Mokulele highway
- Site A-2 and D-1 — adjacent to Pulehu road

D. COMMUNITY MEETINGS

- Kihei Community Association, General Community Meeting — May 16 and June 20
- Kula Community Association, Association Board — June 1
- Paia Main Street Association, General Community Meeting — June 22
- Pukalani Community Association, General Community Meeting — June 29

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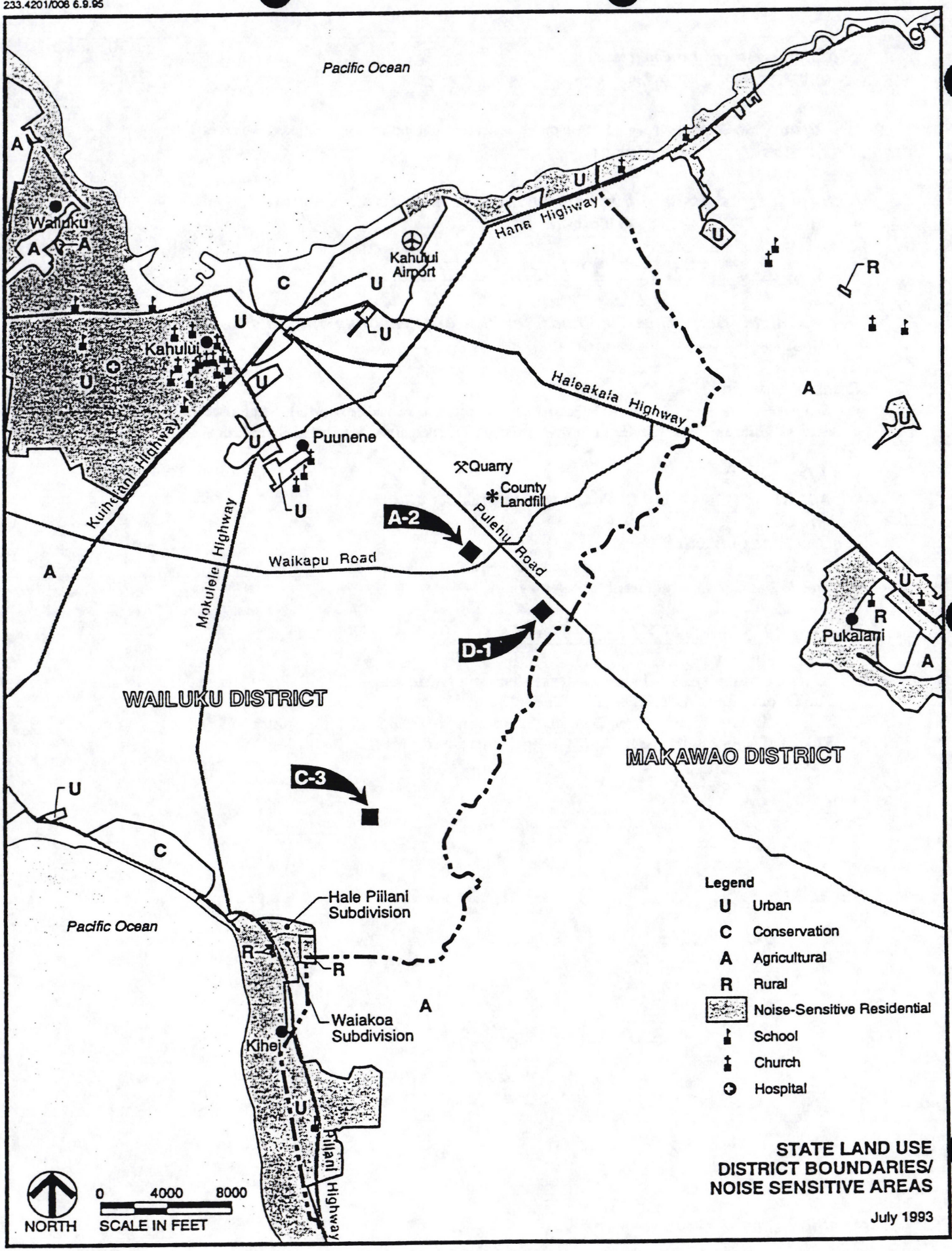

STATE LAND USE DISTRICT BOUNDARIES/ NOISE SENSITIVE AREAS

July 1993

KULA COMMUNITY ASSOCIATION MEETING
AUGUST 17, 1995

MECO New Site N1
GENPP 1-2
YA/G

MEMORANDUM

Hawaiian Electric Company, Inc.

August 21, 1995

Subject: Kula Community Association Meeting
MECO's New Generation Site Presentation

Date: August 17, 1995
Time: 7:00 p.m.
Place: Kula Community Association

Present: MECO
T. Jezierny — S. Kiyonaga
E. Reinhardt — N. Shinyama

HECO
K. Kusaka — S. Seu

ABHI
Mercer Vicens (absent)

Kula Community Association
Approximately 37 members
Robert Monden

I. Purpose of the Meeting:

A. Present to the association the three generation sites that MECO is investigating for the next generation site. See attached fact sheet.

II. Issues:

The following items are questions or issues that were discussed during the presentation:

A. Q. Does the Kihei Community Plan have any plans to develop closer to the C-3 site?
A. MECO is not aware of any plans for Kihei Community to develop closer to C-3. However, MECO is aware of the Puunene Airport Area Master Plan to develop a wastewater facility near the C-3 site.

B. *Q.* What is the next closest agriculture facility besides HC&S to A-2?
A. Probably 3 miles away, above the cane land. Need a different map to determine for sure.

C. *Q.* What are the farmers' concerns?
A. The farmers were concerned with ethylene and sulfur dioxide emissions. MECO is working with the farmers and the University of Hawaii to address their concerns.

D. *Q.* Did MECO consider a site next to HC&S Puunene sugar mill site for the next expansion?
A. MECO did look at the site and determined that the air permit could not be obtained in time, due to complications arising from emissions at the existing Puunene Mill.

E. *Q.* Is MECO looking at different alternatives beside oil fired generation?
A. MECO is presently negotiating with private industries to install 10 to 20 MW of wind power generators and two developers to install a waste to energy plant of approximately 6-15 MW near the landfill.

F. *Q.* Is MECO looking at ways to reduce electrical loads?
A. MECO has proposed 4 energy conservation programs. The main program for residential is solar hot water heaters and heat pumps. This program is expected to be approved by the PUC at the end of this year.

G. *Q.* What is the status of pump storage?
A. There is a study that is evaluating pump storage. Preliminary figures indicate that pump storage is not promising due to land cost. The study will be submitted to the PUC in approximately 6-9 months.

H. *Q.* Will the transmission lines for the new site be designed with poles or towers?
A. The transmission lines for the new site will be designed with poles, similar to the lines installed on Wailapu Road.

I. *Q.* How will the transmission lines be installed at the new site?
A. For the A-2 site, there are existing transmission lines that run north-south and east-west therefore the tie-in will be very short. For the C-3 site, 2 miles of new transmission lines will need to be installed.

J. *Q.* What percentage of the electrical load is residential and commercial?
A. Roughly one third of sales and load is due to residential, one third is commercial, and the final third is hotels.

K. *Q.* How much noise will the plant generate?
A. The plant will be designed for 70 DBA at the property line, which is based on the Oahu County standard since Maui County does not have a standard.

L. *Q.* Will A-2 site take care of all the power needs for Maui if Maalaea was wiped out with a 100 year storm?
A. No, the new site will not be able to handle the load for all of Maui since the system depends on existing units at Maalaea and Kahului.

Comments:

- MECO: Were A&B here, they would tell you they prefer C-3 since it is not in cane.
- Kula Resident: Prefer the A-2 site vs. C-3 and D-1. Do not know what HC&S wants.
- Kula Resident: All the pollution problem seems to be down wind of here (Kula), therefore that may be the reason why MECO may not be getting very much feedback on the new sites.
- Kula Resident: Air from the down country does come up to Kula. You can see it from the fall out of the cane burning. We should be more interested and taking action.
- R. Monden: A-2 seems to be the better site since it is close to the landfill. Will feel more certain when the studies show that there will be no problems; especially after the farmers' concerns about ethylene and sulfur dioxide are addressed.

Kenji C. Kusaka
Project Manager

kck
attachment

cc. HECO & MECO Attendees
Bob Christianson-Stone & Webster Engineering Corporation

MECO'S NEW GENERATION SITE
FACT SHEET

WHAT:

MECO needs to establish a new power plant site for generating unit additions in 2004 and beyond.

WHY:

After this next Maalaea generation addition (1996 - 2000), the Maalaea Plant property will not be expanded. Expansion of MECO's Kahului Plant is unlikely due to property limitations, tsunami zone restrictions, etc.

TO BE INSTALLED:

- Required Acreage: Approximately 50 Acres (including buffer zone).
- Type of Equipment and Structures Proposed:
  a) Four (4) Dual Train Combined Cycle Units (Gas turbines, steam turbines, heat recovery steam generators, stacks, air cooled condensers. Gas turbines are fuel flexible; combined cycle units are most efficient in the State of Hawaii.)
  b) Fuel Tanks & Berm
  c) Fire Protection System
  d) Switchyard
  e) Administration Offices
  f) Maintenance Shop
  g) Warehouses/Storage Area
  h) Water Treatment Facility
  i) Wastewater Treatment Facility
- Related Facility: T&D Baseyard (Potential)
- Generation Capacity: Approximately 232 MW over 30+ years.

WHERE:

- Two sites identified in the Siting Study:
  1) Pulehu Road, one mile mauka of the landfill (Sites D-1 & A-2).
  2) Puunene, one mile southeast of the Maui Airport (Site C-3)

- Distance to the nearest community:
  a) Kihei (C-3): 1.5 Miles
  b) Pukalani (D-1): 2.7 Miles
  c) Puunene (A-2) 2.1 Miles

WHEN:

- Site Selection Target Date: August 31, 1995
- Site Acquisition Target Date: December 31, 1995
- Forecasted Operation Date of the first unit: January 2004

HOW:

- Over 20 Federal, State and County permits required to permit the land and install the generating unit.
- Requires an Environmental Assessment or Environmental Impact Statement which will consider impacts including, but not limited to:
  a) Natural resources
  b) Cultural resources
  c) Archaeological resources
  d) Effects on economic/social welfare
  e) Effect on economic/social activities
  f) Effect on rare, threatened, or endangered species of animal or plant life or habitat
  g) Effect on air quality
  h) Effect on water quality
  i) Effect on noise levels
  j) Effect on traffic
  k) Effect on environmentally sensitive areas
  l) Effect on natural and man-made resources
  m) Effect on scenic and open resources
  n) Provision of facilities and improvements important to state economy
  o) Hazards to life and property from natural hazards, including tsunamis, flooding, erosion, etc.
  p) Consistency with Land Use Plans, Policies, and Controls
- Number of new jobs at the Plant: Initially 10 - 12 with installation of the first combined cycle plant, expanding to 42.
- Construction jobs to be created: 50 - 60 during peak construction period.

COMMUNITY MEETINGS:

1) Kihei Community Association, General Community Meeting
   May 16, 1995, 7:30 PM, Kihei Elementary School Cafeteria
2) Kula Community Association, Association Board
   June 1, 1995, 6:00 PM, Kula Elementary School Library
3) Kihei Community Association, General Community Meeting
   (Follow-up Presentation)
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   August 17, 1995, 7:00 PM, Kula Community Hall
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   August 23, 1995, 7:00 PM, Makawao Elementary School Cafeteria
8) Kahului Town Association (Date Pending)
9) Update Maui County Council (Date Pending)

CONTACT:

To answer any questions, please contact Ed Reinhardt at 871-2364 or Neal Shinyama at 871-2341.

(File: FACTSHT.DOC, REV. 5, August 4, 1995: Revised to include Kula Community Association General Membership meeting and Makawao Main Street Association General Membership meeting.)

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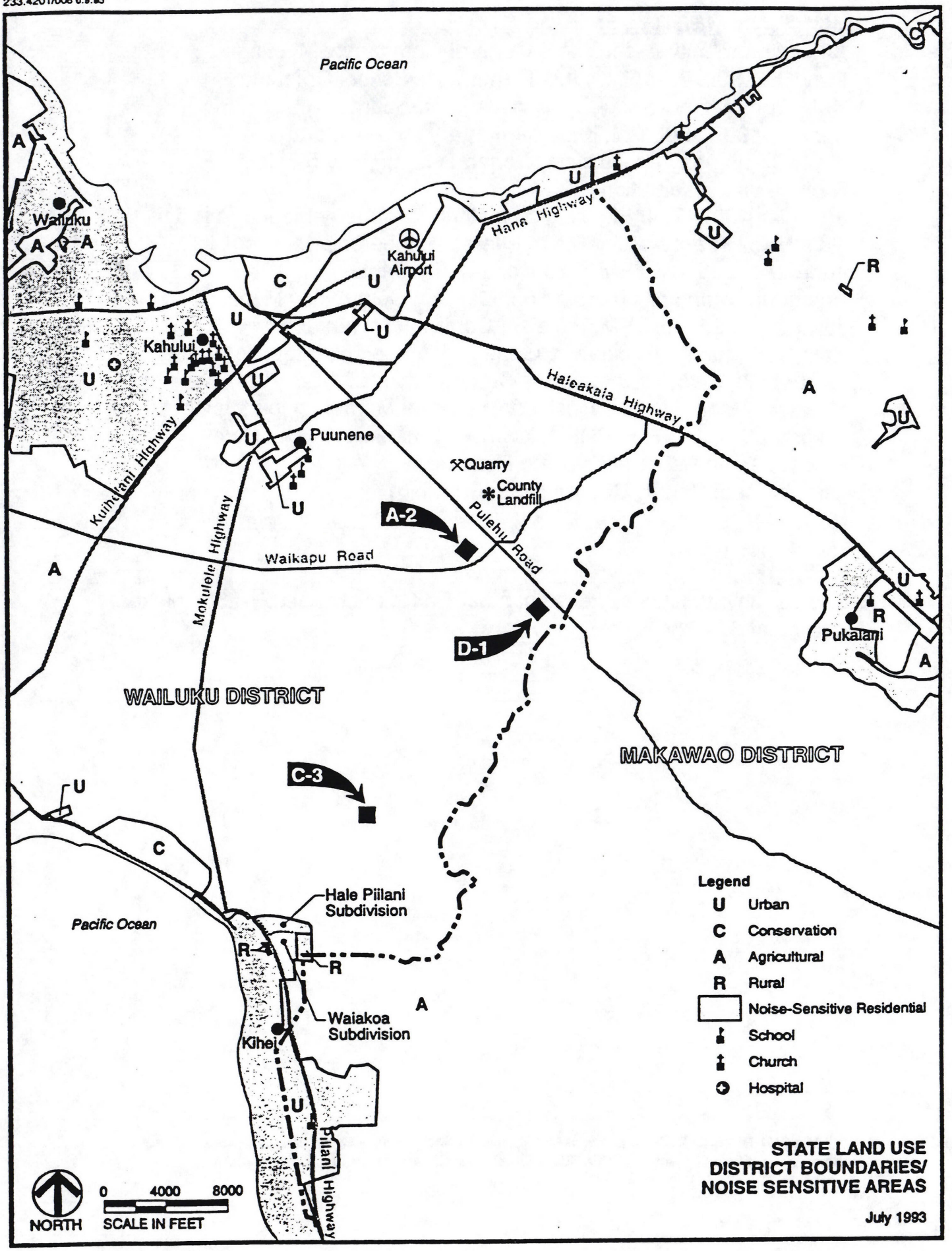

STATE LAND USE DISTRICT BOUNDARIES/ NOISE SENSITIVE AREAS

July 1993

MAKAWAO MAIN STREET ASSOCIATION
GENERAL COMMUNITY MEETING
AUGUST 23, 1995

MEMORANDUM

Hawaiian Electric Company, Inc.

August 24, 1995

Subject: Makawao Main Street Association
MECO's New Generation Site Presentation

Date: August 23, 1995
Time: 6:00 p.m.
Place: Makawao Elementary School

Present: MECO
T. Jezierny S. Kiyonaga
N. Shinyama

HECO
K. Kusaka S. Seu

ABHI
Mercer Vicens (Absent)

Makawao Main Street Association
Approximately 23 members

I. Purpose of the Meeting:

A. Present to the association the three generation sites that MECO is investigating for its next generation site. See attached fact sheet.

II. Issues:

The following items are questions or issues that were discussed during the presentation:

A. Q. How tall are the stacks?
A. At the A-2 site, the stacks are 150 ft. At the C-3 site, the stacks are 210 ft. At Maalaea, the existing stacks are 120 ft.

B. Q. How far is D-1 from Pukalani?
A. Approximately 2.7 miles.

C. Q. When will you decide on a site?
A. September 30, 1995, we'll decide on a site.

D. Q. Which site looks the best?
A. A-2 has the best characteristic for a new generation site.

E. Q. How close will the new highway from Pukalani to Kihei be to the sites?
A. The highway will be mauka for each site if it runs from N. Kihei to Pukalani.

F. Q. Why is A-2 the preferred site?
A. A-2 is not the preferred site. From an air quality standpoint, A-2 is the better site. C-3 shows four 210 ft stacks (rendering), however this is a little misleading. With the present air quality regulations and emission inventory, we can only install one DTCC unit at C-3. If the emission inventory changes or new technology comes up, we may be able to install more units.

G. Q. Which site is most cost effective?
A. If you look at the total cost, land and infrastructure, A-2 is the most cost effective.

H. Q. Why doesn't MECO pursue alternate energy?
A. Alternate energy is not economical for MECO, but economical for developer because of tax breaks. MECO will not develop wind power, because it's not firm power. You can install a lot of wind generators, however if the wind is not blowing you cannot generate any power. We would always need to install backup power generators for wind.

I. Q. What affects would you notice from D-1?
A. For Makawao, little or no impact from D-1. May have a visible impact. No impact due to noise.

J. Q. What will the noise level be?
A. The plant will be designed for 70 dba at the property line.

K. Q. What is the reason for higher stacks at D-1?
A. The higher stack is due to air quality modeling. The higher stack will disperse the emission better.

L. Q. How would they burn cane around the plant (A-2)?
A. They (HC&S) would have to burn cane very carefully. We have the same situation at Maalaea. The cane field is adjacent to the Maalaea Power Plant.

M. Q. What type of population growth is MECO looking at that makes it necessary for the new site?
A. MECO looks at load growth, not population growth. Consumption per resident is going up and construction and commercial industries are also increasing.

N. Q. What population growth is MECO predicting at 2004?
A. We get figures from the Department of Business and Economic Development. However, MECO looks at the number of customers not population.

O. Q. How long will it take for a unit to become obsolete?
A. We forecast 35 years per unit.

P. Q. How much will it cost to buy the land?
A. Approximately $15,000 to $30,000 per acre. $15,000 is for the C-3 area and $30,000 for the D-1 and A-2 areas.

Q. Q. What is the efficiency of the units (DTCC)?
A. The DTCC unit operates at approximately 42% efficiency.

R. Q. Is this (DTCC) the most efficient unit in the world?
A. No, it's the most efficient unit in the state, not the world.

S. Q. Why is MECO settling with existing technology? If new technology comes up, MECO should use it.
A. If new technology comes up, we will look at it. We have an advisory group that looks at new technology every three years.

T. Q. What is the proximate size of alternate energy being developed?
A. HC&S produces 16 MW, presently. The proposed waste to energy plant will be between 6-15 MW, and wind generation will be between 10-20 MW.

U. Q. How far will soot be carried by the stacks?
A. The dispersion of the soot will depend on the terrain, the wind direction, and speed.

V. Q. What damages would be caused by the pollutants?
A. During MECO's Change in Zoning hearings, a DOH toxicologist testified that people can live 50 ft. away from the power plant and have no ill affect. MECO can provide transcript of the hearing if you would like to read them.

W. Q. What was Kihei choice?
A. Kihei submitted a petition stating that they did not want MECO at C-3.

X. Q. What happens in 2004 if the population does not grow? What do you do with the land?
A. MECO can lease the land to HC&S. The land is not charged to the rate payers until it's put into use.

Y. Q. Will the plant produce any magnetic fields?
A. The plant will generate electric fields and magnetic fields. According to the DOH and EPA, there are no known health affects.

Z. Q. Is there a way to measure the fields?
A. Yes, there is an instrument called a Gauss meter. MECO will go to your house to measure EMF if you want the service.

AA. Q. Will the plant produce any chemicals?
A. There will be emissions from the stack. We will also be injecting chemicals into the ground, however we will not be adding or making new chemicals. We will be injecting chemicals at a more concentrated level after we remove some of the purified water.

BB. *Q.* What did the other communities say about the sites?
A. Paia said to go to C-3. Kula had mixed review. Some said not at D-1 and A-2, while others said A-2 site would be good. Kihei said not at C-3. Pukalani said not at A-2 and D-1.

CC. *Q.* Can we get copies of the meeting minutes from the other communities?
A. Yes, we'll send them to Ms. D'Enbeau.

DD. *Q.* When do you plan to see the County Council?
A. Sometime during the first two weeks in September.

EE. *Q.* What happened to the wind turbine at Maalaea?
A. After 3 to 4 years, it fell apart. Was not very successful.

FF. *Q.* Why are you going to the Council?
A. To obtain their inputs and viewpoints.

GG. *Q.* Are you asking for a legal commitment?
A. No. MECO still needs to acquire the land and apply for several permits that will require hearings before the plant can be built.

Comments:

- As an individual, that lives in Haiku, like to speak for C-3 as the site for three reasons; 1) one contiguous piece of land, 2) it is non prime ag. land, and 3) major growth is in the Kihei area, therefore they need to absorb the growth.

  A-2 is prime agricultural land. Community plan is to support agricultural land.

- There is not enough information to make a decision. Need to look at the situation differently. Need to see if there are other alternatives instead of purchasing the land now. If MECO purchases the land, you will be limiting your options and will not think of other alternatives.

  You can smell and taste Kona weather, because of the vog. These new sites will affect us.

- How do you justify the need for this capacity? We should have other options, where a new site is not required.

- The following is the result of the vote held during the association meeting.

A. For the A-2 Site		1
B. Not enough information to acquire any site		9
C. For the C-3 Site		4
D. For the D-1 Site		0
Persons who did not vote		9
	Total	23

Kenji C. Kusaka
Project Manager

kck
attachments

cc. HECO & MECO Attendees
M. Yuen
B. Christianson (SWEC)

MECO'S NEW GENERATION SITE
FACT SHEET

WHAT:

MECO needs to establish a new power plant site for generating unit additions in 2004 and beyond.

WHY:

After this next Maalaea generation addition (1996 - 2000), the Maalaea Plant property will not be expanded. Expansion of MECO's Kahului Plant is unlikely due to property limitations, tsunami zone restrictions, etc.

TO BE INSTALLED:

- Required Acreage: Approximately 50 Acres (including buffer zone).
- Type of Equipment and Structures Proposed:
  a) Four (4) Dual Train Combined Cycle Units (Gas turbines, steam turbines, heat recovery steam generators, stacks, air cooled condensers. Gas turbines are fuel flexible; combined cycle units are most efficient in the State of Hawaii.)
  b) Fuel Tanks & Berm
  c) Fire Protection System
  d) Switchyard
  e) Administration Offices
  f) Maintenance Shop
  g) Warehouses/Storage Area
  h) Water Treatment Facility
  i) Wastewater Treatment Facility
- Related Facility: T&D Baseyard (Potential)
- Generation Capacity: Approximately 232 MW over 30+ years.

WHERE:

- Two sites identified in the Siting Study:
  1) Pulehu Road, one mile mauka of the landfill (Sites D-1 & A-2).
  2) Puunene, one mile southeast of the Maui Airport (Site C-3)

- Distance to the nearest community:
  a) Kihei (C-3): 1.5 Miles
  b) Pukalani (D-1): 2.7 Miles
  c) Puunene (A-2) 2.1 Miles

COMMUNITY MEETINGS:

1) Kihei Community Association, General Community Meeting
   May 16, 1995, 7:30 PM, Kihei Elementary School Cafeteria
2) Kula Community Association, Association Board
   June 1, 1995, 6:00 PM, Kula Elementary School Library
3) Kihei Community Association, General Community Meeting
   (Follow-up Presentation)
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8) Kahului Town Association (Date Pending)
9) Update Maui County Council (Date Pending)

CONTACT:

To answer any questions, please contact Ed Reinhardt at 871-2364 or Neal Shinyama at 871-2341.

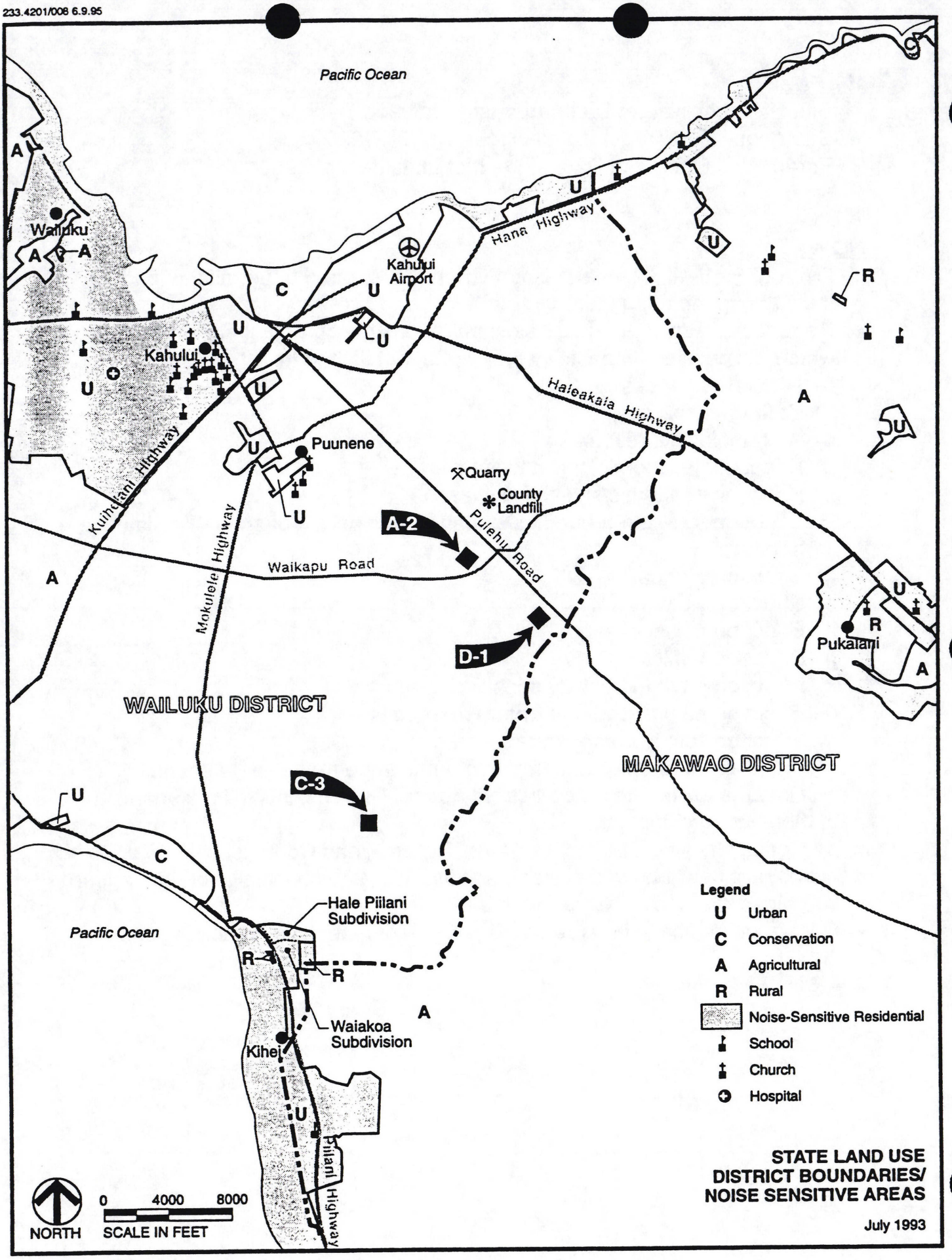
(File: FACTSHT.DOC, REV. 5, August 4, 1995: Revised to include Kula Community Association General Membership meeting and Makawao Main Street Association General Membership meeting.)

WHEN:

- Site Selection Target Date: August 31, 1995
- Site Acquisition Target Date: December 31, 1995
- Forecasted Operation Date of the first unit: January 2004

HOW:

- Over 20 Federal, State and County permits required to permit the land and install the generating unit.
- Requires an Environmental Assessment or Environmental Impact Statement which will consider impacts including, but not limited to:
  a) Natural resources
  b) Cultural resources
  c) Archaeological resources
  d) Effects on economic/social welfare
  e) Effect on economic/social activities
  f) Effect on rare, threatened, or endangered species of animal or plant life or habitat
  g) Effect on air quality
  h) Effect on water quality
  i) Effect on noise levels
  j) Effect on traffic
  k) Effect on environmentally sensitive areas
  l) Effect on natural and man-made resources
  m) Effect on scenic and open resources
  n) Provision of facilities and improvements important to state economy
  o) Hazards to life and property from natural hazards, including tsunamis, flooding, erosion, etc.
  p) Consistency with Land Use Plans, Policies, and Controls
- Number of new jobs at the Plant: Initially 10 - 12 with installation of the first combined cycle plant, expanding to 42.
- Construction jobs to be created: 50 - 60 during peak construction period.



STATE LAND USE DISTRICT BOUNDARIES/ NOISE SENSITIVE AREAS

July 1993

MAUI COUNTY PLANNING COMMISSION
MECO's NEW GENERATION SITE PRESENTATION
OCTOBER 10, 1995

MECO New Site N1
GENPP 1-2
YA/G

MEMORANDUM

Hawaiian Electric Company, Inc.

October 18, 1995

Subject: Planning Commission
MECO's New Generation Site Presentation

Date: October 10, 1995
Time: 11:30 am
Place: Planning Commission Hearing Room

Present:

MECO
T. Jezierny
N. Shinyama
E. Reinhardt
J. Williams

HECO
K. Kusaka
S. Seu

ABHI
Mercer Vicens

M. Luna
T. Ishikawa
C. Edwards (Maalaea Community Association)

I. Purpose of the Meeting:

A. Present to the association the three generation sites that MECO is investigating for its next generation site. See attached fact sheet.

II. Issues:

The following items are questions or issues that were discussed during the presentation:

A. Q. What are the elevations of the C-3, A-2, and D-1 sites?
A. C-3 is approximately 200 ft above sea level and A-2 and D-1 are approximately 400 to 500 ft. above sea level.

B. Q. Why is the C-3 site stack 210 ft. tall while A-2 stack is only 150 ft. tall? Is it due to the urban area being close to C-3?
A. The stack height was determined by air modeling that took into consideration the wind speed, wind direction, and terrain. Distances from urban areas are not factors in the air quality modeling.

C. Q. What were the community inputs on the three site?
A. To summarize, all the communities were not in favor of the site closest to their community.

D. Q. Is the C-3 site the lowest cost?
A. Yes C-3 has the lowest cost for the land, however if you consider the infrastructure cost to develop the C-3 site, it will be higher than the other sites. C-3 requires a new roadway and transmission lines.

E. Q. How large is each site?
A. Each site will require 50 acres.

F. Q. Does one site have an advantage from an operational viewpoint or electrical stability?
A. No, all of Maui is connected together in a grid. Kahului and Maalaea feed the grid, therefore all areas of Maui are supported by both power plants. The new power plant will also feed into the same electrical grid.

G. Q. Which site looks the best?
A. From an air permit perspective, A-2 site is the best. D-1 and C-3 sites look poor.

H. Q. Who approves the air permit?
A. EPA at the Federal level and the DOH at the State level.

I. Q. Where would the water for the plant come from?
A. At each site, we would drill wells. We would then purify the water and use it in our process.

J. Q. Do you recycle the water?
A. Yes, in our heat cycle we have air cooled condensers to cool the water and reuse it in the boiler. However, in our emission control system to lower NOx emission, we inject water in the combustion turbine and that water is lost to the atmosphere.

K. Q. Is C-3 near a flood zone?
A. No.

L. Q. Is MECO required to install the type of units it is proposing at each site?
A. No, if MECO had to go to the C-3 site and air permit would only allow 30-40 MW, we would install only 30-40 MW, then look for another site.

M. Q. How is the electric use divided between residential and commercial?
A. Residential use is approximately one third, hotels use is one third, and commercial use is one third.

N. Q. Does MECO provide incentives to lower electrical use?
A. Yes, MECO has submitted 4 conservation programs to the PUC. One program is for residential customers. If approved, residents will have financial incentives to install either solar hot water heaters or heat pumps.

O. Q. Where is the C-3 site to the area being developed by the county? Inside the proposed area?
A. C-3 is about one half mile east of the proposed site.

P. Q. How many fuel trucks will the plant require?
A. At Maalaea, 17-27 trucks per day, normally around 17-19. At the new site, 49 trucks per day.

Q. Q. Are these sites in conflict with the air traffic flight patterns?
A. None of these sites are in conflict with the Kahului Airport, however, C-3 may be in conflict with the old Puunene Airport if reactivated.

R. Q. How will you get to the C-3 site?
A. Entrance will be from Mokulele highway, the road will run east then north.

Comments:

- K. Barr: Kihei is downwind of all the sites, but at least with A-2 and D-1, it is farther away so that more dispersion can occur. The other communities are not downwind of any of the sites. Would not prefer C-3.

Kenji C. Kusaka
Project Manager

kck
attachment

cc. HECO & MECO Attendees
M. Yuen
B. Christianson (SWEC)

MECO'S NEW GENERATION SITE
FACT SHEET

WHAT:

MECO needs to establish a new power plant site for generating unit additions in 2004 and beyond.

WHY:

After this next Maalaea generation addition (1996 - 2000), the Maalaea Plant property will not be expanded. Expansion of MECO's Kahului Plant is unlikely due to property limitations, tsunami zone restrictions, etc.

TO BE INSTALLED:

- Required Acreage: Approximately 50 Acres (including buffer zone).
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  a) Four (4) Dual Train Combined Cycle Units (Gas turbines, steam turbines, heat recovery steam generators, stacks, air cooled condensers. Gas turbines are fuel flexible; combined cycle units are most efficient in the State of Hawaii.)
  b) Fuel Tanks & Berm
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  e) Administration Offices
  f) Maintenance Shop
  g) Warehouses/Storage Area
  h) Water Treatment Facility
  i) Wastewater Treatment Facility
- Related Facility: T&D Baseyard (Potential)
- Generation Capacity: Approximately 232 MW over 30+ years.

WHERE:

- Three sites identified in the Siting Study:
  1) Pulehu Road, one mile mauka of the landfill (Sites D-1)
  2) Pulehu Road, one quarter mile mauka of the landfill (Site A-2)
  3) Puunene, one mile southeast of the Maui Airport (Site C-3)

- Distance to the nearest community:
  a) Pukalani (D-1): 2.7 Miles
  b) Puunene (A-2) 2.1 Miles
  c) Kihei (C-3): 1.5 Miles

WHEN:

- Site Selection Target Date: November 30, 1995
- Site Acquisition Target Date: April 1, 1996
- Forecasted Operation Date of the first unit: January 2004

HOW:

- Over 20 Federal, State and County permits required to permit the land and install the generating unit.
- Requires an Environmental Assessment or Environmental Impact Statement which will consider impacts including, but not limited to:
  a) Natural resources
  b) Cultural resources
  c) Archaeological resources
  d) Effects on economic/social welfare
  e) Effect on economic/social activities
  f) Effect on rare, threatened, or endangered species of animal or plant life or habitat
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  k) Effect on environmentally sensitive areas
  l) Effect on natural and man-made resources
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  n) Provision of facilities and improvements important to state economy
  o) Hazards to life and property from natural hazards, including tsunamis, flooding, erosion, etc.
  p) Consistency with Land Use Plans, Policies, and Controls
- Number of new jobs at the Plant: Initially 10 - 12 with installation of the first combined cycle plant, expanding to 42.
- Construction jobs to be created: 50 - 60 during peak construction period.

COMMUNITY MEETINGS:

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   May 16, 1995, 7:30 PM, Kihei Elementary School Cafeteria
2) Kula Community Association, Association Board
   June 1, 1995, 6:00 PM, Kula Elementary School Library
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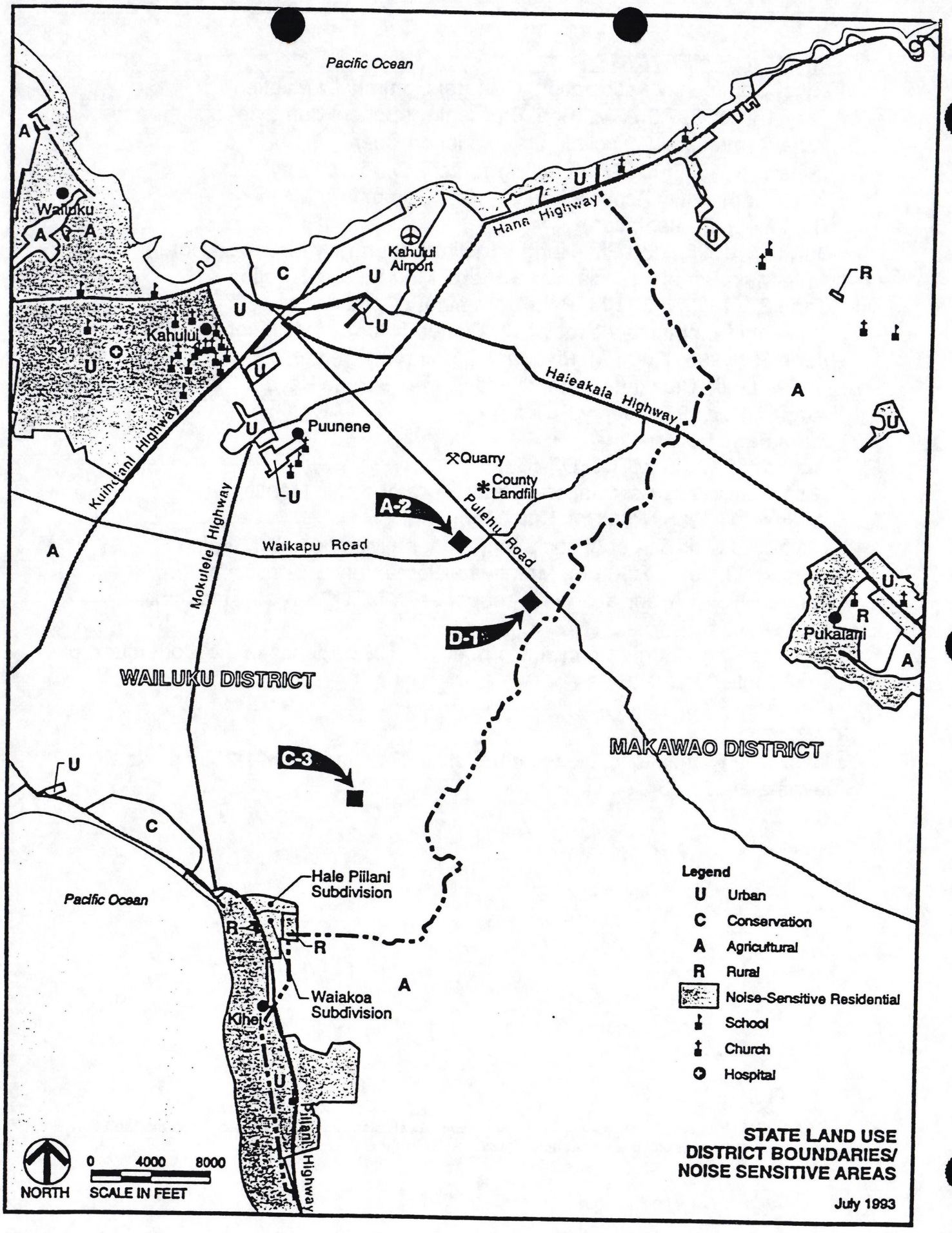
   (Follow-up Presentation)
   June 20, 1995, 7:30 PM, Haggai Institute (Formerly Maui Sun Hotel)
4) Paia Main Street Association, General Membership Meeting
   June 22, 1995, 6:30 PM, Paia Community Center
5) Pukalani Community Association, General Community Meeting
   June 29, 1995, 7:00 PM, Pukalani Community Center
6) Mayor Linda Crockett Lingle, David Blane, George Kaya & Clayton Yoshida
   August 15, 1995, County Building
7) Maui Farm Bureau
   August 15, 1995, MECO Office
8) Kula Community Association, General Membership Meeting
   August 17, 1995, 7:00 PM, Kula Community Hall
9) Makawao Main Street Association, General Membership Meeting
   August 23, 1995, 7:00 PM, Makawao Elementary School Cafeteria
10) Kahului Town Association - No response to MECO's request to make a presentation.
11) Update Maui County Council, October 31, 1995 Agenda of the Committee of the Whole (tentative).

CONTACT:

To answer any questions, please contact Ed Reinhardt at 871-2364 or Neal Shinyama at 871-2341.

(File: FACTSHT.DOC, REV. 6, October 4, 1995: Revised site selection target & acquisition dates, modified the Where to show three sites and updated Kahului Town Association and Council dates.)

233.4201/008 6.9.95



MAUI COUNCIL, COMMITTEE OF THE WHOLE
MECO's NEW GENERATION SITE PRESENTATION
NOVEMBER 2, 1995

MECO New Site N1
GENPP 1-2
YA/G

MEMORANDUM

Hawaiian Electric Company, Inc.

November 6, 1995

Subject: Maui Council, Committee of the Whole
MECO's New Generation Site Presentation

Date: November 2, 1995
Time: 9:30 am
Place: County Council Hearing Room

Present:

MECO

M. May	T. Jezierny
S. Kiyonaga	E. Reinhardt
N. Shinyama	

HECO

K. Kusaka	S. Seu
J. Clary	

ABHI
Mercer Vicens

I. Purpose of the Meeting:

A. Present to the association the three generation sites that MECO is investigating for its next generation site. See attached fact sheet.

II. Issues:

The following items are questions or issues that were discussed during the presentation:

A. *Q.* Will the proposed highway from Kihei to Upcountry Maui come close to the C-3 and D-1 sites?
A. Do not know for sure since we are unfamiliar with the route. (MECO will review the proposed highway routes and get back to the Council.)

B. Q. Can you install four units at A-2 and what is the time frame?
A. Yes MECO can install four units at A-2 with the existing permit requirements and air source inventory. The first combustion turbine is forecasted for 2004 with the remaining units being installed from 2004 to 2030 or beyond.

C. Q. Does MECO prefer the A-2 site?
A. Yes from an air modeling perspective.

D. Q. How much will A-2 cost?
A. Since MECO is presently negotiating land cost with ABHI, we prefer not to divulge that information. For reference, A-2 and D-1 sites will cost between $20,000-25,000 per acre, while C-3 will cost between $10,000-20,000 per acre. However, the total cost for C-3 will be more expensive due to infrastructure cost.

E. Q. What is the closest agriculture land next to A-2?
A. At a minimum, Kula Agricultural Park is approximately 2 miles away.

F. Q. Which sites did the communities prefer?
A. Basically, each community preferred the site farthest away from them.

G. Q. What were the farmer's concerns?
A. The farmers were concerns with emissions from the plant affecting their crops, especially ethylene.

H. Q. What is MECO doing to address the farmer's concern?
A. MECO has met with the Maui Farm Bureau and Dr. Paull from the University of Hawaii. An agreement has been reached for the University of Hawaii to take one year of ethylene data, starting from January 1, 1996 to determine the base line data for ethylene. (Although it was reported that ethylene sampling would begin January 1, 1996, ethylene monitoring started in November 1995.)

I. Q. Where would the water for the plant come from?
A. MECO would drill supply wells at the plant site. The depth of the supply wells will extend below the fresh water table, so we would be drawing brackish water. We would then purify the water and use it in our process.

J. Q. Will you recycle all the water?
A. No, some of the water will be used in our combustion process and will be lost to the atmosphere.

K. Q. What is the closest major residential area near A-2?
A. Kahului is probably the major area closest to A-2

L. Q. Is MECO planning to change the design of the existing transmission lines; add more lines?
A. No, the design of the existing transmission lines will not change.

Comments:

- M. Vicens: ABHI prefers not to take cane land out of production. However with additional information received about the three sites, A&B realizes that A-2 is the only site that can handle 4 units. If C-3 or D-1 were to be chosen now, we'd be back in a few years needing to select another new power plant site. C-3 and D-1 cannot meet MECO criteria to expand until 2030. A-2 may be the correct site from an air quality perspective and also because the landfill is close and the proposed waste to energy plant will be located there. ABHI wants to be part of the solution to help resolve problems on Maui.

- K. Apana: C-3 site is out of the question. In favor of the A-2 site.

- P. Kawano: A-2 site is the preferred site. A-2 you can install 4 units.

- D. Blane: The Mayor and the Planning Commission, all favored the A-2 site. The A-2 site may be close enough for a pipe line for the fuel oil to minimize the truck traffic, and if a new sewer treatment plant is developed, would like to see if there is a way for MECO to use the effluent.

- A. Arakawa: If A-2 is visually friendly, then it seems to be the best site, and also being close to the landfill.

- T. Morrow: Thanks to A&B for cooperating, headed in the right direction.

- R. Monden: Been to other meetings and A-2 seems to be a good site.

- W. Nishiki: MECO is on the right track by getting everybody involved and planning ahead. Keep us informed on the progress of the site selection.

Kenji C. Kusaka
Project Manager

kck
attachment

cc. HECO & MECO Attendees
M. Yuen
B. Christianson (SWEC)

MECO'S NEW GENERATION SITE
FACT SHEET

WHAT:

MECO needs to establish a new power plant site for generating unit additions in 2004 and beyond.

WHY:

After this next Maalaea generation addition (1996 - 2000), the Maalaea Plant property will not be expanded. Expansion of MECO's Kahului Plant is unlikely due to property limitations, tsunami zone restrictions, etc.

TO BE INSTALLED:

- Required Acreage: Approximately 50 Acres (including buffer zone).
- Type of Equipment and Structures Proposed:
  a) Four (4) Dual Train Combined Cycle Units (Gas turbines, steam turbines, heat recovery steam generators, stacks, air cooled condensers. Gas turbines are fuel flexible; combined cycle units are the most efficient Utility owned generators in the State of Hawaii.)
  b) Fuel Tanks & Berm
  c) Fire Protection System
  d) Switchyard
  e) Administration Offices
  f) Maintenance Shop
  g) Warehouses/Storage Area
  h) Water Treatment Facility
  i) Wastewater Treatment Facility
- Related Facility: T&D Baseyard (Potential)
- Generation Capacity: Approximately 232 MW over 30+ years.

WHERE:

- Three sites identified in the Siting Study:
  1) Pulehu Road, one mile mauka of the landfill (Site D-1)
  2) Pulehu Road, one quarter mile mauka of the landfill (Site A-2)
  3) Puunene, one mile southeast of the Maui Airport (Site C-3)

- Distance to the nearest community:
  a) Pukalani (D-1): 2.7 Miles
  b) Puunene (A-2) 2.1 Miles
  c) Kihei (C-3): 1.5 Miles

WHEN:

- Site Selection Target Date: November 30, 1995
- Site Acquisition Target Date: April 1, 1996
- Forecasted Operation Date of the first unit: January 2004

HOW:

- Over 20 Federal, State and County permits required to permit the land and install the generating unit.
- Requires an Environmental Assessment or Environmental Impact Statement which will consider impacts including, but not limited to:
  a) Natural resources
  b) Cultural resources
  c) Archaeological resources
  d) Effects on economic/social welfare
  e) Effect on economic/social activities
  f) Effect on rare, threatened, or endangered species of animal or plant life or habitat
  g) Effect on air quality
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  j) Effect on traffic
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  l) Effect on natural and man-made resources
  m) Effect on scenic and open resources
  n) Provision of facilities and improvements important to state economy
  o) Hazards to life and property from natural hazards, including tsunamis, flooding, erosion, etc.
  p) Consistency with Land Use Plans, Policies, and Controls
- Number of new jobs at the Plant: Initially 10 - 12 with installation of the first combined cycle plant, expanding to 42.
- Construction jobs to be created: 50 - 60 during peak construction period.

COMMUNITY MEETINGS:

1) Kihei Community Association, General Community Meeting
   May 16, 1995, 7:30 PM, Kihei Elementary School Cafeteria
2) Kula Community Association, Association Board
   June 1, 1995, 6:00 PM, Kula Elementary School Library
3) Kihei Community Association, General Community Meeting
   (Follow-up Presentation)
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7) Maui Farm Bureau
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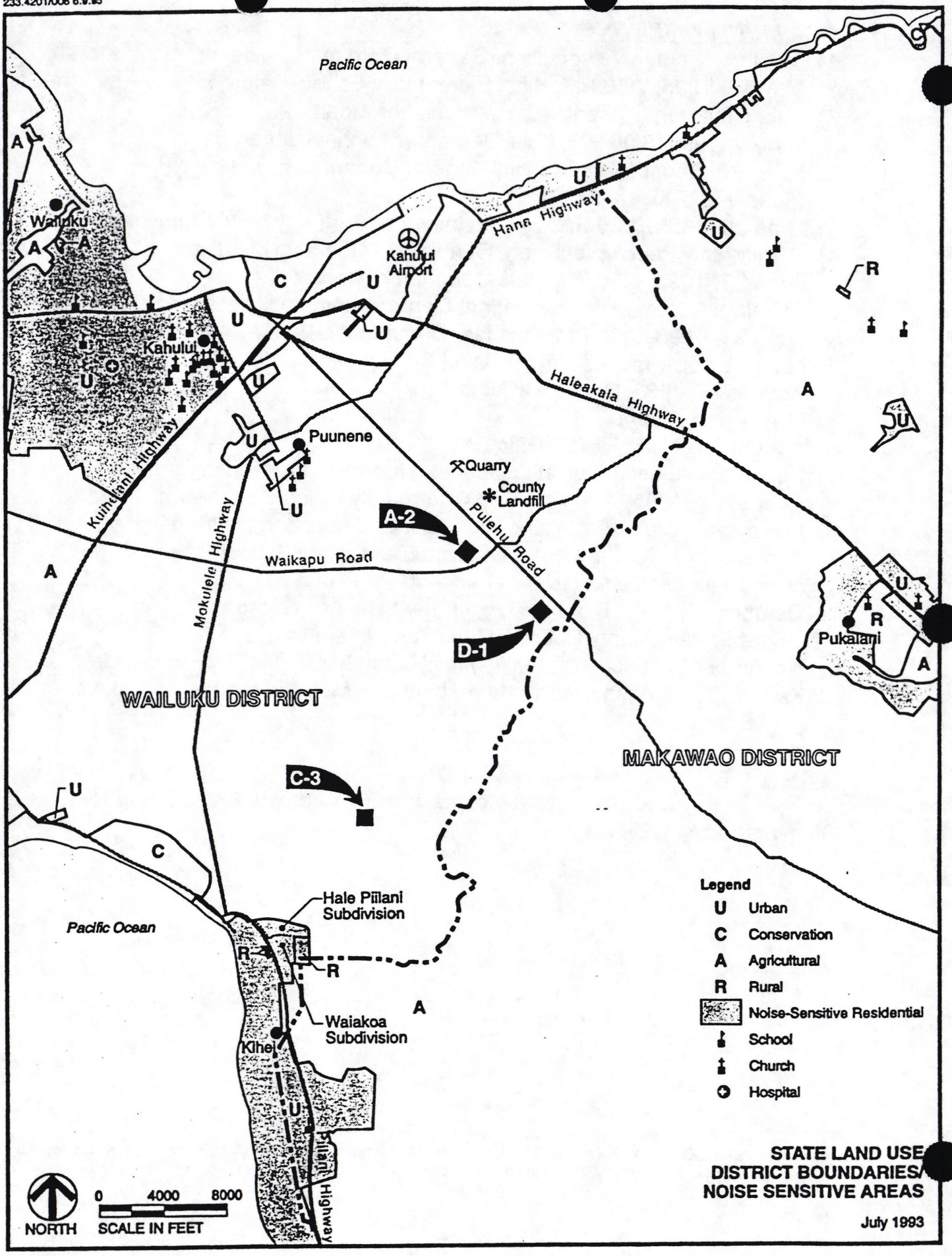
10) Maui Planning Commission, Workshop Presentation
    October 10, 1995, Planning Department Hearing Room
11) Update Maui County Council, Committee of the Whole
    November 2, 1995, 9:00 AM, Council Chamber
12. Kahului Town Association - No response to MECO's request to make a presentation.

CONTACT:

To answer any questions, please contact Ed Reinhardt at 871-2364 or Neal Shinyama at 871-2341.

(File: FACTSHT.DOC, REV. 7, October 27, 1995: Added the presentation to the Maui Planning Commission, and revised the date for the presentation to the Maui County Council Committee of the Whole.)

233.4201/008 6.9.95



KAHULUI TOWN ASSOCIATION
GENERAL COMMUNITY MEETING
NOVEMBER 14, 1995

MECO New Site N1
GENPP 1-2
YA/G

MEMORANDUM

Hawaiian Electric Company, Inc.

November 20, 1995

Subject: Kahului Town Association Meeting
MECO's New Generation Site Presentation

Date: November 14, 1995
Time: 6:00 p.m.
Place: Central Pacific Bank Conference Room

Present:

MECO
T. Jezierny
E. Reinhardt
G. Kauwe
M. Ratte
S. Kiyonaga
N. Shinyama
A. Takabayashi

HECO
K. Kusaka
S. Seu

ABHI
Mercer Vicens (absent)

Kahului Town Association
J. Lawrence
E. Menor
T. Fujimoto
M. Chamberlain
G. Ito
W. Kanekoa
J. Tam

Maui Land and Pineapple
D. Wehr

I. Purpose of the Meeting:

A. Present to the association the three generation sites that MECO is investigating for the next generation site. See attached fact sheet.

II. Issues:

The following items are questions or issues that were discussed during the presentation:

A. *Q.* What type of fuel will be used to run the combustion turbines?
A. Diesel oil.

B. *Q.* What is the noise factor?
A. The noise level at the property line will be 70 dba, which is the Oahu noise standard. Maui presently does not have a noise standard.

C. *Q.* Will anything be released into the atmosphere?
A. The units will have emissions from the stacks, similar to Maalaea and Kahului power plants.

D. *Q.* Are you expanding at Maalaea?
A. Yes, MECO is presently installing its second dual train combined cycle (DTCC) unit at Maalaea.

E. *Q.* How many stacks does Maalaea have?
A. With the second DTCC unit, there will be three stacks.

F. *Q.* How large are the existing power plants and how large will this new power plant be?
A. Kahului Power Plant generates 36 MW of power, Maalaea Power Plant after this expansion will be 221 MW, and the new site power plant will be 232 MW.

G. *Q.* Why don't you replace units at the existing sites?
A. The size of new generation is different from the units being retired. Eventually, after several units have been retired, MECO may look at installing new units at existing sites.

H. *Q.* Isn't Kahului Power Plant scheduled to retire in the year 2000?
A. The earliest possible retirement date for Kahului is 2014.

I. *Q.* Does A&B own the land on all three sites?
A. Yes.

J. *Q.* How large of land does MECO need at each site?
A. 50 acres at each site.

K. *Q.* Which site is the best?
A. From an air quality perspective, A-2 is the best site. A&B has also agreed that A-2 is the only site that MECO can expand up to 232 MW.

L. *Q.* What is the major difference between A-2 and D-1?
A. Air dispersion characteristics will prevent full build-out at the D-1 site. At A-2 we presently can build 232 MW. Also D-1 site is located above the UIC line, which will make it harder to dispose waste water. A-2 is located below the UIC line.

M. *Q.* When the Kona winds blow, will the dispersion at A-2 be less than D-1 at Pukalani?
A. Yes

N. *Q.* Will A&B be willing to negotiate the A-2 site?
A. Yes. In the last three weeks, A&B seems to be reasonable.

O. *Q.* What if A&B does not want to negotiate?
A. MECO does have the right to condemn the property.

P. *Q.* Do you plan to transport fuel by pipe line?
A. We are presently conducting a study for a pipe line to the new sites. Preliminary numbers show that it is economical to install a single wall pipe line from the harbor to the new sites. However, a double wall pipe line will not be economical at this time. Present regulation requires only single wall pipe, but it may change. Therefore, MECO still needs to evaluate the situation further.

Q. *Q.* During Kona winds, you can sometimes smell the landfill all the way at the airport. Won't the emissions from the power plant reach the airport also?
A. We've modeled the dispersion of the emissions during all wind conditions, using a year's worth of actual wind data. Our studies show that even under Kona conditions, emissions from the proposed power plant would disperse and not cause any problems to air quality, including up at the airport.

R. *Q.* What is the projection for this new site?
A. The new site will be expanding until approximately 2040.

S. *Q.* Why can't you expand A-2 more than 232 MW?
A. New emission sources and new regulations may prevent further expansions at A-2.

Comments:

- We need to look at a site where the least amount of people will get hurt; what is good for the majority.
- Even if we're from Kahului, we won't say go to C-3 and dump it on Kihei.
- At the end of MECO's presentation, the Kahului Town Association Board voted and unanimously agreed that the next generation site should be A-2.

Kenji C. Kusaka
Project Manager

kck
attachment

cc. HECO & MECO Attendees
Bob Christianson-Stone & Webster Engineering Corporation

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(File: FACTSHT.DOC, REV. 8, November 6, 1995: Added the date for the KTA presentation.

233.4201/008 6.9.95

