

GEOHERMAL BRIEFINGS/MEETINGS

✓ Dec. 11, 1989 (Monday) -- 4:30 pm

Briefing for the Governor -- Pele Defense Fund

Warren Price, Roger Ulveling, Les Matsubara,
Maurice Kaya, Bill Paty, Libert Landgraf,
John Lewin, Chuck Freedman, Sus Ono, Josh Agsalud

✓ Dec. 13, 1989 (Wednesday) -- 3:00 pm

Governor with Pele Defense Fund

(State officials in attendance to be determined
at 12/11/89, 4:30pm, meeting.)

✓ Dec. 14, 1989 (Thursday) -- 11:30 am -- (If Needed)

Briefing for the Governor -- Puna Community Council

✓ Dec. 14, 1989 (Thursday) -- 3:30 pm

Governor with Puna Community Council (PCC)

PCC: Ron Phillips, Stuart Marks, Nelson Ho,
Sherry Moore and Clive Cheetham

Dec. 20, 1989 (Wednesday) -- 9:00 am

Briefing for the Governor -- Pro-Geothermal

Dec. 20, 1989 (Wednesday) -- 1:00 pm

Governor with Pro-Geothermal Group
(Sus Ono to determine what organizations to attend)

Dec. 21, 1989 (Thursday) -- 3:00 pm

Governor with UH, Ormat, and True

(BISHOP)

Briefing Material for the December 19, 1989, meeting with Bishop Estate Concerning Geothermal Resource Mining Lease R-1.

BACKGROUND

- o Geothermal Resource Mining Lease (GRML) R-1 was issued to Bishop Estate on February 20, 1981.
- o GRML currently subleased to Puna Geothermal Venture (PGV).
- o Landownership: Private.
- o Total acreage within the leased area = 3,487 acres.
- o Land Use Classification: AG (3,044 acres), Cons (443 acres).
- o Total acreage contained within the Kamaili GRS = 751 acres. (All 751 acres classified as Agriculture.)
- o Ashida No.1 drilled by Barnwell (1980) near the boundary of GRML R-1 was unsuccessful.

STATUS

- o No geothermal development activity has taken place on the leased lands.
- o On January 30, 1987, a letter from Paty to Bishop Estate was sent requesting an update on the current status and future plans, if any, for geothermal mining operations.
(To date, no response has been received by the Department.)
- o On November 20, 1989, a letter from Tagomori to Richard/Ormat was sent requesting the submittal of evidence of a certificate of liability insurance as required under the geothermal mining lease.

DISCUSSION

- o Lease requires the commencement of mining operations within 3 years from the effective date of the lease.

Revocation of the lease may be applicable, if the lessee fails to commence such activity, or if lessee ceases all mining operations for a period of one year without the written approval of the Board.

- o In response to a request from Bishop Estate, Dowald prepared Circular C-117, which described the Department's rationale in determining the southern boundary of the Kamaili GRS which excludes a major portion of Bishop's mining lease R-1.

(BULLET)

BACKGROUND AND STATUS OF TRUE/MID-PACIFIC GEOTHERMAL VENTURE

- o March 1982 CDUA filed by Campbell Estate to develop geothermal resources at Kahaualea, Hawaii
 - o May 1982 Petition for Contested case hearing on CDUA filed with the BLNR
 - o October - December 1982 BLNR conducted contested case hearing (total 14 days)
 - o February 1983 BLNR issues Decision and Order granting exploration rights within a designated 800 acre area within Kahaualea
 - o June 1983 Act 296, SLH 1983, (Chap. 205-5.2, HRS) passed by the Legislature, authorizing the BLNR to designate GRS statewide
 - o May 1984 Act 151, SLH 1984, passed by the Legislature, gave priority to the assessment of Kahaualea as a potential GRS, and mandated the BLNR to act on such designation by 12/31/84
- (Act 151, also "grandfathered" (3) existing geothermal resource mining leases as GRS)
- Public informational meetings held on the proposed designation of 5,300 acres of Kahaualea as a GRS
- o September 1984 Public Hearings held on the proposed Kahaualea GRS, at which time requests for contested case hearing were received by the BLNR
 - o December 1984 BLNR conducted contested case hearing (total 9 days)

Decision and Order (D/O) issued by the BLNR designating the 800 acre area identified in the February 1983 D/O as a GRS subject to the following conditions:

- 1) Cessation of volcanic activity near the area
- 2) No new activity until eruptions cease

Land exchange proposed

3) Campbell Estate investigate and consider a land exchange involving State owned lands in the Kilauea Middle East Rift Zone (KMERZ)

4) BLNR assess the KMERZ for designation as a GRS on basis of information received during the contested case hearing

5) BLNR direct DOWALD to assess the KMERZ area in and adjacent to the Wao Kele 'O Puna Natural Area Reserve beginning on the Western boundary of the existing Kama'ili GRS

6) That if the KMERZ is not designated as a GRS or if the land exchange is not consummated, then the 5,300 acre Kahaualea area originally proposed by the BLNR, be designated as a GRS

7) That if the land exchange is consummated, the BLNR urge the Federal government and the National Park Service to acquire Tract 22

8) Lastly, if the land exchange is consummated and involves State or other lands upon which geothermal activities may take place, then the GRS designated (5,300 acres) in this D/O shall be eliminated

o January 1985

DLNR began assessment of KMERZ area as a GRS using the following criteria set forth in Act 296:

a) Objectives of the Hawaii State Planning Act, Chapter 226, HRS

b) Provision for designation in LUC Districts

c) EIS not required for the assessment of areas

d) Area's potential for geothermal resources

e) Prospects for utilization of geothermal energy

f) Social and environmental impacts

g) Compatibility with existing land uses

h) Potential economic benefits to be derived from geothermal development

- o January 1985⁵ This assessment is outlined in DOWALD Circular C-114, and resulted in the proposal by the BLNR to designate 11,754 acres of the KMERZ area as a GRS
- o March 1985 Public informational meetings on the proposed KMERZ GRS held on the island of Hawaii
- o August 1985 CDUA filed with the BLNR to explore and develop geothermal resources in the proposed KMERZ GRS
- o September 1985 Public hearing held on the proposed GRS designation, at which time a request for contested case hearing was made to the BLNR
- o November 1985 BLNR conducted contested case hearing (total 3 days)
- o December 1985 Decision and Order issued by BLNR designating 9,014 acres of the Wao Kele 'O Puna area as a GRS

True/Mid-Pacific's draft supplemental EIS filed with DLNR and OEQC

Land exchange deeds between Campbell Estate and the State of Hawaii were executed
- o January 1986 Public hearing on Campbell Estate/True/Mid-Pacific's CDUA held by the BLNR, at which time requests were made for contested case hearing
- o February 1986 Final supplemental EIS filed with the BLNR

BLNR conducted contested case hearing (total 5 days)
- o March 1986 Contested case hearing reconvened (1 day)
- o April 1986 Decision and Order issued by the BLNR approving geothermal exploration and development in the KMERZ GRS
- o July 1987 Geothermal Resource Mining Lease R-5 (for 9,014 acres) issued by the BLNR to Campbell Estate/True-Mid-Pacific Geothermal Venture
- o February 1989 Plan of Operations, Application for Permit to Drill, and Environmental Monitoring Plans and Programs submitted to DLNR by True/Mid-Pacific
- o March 1989 BLNR approves True/Mid-Pacific's Plan of Operations

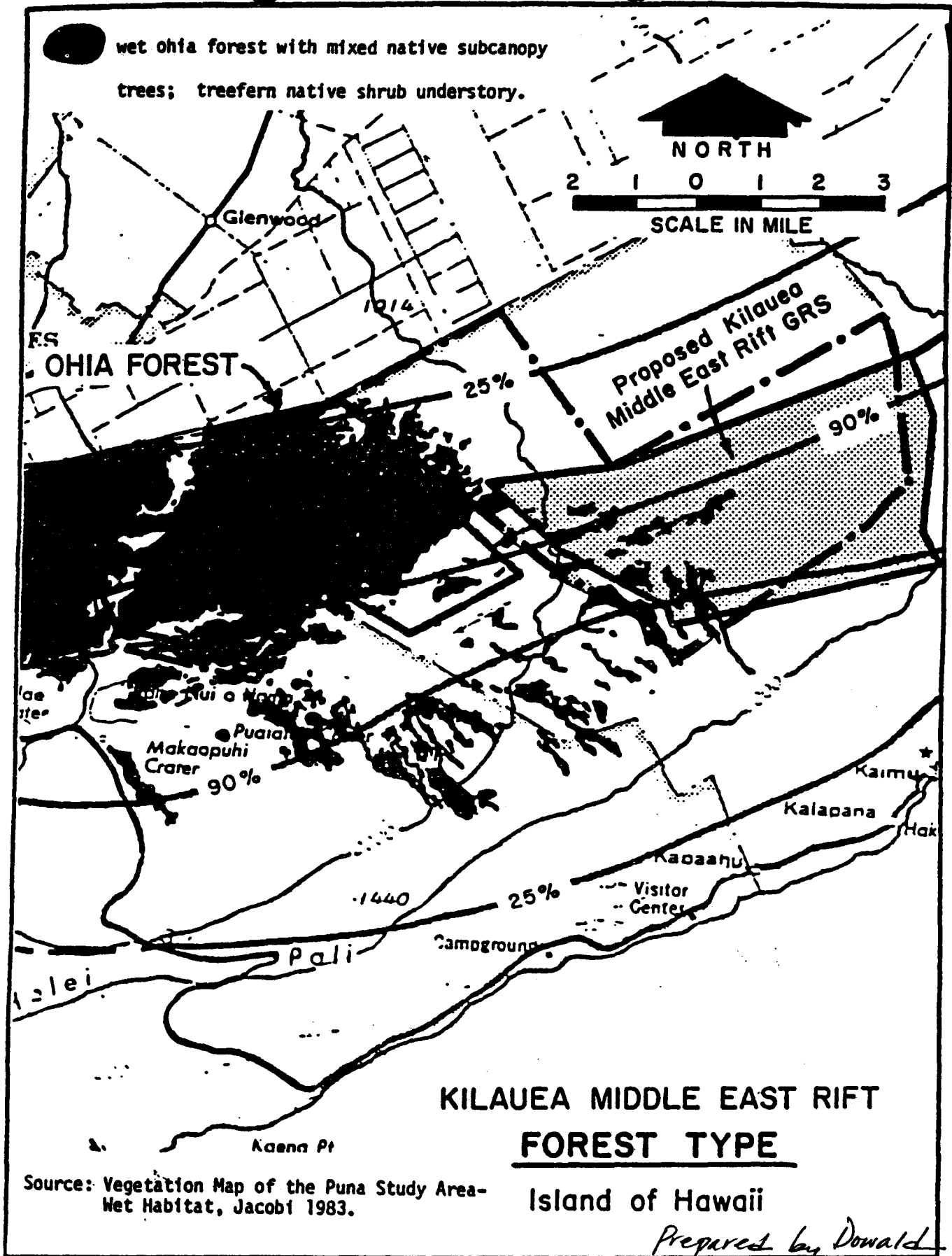
- o May 1989 DLNR approves Environmental Monitoring Plans and Programs, and issues Geothermal Well Drilling Permit
- o June 1989 DLNR approves True/Mid-Pacific's Archaeological Research and Design

DLNR conducts inspection of grubbing and grading activity at True/Mid-Pacific well site (6/30/89)
- o July 1989 DLNR issues Cease and Desist Order to Campbell Estate/True Geothermal in response to clearing and grubbing violations
- o August 1989 BLNR fines True/Mid-Pacific Geothermal Venture \$16,638

Cease and Desist Order lifted by the BLNR
- o September 1989 DOH issues Authority to Construct (ATC) Permit to True Geothermal for (12) wells
- o November 1989 True Geothermal begins drilling of geothermal well True/Mid-Pacific A1-1 (11/18/89)

(Note: this chronology does not address the numerous lawsuits and appeals related to the project and/or land exchange)

Figure 32.



*Prepared by Donald
for DEED Subzone Report
June 1986 (Circular C-114)*

Site No. 2500 - Kukii Heiau, remains of heiau built by Umi on his tour of Hawaii after coming to power.

Development of geothermal resources in the Kilauea lower east rift zone has been underway since 1973-74 with the issuing of geothermal resource mining leases for four areas, designated GRML R-1, R-2, R-3, and R-4. Development of additional sites in this zone area should not impact any endangered species essential habitat, but may impact existing communities in terms of noise and aesthetics. The provision of a buffer zone will help to mitigate such impacts. Air quality should not be impacted, since it is expected that given the current level of abatement technology, geothermal facilities can comply with the proposed State air quality standards for geothermal development.

Kilauea Middle East Rift Zone

A detailed vegetation survey of the Puna, Hawaii, area was conducted by J.D. Jacobi (1983). The surveyed areas were mapped into approximately eight vegetation categories. (See "Vegetation Map of the Puna Study Area-Wet Habitat," U.S. Fish and Wildlife Service, Mauna Loa Field Station, Hawaii.)

Figure 32 shows the highest quality native vegetation in the Kilauea middle east rift zone area. It is classified as "wet ohia forest with mixed native subcanopy trees; treefern native shrub understory." The greatest quantity of this prime native vegetation class is uprift and outside of the proposed Kilauea middle east GRS; however, some areas exist in the western part of this proposed GRS. Aside from its intrinsic value, this vegetation can provide a source of native seed for bare lava areas in the region. Other vegetation in the southwestern part of this proposed GRS is classified as "closed canopy, wet ohia forest with mixed native subcanopy trees; treefern, native shrub understory with some introduced shrubs and ferns." There are also small sections of ohia-kukui forest in the southwestern section. The kukui trees may have been planted by the early Hawaiians.

The northern part of this proposed GRS includes a large section of vegetation classified as "open canopy, wet ohia forest with mixed native subcanopy trees; treefern native shrub understory with some introduced shrubs and ferns."

The southeastern section of this proposed GRS includes a large section of vegetation classified as "wet pioneer ohia community (trees less than 10m tall)."

A significant part of this proposed GRS is comprised of mostly bare recent lava (1963 to 1985 flows) (See geologic hazards section).

The "Puna Geothermal Area Biotic Assessment," published in April 1985 by the University of Hawaii, Department of Botany, indicates that a number of plant species found within the Kilauea east rift zone area are Category 1 candidates for listing as endangered by the U.S. Fish and Wildlife Service. Of the 19 Category 1 species collected in the University's survey, only two are found within the proposed GRS--Bobea timonioides, a medium-sized tree, and Cynea tritomantha.

A Category 1 species is one for which the U.S. Fish and Wildlife Service has sufficient information to support the biological appropriateness of listing as endangered, but for which additional data is required concerning the environmental and economic impacts of listing the species and designating a critical habitat for it.

Bobea timonioides, also known as 'akakea, is found in Ohia forest types. It was sighted at three locations in this proposed GRS, at one site in the designated Kapoho GRS, and at two sites along the lower rift zone outside this proposed GRS.

Cynea tritomantha var. tritomantha, known as 'aku'aku, was sighted in the northeast corner of the proposed Kilauea middle east rift GRS. It should be noted that the endemic fern, Adenophorus periens, was sighted mostly outside of this proposed GRS to the west and north.

Any impact of geothermal development on these plant species may be avoided by careful facility siting and through the permitting process.

resource potential of the project area. Figure 4 delineates the estimated percent probability of geothermal resource potential in the middle east rift zone GRS. (The designated GRS was reduced by approximately 2500 acres from the proposed GRS, but is within the boundary of the proposed GRS except on the north side where the GRS extends to the former Puna Forest Reserve boundary, an area of less than 100 acres). High rainfall amounts on the eastern portion of the island of Hawaii, and possibly seawater intrusion below the project area, provide a large source of water to supply the geothermal system.

Studies conducted (Holcomb, 1980) have shown that the surface volcanic expressions of the entire east rift zone indicate little, if any, change in the geologic character of the rift zone from upper to lower elevations. From these studies it is presumed that the subsurface character will not be much different between the upper and lower portions of the rift zone (Niimi, 1985).

The studies conducted to date, as well as the exploratory and production wells that have been drilled in the lower east rift zone by Thermal Power Company and the HGP-A group, provide a preponderance of evidence that geothermal resources exist in the GRS (Figure 3). The exact location of those resources within the project area can only be determined through exploratory drilling as indicated above and described in Paragraph C below.

C. EXPLORATION AND DEVELOPMENT CONCEPT

Figure 5 identifies the locations of surface areas within the project area that are expected to be used for geothermal development activities. Table 1 indicates the estimated acreage required for the

TABLE 1

ESTIMATED SURFACE ACREAGE REQUIRED FOR PROJECT USE

<u>LAND USE</u>	<u>LENGTH</u>	<u>WIDTH</u>	<u>AREA</u>	<u>TOTAL ACRES</u>
Primary Access Roads	3.8 miles	30 ft		13.8
Service/Maintenance Roads	17 miles	20 ft		41.2
Electrical Transmission Lines	12 miles	44 ft		64.0
Fluid Transmission Lines	17 miles	10 ft		20.6
Drilling Sites (35)			2- 3 acres each	70 -105
Permanent Power Plant Sites (3-5)			5- 8 acres each	15 - 40
Miscellaneous Use			20 acres	20
	TOTAL			<u>244.6-304.6</u>

Percentage of Acreage Required based on:
 Approx. 26,000 Acres in Parcel = 0.94 - 1.2
 Approx. 8,500 Acres in GRS = 2.87 - 3.58

total 100MW project use.

Within the project area GRS, surface areas for geothermal development activities were selected on the basis of the geological analyses of the rift zone, surface expressions that are indicative of earlier volcanic activity, minimizing potential environmental impacts and the slope of the surrounding terrain. Those sections of the active rift zone with significant faults and cracks were avoided, as were the more environmentally sensitive 'ohi'a class 1 forests. Due consideration was given to surface features along the rift zone that would tend to minimize the potential for lava flows into a planned exploration development (E/D) site.

These considerations dictated that exploration and development within the GRS be planned to occur on either side of the rift zone including along transects trending northerly from the rift zone in order to locate and develop the northern boundary of the reservoirs expected to exist in this area.

Prospective drilling sites were evaluated in consideration of (1) the physical characteristics of the sites, especially the slope of surrounding land; (2) the objective to avoid, to the extent feasible, areas indicated to have the highest quality forest; (3) the need to locate wells at sufficient distance from other wells to assure the maximum effective exploration/development effort over the area with the minimum amount of drilling; and (4) the objective that development would occur with the most appropriate spacing to enhance the

production life of discovered reservoirs.

Inasmuch as the location of geothermal reservoirs must be determined by deep drilling and since the economic producibility of the resource from each discovered reservoir can only be determined by testing each successful well, the drilling sites selected, as shown in Figure 5, are tentative. Depending upon drilling results and testing, the final surveyed location of each proposed well will be identified in each application for a drilling permit for each well (see Section VI). For planning purposes, five exploration/development (E/D) areas have been selected. Each area has three primary drilling sites planned (for a total of 15 sites) connected by access/service roads. Allowing for estimates of non-producible wells, a total of 35 individual drilling sites within the 5 E/D areas may ultimately be required to produce 100 MW of electricity. The drilling sites will occupy from 2-3 acres. If directional drilling is technically and economically feasible, up to 6 exploration/development wells may be drilled from one or more drilling sites.

The first drilling site (see Figure 5) is planned near the eastern area of the proposed sub-zone, north of the rift zone center in E/D area "A". The general sequence of exploration drilling is as follows:

- 1) If the first exploration well in E/D area "A" is successful, the second well site in this E/D area (Site 2) will be drilled to obtain indications of the northern boundary of the discovered reservoir. (A "successful" well is one from which geothermal resources can be produced economically.)

Regardless of the results of this well the next exploration well would be drilled in E/D area "B", at one of the three planned sites.

- 2) If the first exploration well in E/D area "A" is not successful, the second well will be drilled at one of the three sites in E/D area "B" on the south side of the rift zone center near Pu'u Heiheiahulu.
- 3) If the first well in E/D area "B" is successful, another exploration well would be drilled at one of the other planned locations within E/D area "B". If the first well in this E/D area is unsuccessful, the next well would be drilled at one of the three sites in E/D area "C", on the north side of the rift zone center.
- 4) If the first two wells are unsuccessful in E/D area "A" and E/D area "B", a decision would be made to move to E/D area "E", in the western portion of the GRS near the more active section of the rift zone, or to terminate or suspend the project. If a well drilled at this site is also unsuccessful, the project would be terminated.
- 5) If a successful well is drilled in E/D area "C", the next wells would be drilled in E/D area "D" and then "E".

Power plant sites will be located at a drilling site or within 2 miles of the furthest well site supplying steam to the plant. Pending successful well field development, five tentative power plant locations are shown in Figure 5. Power plants will vary in size from 5 MW to 55 MW. The area needed for a power plant will vary from 5 to

8 acres depending on the size/capacity of the plant.

It is noted that prior to the construction and/or operation of power plants, Authority to Construct (ATC) and a Permit to Operate permits must be obtained from the State Department of Health. The ATC permit application must detail the specific equipment and procedures that will be used to ensure maintenance of applicable air quality standards in addition to other environmental protection measures that will be used to ensure that the power plant construction and operation will meet all other applicable environmental protection regulations.

Service roads (20 ft. width) and transmission pipelines (adjacent to service roads in a 10-ft. corridor) will be constructed between wells and power plants.

Successful exploration wells would be shut-in after completion and testing if there is no immediate market for the resource.

Drilling of development wells will occur concurrently with the ability of the electric utilities to replace oil generated electricity with geothermal generated electricity. As a general rule, each development well will be drilled within 2000 feet of wells that have intersected reservoirs with economically producible resources.

The primary access road into the GRS and project area will be via State Road 130 to Pahoa By-Pass, North of Pahoa, to South Road and then to Middle Road in the Kaohe Homesteads (Figure 5). From the boundary of the State land, the access road would proceed to E/D "A" to the first drill site north of the center line of the rift zone.

A secondary access road planned via State Road 130 to a county road approximately 3 miles south of Pahoa leading to the cinder pit

south of Iilewa Crater. From the end of the county road, the access road into the State agricultural parcel (TMK 1-2-10:1) would proceed through AMFAC land (TMK 1-3-01:07), subject to granting of an easement to E/D area "B" on the south of the center line of the rift zone. An emergency exit road to the south from the center of the GRS (E/D Area "D") is planned for the route shown connecting with the western end of the county road leading to Route 130.

D. PROJECT SCHEDULE

The preceding development plan is presently planned to be accomplished over an eight to ten-year period as shown in Figure 6. Figure 6A shows the most optimistic geothermal development schedule for Hawaii County. For planning purposes it has been assumed that initial drilling operations in E/D area "A" will begin on July 1, 1986. Assuming that all permits are obtained in a timely manner, that drilling operations proceed in an orderly fashion and that one out of four wells is not producible, all drilling and well testing operations will be complete around July 30, 1993. The first 12.5 MW of power should be on-line around March 1, 1989 and the final 75 MW should be on-line during 1995.

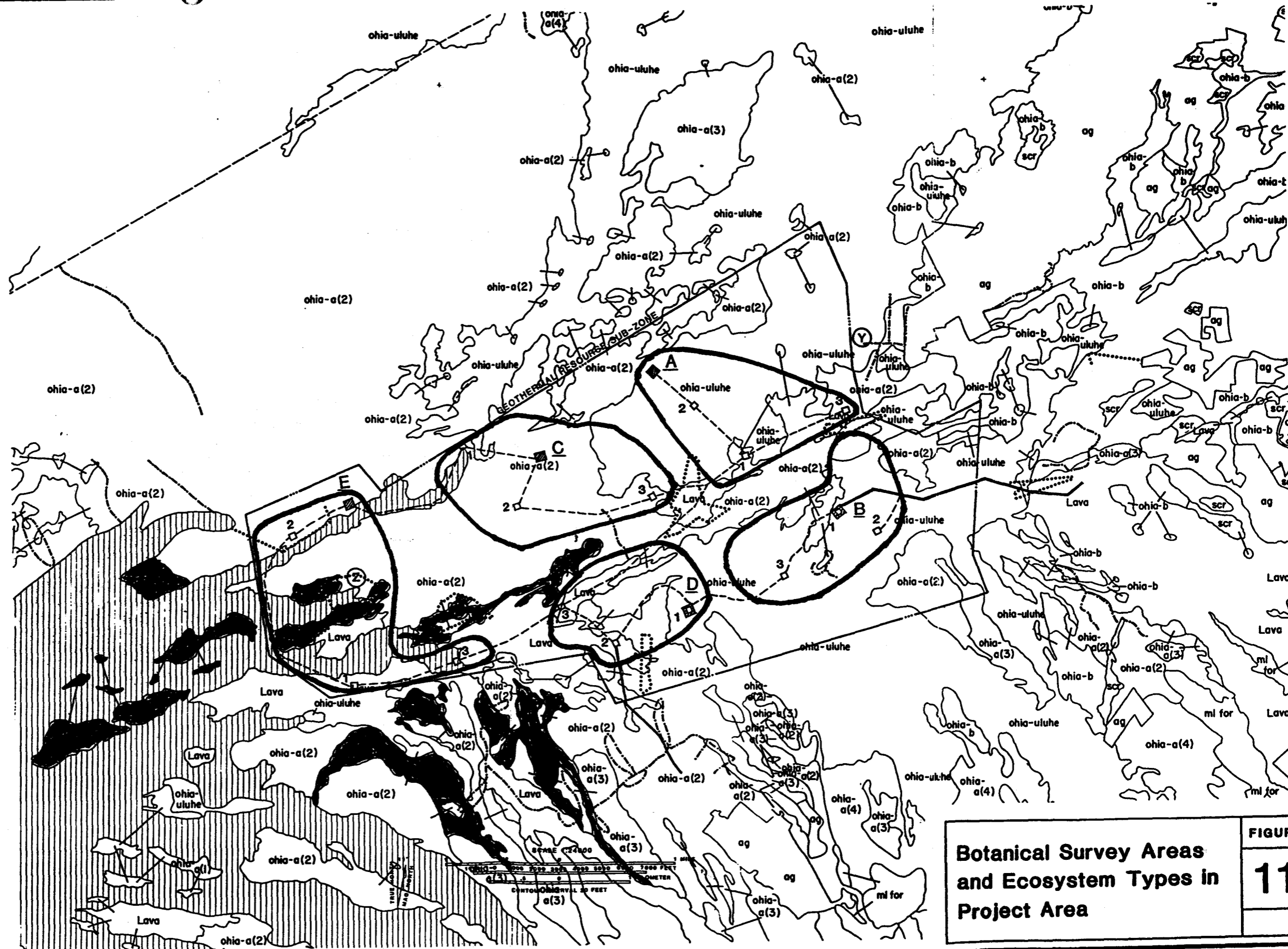
The development schedule (Figure 6) is based on the following assumptions:

- 1) A land use permit is issued to authorize the development of up to 100 MW of geothermal generated electrical power.
- 2) The initial exploration and development drilling will supply

LEGEND

- Geothermal Resources Subzone study area
 - survey route (this study)
 - Char & Lamoureux (1985) transect route
 - ||||| Pu'o O'o flows
 - Lava**
lava flows with pioneer vegetation
 - ohia-uluhe 'ohi'a-uluhe woodland
 - ohia-a(1) wet 'ohi'a forest with native species
 - ohia-a(2) wet 'ohi'a forest with native species and exotic shrubs
 - ohia-a(3) 'ohi'a-kukui forest with mixed native and exotic shrubs
 - ohia-b 'ohi'a forest with exotic subcanopy and shrub layers
 - (A-E)** Planned exploration/dev. area
 - ▨ Power plants (5 - 8 acres)
 - Drilling sites (2 - 3 acres)
 - Access roads
 - - - Maintenance/service roads
 - Emergency exit road
 - (X) Approximate location of *Adenophorus periens* sighting by USFWS Forest Bird Survey
 - (Y) Location of *Cyanea tritomantha* (outside of designated subzone)
 - (Z) Locations of large concentrations of *Bobea timonoides*. Scattered trees occur elsewhere in ohia a(2) forests.
- Tetraplasandra hawaiiensis* is very widespread throughout the subzone and surrounding areas usually occurring as scattered individuals or small groups of trees.

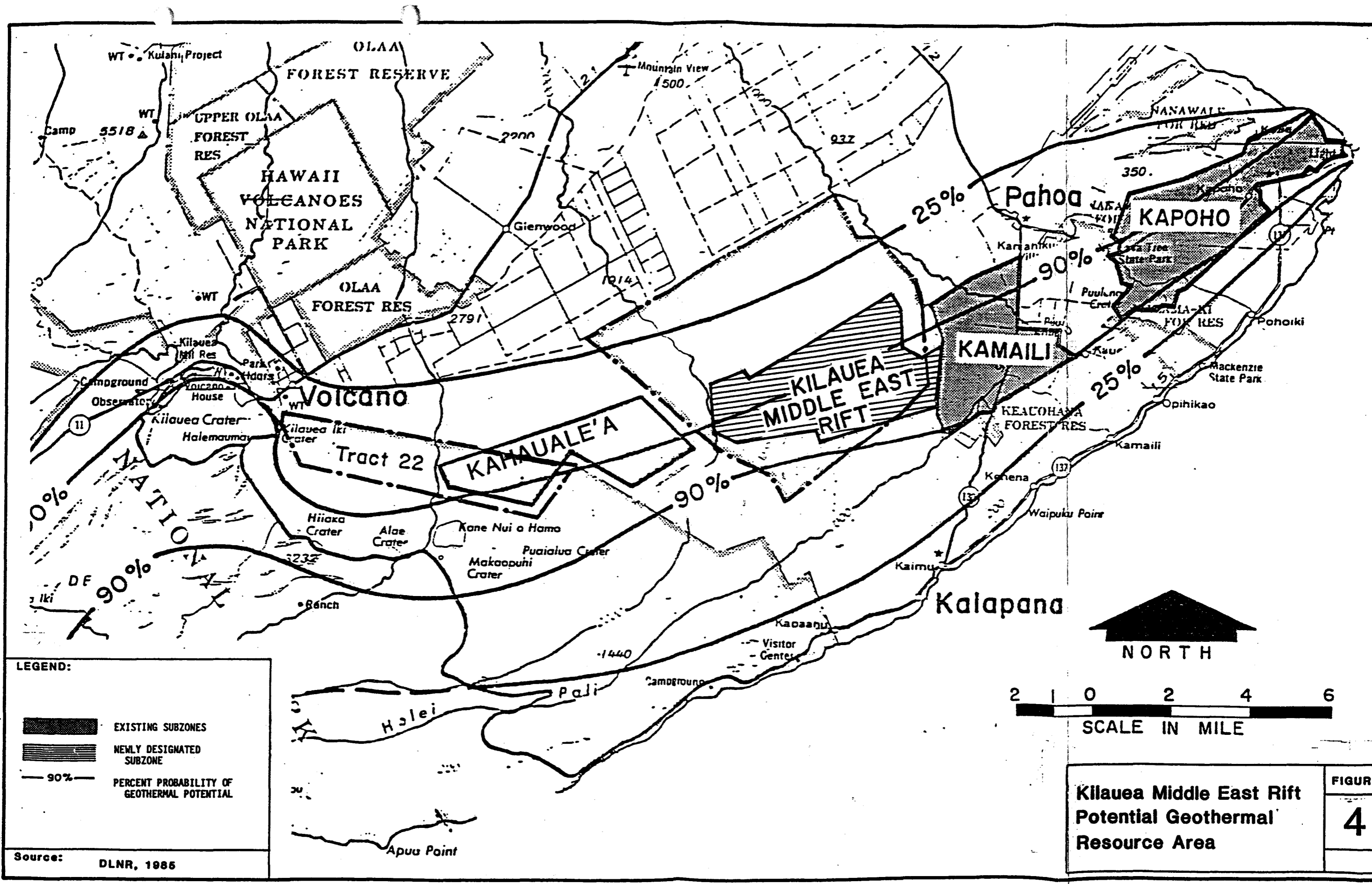
Source:
CHAR & LAMOUREUX, 1985b



Botanical Survey Areas and Ecosystem Types in Project Area

FIGURE 11

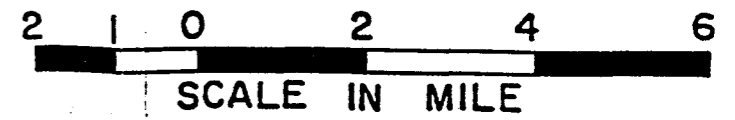
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Final Supplemental Et
February 1986*



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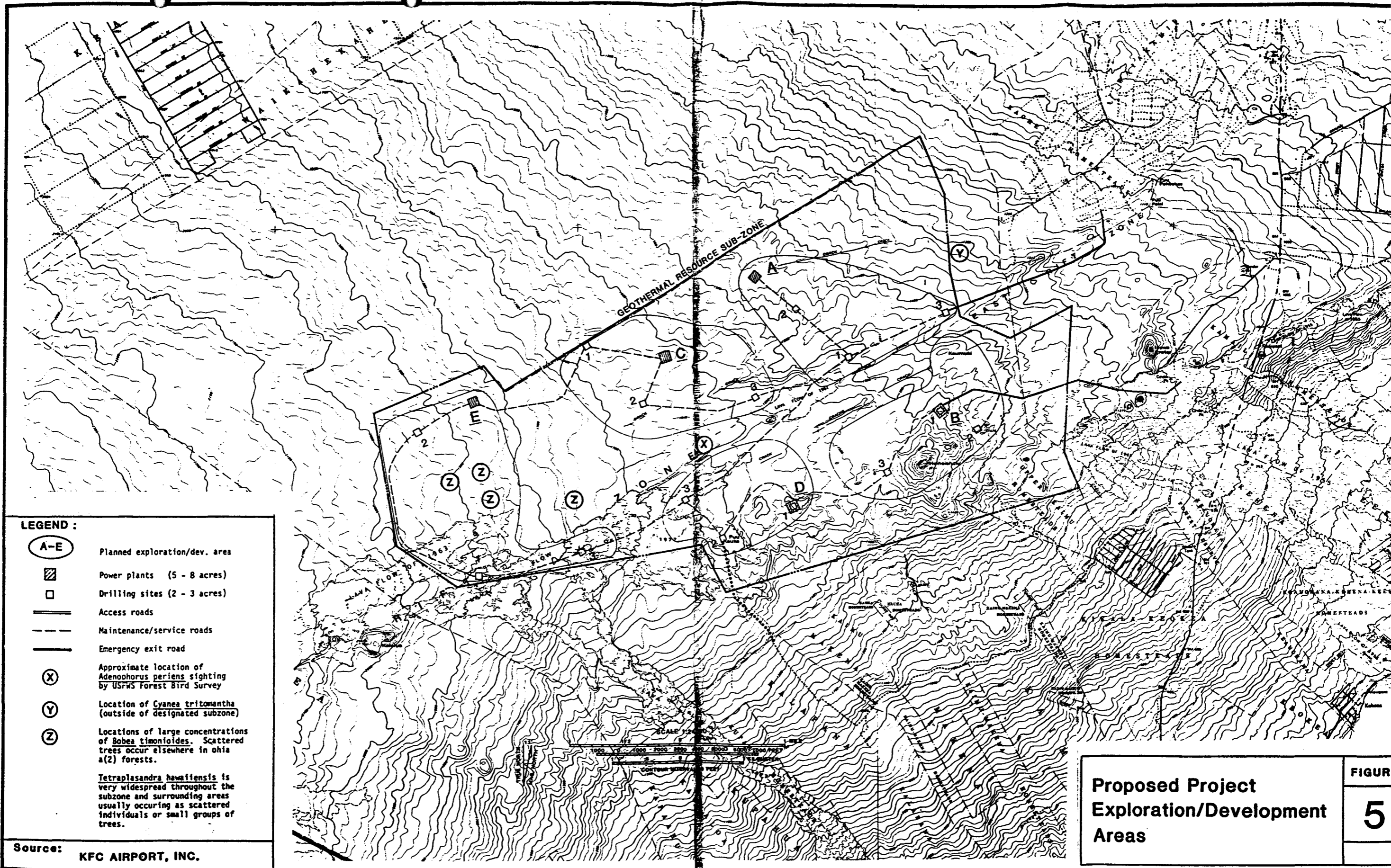
- EXISTING SUBZONES
- NEWLY DESIGNATED SUBZONE
- 90% PERCENT PROBABILITY OF GEOTHERMAL POTENTIAL

Source: DLNR, 1985



**Kilauea Middle East Rift
Potential Geothermal
Resource Area**

**FIGURE
4**



**Proposed Project
Exploration/Development
Areas**

**FIGURE
5**