University of Hawaii at Manoa
Hawaii Institute of Geophysics

MEMORANDUM

October 22, 1984

MEMO TO: Manabu Tagomori

FROM: Donald Thomas

SUBJECT: Testimony by J. Iovanitti re: Bishop Estate Lease

Review of Mr. Iovanitti's written testimony and attachments indicates that the data offered is virtually identical to that presented by Mr. Iovanitti to the Technical Committee earlier this year. The opinion of the Technical Committee with regard to Mr. Iovanitti's interpretation at that time was that it was at strong variance with accepted models of the rift zone and that the data used did not support Mr. Iovanitti's conclusions to such a degree that it invalidated the accepted models.

The data submitted more recently by Mr. Iovanitti still does not support a model that finds substantial temperatures associated with the coastal flank of the Kilauea East Rift Zone and hence a change in the proposed subzone in that area is not believed to be warranted.

DT:ctk

RATIONALE FOR SUBZONE BOUNDARY AT 90% RESOURCE LINE
(excluding lower part of Bishop Property)

The 90% resource potential line was established by the Geothermal Resource Technical Committee after an extensive evaluation of geological, geophysical, and geochemical data.

Subsequently, additional information has been brought forth, some at the recent Kahaualea contested case hearing.

--Interpretation of available geologic data suggests that the rift has migrated southward to its present active location. This active rift location is presently situated in the 90% geothermal resource potential area.

--Due to the southward migration, a trailing residual heat source is thought to exist to the north of the 90% geothermal resource area.

--The area to the south of the southward moving (extremely slow) rift zone is not believed to have a similar residual heat source.

--The geothermal heat source is much broader in the northward direction and stops more sharply in the southward direction than would be indicated by surface expressions.

--Therefore, the above suggests that the resource potential exists between the 90% and 25% line to the north and that the 25% line to the south might be moved northward. In the absence of further information, the available information suggests that the resource potential may drop sharply to the south of the 90% resource potential area.

--Additionally, there is no need to extend the geothermal subzone into a doubtful (as indicated above)>25% resource potential area when ample area for geothermal development exists in the immediately adjacent 90% resource area to the north. >25% resource areas have been subzoned on Maui and are proposed in Kilauea's SW rift zone because these areas do not offer a more viable resource in the immediate area. (note: There are no 90% resource areas on Maui. The 90% resource in the Kilauea SW rift zone is almost entirely within the Hawaii Volcanoes National Park.)

Source: Dr. Don Thomas and others.

Kilauea Southwest - Joe

KILAUEA SOUTHWEST RIFT ZONE
GEOTHERMAL RESOURCE ASSESSMENT

The geothermal potential for the Kilauea Southwest Rift zone was evaluated by the Technical Committee on the basis of available geophysical data from surveys conducted during the last two decades. Resistivity and ground water temperature anomalies have been identified; the former on both the upper and lower rift areas and the latter in areas of steaming ground on the upper and middle rift and in a coastal spring adjacent to the lower rift. Self potential data also indicates the presence of thermal activity on the upper rift and recent intrusions of magma into the upper and middle rift support the presence of at least an ephemeral thermal resource. Aeromagnetic data, however, do not show a significant curie temperature anomaly associated with the rift zone suggesting a much more limited resource than is present on the East Rift Zone. The absence of a significant offshore extension of this rift would also indicate far less magmatic intrusion into the land based portion of the rift.

The overall assessment of the probability for a resource on the Kilauea Southwest Rift therefore, is that a geothermal resource has a very high probability (greater than 90%) in the upper, more active portion of the rift but that this probability gradually declines toward the lower extension of the rift zone. (At the present time no additional data has been presented since the completion of the original assessment by the technical team that would indicate that the 90% resource line should be relocated.)

Kilauea Southwest Rift Zone Geothermal Resource Assessment

Kilauea Southwest Rift Zone

The geothermal potential for the Kilauea Southwest Rift Zone was evaluated by the technical committee on the basis of available geophysical data from surveys conducted during the last two decades. Resistivity and groundwater temperature anomalies have been identified; the former on both the upper and lower rift areas and the latter in a coastal spring adjacent to the lower rift. Self potential data also indicates the presence of thermal activity on the upper rift and recent intrusions of magma into the upper and middle rift ~~suggest~~ support the presence of at least an ephemeral thermal resource. Aeromagnetic data, however, do not show a significant curie temperature anomaly associated with the rift zone suggesting a much more limited resource than is present on the East Rift Zone. The absence of a significant offshore extension of this rift would also indicate far less magmatic intrusion into the land based portion of the rift.

The overall assessment of the probability for a resource on the Kilauea East Rift Zone, therefore, is that a geothermal resource has a very high probability (70% in the upper, more active portion of the rift but that this probability gradually declines toward the lower extension of the rift zone. (At the present time no additional data has been presented ~~that suggest~~ since the completion of the original assessment by the technical team that would indicate that the 70% resource line should be relocated).

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Kilauea Middle East Rift Zone Geothermal Resource Assessment

(Supplemental Discussion of Kilauea Middle Rift Zone)

The technical committee evaluated the resource potential of the Kilauea East Rift Zone ~~on the basis of geophy~~ using available geophysical, geochemical and geological data. The ~~discussion~~ evaluation of this data indicated that the ~~East Rift~~ potential for a geothermal resource on this ~~East~~ rift zone was (>90%) through its entire length. This finding was based on the following data: extensive ~~activity~~ eruptive and intrusive activity along the entire length of the rift during the last millenium; an aeromagnetic anomaly associated with the rift ~~iden~~ showing that temperatures in excess of 500°C were present at shallow depths in the rift; resistivity anomalies indicating shallow high temperature ground water; the presence of high temperature shallow wells within and adjacent to the rift; and productive deep geothermal wells. The evaluation of the rift zone suggested a >90% probability for a resource along the presently visible trace of the rift with a gradual decline

decline in probability out to the extent of the aeromagnetic anomaly. Oral and written testimony subsequent to the the completion of the technical committee's assessment brought out the following additional considerations: 1) ~~The aeromagnetic data~~ An interpretation of the aeromagnetic data by one of the technical committee members suggested that curie temperatures (>~500°C) may be present at depths of 2-3 kilometers out to the limits of the 25% probability line originally drawn; 2) An interpretation of the available geologic and gravity data suggests ~~a new low~~ that the rift zone has migrated northward to its present active location and is much broader ~~than~~ in the northward direction than the present surface expression. These interpretations would therefore suggest that a high resource potential exists between the 90% and 25% lines originally drawn and that the 25% line might be moved northward; in the absence of further drilling data ~~that~~ in this area however, such a modification may not

be justified. An assessment of the resource potential south of the surface expression of the rift zone ~~would initiate~~ based on this latter interpretation suggests that the resource potential declines much more rapidly below the lower 90% line and may reach a 25% probability above the current ~~this~~ 25% line. This is substantiated to some degree by deep drilling and production data from other wells in the lower rift where deep wells have reportedly encountered lower temperatures and permeabilities than those in the rift. Production of fluids in the HGP-A well also indicates that lower temperature water is intruding into ~~the~~ one of the production aquifers suggesting relatively lower temperature fluids near the well bore.

Therefore, the present assessment of the resource potential for the middle rift zone is that a 90% probability for a reservoir exists within the current surface expression and that the potential tapers off gradually toward the north

but much more sharply to the south of the 90° zone.

Supplemental Discussion of Kilauea Middle Rift Zone

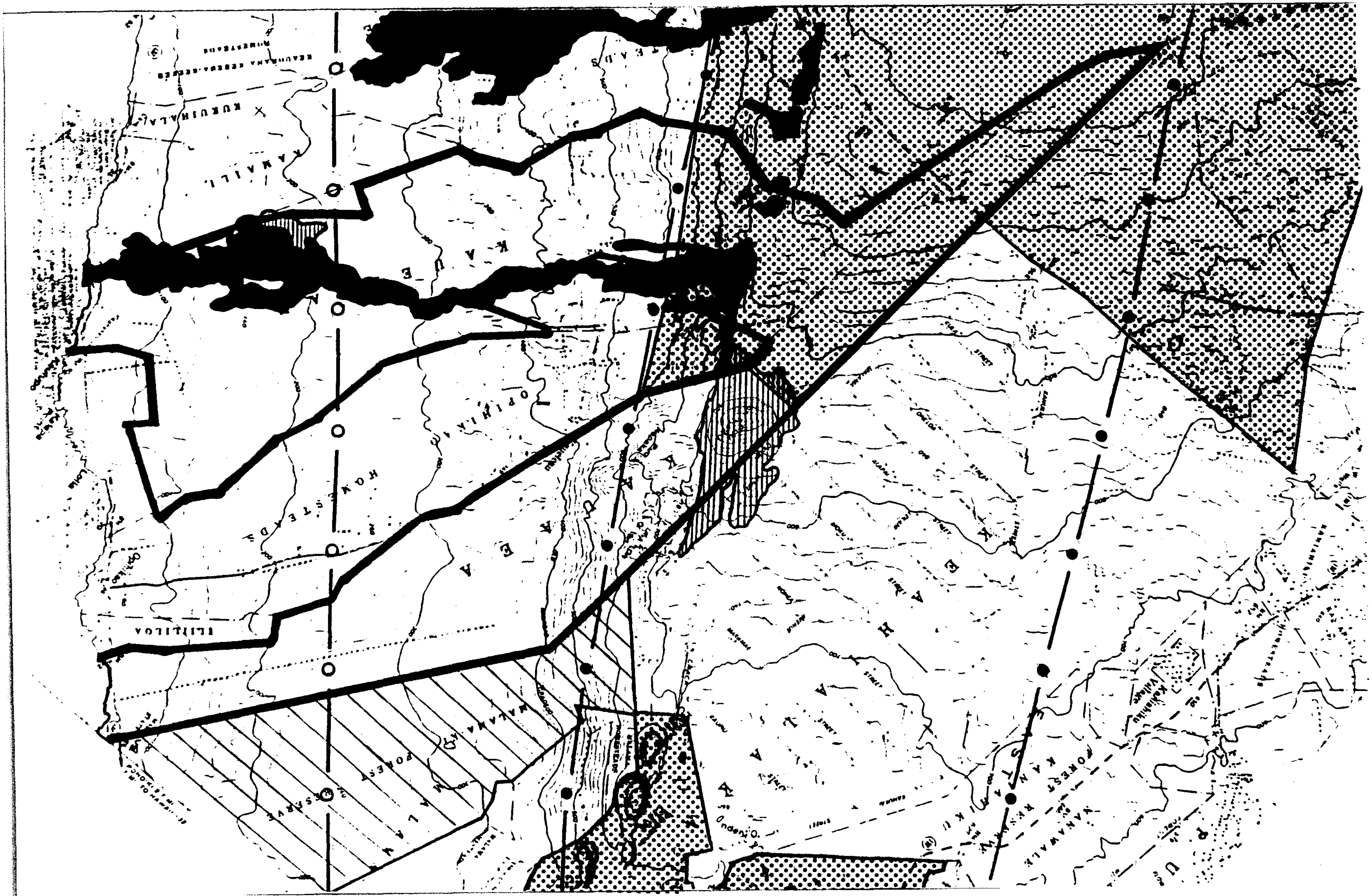
The Technical Committee evaluated the resource potential of the Kilauea East Rift Zone using available geophysical, geochemical and geological data. The evaluation of this data indicated that the potential for a geothermal resource on this rift zone was greater than 90% through its entire length. This finding was based on the following data: extensive eruption and intensive activity along the entire length of the rift during the last millenium; an aeromagnetic anomaly associated with the rift showing that temperatures in excess of 500°C were present at shallow depths in the rift; resistivity anomalies indicating shallow high temperature ground water; the presence of high temperature shallow wells within and adjacent to the rift; and productive deep geothermal wells. The evaluation of the rift zone suggested a greater than 90% probability for a resource along the presently visible trace of the rift with a gradual decline in probability out to the extent of the aenomagnetic anomaly. Oral and written testimony subsequent to the completion of the technical committee's assessment brought out the following additional considerations:

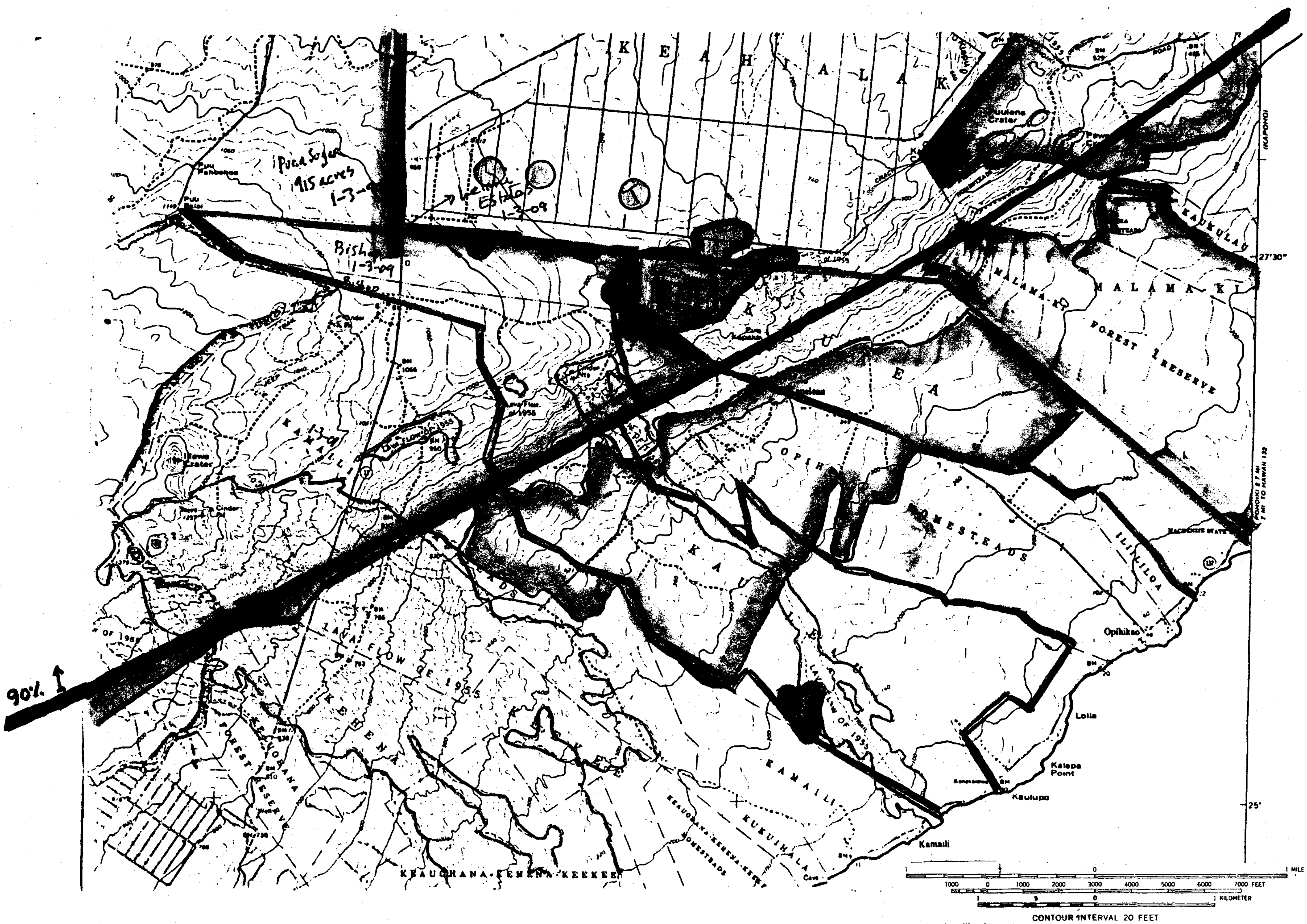
(1) An interpretation of the aeromagnetic data by one of the technical committee members suggested that Curie temperatures (greater than 500°C) may be present at depths of 2-3 kilometers out to the limits of the 25% probability line originally drawn.

(2) An interpretation of the available geologic and gravity data suggests that the rift zone has migrated southward to its present active location and is much broader in the northward direction than the present surface expression.

These interpretations would therefore suggest that a high resource potential exists between the 90% and 25% lines originally drawn and that the 25% line might be moved northward; in the absence of further drilling data in this area; however, such a modification may not be justified. An assessment of the resource potential south of the

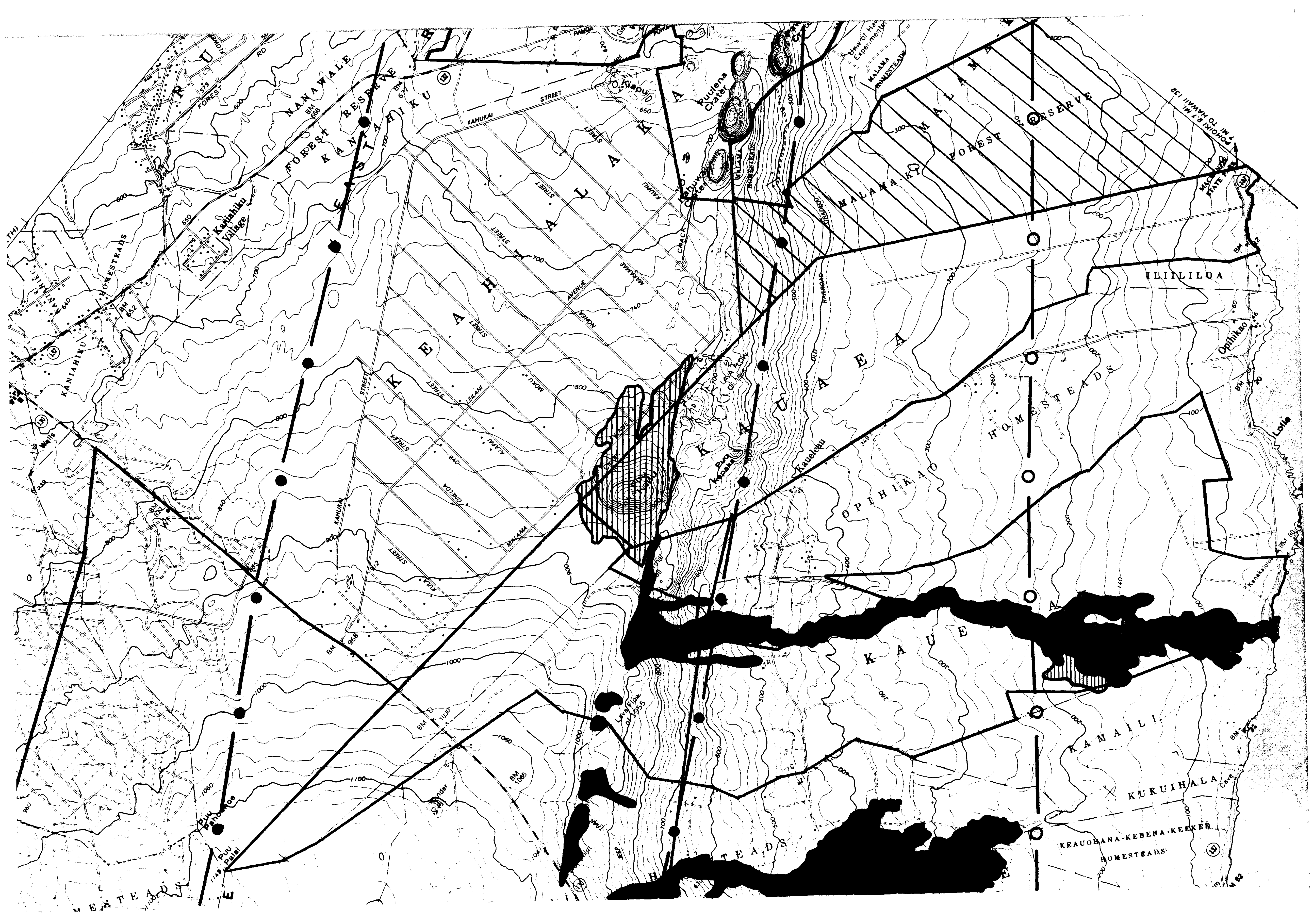
surface expression of the rift zone based on the latter interpretation suggests that the resource potential declines much more rapidly below the lower 90% line and may reach a 25% probability above the current 25% line. This is substantiated to some degree by deep drilling and production data from other wells in the lower rift where deep wells have repeatedly encountered lower temperatures and permeabilitities than those on the rift. Production of fluids in the HGP-A well also indicates that lower temperature water is intruding into one of the production aquifers suggesting relatively lower temperature fluids near the well here. Therefore, the present assessment of the resource potential for the middle rift zone is that a 90% probability for a resource exists within the current surface expression and that the potential tapers off gradually toward the north but much more sharply to the south of the 90% zone.





90% Probability High Temp. Geothermal Resource
GRS boundary
Agricultural & grazing area

Native Ohia Forest
Forest Reserve Area
Community Area
Bishop Estate Property



NANAWALE
FOREST RESERVE
KANIAHIKU
Kaniahiku Village
HOMESTEADS
KAHUKAI STREET
AVENUE
Puulena Crater
MALAMA-KI FOREST RESERVE
MALAMA HOMESTEADS
ILIILILOA
Opihikao
OPIHIKAO
HOMESTEADS
Kaueleau
Lava Flow of 1955
KAMAILI
KUKUIHALA
KEAUOHANA-KEHENA-KEEKEE
HOMESTEADS
Puu Pahoehoe
Puu Palai