An Archaeological Reconnaissance Survey in the Geothermal Resource Subzone of Upper Kaimu, Makuu, Kaohe, Kehena, Kaapahu and Kamaili, Puna. Hawaii

by

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prepared for

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INTRODUCTION

As on previous occasions over the past three years, I was again contacted late in 1989 by Mr. Rod Moss of True Mid-Pacific Geothermal, Inc. He asked if I would carry out an additional archaeological survey for access roads and drilling sites for the proposed exploratory wells 2 and 3. As with well 1 they are on property of the Estate of James Campbell in the Puna District on the island of Hawaii. Since I had already surveyed within the general region for True Mid-Pacific, as well as for the Natural Energy Institute of the University of Hawaii, I perceived an acquaintanceship with the area and its terrain as positive preparation for additional research. I therefore agreed to take on this new project.

Mr. Nobuchika Santo of Island Survey, Inc. again provided helpful assistance. Prior to our going into the field he passed information on the location of dangerous volcanic fissures and other advice and counsel based on the field experience of his survey crew. He also provided us with the necessary map data that resulted from his field work. Not only was this information of great prior service to us, but later, while in the field, we were able to very easily locate the centerline stakes for the access roads and the boundary stakes for the drilling sites. In turn, our transects were accordingly determined and this had the precise and reassuring affect of providing us with the knowledge that we were where we shound be at all times. If it were not for the dense forest cover of the project area this need not have been a problem. However, the region is covered with a very heavy vegetation screen that obscures natural landmarks. Hence, Mr. Santo's survey cut and centerline stakes were all that provided us with a good locational base that kept us from going astray.

In early December, 1989 the field exploration was carried out by myself with the assistance of my son, Ken.

AREA

The area examined and reported on in this document is in the Puna District of the island of Hawaii (See Figure 1). More precisely it is found in the *mauka* portions of the *ahupua'a* of Kaimu and Makena, on property of the Estate of James Campbell. The study area may be additionally identified as being listed under Tax Map Key: 1-2-10:3. Specifically, this project was concerned with the proposed connecting access roadways linking the True Mid-Pacific well site 1 with the proposed well site 2 and 3 (See Figure 2). Both well sites 2 and 3 consist of rectangular-shaped sections of land, roughly five acres in size. One is to the northwest and the other to the west of the existing drilling rig located at well site 1. Almost 2306 feet (297m) seperates a point at the intersection of the present access road and well site 1 from well site 2 (See Figure 3), and 4710½ feet (1427m) links the same point with well site 3 (See Figure 4).

This archaeological project area is entirely within the Wao Kele O Puna Natural Area Reserve, the Geothermal Reserve Subzone, and the Geothermal Development Area. It clearly sits atop the east rift zone of Kilauea volcano, just north of the point of eruption and lava flow of 1961. The survey was conducted between a low elevation of approximately 1480 feet (449m) to a high of about 1540 feet (467m) above sea level.

The region is dominated by soil covered *'a'ā* and *pahoehoe*. Two soil types may be identified, the Kiloa and the Keei (Sato, et al, 1973). Most of the tract along the rift zone, including the study area, is included within the Kiloa series (rKXD). This is marked by an extremely stony muck, up to 10 inches in depth, atop a base of fragmental *'a'ā* lava. Surface slope is generally between 6 and 20 percent and the soil is generally well-drained, thin, stony, and organic in make-up. The adjacent expanse of forest is included in the Keei soil series (rKGD). These soils are noted as "well-drained, thin, organic soils overlaying *pahoehoe* lava bedrock. They are gently sloping to moderately steep soils" (Ibid., p. 27) with rock outcrops scattered over 25 to 50 percent of the ground surface. Only farther to the south, and some distance from the present project area, do we see *pahoehoe* lava (rLW) dominating the ground surface. This is noted for a strip of terrain that includes Puu Kauka and Heiheiahulu. Soil erosion is generally slight within the study area, what with the good soil permeability and the heavy vegetative cover.

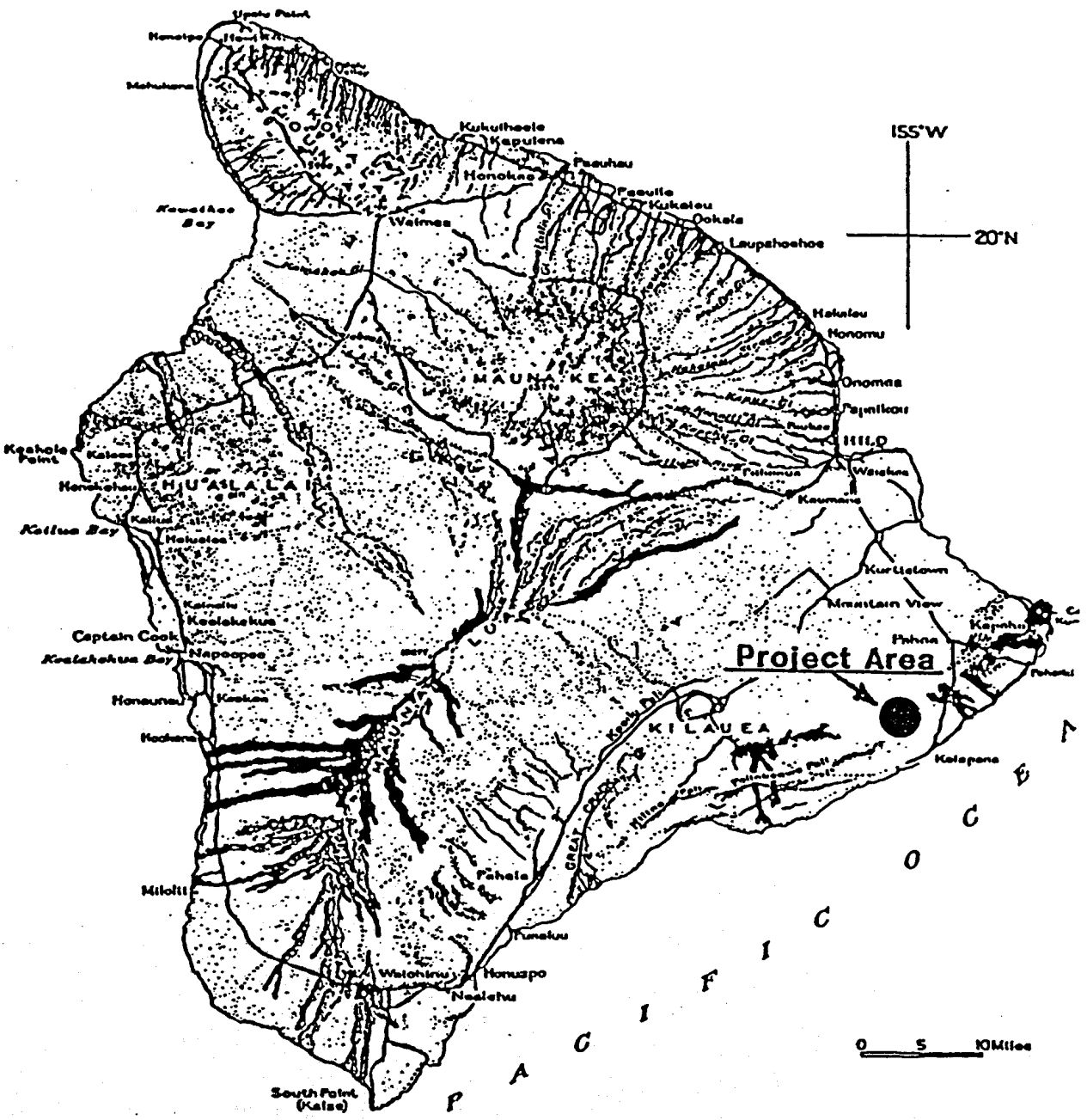


Figure 1. Project Area Map

(From Macdonald and Abbott 1970: 288)

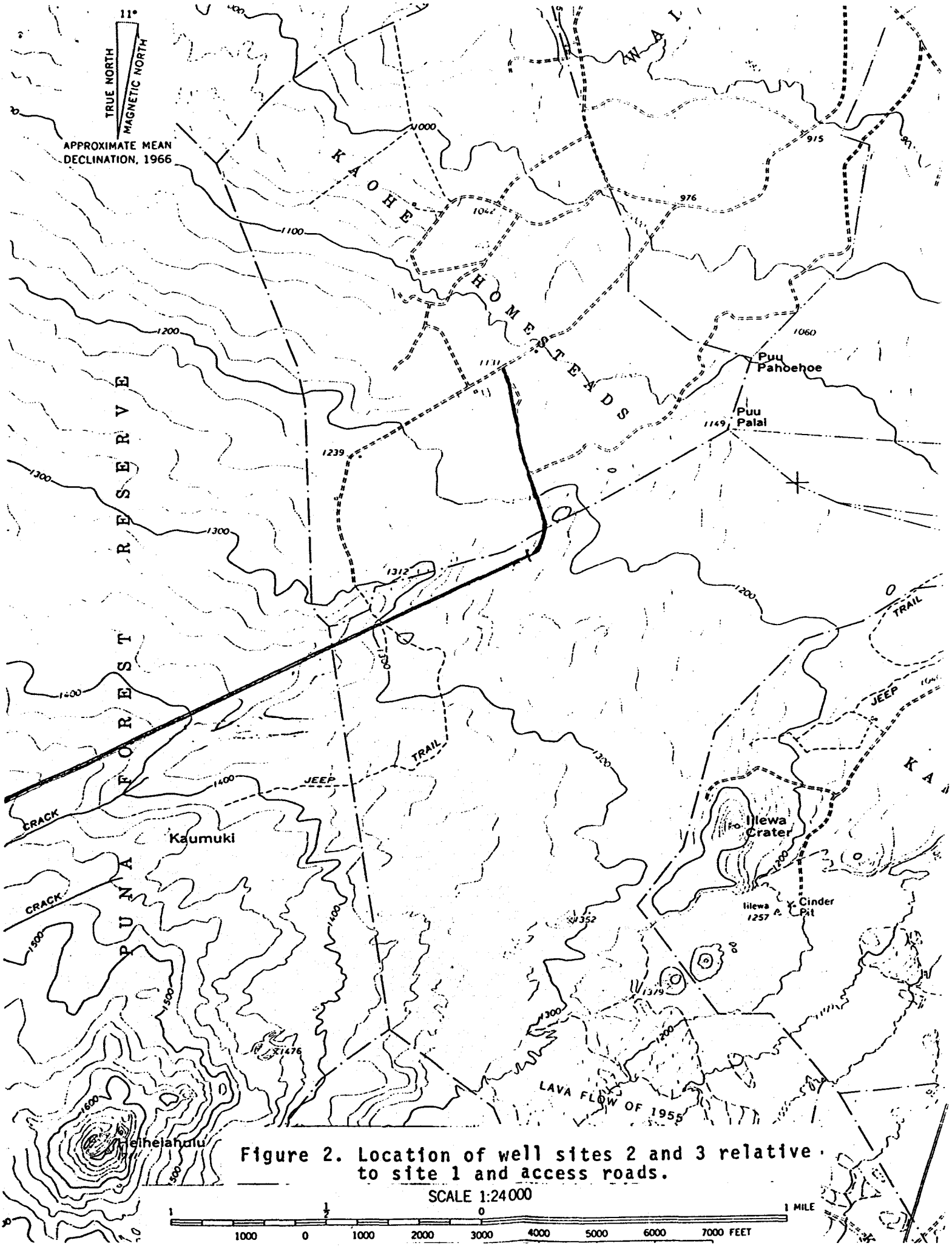
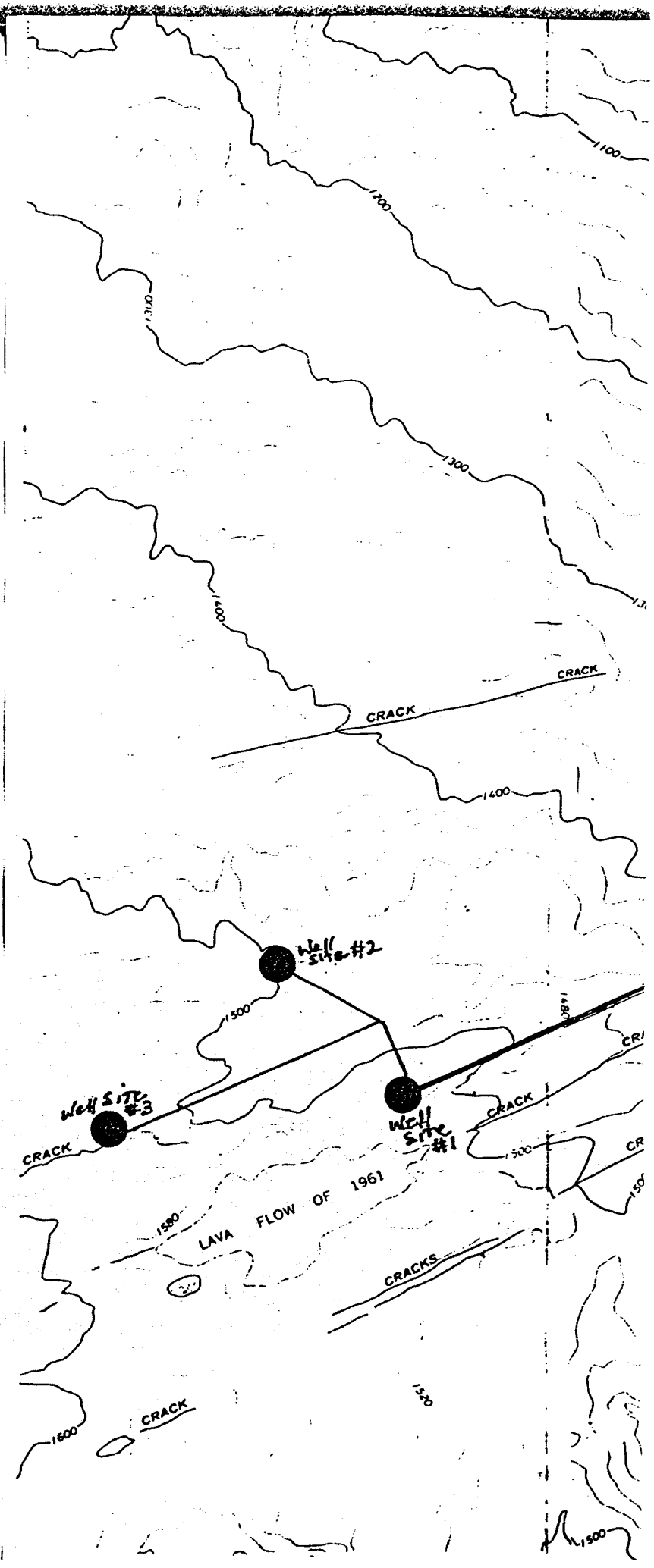


Figure 2. Location of well sites 2 and 3 relative to site 1 and access roads.


1100
1200
1300
1400
1500
1600
CRACK
CRACK
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CRACKS
Well Site #2
Well Site #3
Well Site #1
LAVA FLOW OF 1961

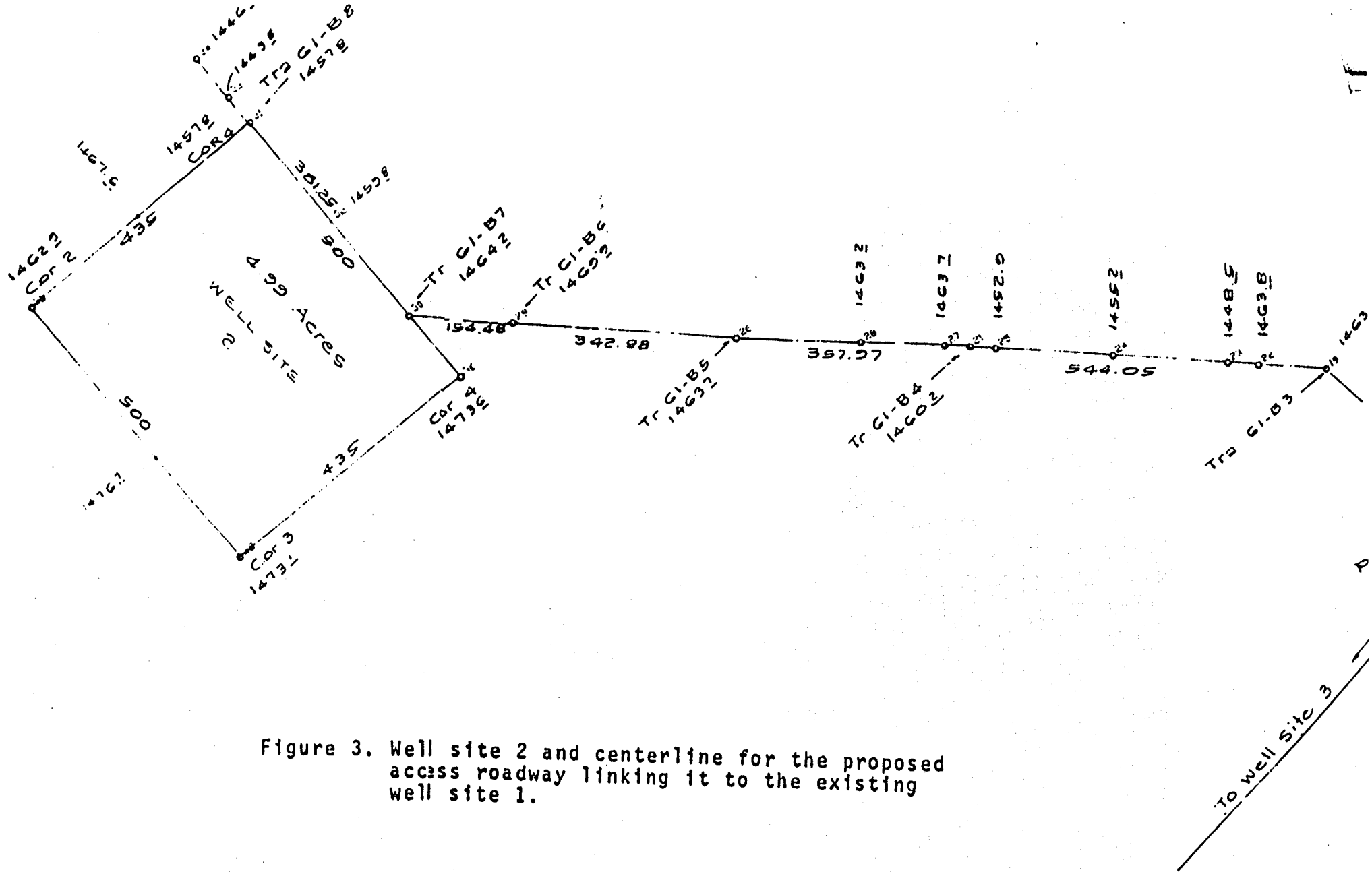


Figure 3. Well site 2 and centerline for the proposed access roadway linking it to the existing well site 1.

TRUE NORTH
SCALE: 1" = 200'
KENYON
Catchment
Tr C1-B-2
Tr C1-B
WELL SITE
1
Existing
500.0
1463.5
1463.5
Tr G1-B2
210.46
1457.3
1459.2

TRUE NORTH
SCALE 1" = 200'

TO well site 2

1436.2
1495.1
1480.2
1478.2
1478.2
1466.2
1462.4
1460.0
1460.5
1457.3

Tr G1-I
1499.0
Fissure

289.58

Tr G1-H
1496.4

242.04

Tr G1-G
1483.6

401.43

Tr G1-F
1479.4

232.16

Tr G1-E
1473.3

740.22

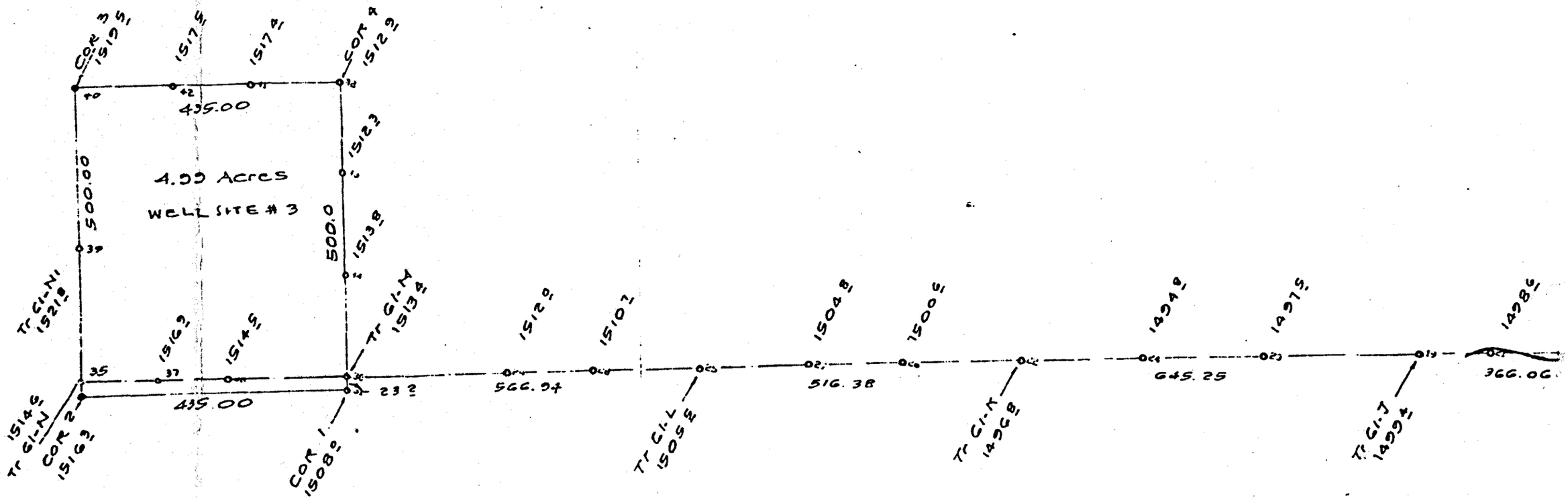
Tr G1-D

210.46

Tr G1-B.2
1462.6

Existing
WELL SITE
1

Roadway



Note:
Location of fissures approximate

Figure 4. Well site 3 and centerline for the propos access roadway linking it to the existing well site 1.

As with previous surveys undertaken nearby, we found the area extremely rugged, with numerous deep cracks or fissures, crevices, vent lines, and tree molds along and adjacent to the survey corridor. A thick forest covering of upland vegetation is everywhere within the region examined. *'Ohi'a* and ferns of many varieties cover the ground to a point that archaeological examination is especially difficult. Visual inspection is limited to but a few feet, never more than 20± feet, and usually closer to 5 or 10 feet. Quite often *uluhe* and *'ie'ie* form such an embranglement that it is not only impossible to see through this vegetative mass, but likewise, movement is abruply arrested. *Hapu'u* were encounted everywhere during the field investigation. These tree ferns sometimes reach a height of 30 to 40 feet (91.5 - 122m) and together with the *'ohi'a* form the upper canopy of the forest. *'Ohi'a* also reaches massive proportions here and there. We noticed some, 1 to 1.1 meters (3 - 3.7 feet) in diameter, laded with vines of the *'ie'ie* and *uluhe*, extending perhaps 60 to 65 feet (183 - 198m) skyward. A good amount of the sunlight is filtered by the tall vegetation so that only limited areas near the ground receive sunshine. Here we sometimes see the common guava (Psidium guajava), as well as the *waiawī*, grasses, *'ākala*, *uluhe*, *kīlau*, and wild orchids, to name the more commonly encountered vegetation of these sunlit patches. The *waiawī* often grows rapidly in these sunny spots, with tall, thin, linear trunks, created by competition for sunlight as the canopy grows upward. As these trees grow they can become draped with vines and *uluhe* and eventually they join with the forest canopy, thereby aiding in the diminishment of the very energy source that gave it its spurt of growth.

A few examples of *awapuhi* were noted and here also, in the darker portions of the forest, the ground was sometimes moss covered. In addition to those ferns already mentioned, a number of various species of ground ferns were encountered. In the trees, bird's-nest ferns were not uncommonly seen. Here and there we came across the *kī* plant. It was not common, but present. We were especially aware of it in the vicinity of the large fissure that parallels the corridor to well site 3. Elsewhere it was more often seen through examples of single plants.

We were somewhat surprised to find the absence of

maile during this survey. This is not to say it is not present here, rather that we did not encounter any as we had on our previous examinations of adjacent areas.

Rainfall is fairly high in the region, although no records are present for anywhere near the project area. If one were to extrapolate we may well find an annual rainfall pattern of somewhere between 150 and 200 inches. Temperature is fairly cool because of the elevation, but humidity tends to be high. There also is a pattern of frequent cloud cover, fog and mist.

Figure 5. View westward along centerline of proposed road to well site 2. Photo taken east of Tr 61-B4 and west of the ground surface fault.

METHODOLOGY AND FINDINGS

This report is based on field data obtained through a procedure identified as a reconnaissance survey. Quite often, although not always, this is the initial or preliminary archaeological examination. It normally includes visual examination and recording of data while walking over the project area. Note taking and/or tape recording of data, illustrations through photographs and/or drawings and maps, and recommendations as to archaeological significance of the area or portions of it, are always part of the survey. Further archaeological work, if any, must find its basis for being in the original reconnaissance survey, and recommendations toward this end are generally part of the survey report.

In the case of this project, the ground examination was carried out by myself with the assistance of my son, Ken. On four different occasions we were in the project area, with close to a total of 68 man hours expended in field work.

Prior to the pursuit of field activity we acquired copies of maps based on the work accomplished by Mr. Santo and his survey crew. They had already cut the road survey lines of sight through the rainforest to both well sites 2 and 3 (See Figures 3 and 4). Centerline stakes were present along the proposed access roadway and at all four corners of the well sites.

In addition to the minimum requirements for a reconnaissance survey set forth by the Society for Hawaiian Archaeology, two other documents formed the basis for guidance and direction for the present project. The State of Hawaii's Land Board decision of April 11, 1986 set requirements for the investigation as it did in my previous work (See Bonk, 1988). Four specific items were set forth as requirements in that document (See Appendix A). The first of these specific items refers to the SHA standards for archaeological reconnaissance surveys. The second includes reference to the specific areas to be surveyed, that is a project area is defined (access corridors, drill sites, power plant sites. etc.). The third is concerned with the amount of coverage. Specifically, this set the designation of an area "two to five times larger" than the actual road corridor, drill site, etc.In this report reference is made to a buffer zone or area added to the actual road corridor or well site. This attempts to take into account and thereby satisfy the "two to five" coverage

requirement. Lastly, a research design was called for that would serve as a guide for future work.

The research design for archaeological survey methods was completed in the summer of 1989 (See Appendix B). For the author of this report it served to set standards for two previous studies within the region (See Bonk, 1989a, 1989b, 1989c, 1989d and 1990) as it did for this work.

Our first day in the field was taken up with an examination of the road corridor that connects the existing well site 1 with the proposed well site 2 (See Figure 3). We followed the centerline survey cut through the forest to the point of its connection with the new well site. Along the way we encountered a slight fault between Tr 61-B3 and B4. As the centerline crosses this depression we, and the surveyors before us as well, were required to carefully descend the 15 to 20 feet that had been produced by this ground displacement.

In addition to this 0.4 mile transect along the centerline of the proposed road we covered a second transect approximately 30 to 40 feet north and roughly parallel to the first. A third transect, of about equal distance south of the centerline, completed the activities of the first day's work. This allowed coverage of a corridor strip 90 to 120 feet in width.

We next examined the 4.99 acre area proposed for well site 2. Firstly, we followed a transect along the perimeter of the site, again checking along the line cut through the forest by the surveyors. With this complete we then examined the area along a second transect about 30 to 40 feet distant from the boundary of well site 2. This transect, like the first, completely encircled the drill site and when finished provided a buffer zone surrounding the well site. The final work at well site 2 involved a series of east-west transects through the proposed well site. Fifteen such transects were carried out using intervals of approximately 30 to 40 feet.

After completion of our investigation of the proposed roadway corridor and well site 2 we transferred our attention to the corridor for well site 3. Starting at the intersection of the proposed roadways we proceeded westward following the centerline for the access road to well site 3 (See Figure 4). This corridor is close to

double the distance of the site 2 corridor and rife with added difficulties. Before we attained the halfway point we came across the area identified by a deep fissure (Ibid.). This was one of the most dangerous places to traverse and certainly the caution that was required of us had the effect of slowing down our foreward progress. Beyond the difficulty of movement and time we nevertheless were able within a day's time to complete the 0.835 mile centerline transect to the well site and the parallel transects to the north and south.

Finally, with the completion of the proposed roadway and buffer zone to the north and south we now moved our investigation to the one remaining area to be examined, well site 3 and a buffer zone around it. Our procedure here followed the same design used at well site 2. First the perimeter transect, then a second transect 30 to 40 feet away and enveloping the well site with a buffer zone, and lastly a series of 15 east-west transects through the 4.99 acres of the well site.

Figure 6. View eastward along centerline of proposed roadway to well site 2. Photograph taken east of Tr 61-B4 and west of fault.

Figure 7.

Photograph taken at the northwest corner of well site 2. View southward along the west border.

Figure 8.

Photograph taken at the northwest corner of well site 2. View eastward along the north border.

Previous archaeological fieldwork conducted by Paul H. Rosendahl, Ph.D., Inc. within the Geothermal Resource Subzone includes five transects to the northeast, southeast, and southwest of the area reported on in this report (Haun, et al, 1985). In only one of these areas examined, that of transect five, did field crews come across probable archaeological remains. This included five to six cairns and mounds on the southeast summit of Heiheiahulu, some 1.4 miles southeast of the nearest area covered in our fieldwork.

In nearby Kahauale'a a reconnaissance survey was conducted by Hommon (1982) without finding anything of archaeological significance. Here too Rosendahl (1985) undertook a more recent field examination and again found nothing of cultural value. Additionally, an addendum by Rosendahl to the previously mentioned report by Haun and others (1985) reports on the use of a helicopter to make a low level aerial reconnaissance of the proposed development area. He landed and added a sixth transect to Haun's work. This transect is about three and a half miles west of our study area. On this trip Rosendahl also landed to examine an area adjacent to Haun's transect five at Heiheiahulu.

Over the last three years the author of this report carried out three projects on land adjacent to that being reported on in this paper. In 1987 a reconnaissance survey was undertaken for True/Mid-Pacific Geothermal, Inc. along the access road corridor and at well site 1 (Bonk, 1988). Later, as a follow-up, archaeological monitoring was conducted after grubbing and clearing of the roadbed and well site was complete (Bonk, 1989a). About the same time another reconnaissance survey was conducted for the University of Hawaii's Natural Energy Institute in a small area on the south side of the road leading to True/Mid-Pacific's drill site. This survey was limited to an area of less than ¼ acre close to the Kaohe Homestead end of the roadway that terminates at the drill site 2.4 miles westward (Bonk, 1989b). In all of this work we found a marked absence of direct evidence supporting human cultural activity in the area.

When we examine other than archaeological data we find nothing of a specific reference to the study area. Holmes (1982) mentions the U.S. Exploring Expedition of 1840 following a trail south of and paralleling the east rift zone from near Kalalua crater to Kapoho. He also mentions that the forest zone of Kahauale'a was ex-

ploited for its birds and for wood gathering. In addition, we read that the uplands of Kupahua, Kapaahu, Kaimu, Makena, and Kalapana were extensively planted in aboriginal times (Handy and Handy, 1972).

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Field examination produced no direct evidence of human use or presence within the study area. Caves, burials, temorary or permanent habitation sites, trails, platforms, paving, stone alignments or walls, agricultural evidence supported by terraces, ground clearings or anything else suggesting horticultural use, or for that matter cultural indicators of any kind, were not seen during the field examination. However, this does not rule out former forest product exploitation within the area. But without some indication of human presence we can only speculate as to cultural exploitation.

As with my previous reports on work within the area I must again caution that this survey, although expanding on acreage examined, nevertheless does not forestall future examination in neighboring areas, nor should it do so. Again, the presence of *kī* and *'awapuhi* gives some support to the belief that we should find additional cultural use indicators within the Geothermal Resource Subzone. If, in the future, this proves to be the case it should more likely take place in the lower elevations and toward the southern portions of the Geothermal Resource Subzone. In my report of last year (1989b, p. 12) I suggested that *kī* and *'awa*, and we now have to add *'awapuhi*, "had multiple uses and were culturally important plants in the past and therefore their presence may well provide the beginning of cumulative evidence that will help us in furthering knowledge of prehistoric forest useage".

In summary, let me again state that no artifactual material was found during our survey of well sites 2 and 3 and for the roads providing access. However, the presence of nonartifactual but cultural useful plant life may well prove helpful as we have an opportunity to gain more data on forest products. Some changes in the native forest have taken place with the introduction of exotic plant life and the foraging of animal life. Wild boars and sows were common enough to be seen on a number of occasions and ground disturbance due to their predation was frequently noticed.

Finally, it must be said that the research design used as a guide for this project (State of Hawaii, DNLR, 1989) is generally a good one and was useful in preparing for and in the carrying out of the field work and in the writing of this report. I further see no additional benefit derived from further examination of the project area, I therefore recommend that ground surface alteration be allowed to proceed but with the further recommendation that archaeological monitoring of soil-covered areas again be carried out following grubbing and clearing.

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GLOSSARY OF HAWAIIAN WORDS

'ā'a	Lava, stony, rough clinker type.
'ākala	The thimbleberry (Rubus rosaefolius).
'awapuhi	Wild ginger (Zingiber zerumbet), found from India through Polynesia. The root was used to scent and dye *kapa*.
hapu'u	An endemic tree fern (Cibotium Sp.) common to many forests of Hawaii.
'ie'ie	An endemic woody, branching climber (Freycinetia arborea) growing luxuriantly in forests at altitudes of about 1500 feet.
kī	Ti, a woody plant, (Cordyline terminalis). Native use of the leaves was common.
kīlau	Bracken or brake (Pteridium aquilinum). A cosmopolitan, stiff, weedy fern,
kīpuka	A clear place in a lava field or flow. A place surrounded by lava where there may be vegetation.
maile	A native twining shrub (Alyxia olvine-formix) with shiny fragrant leaves used for decoration and leis.
mauka	Inland, upland, towards the mountain, uplands.
'ōhi'a	A tree (Metrosideros macropus, M. collins) famous in song and tale of Hawaii.
pahoehoe	Smooth, unbroken, type of lava. As contrasted with *'ā'a*.
uluhe	All Hawaiian species of false staghorn fern (Dicranopteris linearis).
waiawī	The yellow strawberry guava (Psidium cattleianum). A small tree from Brazil.