BENJAMIN J. CAYETANO
GOVERNOR

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
JERRY M. MATSUDA
GLENN M. OKIMOTO

RECEIVED
'96 FEB -6 A11 :13
OFC. OF ENVIRONMENTAL
QUALITY CONTROL

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

JAN 31 1996

IN REPLY REFER TO:

HWY-PA
2.8877

TO: GARY GILL, DIRECTOR
OFFICE OF ENVIRONMENTAL QUALITY CONTROL

FROM: KAZU HAYASHIDA
DIRECTOR OF TRANSPORTATION

SUBJECT: TRANSMITTAL OF NEGATIVE DECLARATION FOR KEAAU-PAHOA ROAD, KEAAU TOWN SECTION, PROJECT NO. 130B-01-92, TMKS: 3-1-6-03; 3, 5, 15, 20, 26, 68, AND 73 PUNA DISTRICT, ISLAND OF HAWAII

The Department of Transportation (DOT) has reviewed the comments received during the 30-day public comment period. The DOT has determined that this project will not have a significant environmental effect and has issued a negative declaration. Please publish this notice in the next OEQC Bulletin.

We have enclosed a completed OEQC Bulletin Publication Form and four (4) copies of the Final Environmental Assessment.

Please feel free to contact Mr. Nelson Sagum at 587-1834, if you have any questions.

Enclosures

17

1996-02-23-~~EA~~ HI - FEA - Keaau-Pahoa Bypass Road FEB 23 1996

FILE COPY

NOTICE OF DETERMINATION
NEGATIVE DECLARATION FOR THE PROPOSED
KEAAU-PAHOA ROAD, KEAAU TOWN SECTION
(Project No. 130B-01-92)

A. Proposing Agency

Department of Transportation, State of Hawaii

B. Accepting Authority

Not applicable to a negative declaration.

C. Description of the Proposed Action

The Department of Transportation (DOT), State of Hawaii, proposes to design and construct a four-lane bypass road routing Keaau-Pahoa Road (State Highway 130) around the town of Keaau on the island of Hawaii. Puna's population has grown rapidly since 1970 with many of its workers commuting to Hilo. Traffic has grown concomitantly, with passage through Keaau now a significant bottleneck. The proposed bypass, in conjunction with other recent and planned improvements, is intended to alleviate this situation.

Keaau-Pahoa Road is a two-lane roadway providing access to lower Puna. At its northerly end, Keaau-Pahoa Road passes through Keaau to its juncture with the Hawaii Belt Road (Mamalahoa Highway/Volcano Road, State Highway 11).

DOT examined six (6) alternatives for this project, including the selected alignment, Alternative 1 (refer to Exhibit 1). Alternatives 2 and 3, alternate makai routes, had serious social and environmental impacts and may be opposed by various community groups. Alternative 4, the mauka alternative, would not significantly reduce traffic congestion in the center of Keaau and would conflict with current plans for a new elementary school. Alternative 5, a proposal to widen the existing Keaau-Pahoa Road, is constrained by development adjacent to the highway. Alternative 6, the no-action alternative, failed to satisfactorily address major project objections including the reduction/elimination of traffic congestion in Keaau.

Hence, Alternative 1 will begin on Keaau-Pahoa Road, in the vicinity of the former plantation manager's house (Banyan Inn), proceed between 8-1/2 Mile Camp and the Milo Street neighborhood, and return to Mamalahoa Highway at Keaau Road (refer to Exhibit 1). The proposed 2.2 mile highway was selected for this project based on its

accomplishment of project objectives and an evaluation of various criteria. A highway makai of the existing facility would better accommodate the major direction of traffic flow. In addition, travel along State Highway 130 will improve due to fewer intersections and the "restricted" access of the bypass.

Most of the right-of-way required for Alternative 1 would pass through former cane fields, now fallow. A macadamia nut orchard near Keaau-Pahoa Road may be impacted, depending on specific alignment decisions. No parcels would be left without access, although some adjacent parcels may not be provided direct access to the bypass.

Alternative 1 would improve the level-of-service from the present peak hour LOS E to LOS C or better through the design year of 2013. Benefits would include improved public safety and more efficient delivery of goods and services, including emergency services, to Puna residents. Evacuation of residents in the event of natural disaster may become easier after bypass construction.

D. Determination and Reasons Supporting the Determination

The proposed project would not have a significant effect on the environment and therefore preparation of an environmental impact statement is not required. The "Significance Criteria," Section 12 of Hawaii Administrative Rules Title 11, Chapter 200, "Environmental Impact Statement Rules," were reviewed and analyzed. Based on the analysis, the following were concluded:

1. *No irrevocable commitment to loss or destruction of any natural or cultural resource would result.* The right-of-way for Alternative 1 is primarily in former cane lands, now unused. No significant natural resources are present. Protection of potential cultural resources would be accomplished through an archaeological mitigation program comprised of either advance subsurface testing or monitoring during construction. Such a program would require approval of the State Division of Historic Preservation.

2. *The action would not curtail the range of beneficial uses of the environment.* The project, while certainly curtailing use of lands within the right-of-way to transportation and utilities uses, would increase access to Lower Puna, thereby facilitating beneficial uses of other lands in the District.

3. *The proposed action does not conflict with the state's long-term environmental policies or goals and guidelines.* The State's environmental policies and guidelines are set forth in Chapter 344, Hawaii Revised Statutes, "State Environmental Policy." Two broad policies are espoused: conservation of natural resources, and enhancement of the quality of life. The proposed project does not consume significant natural resources. It would include

mitigative measures to minimize various categories of pollution, while promoting general welfare and improving the efficiency of transportation allowing fulfillment of the social, economic and other requirements of residents. The project is further supportive of the following guidelines specific to transportation established in Chapter 344:

- Encourage transportation systems in harmony with the lifestyle of the people and environment of the State;
- Adopt guidelines to alleviate environmental degradation caused by motor vehicles; and
- Encourage public and private vehicles and transportation systems to conserve energy, reduce pollution emission, including noise, and provide safe and convenient accommodations for their users.

4. *The economic or social welfare of the community or state would not be substantially affected.* Construction of the bypass would result in temporary economic benefits to the construction industry and indirectly to other economic sectors as well. Operation of the bypass would reduce traffic through Keaau, perhaps decreasing revenues to merchants. The population base and degree of competition for customers, however, is expected to increase greatly as the development plans of W. H. Shipman, Ltd. are implemented. The net result to individual merchants will depend on their respective competitive situation. No significant social impacts are anticipated, although the rural character of 8 ½ Mile Camp may be lessened by the proximity of the bypass. Improved access and mitigation measures may offset this impact.

5. *The proposed action does not substantially affect public health.* The project would reduce both noise and emissions of air pollutants within Keaau village. It will facilitate provision of emergency and other public services.

6. *No substantial secondary impacts, such as population changes or effects on public facilities, are anticipated.* The bypass project arises from needs established by a rapidly growing population. To the extent that access to Lower Puna is improved, subdivision build-out may accelerate somewhat. This impact, however, may be more responsive to general economic conditions rather than simply improved traffic conditions. An improved roadway network will improve access to public facilities in and around Keaau.

7. *No substantial degradation of environmental quality is anticipated.* The project area is unremarkable in terms of environmental resources, and standard mitigation measures would suffice to protect ambient environmental quality. Some redistribution of noise and vehicle exhaust emissions would take place. While conditions within Keaau village would be improved, noise levels near

8 ½ Mile Camp would be elevated. Mitigation measures can be employed to reduce the impacts to acceptable levels. The project is not expected to result in concentrations of air pollutants exceeding State or federal standards for ambient air quality.

8. *The proposed action does not involve a commitment to larger actions, nor would cumulative impacts result in considerable effects on the environment.* The proposed project is self-contained and independent of other proposed highway improvements or other types of projects. It does however, address deficiencies in the roadway network recognized in various State and County planning documents.

9. *No rare, threatened or endangered species or their habitats would be affected.* A small amount of potential forage habitat for Hawaiian Hawks, Owls and Bats would be removed, but the large home ranges of these animals render the loss insignificant. No endangered, threatened or candidate floral species would be affected by the project.

10. *Air quality, water quality or ambient noise levels would not be detrimentally affected.* The net effect of the project on air quality would be to reduce emissions within Keaau village, while increasing emissions along the bypass corridor. Improved traffic flow, however, would reduce the possibility of "hot spot" formation. Potential violations of State Ambient Air Quality Standards within Keaau would be alleviated. Noise in Keaau would be reduced, but that at residences near the bypass would be significantly increased. Implementation of various mitigation measures will be necessary to minimize this impact. No significant water quality impacts are anticipated either during construction or operation of the bypass.

11. *The project would not affect environmentally sensitive areas, such as flood plains, tsunami zones, erosion-prone areas, geologically hazardous lands, estuaries, fresh waters or coastal waters.* No environmentally sensitive areas would be affected. The project site is on basically flat land well inland of the coast. Tsunami inundation is unlikely. Seismic risks are minimal; no structures are anticipated as part of the project. The volcanic hazards are comparable to those in Hilo.

E. Supplementary Information

The Environmental Assessment (EA) for the proposed action and the results of the coordination undertaken with affected agencies and parties are attached to support the determination of a Negative Declaration.

F. Name, Address and Phone Number of Contact Person

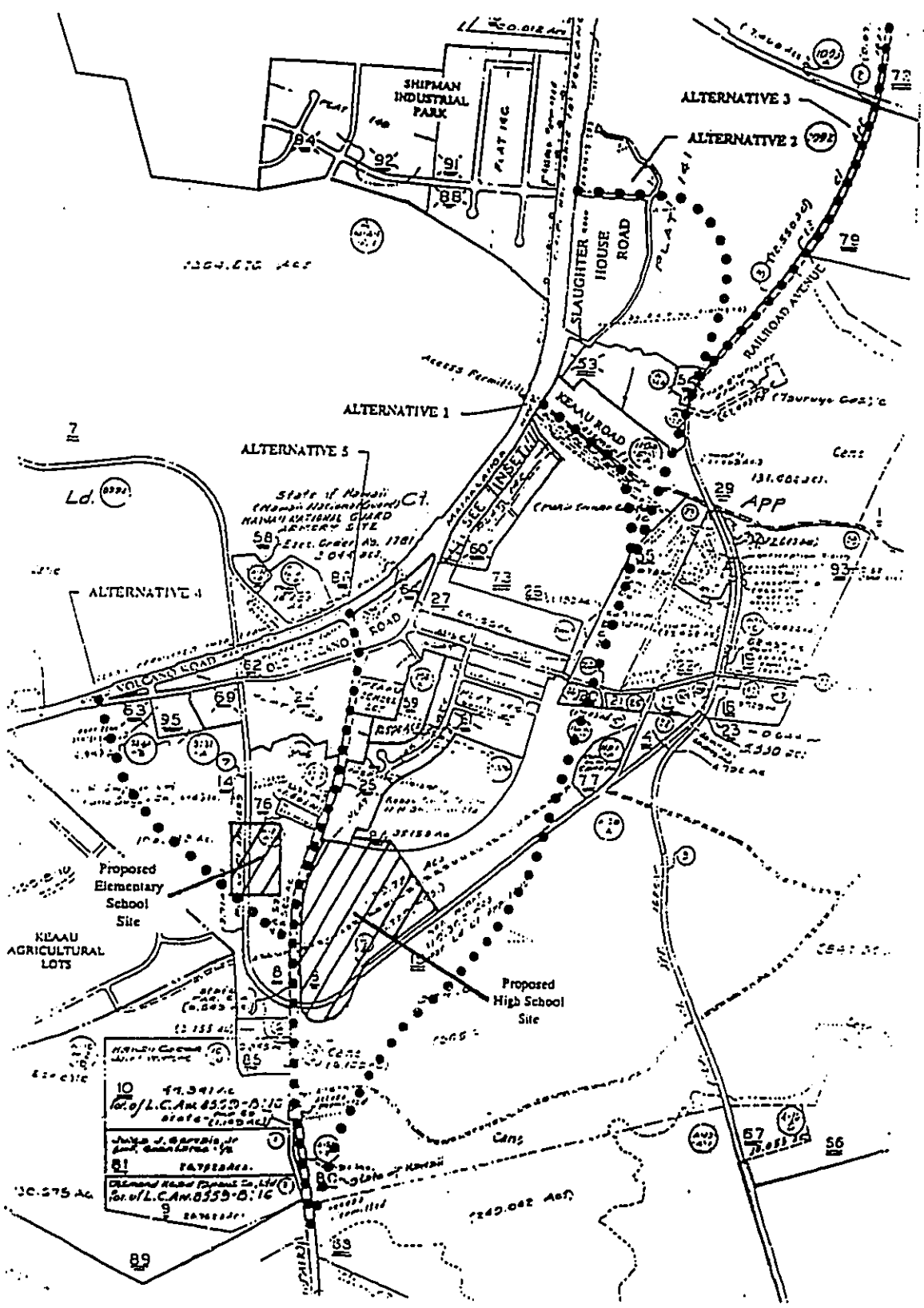
Department of Transportation, Highways Division
869 Punchbowl Street
Honolulu, Hawaii 96813
Attention: Nelson Sagum (587-1834)

RESPONSIBLE OFFICIAL

Kazu Hayashida
Director

12/5/95
Date

EXHIBIT 1. ALTERNATIVE ALIGNMENTS



FINAL ENVIRONMENTAL ASSESSMENT

KEAAU-PAHOA ROAD
KEAAU TOWN SECTION
(KEAAU BYPASS ROAD)

Project No. 130B-01-92
Keaau, Puna District, Island of Hawaii
Tax Map Keys: 3-1-6-03:3,5,15,20,26,68 and 73

Proposing Agency:

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813

Responsible Official:

Kazu Hayashida
Director

DEC 5 1995
Date

Prepared by
GK & Associates/
Imata & Associates

This document is prepared pursuant to Chapter 343, HRS.

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A. "Archaeological Survey of the Kea'au-Pahoa Road, Keaau Town Section, Project No. 130B-01-92, Puna, Hawai'i (TMK 1-6-03)." Prep. by Ogden Environmental and Energy Services Co.

B. "Socio-Economic Impacts of the Proposed Keaau-Pahoa Road, Keaau Town Section." Prep. by Community Resources, Inc.

C. "Traffic Impact Analysis Report for Keaau-Pahoa Road, Keaau Town Section, Keaau, Hawaii." Prep. by Barton-Aschman Associates, Inc.

D. "Environmental Noise Assessment, Keaau-Pahoa Road (Keaau Bypass Road), Keaau Town Section, Puna District, Island of Hawaii." Prep. by Darby & Associates.

E. "Air Quality Impact Analysis, Keaau-Pahoa Road, Keaau Town Section, Project No. 130B-01-92." Prep. by Ogden Environmental and Energy Services Co.

F. "Botanical Survey, Kea'au-Pahoa Road, Kea'au Town Section, Project No. 130B-01-92, Puna District, Island of Hawai'i." Prep. by Char & Associates.

G. "Bird and Mammal Survey for Keaau-Pahoa Road, Keaau Town Section, Project No. 130B-01-92." Prep. by Dr. Leonard A. Freed.

1.0 PROJECT DESCRIPTION

1.1 BACKGROUND

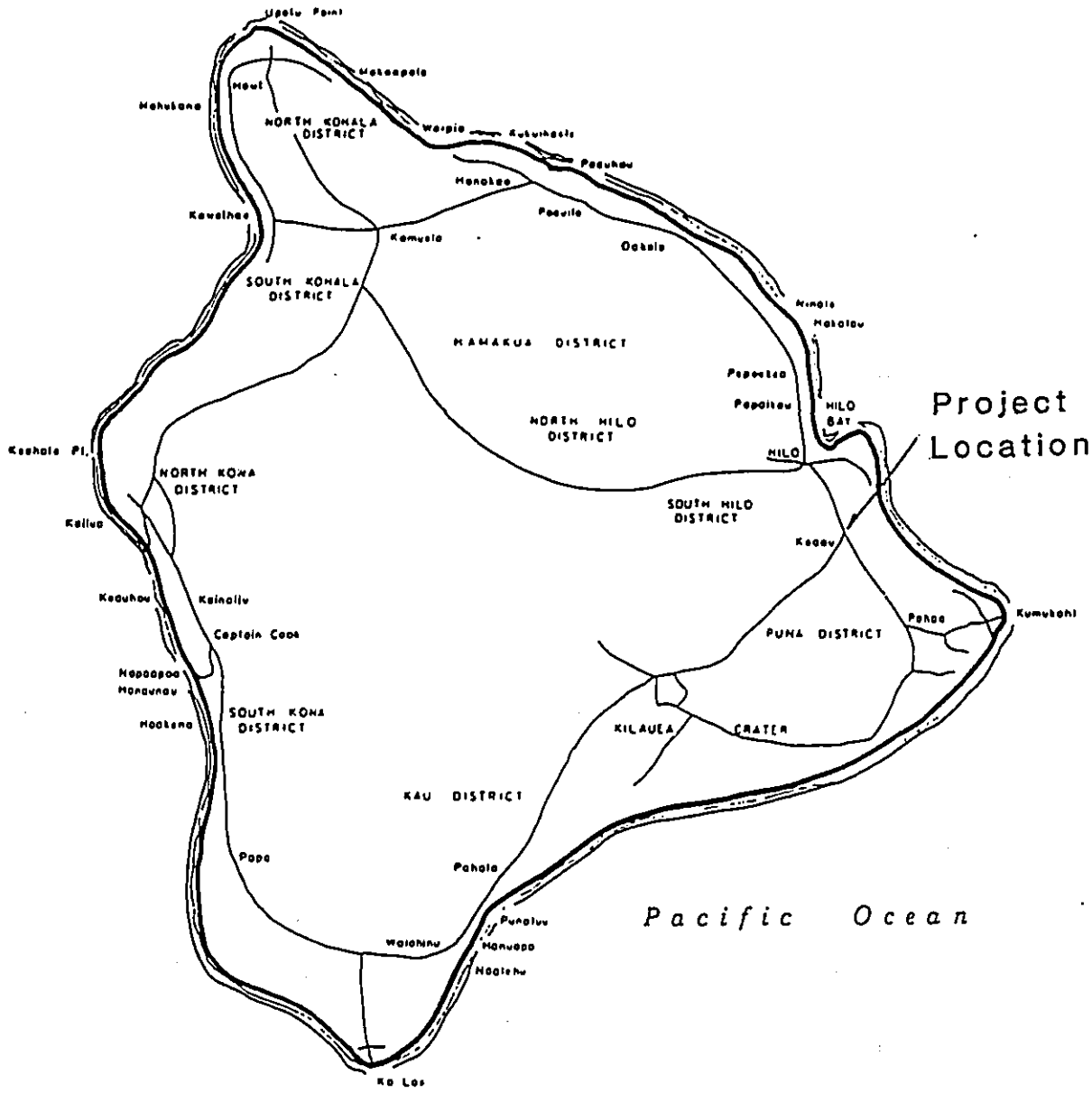
The Department of Transportation (DOT), State of Hawaii, proposes to design and construct a bypass road routing Keaau-Pahoa Road (State Highway 130) around the town of Keaau on the island of Hawaii (Figure 1). Keaau-Pahoa Road is generally a straight, high-speed, two-lane roadway with a posted speed limit of 55 mph providing access to the lower Puna region and linking the towns of Kalapana, Pahoa and Keaau with Hilo. At its northerly end, Keaau-Pahoa Road is a narrower two-lane road with reduced speeds of 25 mph and 35 mph passing through Keaau to its juncture with the Hawaii Belt Road (Mamalahoa Highway/Volcano Road, State Highway 11) at a signal-controlled intersection. Between Keaau and Hilo, Mamalahoa Highway is a four-lane divided expressway with a posted speed limit of 55 mph. Between the Hawaii Volcanoes National Park and Keaau, Volcano Road is a high-speed, two-lane roadway designated as a minor arterial.

Puna's population has grown very rapidly since 1970 with a large number of its workers commuting to Hilo every day. Traffic volumes have grown concomitantly with passage through Keaau town now a significant bottleneck. The proposed Keaau Bypass, in conjunction with other recent and planned improvements, is intended to alleviate this situation. Other recent DOT projects affecting traffic in the vicinity include:

- Keaau-Pahoa Road, Pahoa By-Pass, Project No. RS-130 (17) - Construction of a bypass road around Pahoa on Keaau-Pahoa Road from the vicinity of Kahakai Boulevard to approximately 2.8 miles south of the Pahoa-Kapoho-Kalapana junction. This project has improved traffic flow from lower Puna through Pahoa.

- Keaau-Pahoa Road Improvements, Vicinity of Keaau School, Project No. 130B-01-91 - Beginning at the intersection of Keaau-Pahoa Road and Old Volcano Road and extending 0.44 mile toward Pahoa, the project consists of constructing paved shoulders, left and right turn lanes, a shoulder lane, retaining walls, sidewalks and metal pipe railings; modifying the existing traffic signal system; installing a new 16-inch water line, signs and pavement markings; and striping. This project has improved traffic flow through Keaau by providing improved access and alternative discharge points for Keaau School students.

FIGURE 1. PROJECT LOCATION



ISLAND OF HAWAII

- Keaau-Pahoa Road Resurfacing and Improvements, Keaau toward Pahoa, Federal Aid Project No. STP-0130(25) - Improvements to two sections of Keaau-Pahoa Road (mileposts 0.20 to 4.69 and mileposts 9.19 to 9.79), including leveling and resurfacing existing pavement, excavating and backfilling, installing guardrails and curbs, widening pavement and roadways for Shower/Pohaku Drive and Kaloli Drive channelized intersections, widening shoulders, reconstructing weakened pavement areas, adjusting reference survey monuments, valve boxes and manholes, relocating water meter boxes and service laterals, removing, installing and replacing signs and reflector markers, and installing pavement markings.

1.2 PROJECT CONCEPT

A new four-lane roadway is proposed as an alternate route to bypass Keaau town to alleviate traffic congestion through the town. The bypass road will primarily serve through traffic between Puna and Hilo. Restricted access and fewer intersections will provide better traffic flow with greater roadway capacities. Widening the existing roadway through the town is constrained by existing development adjacent to the roadway. A mauka route would skirt the northerly boundaries of the Keaau Agricultural Lots and meet Volcano Road at an existing connection with Old Volcano Road. A makai route would better accommodate the major direction of traffic flow and is proposed to meet Mamalahoa Highway at either Keaau Road or Shipman Industrial Park.

1.3 PROJECT COST AND SCHEDULE

Until the final alignment is selected and design work is complete, cost estimates remain imprecise. Information provided by DOT indicates that project planning and design will cost approximately $1.6 million. Personal communications with Hugh Ono, Hawaii District Highways Engineer, indicate that construction costs average about $3 to $ 3.5 million per mile (see Appendix B). More specific information regarding the preferred alternative may be found in Section 2.3.

The anticipated project schedule is as follows:

- Planning - March 1993 to September 1995
- Design - November 1995 to October 1996
- Construction - January 1997 to December 1997

2.0 ALTERNATIVES

2.1 ALTERNATIVES CONSIDERED

An evaluation of the preliminary alternatives for this project was completed by Imata & Associates (1994). Six alternatives were examined, as shown on Figure 2 and described below:

- Alternative 1 - Makai connection to Mamalahoa Highway at Keaau Road. Bypass the town on the northerly side through former cane fields, proceed between 8½ Mile Camp and the Milo street neighborhood, then return to Mamalahoa Highway at Keaau Road;

- Alternative 2 - Makai connection at Shipman industrial Park - Follows the same alignment as Alternative 1 for much of the way but rejoins Mamalahoa Highway at an existing roadway opposite the main access road to Shipman Industrial Park;

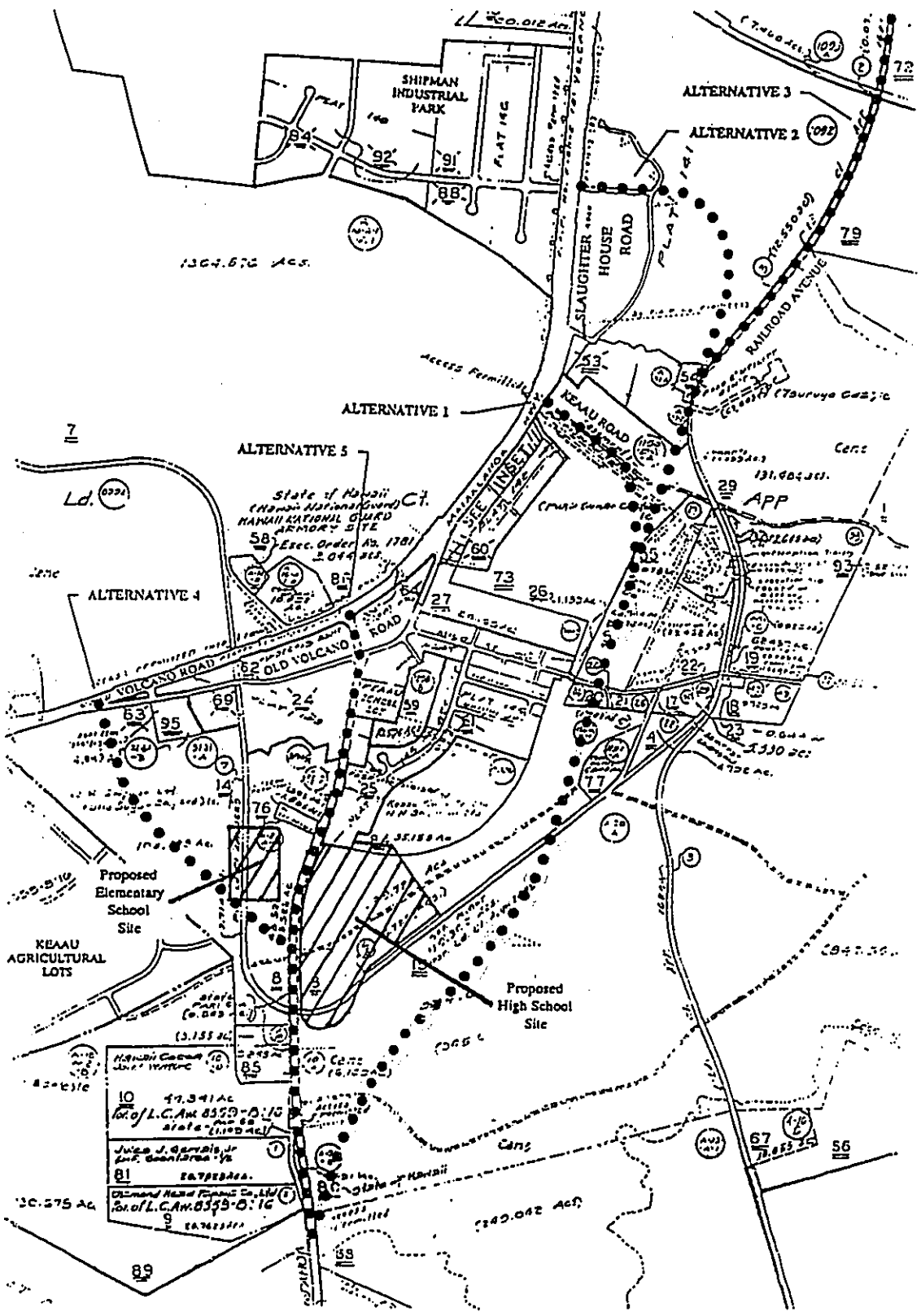
- Alternative 3 - Connection to Railroad Avenue. Follows much the same alignment as Alternatives 1 and 2 but rather than returning to Mamalahoa Highway, connects directly to Railroad Avenue at the South Hilo/Puna district line.

- Alternative 4 - Mauka connection to Volcano Road approximately 0.5 miles southwest of Keaau town. Bypass Keaau town through former cane fields to the southwest between the town and the Keaau Agricultural Lots and rejoin Volcano Road approximately 0.5 miles southwest of the existing Keaau-Pahoa Road/Mamalahoa Highway intersection;

- Alternative 5 - Widen existing Keaau-Pahoa Road to four lanes through Keaau to accommodate present and future traffic volumes projected to the year 2013. The Keaau-Pahoa Road/Old Volcano Road intersection would have to be improved and existing traffic signal phases adjusted;

- Alternative 6 - The No-Action alternative in which the present Keaau-Pahoa Road through Keaau town would remain basically unchanged.

FIGURE 2. ALTERNATIVES



2.2 RANKING OF THE ALTERNATIVES

The alternatives were ranked on the basis of their capacity to satisfy project objectives, alignment criteria and environmental criteria. Project objectives included immediate relief (Provide immediate relief to existing congestion caused by localized intersection problem as opposed to long-term plan to provide alternate route to Hilo.); safety convenience and efficiency (Provide safe, convenient and efficient movement of existing and future traffic volumes.); accommodation of projected future traffic volumes at LOS C (see definitions of LOS on pages 29-30) or better (through the design year of 2013); design speed (60 mph); and consistency with state and county plans (Determine conceptual consistency with State DOT "Island of Hawaii, Long Range Highway Plan" and County of Hawaii "General Plan."). Alignment criteria included length, cost (including roadway, land acquisition and mitigative measures) and avoidance of downstream bottlenecks. Environmental criteria included avoidance of productive agricultural lands, historic and cultural sites and residential or commercial displacements, minimization of potential social and economic impacts (displacement of existing land uses, changes in access and neighborhood character of adjacent and surrounding areas), and minimization of noise, air quality and wildlife impacts. For each criterion, each alternative was assigned a numerical score with 1 representing "best" or "minimal impact," and 4 representing "worst" or "major impact." Although assignment of scores by criterion was qualitative, scores were totaled to give a quantitative ranking for comparative purposes. The lower the score, the better the alternative.

The results (Table 1) showed the following relative ranking of the alternatives: 1, 2, 4, 6, 3, and 5. Project objectives were satisfied completely by Alternatives 1 and 2, poorly by Alternative 3 and very poorly by Alternatives 6, 5 and 4. Alignment criteria were best satisfied by the No-Action Alternative (No. 6), while Alternative 3 was the worst. Environmental criteria were also best satisfied by Alternative 6, and least satisfied by Alternative 3. Overall, the deciding factors were satisfaction of project objectives by Alternatives 1 and 2, and the relatively lower environmental impacts of Alternative 1. Alternative 4 showed the least environmental impacts, but failed to satisfactorily meet project objectives. Alternative 3 was among the worst by every measure, particularly the alignment criteria. That alternative was ranked just above Alternative 5 due to the latter's very poor satisfaction of project objectives.

2.3 THE PREFERRED ALTERNATIVE

Based on the above analysis, Alternative 1 was selected as the preferred alternative. Depending upon final alignment decisions, this alternative would pass through five to seven parcels, two owned by Puna Sugar Co., Ltd. and five leased by Puna Sugar Co., Ltd. from W.H. Shipman, Ltd. Bypassing the town and the Keaau-Pahoa Road/Mamalahoa Highway intersection would relieve existing congestion, move traffic safely, conveniently and efficiently between Puna and Hilo, and accommodate future traffic volumes at optimum speeds and acceptable levels-of-service. This alignment is consistent with and can be readily integrated into long-range State and County plans.

TABLE 1 - COMPARISON OF ALTERNATIVES

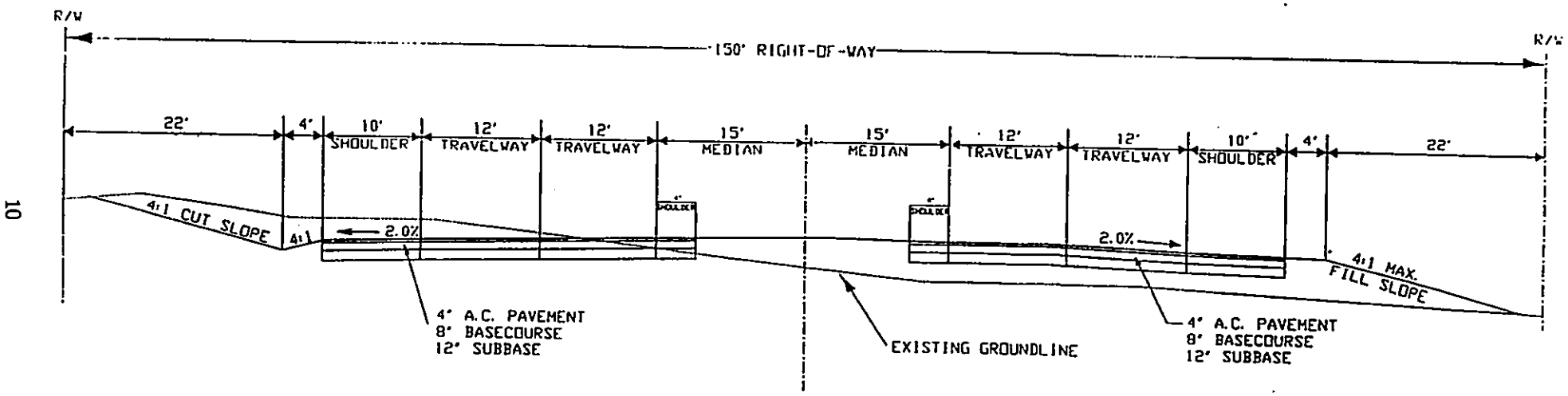
ALTERNATIVES	1	2	3	4	5	6	
Project Objectives							
Immediate relief	1	1	1	3	4	4	
Safety, convenience, efficiency	1	1	3	4	4	4	
Accommodate future traffic volumes at LOS C	1	1	3	3	3	4	Legend
Design speed	1	1	3	4	4	4	
Consistency with State and County plans (conceptual)	1	1	1	3	3	4	1 Best 2 3 4 Worst
Alignment Criteria							
Length	3	3	4	2	2	1	
Cost	3	3	4	2	3	1	
Avoid downstream bottlenecks	1	1	3	3	4	4	
Environmental Criteria							
Agricultural lands	3	4	4	2	1	1	
Historic & cultural sites	1	1	1	1	3	1	Legend
Relocation of residences, businesses, etc. (non-agriculture)	2	3	3	1	4	1	1 Minimal impact 2 Minor impact 3 Moderate impact 4 Major impact
Noise	3	3	4	3	2	1	
Air quality	2	2	2	2	3	4	
Flora/fauna (endangered & threatened)	1	1	1	1	1	1	
Social	2	3	4	1	4	4	
Economic	3	4	4	1	2	1	
TOTALS	29	33	45	36	47	40	

Ambient noise and concentrations of air pollutants would be elevated in the relatively isolated area crossed by this alternative. Presently, access into this area is limited and contributes to the retention of its rural character. Locating the bypass in this area may alter the character of the neighborhood and life styles of nearby residents. Existing macadamia nut and papaya orchards would be affected.

Assuming a 150-foot wide right-of-way, approximately 39.5 acres would have to be acquired along the approximately 2.2 mile long alignment. The DOT Right-of-Way Branch estimates that the costs associated with the acquisition, including staff time, appraisal fees, cadastral functions, legal fees and purchase costs, would total approximately $880,000.

Figure 3 presents the recommended typical roadway section.

FIGURE 3. RECOMMENDED TYPICAL SECTION



3.0 SUMMARY DESCRIPTION OF THE AFFECTED ENVIRONMENT, POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

3.1 EXISTING SITE - LAND USE AND REGULATORY STATUS

The project area is located in the District of Puna, in the ahupuaa of Keaau. Puna has two small urban centers: Keaau, and Pahoa, which lies some ten miles eastward. Four miles north of Keaau is the city of Hilo, which in 1990 had a population of 37,808. Hilo is the largest city and leading commercial center on the Island of Hawaii. The administrative center for the County of Hawaii and a campus of the University of Hawaii are located in Hilo (Hahn and Associates, 1993). Several small villages are also present in Puna, including Mountain View, Kurtistown and Volcano. Extensive tracts of rural/suburban settlement are present between these villages and towns. Some forty subdivisions containing about 55,000 lots are located in this area. Among the largest and most populous are Hawaiian Paradise Park, Hawaiian Beaches, Orchid Land, Hawaiian Acres and Ainaloa. Most of the lots are not improved, and infrastructure is limited (Community Management Associates, 1992).

With an 83 percent increase in population from 1980 to 1990, the Puna district is the second fastest growing region on the island of Hawaii. This rapid growth is expected to continue and even to accelerate. Due to the youthfulness of the population, the fertility rate is the highest in the state, averaging four children per family. Responding to the needs of this rapidly growing population is all the more difficult with the population so widely dispersed throughout the district and in areas where most of the lots are zoned for agriculture and serviced by inadequate infrastructure (Office of State Planning, 1992).

Because of its position on the intersection of the Hawaii Belt Road (Mamalahoa Highway/Volcano Road, State Highway 11) and Keaau-Pahoa Road (State Highway 130), Keaau serves as a transportation node. With a 1990 population of 1,584, Keaau consists of a commercial core, anchored by a supermarket/shopping center, surrounded by an irregular network of house lots, one-to-five acre ag/house lots, and larger farms specializing in high-value crops such as orchids and tropical fruits. Macadamia nuts now dominate the agriculture of the surrounding area, including C. Brewer's Mauna Loa Macadamia Nut orchards (Hahn and Associates, 1993).

W.H. Shipman, Ltd. is the largest private landowner in the Keaau area, controlling about 15,500 acres. From 1985 to 1993, W.H. Shipman, Ltd. received land use approval to develop an industrial park (see Figure 2). The park consists of 488 acres, 312 of which were

reclassified from Agricultural to Urban in 1985 and zoned for industrial uses by the County in 1986. Reclassification of the remaining approximately 176 acres (Increment II) was approved on July 2, 1993. A total of 183 acres have been developed for sale or lease to individual tenants. Occupants of the industrial park include contractors, base yards, and wholesale and distributor operations. It is now in the process of development of the third of several increments, with approximately 75 acres already completed and sold. The industrial park is just inside the Puna-South Hilo district boundary, mauka and adjacent to Mamalahoa Highway. It is significant not only as the only major urban-use expansion in Puna during the 1980s but also because it offers fee simple industrial parcels in a fully developed industrial subdivision (Community Management Associates, 1992).

W.H. Shipman, Ltd. has two other developments in progress: 1) redevelopment of commercial buildings in Keaau Village, and 2) planning for a new elementary school site in Keaau. W.H. Shipman, Ltd. successfully petitioned the Land Use Commission to reclassify 660 acres of agricultural land to urban. The area will be the first increment of development of Shipman's Conceptual Keaau Development Plan (see "Petition Area Boundary" on Figure 5). W.H. Shipman, Ltd. proposes to develop this area with a mix of commercial, industrial, residential and open space and public facilities, including park and school sites. W.H. Shipman, Ltd. is seeking state land use approval and county rezoning. Development could start in three years and take 10 years to finish. The majority of the project involves single and multifamily homes, with additional commercial development toward the end of the project (McWilliams, 1993).

Hawaii Brewery Development Co., Inc. has requested a special use permit to build a brewery on 14.5 acres in Keaau near the intersection of Slaughter House Road and Mamalahoa Highway. About 40 people would be employed (Rodrigo, 1993). The facility would occupy the former Miko Meat Co. slaughterhouse, and have a 200-seat tasting room.

Other land uses in the surrounding area include:

- Puna Power Plant - Hawaii Electric Light Company (HELCO) operates a power plant at the former Amfac mill, which is comprised of a 14-megawatt steam generator and a 20-megawatt combustion turbine.

- Residential Subdivisions and Plantation Camps - Surrounding Keaau are about 200 subdivided and mostly developed houselots of 10,000 to 15,000 square feet. There are also several former plantation camps, including 8 ½ Mile Camp, 9 Mile Camp, and 9 ½ Mile Camp, originally developed by Puna Sugar Company for employee housing. The houses were sold to the workers, and W.H. Shipman, Ltd. sold the fee interest in the lands within these camps to associations made up of the residents.

- Keaau Agriculture Lots - This agricultural subdivision consists of 322 one-acre lots created to provide housing opportunities for former sugar workers on

lands provided by Puna Sugar Company (Amfac).

- Agricultural Fields - Near Keaau are a number of agricultural operations including the 2500 acre Mauna Loa Macadamia Nut orchards. The state Panaewa Farm Lots and the Hawaiian Home Agricultural Lots are situated near the Puna-South Hilo district border. Within nearby W.H. Shipman, Ltd. lands are a number of ongoing agricultural operations including over 290 acres of bananas, 266 acres of macadamia, 250 acres of foliage crops, as well as papaya and vegetable crops.

- Commercially-Zoned area - The Keaau Town Center includes a total of 56,000 square feet of leasable commercial space. The shopping center site is leased by W.H. Shipman, Ltd. to a master lessee who in turn leases space to individual businesses. A small number of retail and service businesses including gas stations, small groceries and restaurants operate on Old Volcano Highway off Keaau-Pahoa Road, mostly in plantation-era buildings on land leased from Shipman.

- Water Wells - According to information on file at the State Division of Water Resource Management, there are eight wells in the vicinity of the makai bypass alternatives. Seven are near the Puna Sugar Mill complex. Five of these (four industrial water sources and one recharge well) are owned by Puna Sugar Co. Two are municipal water sources for the Hawaii Department of Water Supply. The eighth well is registered to Miko Meat Corporation and is located near the slaughterhouse.

Figure 4 shows the state Land Use District designations for Keaau and surrounding lands. The town core and Shipman Industrial Park are designated Urban; the surrounding lands are in the Agriculture district. W.H. Shipman, Ltd. recently petitioned the state Land Use Commission to reclassify four parcels (totalling 660 acres) adjoining Keaau from Agriculture to Urban. On July 18, 1994 the Commission granted the reclassification (Docket No. BR93-699). Alternative 5, widening Keaau-Pahoa Road, would affect Urban lands; Alternative 4, the mauka alternative, would bisect one of the new Urban areas. Alternatives 1, 2 and 3 would skirt the makai boundary of the newly designated Urban lands.

Figure 5 summarizes the County General Plan Land Use Allocation Guide Map for the Keaau area. Most of the area surrounding Keaau is slated for low density uses, with Shipman Industrial Park and the area around the former sugar mill designated for industrial uses. Lands makai of 8 ½ Mile Camp are projected for intensive agricultural uses. Alternatives 1, 2 and 4 would traverse areas of low density use, while alternative 3 would

FIGURE 4. STATE LAND USE DISTRICTS

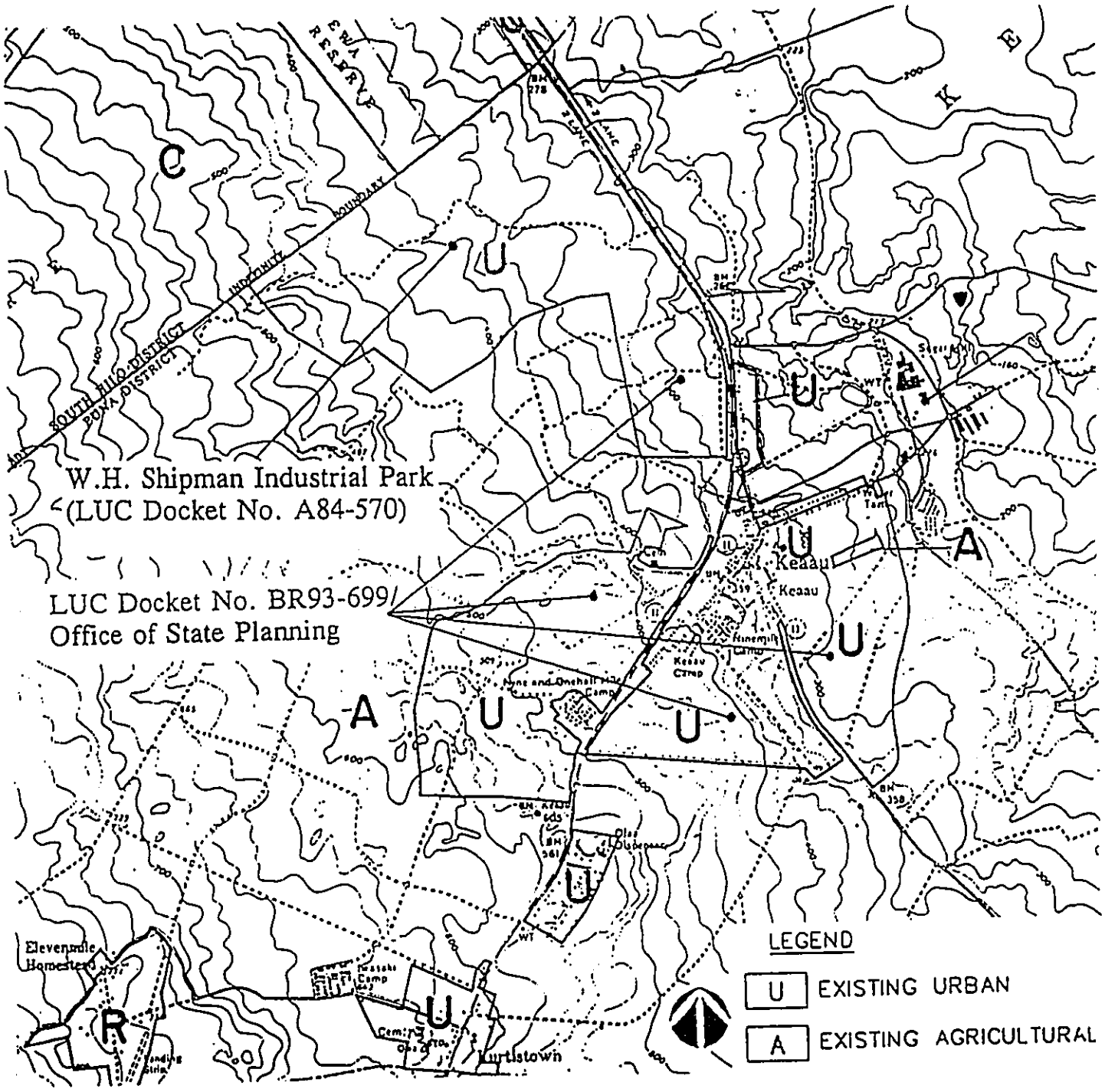
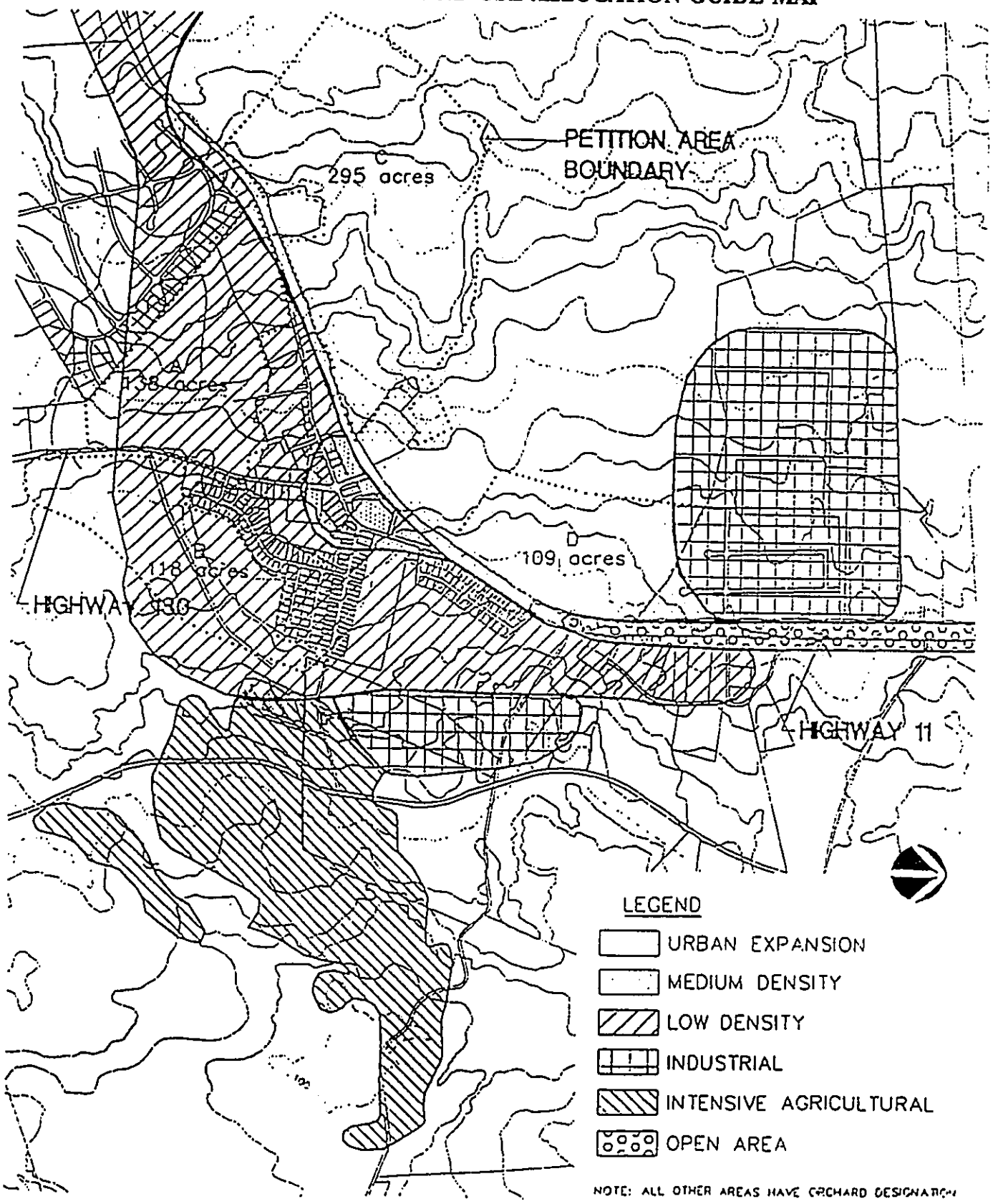


FIGURE 5. COUNTY LAND USE ALLOCATION GUIDE MAP



in addition pass through an industrial area. Alternative 5 would pass through the town center, designated for medium density uses.

Figure 6 shows the County zoning of lands surrounding Keaau. Most are designated A-20a, meaning Agriculture of minimum lot size 20 acres. Very low density residential use is permitted in the Agriculture zone. A small Agriculture zone of minimum 5 acre lot size is located north of the Keaau Loop area. Alternatives 2 and 3 could affect this area. Shipman Industrial Park is zoned MG-20 (General Industrial, 20 acres minimum lot size).

Figure 7 shows zoning within the Keaau urban core. Most parcels are zoned RS, single family residential, with minimum lot sizes of 10,000 or 15,000 square feet. Near the town center, zoning is CV, village commercial, with minimum lot sizes of 10,000 square feet. Alternative 4 could impact properties zoned for residential use depending on where the bypass joined Volcano Road. Alternative 5 would affect residential and commercial properties along Keaau-Pahoa Road.

A tax map showing Keaau and the alternative bypass routes is shown on Figure 2. Alternative 1, the shortest of the makai alternatives, would affect agricultural and commercial parcels controlled exclusively by Puna Sugar Company, most leased from W.H. Shipman, Ltd., but some owned in fee. Most of these lands are former sugar cane fields, now fallow. The few existing structures could be avoided in selecting a specific alignment.

Alternative 2 would pass over most of the same parcels as Alternative 1, but two industrial parcels now owned by the Hawaii Brewery Development Company could also be affected. The northern portion of this route would pass through macadamia nut orchards, and could impact several residences near Mamalahoa Highway.

Alternative 3 would also impact many of the same parcels as Alternatives 1 and 2, but would affect additional macadamia nut and papaya orchards as it approaches the district boundary.

Alternative 4 would mostly pass through old cane lands but, depending on the terminus locations, could impact improved residential parcels at either end.

Alternative 5 would impact all parcels along Keaau-Pahoa Road for about a mile and a half southwest of Mamalahoa Highway. Agricultural, commercial, improved and unimproved residential, and school uses would be affected.

Part of the alternative evaluation process was geared toward minimizing impacts to existing uses, especially residential and commercial. This avoidance is a de facto form of impact mitigation. More specific mitigation will be possible in the alignment definition phase, but of the action alternatives, clearly Alternatives 1 and 4 would least impact existing land uses.

FIGURE 6. ZONING AROUND KEAAU

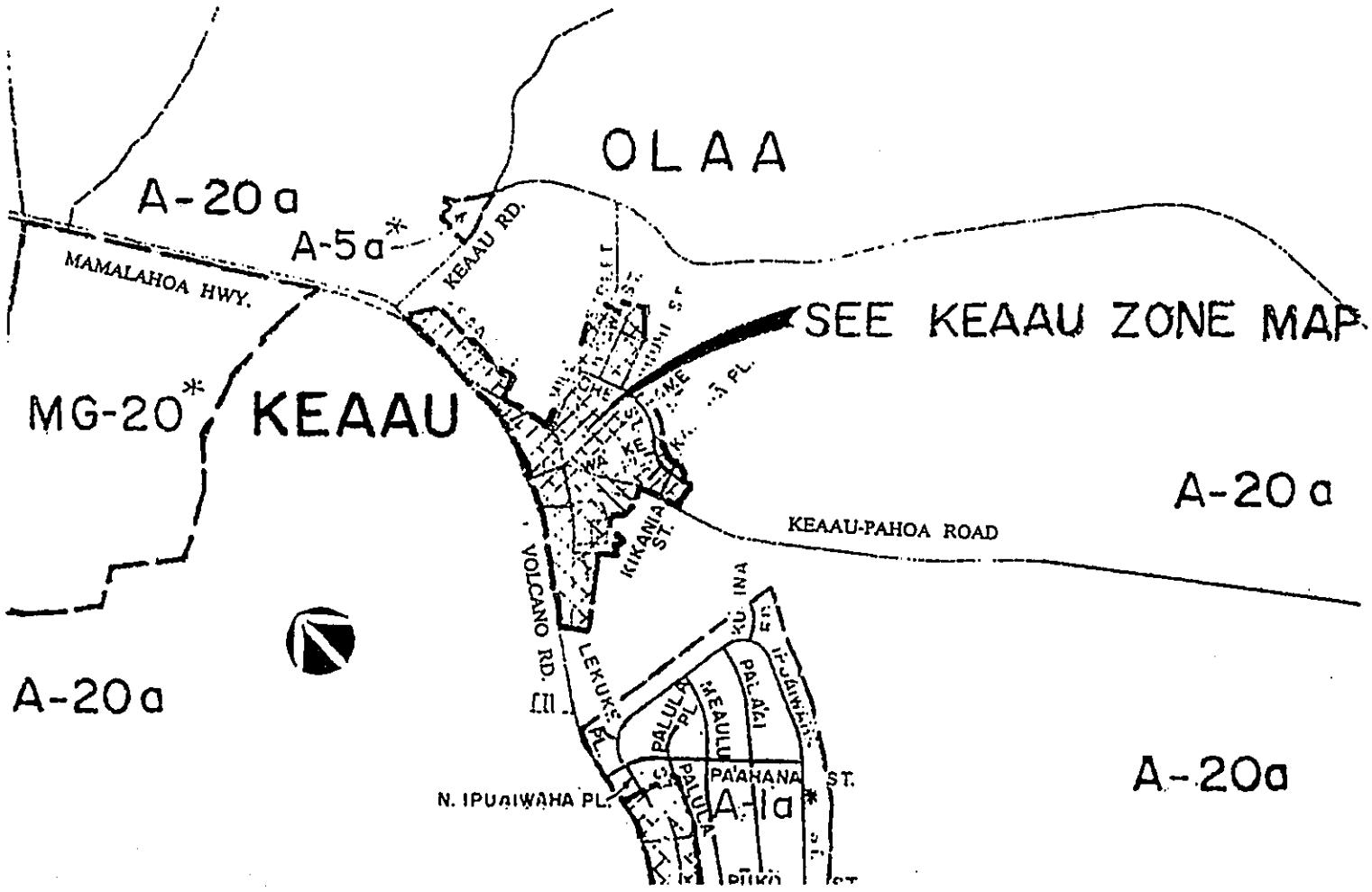
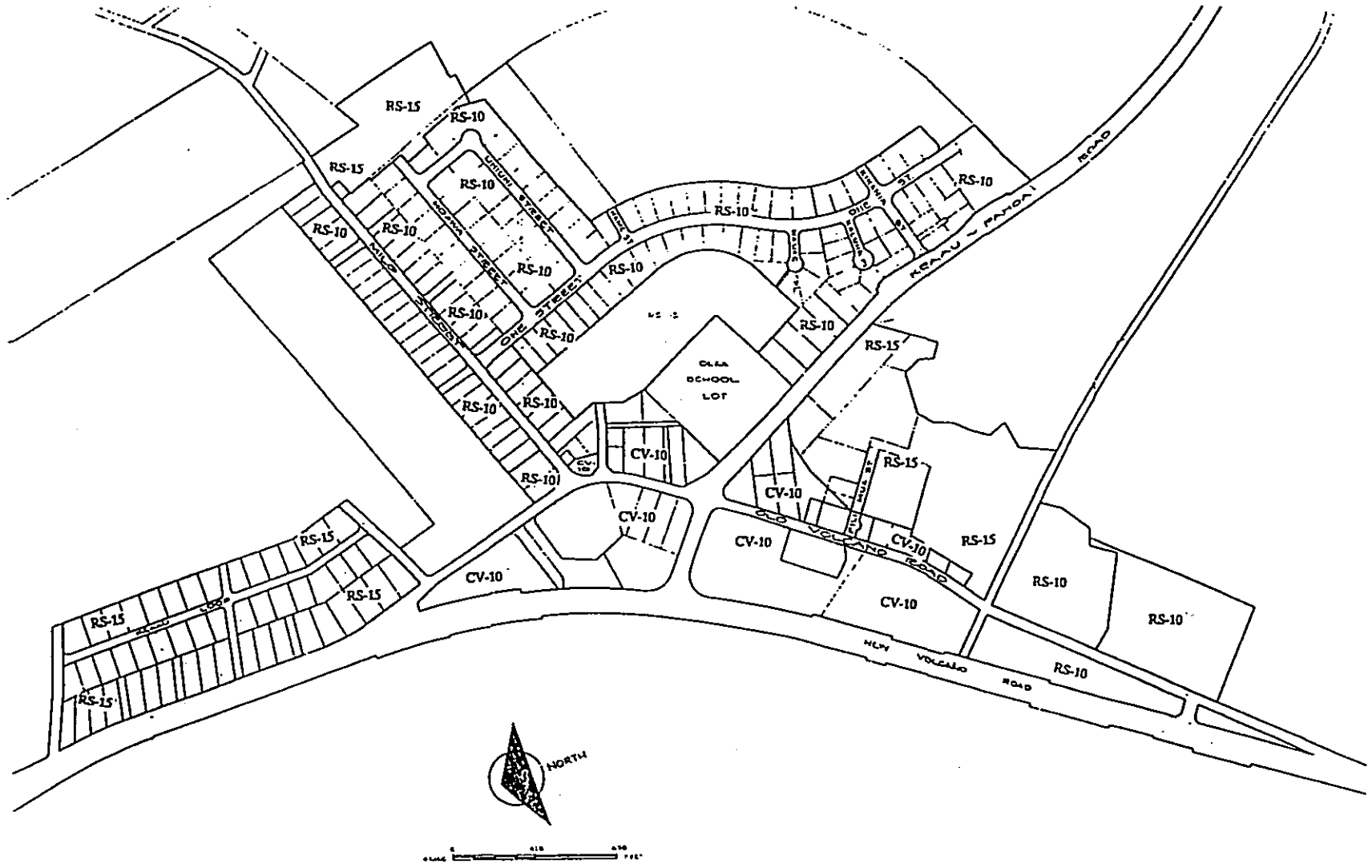


FIGURE 7. ZONING IN KEAAU



KEAAU
ZONE MAP

3.2 ARCHAEOLOGY AND HISTORICAL SITES

An archaeological survey was completed by Ogden Environmental and Energy Services Co., Inc., and is attached as Appendix A. Objectives of the survey were to identify potentially sensitive archaeological areas that may be impacted by construction of the bypass. The assessment included: 1) a historical literature and background search; 2) consultations and review of previous archaeological investigations; 3) examination of land documents, maps and aerial photographs; 4) a summary and evaluation of the historical background research, consultations and results of the archaeological field work; and 5) assessment and recommendations for evaluation of archaeological resources.

The historical background and literature search undertaken to assist in predicting sensitive archaeological areas within the proposed makai bypass corridor indicates that the landscape was initially a tract of land covered with ferns. In the 1820s a large native settlement with cultivated gardens was located east of the site along the coastline of Keaau ahupuaa. South of the site in the uplands known as Olaa were several villages with a population of about 100.

Several extensive forests between the native settlement on the coast, to a tract of ferns in Keaau, and to the villages at Olaa, were described by the early missionaries. The forest locations were surveyed in 1875, and one of the remaining forests at the north end of Keaau town was removed in 1948 for development of a macadamia nut orchard.

Native populations and settlements in Keaau ahupuaa, identified as a large village on the coast, and the villages at Olaa had apparently declined, were abandoned, or were possibly destroyed by tsunami prior to 1848. One parcel of land containing less than 14 acres planted in coffee trees was claimed by a native during the Hawaiian division of lands in 1848. This parcel was sold to the Roman Catholic Church in 1865. The remainder of Keaau ahupuaa, set aside for the high chief, or Prince William C. Lunalilo, was used for livestock pasturage in the late 1800s, with the construction of Volcano Road impacting the area between 1889 and 1893.

Over 3,000 acres of Keaau ahupuaa, purchased by W.H. Shipman and partners in 1882, were leased to the Olaa Sugar Company for a sugar plantation in 1899. Major impacts after 1899 were the Hilo Railroad (1900/1902-1946/1949) and alteration of the landscape for the Olaa Sugar Company cane fields, mill site, and plantation buildings. Additional impacts were the deforestation, dynamite blasting, and leveling of 1,000 acres of forest lands in 1948 for commercial planting of macadamia nut trees.

Historical records and documents indicate that most of the proposed Keaau Bypass corridor has been heavily impacted by historical agricultural development. Historical sites in Keaau have been recently recorded in areas of second-growth vegetation attributed to activities of the Olaa Sugar Plantation.

Potential archaeologically sensitive areas within the proposed bypass route that are indicated by the background research are near 8 ½ Mile Camp constructed in about 1899; areas appearing to have been marginally impacted at the north end of Keaau Town along Slaughter House Road; and gullies in the macadamia nut orchard.

The archaeological field survey, however, found no significant cultural remains. Deteriorated wooden fence remains found on the surface near 8 ½ Mile Camp indicate some former use of the area associated with the 8 ½ Mile Camp.

The State of Hawaii historic preservation review process requires archaeological evaluation of the significance of each site under the following evaluation criteria:

A) Association with events that have made an important contribution to the broad patterns of our history;
B) Association with famous people or Hawaiian deities;
C) Be an excellent example of a type of site;
D) Have yielded or is likely to yield information for research on prehistory or history; and
E) Have traditional cultural significance to an ethnic group.

Historical remains near 8 ½ Mile Camp in the proximity of the proposed Keaau Bypass corridor are undated. Subsurface remains are indicated and are likely to yield information on the history (Criterion D) of 8 ½ Mile Camp. To expedite environmental assessment of cultural resources in the Keaau Bypass corridor it is therefore recommended:

- that limited subsurface testing be undertaken to determine the presence or absence of historical cultural remains near 8 ½ Mile Camp, and the area function, and significance, if any.

An alternative recommendation will require coordination between the Keaau Bypass field supervisor and archaeological crew:

- archaeological monitoring during construction of the Keaau Bypass in the area of 8 ½ Mile Camp.

If archaeological remains are encountered, standard specifications of State contracts will apply (State of Hawaii, Dept. of Transportation, Highways Div., 1994). Specifications with respect to archaeological, historical, and burial site findings are as follows:

> *Whenever the Contractor encounters possible archaeological, historical or burial site findings, the Contractor shall immediately suspend the operation and inform the Engineer verbally and follow up with a written letter. The Engineer will contact the Department of Land and Natural Resources (DLNR) and other agencies to evaluate such findings and decide the course of action.*

The contractor shall not resume operations suspended without the prior written acceptance of the Engineer....

Failure or refusal to comply with the terms of this Section of Chapter 6E, Hawaii Revised Statutes, may subject the Contractor to the penalties described in Section 6E-11, Hawaii Revised Statutes,:

> *(1) a fine of not more than ten thousand ($10,000) dollars for each separate offense,*
> *(2) seizure and disposition of equipment, and*
> *(3) if the Contractor knowingly fails or refuses to comply, a prohibition from participating in the construction of State or county projects for ten (10) years.*

Construction work and equipment shall remain within the right-of-way limits....The Archaeologist will decide the limits of the site. Also, the Archaeologist will decide, with the Engineer, the best means for protecting the site from further disturbances which requires further investigation of salvage as determined by the SHPO [State Historic Preservation Officer]. *Protection may include barricades, roping off, temporary fencing or other means.*

3.3 SOCIAL AND ECONOMIC ENVIRONMENT

A social and economic impact assessment of the proposed bypass road was completed by Community Resources, Inc. (CRI), and is contained in Appendix B. The contents of this section are extracted from that report.

Puna has historically been an agricultural district, with large coffee plantations developed around the turn of the century first giving way to sugar cane and now diversified agriculture. Commercial and retail operations have focused on meeting the needs of the small communities. Industrial activities are limited, and include processing of agricultural products and production of electricity at the former Puna Sugar Mill, although the Shipman Industrial Park provides opportunities for expansion. A small geothermal energy facility is located at Pohoiki. Tourism is limited, with the attractions of Volcanoes National Park the primary destination.

Many of the towns and subdivisions of the Puna District serve as bedroom communities for people who commute to Hilo. The largest of these towns are Keaau and Pahoa. Because Puna's residential subdivisions offer some of the cheapest land in the state, its population has grown tremendously over the last 20 years. Infrastructure development has lagged behind population growth. Puna's 1990 population was just below 21,000, some four times its 1970 count. The region experienced an average annual growth rate approximately double the County's rate for the years between 1970 and 1990.

Demographically, Puna's population is slightly younger than the County as a whole, with Caucasians the largest single ethnic group. Hawaiians comprise about twenty percent of Puna's population. Incomes of Puna residents, tend to be low, with the share of the population in poverty well above the County average. Unemployment levels are higher than the County average. The share of the workforce in blue collar occupations is somewhat higher than Countywide. Puna residents, and Keaau residents in particular, continue to be active in agriculture. Despite the decline in the sugar industry, the Keaau labor force employed in agricultural occupations increased from 10% to 41% between 1980 and 1990.

It is anticipated that the low cost of house lots in Puna will continue to attract new residents, but new employment opportunities are limited. Large-scale geothermal development does not now seem likely, and diversified agriculture is creating jobs at a modest rate. Dramatic increases in tourism in Puna are unlikely. W.H. Shipman's Conceptual Development Plan for some 2,500 acres of lands around Keaau offer the promise of new residential, employment and business opportunities. The 660 acre first increment could be developed within five years (see Section 3.1 and Figure 4). The state Department of Hawaiian Homelands has plans for 177 agricultural lots at Makuu, on 1,500 acres of its land between Ainaloa and Hawaiian Paradise Park. The lots have been awarded and infrastructure construction is scheduled to begin in 1994. In any event, the expected continuation of population growth in Puna will increase the number of workers commuting to jobs outside the District.

The CRI assessment included interviews with key informants from the community. Informants responded favorably about the proposed bypass road, although some concern was expressed about potential loss of revenues to Keaau merchants. The results of several earlier community surveys were summarized as follows:

> *When asked about problems facing the community, respondents in the 1980s gave great weight to the lack of jobs in Puna. By 1988, problems of crime and traffic were also mentioned often, and mentioned more frequently by Puna residents than by others on the Big Island....In 1991, respondents saw little need of opportunity to get new jobs in Puna. Similarly, road improvements ranked low among priorities.*

Informants interviewed by CRI evaluated this project in light of a few very specific concerns. Most of these directly follow from the general concerns with population growth and inadequate infrastructure already noted. The rest have to do with the particular location of the bypass.

Need to Relieve Traffic Congestion: Interviewees told of miles of bumper-to-bumper traffic in the morning, and welcomed the bypass as helping to alleviate the problem. Many also thought that some congestion would still occur, for various reasons:

- With the continuing growth in Puna's population, a bypass was seen as a short-term measure or "Bandaid." Improvement of the entire road system would sooner or later be needed.

- Some thought the bypass would simply relocate congestion onto Mamalahoa Highway.

- The volume of traffic making a four-lane bypass necessary will leave the rest of Keaau-Pahoa Road, a two-lane road between Keaau and Pahoa, congested.

- Some noted that many commuters will not use the bypass, because they will have to leave or pick up children at school in Keaau.

- Some wanted an overpass at the Mamalahoa Highway intersection of the bypass, arguing that it would be needed to avoid congestion at that point.

Need for an Alternate Route out of Lower Puna: The project was seen as a first step towards developing an alternate road from lower Puna to Hilo, by way of Railroad Avenue. Some welcomed this as needed in an emergency. However, several found the alternate route insufficient, since the alternate route would begin near Keaau, while disasters forcing residents to evacuate would likely occur further south.

All who discussed this issue noted that residents of the Hawaiian Home Lands along Railroad Avenue in South Hilo District were opposed to making their neighborhood street into a major roadway linking Puna with Hilo.

Government Contribution to Address Puna's Needs: Puna residents largely welcomed the project as an attempt to respond to the problems of population growth in Puna. It was seen as an exception to the perceived pattern of refusing infrastructure and services to Puna residents.

Anticipated Impacts on Keaau Business: The bypass was expected by many to reduce the number of customers using Keaau retail businesses. A mauka route was preferred by a few as leading potential customers past the Keaau commercial area.

A few thought that the Keaau town area would be more commercially successful in time, with improvements to older buildings and efforts to sell to both Puna residents and tourists. From this viewpoint, the bypass would have little impact on the merchant's eventual success.

Anticipated Impacts on Adjacent Land Uses: Representatives of landowners noted potential impacts of the project on adjacent lands. They were concerned that the land taken for the project would affect a few productive uses. On the other hand, they found that it might improve access to property, making development feasible.

Several interviewees viewed the bypass as part of plans by W.H. Shipman, Ltd. They noted that new residential development in Keaau would benefit from improved traffic flow through the town, and thought that Alternative 1 or 2 would be preferred by Shipman as furthering the landowner's interests.

CRI's assessment of the potential impacts of the proposed project are summarized below:

- **Employment Impacts.** It is estimated that the project will generate about 186 to 264 person-years of construction-related employment, including direct, indirect and induced impacts.

- **Displacement of Existing and Planned Land Uses.** Most of the land traversed by the bypass route was once planted in cane, but is now unused. The project will displace at most one house (if Alternative 2 is selected). Alternative 2 also passes through areas planted in flowers and papaya, and crosses a site where a concrete pad has been made for warehouse use (partly on an existing right-of-way). Near Keaau-Pahoa Road, the bypass route passes through a macadamia orchard. The extent of displacement will depend on specific alignment decisions which are still to be made. Potential mitigations include compensation for property taken and aligning the bypass road right-of-way to minimize the taking of structures or other improvements.

- **Loss of Access.** Bypass development would affect access of makai properties to Keaau. In most cases, access can be given by means of a crossing at Milo Street. Other arrangements may be necessary for some parcels, but no parcel will be left without access.

- **Improved Access.** The bypass is planned as a limited access road, so properties immediately abutting the route will probably not have direct access to the bypass. However, properties in the general area would gain improved access to Mamalahoa Highway by way of the Milo Street crossing and the bypass.

- **Change in Neighborhood Character.** 8 ½ Mile Camp, now a relatively isolated residential area, will be closer to major roadways and will be visible from the Keaau Bypass. Residents could perceive this as a loss of rural atmosphere. Landscaping may provide adequate mitigation of this impact. The Milo Street intersection could become a new, alternate way into Keaau for drivers seeking to avoid the congestion of the commercial district. This could lead to increased traffic through residential areas. Mitigation could be achieved by designing the Keaau-Pahoa Road/Bypass junction to encourage easy and safe flow of traffic from Lower Puna and the Bypass into Keaau and vice versa.

- **Impacts on Keaau Town.** With less traffic congestion in Keaau, merchants could see fewer customers. The impact of the bypass, however, is likely small in relation to the overall impact of new developments proposed by W.H. Shipman, Ltd. The Shipman proposals call for a great increase in housing in Keaau, but also include a major competing commercial site. Mitigation of the bypass's impact on Keaau commerce could be achieved by designing the Route 130/Bypass junction to encourage easy and safe flow of traffic from lower Puna into Keaau and vice versa. Also, Keaau merchants may benefit from redevelopment of the commercial district and advertising along major roadways similar to signage used near Pahoa. Such advertising would respond to project impacts and to other factors which have limited growth of the commercial area.

- **Impacts on Lower Puna.** The proposed bypass will lessen traffic congestion and hence help to make Lower Puna subdivisions attractive to persons working outside Puna District. It will not provide an alternate access road. That would require development of at least another mile of roadway along Railroad Avenue.

- **Impacts on South Hilo.** The project will have little or no impact outside Puna. A road connection between the Bypass and Railroad Avenue in South Hilo could provide a needed alternative road for Puna, while changing the volume and character of traffic along Railroad Avenue. Such a connection is not the preferred route of this project and extends beyond the limits of our study area.

3.4 UTILITIES, PUBLIC FACILITIES AND SERVICES

Transportation

Regionally, the area is well situated in relation to airport and port facilities, which are both located within ten miles of Keaau. Hilo is the home of the largest deep-water port on the Island of Hawaii. Hilo International Airport has full air cargo services, and although passenger service is currently limited to interisland flights, the airport has in the past supported mainland flights on daily or more frequent schedules. Most of the roadway between both the port and airport facilities and the project area is a four-lane divided highway (Hahn and Associates, 1993). None of these facilities would be impacted by the proposed project. Other aspects of traffic and the roadway system are addressed in Section 3.5.

Water Supply

The County of Hawaii Department of Water Supply (DWS) operates and maintains two water systems in the vicinity of Keaau: the Hilo City water system and the Olaa water

system. The Hilo system terminates within the Panaewa farm lots, near the South Hilo-Puna District boundary line, to the northwest of Keaau. It would not be impacted by the proposed project.

The Olaa system serves the towns of Keaau and Mountain View and a few other neighboring residential areas. The Olaa system is supplied by three well sources, two of which are located near the Puna Sugar Mill and have a joint output of 1,250 gallons per minute (gpm). Bypass alternatives 1, 2 or 3 would pass near the sugar mill, but the final alignment could be adjusted to avoid conflicts. These alternatives would also pass over a portion of the water distribution system. Mitigation would entail specifying that the bypass road contractor verify the locations of all buried utilities, and maintain service during construction.

The third well source, Olaa Deep Well Station No. 3 (1,200 gpm), was constructed in 1991 on the mauka side of Volcano Road approximately 1.4 miles south of Keaau. The system was recently improved by the construction of a 1.0 million gallon reservoir at Olaa Well Station No. 3 and the installation of a 16-inch distribution line from this station to Keaau. This pipeline follows Volcano Road towards Keaau, turns onto Old Volcano Road, passes through the center of Keaau village, and finally ties into an existing 16-inch water line at the intersection of Milo Street and Old Volcano Road. This previously existing water line runs via Old Volcano Road to Shipman Industrial Park, which is approximately 1.0 mile north of Keaau village. Another pipeline that branches from the new 16-inch line was constructed along Keaau-Pahoa Road. A 16-inch line runs along Keaau-Pahoa Road and terminates in the vicinity of Keaau School (Hahn and Associates, 1993). The water lines running along Keaau-Pahoa Road would be impacted by Alternative 5, and at the junctions of Alternative 4 or Alternatives 1/2/3. Again mitigation of potential impacts would consist of maintenance of service during construction.

Wastewater Disposal

The current method of wastewater disposal in the Keaau area is through individual or private cesspools. The recent adoption of the amendments to Chapter 62, Title 11, Hawaii Administrative Rules, "Wastewater Systems," and the adoption of the Critical Wastewater Disposal Areas, dated October 2, 1991, placed severe restrictions on the utilization of cesspools as an acceptable method of wastewater disposal.

Keaau is located within a waste disposal area considered non-critical, but the use of cesspools there has been restricted to lots one acre in size or greater. The minimum requirements for individual wastewater disposal under the new rules will include the installation of a septic tank and leaching system for each wastewater source (Hahn and Associates, 1993). The bypass road would have no direct effects on wastewater volumes or disposal scenarios.

Electrical Power

Electrical power is provided on the island of Hawaii by the Hawaii Electric Light Company (HELCO). There is a 14-megawatt (MW) steam generator and a 20-MW combustion turbine generator located at the former sugar mill. HELCO maintains two 69 kilovolt (KV) transmission lines that are supplied with power by generating stations in the Kanoelehua Industrial Area and at the old Puna Sugar Mill site. Alternatives 1, 2 and 3 would pass beneath the 69 KV line at two locations. Coordination between DOT, the contractor and HELCO will be necessary during final alignment and construction.

Telephone

GTE Hawaiian Telephone (Hawaiian Telephone) presently maintains telephone service facilities near Keaau. A switching station located on Milo Street is currently being expanded to keep pace with existing demand. As with the other utilities, mitigation of potential impacts will involve coordination among DOT, the contractor and the utility during final alignment and construction.

Cable TV

Jones Space Link of Hawaii, Ltd., currently offers cable television service to the Keaau Area. Potential impacts and mitigation measures would be similar to those anticipated for telephone service.

Police, Fire and Emergency Services

The Police Station in Keaau serves the entire Puna District and is staffed by 43 police officers and two clerks. Service is provided on a twenty-four hour basis, and at any given time there are five officers on duty. The number of personnel at the facility has increased parallel with population growth in Puna, but the station still lags behind its optimum number.

Fire and emergency services are available on a twenty-four hour basis at Keaau Fire Station. Currently the station employs three captains and fifteen firemen on three shifts. Full emergency service including ambulance service is available. The station also relies on the Kawailani, Waiakea, Kaumana (all in Hilo) and Pahoa stations for backup.

The proposed bypass road could impact delivery of these services in two ways. First, if the improved access to lower Puna indirectly contributed to an acceleration of build-out in the residential subdivisions, the disparity between actual and optimal staffing could be exacerbated. Second, improved traffic flow could speed delivery of emergency services. The former could be mitigated by recruitment of additional personnel; the latter requires no mitigation.

Schools

The Keaau area currently supports one kindergarten through eighth grade facility, Keaau Elementary and Intermediate School. This school draws kindergarten through sixth grade students from not only the Keaau area, but also from Kurtistown and parts of Hawaiian Paradise Park and other subdivisions on Keaau-Pahoa Road. The intermediate grades (7-8) draw students from the above-mentioned areas and also Mountain View, Glenwood and Volcano. High school students from all these areas currently attend Waiakea High School.

The State of Hawaii Department of Accounting and General Services (DAGS), on behalf of the Department of Education (DOE), is proposing to build a new Keaau II Elementary School to serve grades K-5 in the Puna District. The target opening date for the new facility is the fall of 1997 with a design enrollment of 945 students (Group 70 International, 1994). Candidate sites included one in Kurtistown, two in Hawaiian Paradise Park, and three in Keaau. The DOE has selected a site mauka of Keaau-Pahoa Road (Personal communication from George Atta, Group 70 International, to John Kirkpatrick, Community Resources, Inc., Sept. 14, 1994). This site would be impacted by selection of bypass Alternative 4. If this alternative were selected, coordination between the state Departments of Transportation and Accounting and General Services would be required to minimize this potential conflict.

In addition, W.H. Shipman, Ltd., in partial satisfaction of conditions imposed by the Land Use Commission on the petition for reclassification of lands from Agriculture to Urban, has offered to dedicate a site for a new high school. The site offered is close to the junction of the proposed bypass (Alternatives 1, 2 and 3) with Keaau-Pahoa Road. Again close coordination of the DOT with the Department of Education during final alignment of the bypass and site planning for the high school will mitigate potential impacts.

Libraries

A community library is presently housed within Keaau School. This arrangement is less than satisfactory because of parking deficiencies that limit access for public patrons, and also because of conflicts between school and public needs. The parking situation could be temporarily worsened during construction along Keaau-Pahoa Road if Alternative 5 were selected. None of the other alternatives would impact potential library usage.

Recreational Facilities

Although the 124 acres of park land in Puna may be considered adequate in size under county standards, less than half is developed at present (Community Management Associates, 1992). Herbert Shipman County Park, which is almost eleven acres in size, currently provides Keaau with a baseball field, a basketball court, two tennis courts and

open space. Additional recreational facilities are available at Keaau School. Significant impacts are not expected to any recreational facilities by any of the alternatives. If Alternative 5 is selected, access could be impeded somewhat during construction, but the long-term impact would be better access.

Civil Defense

Civil Defense services are primarily provided by the Hawaii County Civil Defense Agency, which is headquartered in Hilo. Improved access to lower Puna would contribute to public safety in certain emergency situations.

3.5 TRAFFIC

The roadway network in Puna consists of state, county and private roads. There are 46.95 miles of state highways in Puna. These include Route 11 (Hawaii Belt Road, Mamalahoa Highway, Volcano Road) from Hilo to the Hawaii Volcanoes National Park via Volcano, Route 130 (Keaau-Pahoa Road, Pahoa-Kalapana Road) from Keaau to Kaimu via Pahoa, and Route 137 (Kalapana-Kapoho Beach Road) from Kaimu to Kapoho. County roads cover a total of 218.59 miles in Puna; 190.39 miles are paved, 3.4 are oil treated and 24.8 are unimproved. Most of the existing county roadways were built under less stringent standards than those now in place, and many are now considered substandard with no provisions for upgrading under current and foreseeable budget constraints. There are also about 450 miles of private roads in Puna varying greatly in quality (Community Management Associates, 1992).

Existing Improvement Plans

Both state and county planners recognize the need to expand and improve the Puna roadway network. The Long Range Highway Plan prepared for the state and county (Parsons Brinkerhoff Quade & Douglas, 1991) prioritized highway needs to 2010 and beyond. "Tier 1" projects responded to the greatest capacity needs; "Tier 2" projects were ones that deserved consideration for improvement within the time line of the plan; "Tier 3" projects were seen as responding to needs arising after 2010. Puna projects were assigned as follows:

Tier 1:

- Keaau Bypass: planned as two-lane arterial;
- Route 130, Keaau Bypass to Pahoa Bypass: widen to four-lane arterial;

Tier 2:

- Pahoa-Kapoho Road: provide standard width lanes and shoulders; and

Tier 3:

- Kapoho Beach Road: construct new two-lane road between Hilo and Kapoho.

The Facilities Map of the Hawaii County General Plan identifies two proposed secondary arterial highways near Keaau. The first is an extension of Komohana Street in Hilo to the center of Keaau village, and the second is a connecting road between a proposed primary arterial coastal road and Mamalahoa Highway just north of Keaau village. These roadways are part of the County's Long Range Transportation Network. No timetable for development of these roads has been established.

The County of Hawaii General Plan goals with respect to transportation are as follows:

- Provide a transportation system whereby people and goods can move efficiently, safely, comfortably and economically.
- Make available a variety of modes of transportation which best meets the needs of the county.

The "Courses of Action" for Puna cited in the General Plan for thoroughfares and streets include the addition of several primary and secondary arterial routes in Puna and are as follows:

- Primary arterial rights-of-way providing access to the district should be increased as necessary where they pass through relatively undeveloped lands.
- The present Puna Coast Road, eventually to connect with the Chain of Craters Road, should be developed as a scenic parkway along the coast. Alignment should basically follow the existing road from the Kalapana end of the Chain of Craters Road to the proposed extension of the Saddle Road in the vicinity of the Hilo Airport.
- A new road alignment to connect the junction of the Kapoho-Pohoiki Roads with the Pohoiki area should be constructed. This alignment will eliminate a series of curves in the present road.
- Consider, in conjunction with community associations and the property owners, the use of a variety of mechanisms to provide infrastructure in the non-conforming subdivisions.
- Major collector roads should run from:
  - Opihikao to the Puna Road.
  - Volcano Road to the coast parkway along the Puna-South Hilo boundary.
  - Volcano Road to the Saddle Road above Hilo along the existing Kulani Road.
  - Upper portion of the National Park to a point approximately two miles west of Kalapana.

The proposed Keaau Bypass implements a Tier 1 project of the Long Range Highway Plan for the Big Island, and it also complements the County's long range planning. The preferred makai bypass alternatives would provide a connecting point for the proposed

secondary link between a coastal arterial and Highway 11. The mauka alternative might provide a better connection with the Komohana Street extension if it develops as preliminarily mapped, however, if the Keaau end of this extension is relocated to meet the bypass/Mamalahoa Highway intersection, the desired major alternative route into Hilo would result. Such an alignment could also connect with the spur leading to the coastal highway.

Mass Transportation

The County's Hele-On Bus system serves a very limited number of riders in Puna. Two routes serve Puna: Pahoa-Hilo and Kau-Hilo. Inconvenient scheduling is said to limit ridership.

Keaau Traffic

Keaau straddles the junction at which State Highway 130 (Keaau-Pahoa Road) terminates upon meeting State Highway 11 (Mamalahoa Highway). Because this intersection gathers motorists from both lower Puna and upper Puna on their way to Hilo, traffic volume can sometimes be heavy, especially during peak hours.

To quantify the existing traffic situation and allow projections of future conditions with or without a bypass, a traffic study was completed by Barton-Aschman Associates, Inc. (Appendix C). The study employed traffic projections provided by DOT, preliminary engineering data from Imata and Associates, and additional information collected for the study, including existing traffic parameters at various intersections in the project area, roadway geometrics and traffic signal phasing and timing to describe the present traffic and project future traffic in terms of the level-of-service (LOS) at each affected intersection. In addition, various lane configurations were analyzed for each new intersection, and recommendations made on the basis of capacity to carry the projected traffic volumes. Further analysis was done to determine if the intersections required signalization.

The following brief explanation of the level-of-service concept will aid understanding of the basis for the comparisons made in the analysis. "Level-of-service" is a term which denotes any of a number of combinations of traffic operating conditions that may occur on a given roadway when it is subject to various traffic volumes. Factors such as speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort and convenience affect the determination of level-of-service. Analytically, it is related to a ratio of the traffic volume to the theoretical traffic capacity of the roadway or intersection (V/C ratio).

There are six levels-of-service, A through F, which describe driving conditions from best to worst, respectively. They are described as follows:

- **Level-of-service A** represents uncongested, free-flow conditions. On a two-lane road, passing demand is well below passing capacity. Drivers would be

delayed no more than 30 percent of the time by slow moving vehicles. For multi-lane highways, the ability to maneuver within the traffic stream is high. Minor traffic flow disruptions at this level are easily absorbed without causing significant delays or queuing.

- **Level-of-service B** is indicative of a stable flow where the presence of other vehicles begins to be noticeable. As passing demand approaches capacity on two-lane roadways, platooning is common. At this level, minor traffic disruptions are still easily absorbed, but local deterioration in LOS will be more obvious.

- **Level-of-service C** represents conditions at which noticeable delays occur and the freedom to maneuver between lanes becomes restricted. Slowing of traffic is particularly noticeable when vehicles turn left and passing capacity is reduced.

- **Level-of-service D** represents congestion and the limits of stable traffic flow. Traffic congestion severely restricts speeds and the ability to maneuver. Only the most minor of traffic disruptions can occur without extensive queues forming. On two-lane roads, passing demand is high while passing capacity approaches zero.

- **Level-of-service E** represents unstable traffic flow operations at or near capacity. Any disruption, no matter how minor, causes queues and deterioration of LOS. Passing becomes virtually impossible on two-lane roadways.

- **Level-of-service F** represents heavily congested flow with the traffic demand exceeding capacity. Operations within queues are very unstable, with traffic experiencing short spurts of movement followed by stoppages.

Figure 8 shows the growth in traffic through Keaau during the period 1978 to 1992. The present LOS during both morning and afternoon peak hours is E. Projections to the year 2003 and beyond reveal a further deterioration of conditions to LOS F. By adding another northbound through lane and a southbound lane turning eastward at Keaau-Pahoa Road, current conditions could be mitigated to LOS A. By further adding another westbound lane on Keaau-Pahoa Road turning northward on Mamalahoa Highway, the 2003 LOS would be B and the 2013 LOS would be C (Table 2). From a purely traffic flow viewpoint, these are acceptable levels-of-service. Widening of Keaau-Pahoa Road, however, would have a host of other negative consequences, including destruction of historic buildings, displacement of businesses and residences, increased probability of carbon monoxide "hot spots" during peak hours, and increased noise.

FIGURE 8. HISTORICAL TRAFFIC GROWTH THROUGH KEAAU

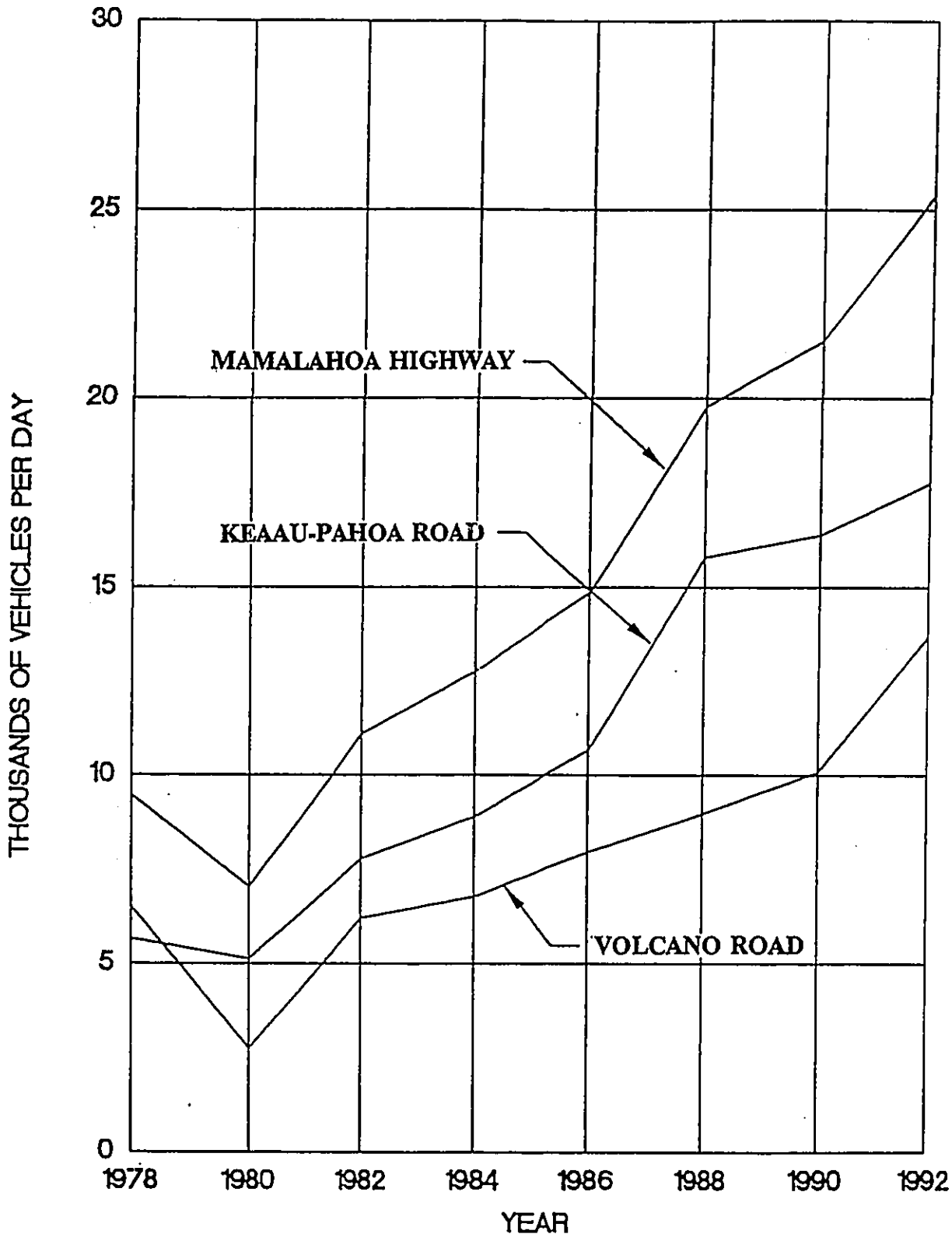
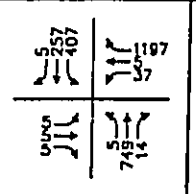
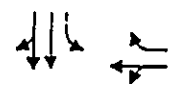
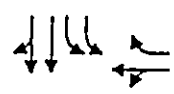
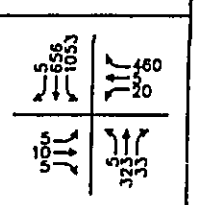
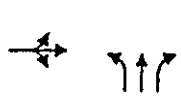
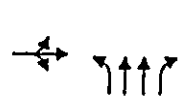
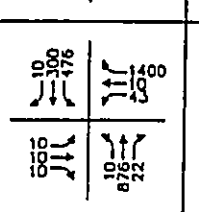
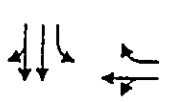
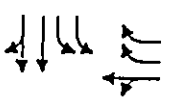
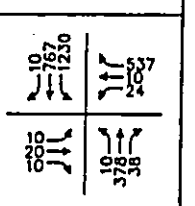
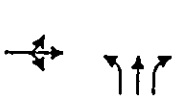
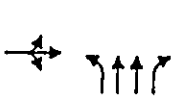
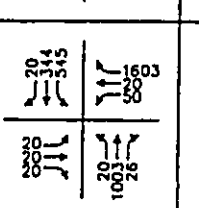
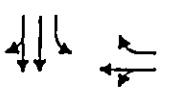
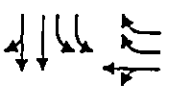
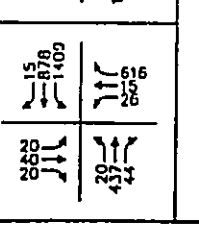
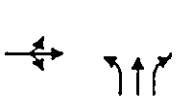
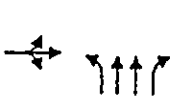


TABLE 2
LEVEL-OF-SERVICE ANALYSIS FOR THE NO-BUILD ALTERNATIVE
MAMALAHOA HIGHWAY AT KEAAU-PAHOA ROAD

Year	Period	Peak Hour Volume	Existing Conditions		Mitigated Conditions	
			Lane Configuration	V/C (LoS)	Configuration	V/C (LoS)
1993	AM Peak Hour			0.903 (E)		0.577 (A)
	PM Peak Hour			0.919 (E)		0.514 (A)
2003	AM Peak Hour			1.076 (F)		.684 (B)
	PM Peak Hour			1.125 (F)		0.626 (B)
2013	AM Peak Hour			1.231 (F)		0.789 (C)
	PM Peak Hour			1.290 (F)		.719 (C)

Several analyses were done to identify the required characteristics of a bypass road around Keaau. Using standard design assumptions (see Appendix C for details), it was determined that the LOS for a two-lane bypass would be D for the 2013 design traffic. LOS D falls below the DOT standard of LOS C for new or improved roadways, and indicates congestion and peak hour delays would be experienced. A four-lane highway is therefore required to carry the projected traffic at an acceptable level-of-service.

The Bypass would intersect both Keaau-Pahoa Road and Mamalahoa Highway. Various lane configurations were analyzed for their effects on the level-of-service. The configurations shown on Figure 9 were found to be most effective in maintaining at least a LOS C. A signal warrant analysis was then completed, and showed that signalization is required at both terminal ends of the bypass.

3.6 NOISE

A noise impact assessment for the proposed project was completed by Darby & Associates, and is included as Appendix D. Like the air quality assessment, the first step in the noise assessment was to determine ambient conditions. Field measurements were taken at the five noise sensitive locations described below and identified in Figure 10.

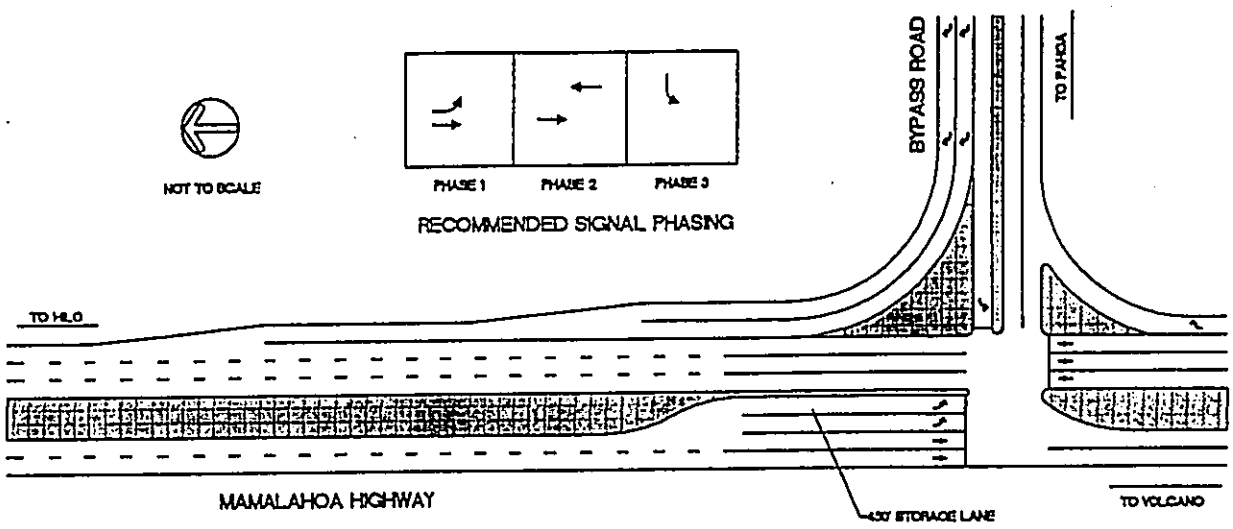
A. Shipman Industrial Park road extension east of Mamalahoa Highway,
B. Road adjacent to 8 ½ Mile Camp,
C. Milo Street at water tank,
D. Corner Uhiuhi Street (dog leg), and
E. Corner Uhiuhi Street and Ohe Street.

The average ambient noise levels during non-peak traffic times ranged from 41 to 45 dBA, typical of rural/residential areas. During peak traffic times, noise at the same locations increased to between 50 and 54 dBA due to noise from existing roadways.

Construction of a bypass road would reduce traffic through Keaau town, and consequently lower noise levels. Reductions of about 3.6 and 2.0 dB along Keaau-Pahoa Road and Mamalahoa Highway, respectively, would be experienced in the years 2003 and 2013. Near the bypass road alignment, however, noise would increase during and after construction. All noise sensitive locations (residences) along the bypass road would be significantly impacted by construction noise and by future peak hour traffic noise along the bypass. The shorter bypass alternative would impact fewer residences. Table 3 summarizes the projected traffic noise at the five noise sensitive locations along the bypass corridor.

Mitigation of construction noise can be achieved through adoption of a construction noise permitting process, similar to that in effect on Oahu, or the stipulation of noise control requirements in the project's contract documents. If blasting is required during the construction, the use of proper blast design techniques can control blast noise within acceptable limits.

FIGURE 9. BYPASS TERMINAL INTERSECTIONS' CONFIGURATIONS



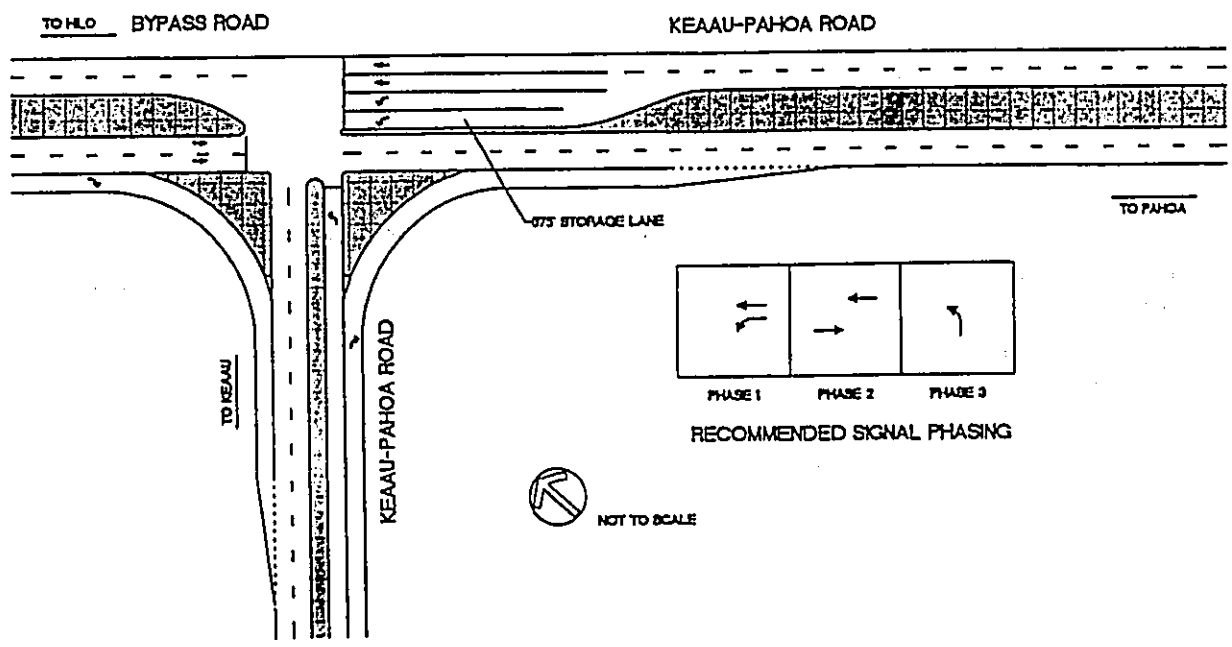
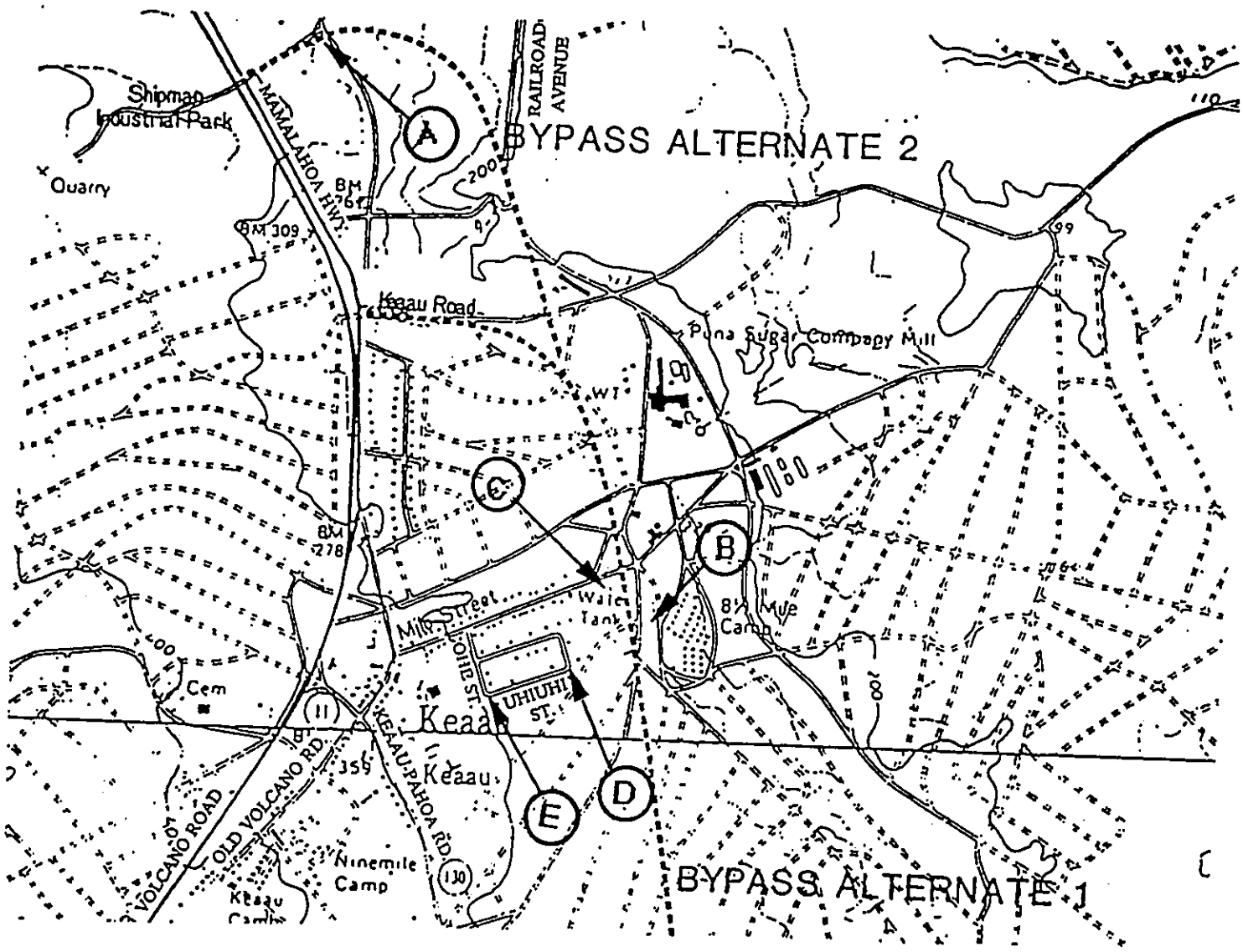


FIGURE 10. AMBIENT NOISE LEVEL MEASUREMENT SITES



Possible traffic noise mitigation techniques include: reduced vehicular speed, use of retaining ("Jersey") barriers, construction of noise barriers, alteration of horizontal and vertical roadway alignments, acquisition of real property, design of roadway surfaces, and air-conditioning of impacted dwellings.

TABLE 3
PEAK HOUR TRAFFIC-GENERATED NOISE LEVELS
AT NOISE SENSITIVE LOCATIONS

NOISE SENSITIVE LOCATION[a]	APPROXIMATE DISTANCE TO BYPASS ROAD CENTERLINE (Feet)	Leq(h) in dBA		
		1993 (EXISTING)[b]	2003 WITH BYPASS[c]	2013 WITH BYPASS[c]
A (if Alt. 1)	5,300	54.2	55.8[d]	56.4[d]
A (if Alt. 2)	100	54.2	70.1	70.7
B	350	50.2	61.6	62.2
C	200	49.9	68.2	68.8
D	210	50.6	68.0	68.6
E	1,300	51.8	60.1	60.7

[a]Noise sensitive locations as shown on Figure 10.
[b]Calculated using 1993 peak hour traffic flow parameters for Mamalahoa Highway plus measured average ambient sound level.
[c]Except as noted otherwise, calculations for Keaau Bypass Road are based on a vehicle speed of 55 mph, a vehicle mix of 93.9% automobiles, 3.6% medium trucks and 2.5% heavy trucks, and a 2.5% grade.
[d]Calculation based on peak hour traffic flow parameters for Mamalahoa Highway.

3.7 CLIMATE AND AIR QUALITY

Located on the windward coast of Puna, the area has a nearly constant exposure to the northeast trade winds. Mean maximum temperatures range from 75°F in the winter months, to 85°F in the summer and fall. Mean minimum temperatures range from 60°F in winter to 70°F in summer.

An air quality impact analysis of the proposed bypass was prepared by Ogden Environmental and Energy Services Co., and is included as Appendix E. Short-term (during construction) and long-term (during operation), local and regional impacts were considered, with potential impacts resulting in ambient air pollutant levels exceeding either state or federal standards considered the criterion of significance. Hawaii state and federal ambient air quality standards (AAQSs) are summarized in Table 4.

To predict future ambient air quality, it is necessary to understand both the climatology and the existing air quality of a site. Effects related to a given project can then be superimposed on the existing situation via computer model to determine whether or not exceedances of AAQSs would occur. Meteorology, climatology and topography assumptions pertinent to the air quality modeling are summarized in Appendix E.

Establishment of ambient conditions usually requires a long-term air quality monitoring program. The most representative data available are from HELCO's Waiakea monitoring station, about 5.5 miles north of the proposed project site. Ambient concentrations of sulfur dioxide (SO_2), nitrogen dioxide (NO_2), particulate matter less than 10 microns in aerodynamic diameter (PM_{10}), and carbon monoxide (CO) were measured from February 1989 to May 1990, and are considered to represent baseline air quality for this study.

Three categories of impacts were addressed: short-term (construction-related); long-term (associated with operation of a bypass road); and indirect. During construction, the emissions of concern are tailpipe emissions from construction equipment and workers' vehicles, and fugitive dust. Tailpipe emissions include SO_2, oxides of nitrogen (NO_x), hydrocarbons (HC), CO and PM. Diesel engines will emit more SO_2, NO_x, and PM, while gasoline engines will emit more HC and CO. Localized increases in these emissions are considered unavoidable during construction, but exceedances of ambient air quality standards are not expected.

Fugitive dust generated from site work is estimated at 1.2 tons per acre per month. Strict compliance with State of Hawaii Air Pollution Control Regulations (Section 11-60-5, HAR) regarding establishment of a regular dust-watering program and covering of dirt-hauling trucks would be required to effectively mitigate fugitive dust emissions from construction activities. Twice-daily watering is estimated to reduce dust emissions by up to 50 percent. Soil transported onto paved roads by construction vehicles and activities should be promptly removed. Use of wind screens and/or limiting the area that is disturbed at any given time may be required in sensitive or dust-prone areas. Paving of designated areas and landscaping as early as possible in the construction sequencing would reduce total fugitive dust emissions. Construction equipment should be properly maintained and tuned to minimize exhaust emissions (Section 11-60-4, HAR). Equipment should be shut down rather than left idling when not in use.

Operation of a bypass road will impact air quality in the vicinity by the tailpipe emissions of motor vehicles, with the most significant emission being CO. High short-term concentrations of CO, known as "hot spots", can occur at locations where traffic is congested, such as at intersections. Within the study area, the greatest potential for hot spot occurrence is at the intersection of Mamalahoa Highway and Keaau-Pahoa Road where traffic congestion is most likely. Human receptors are present there as pedestrian traffic. Conditions at that intersection were modeled using future traffic projections with and without construction of a bypass road. (See Appendix E for details of the computer modeling.) The results of the modeling are summarized in Table 5.

TABLE 4
AMBIENT AIR QUALITY STANDARDS

POLLUTANT	AVERAGING TIME	MAXIMUM ALLOWABLE CONCENTRATION ($\mu g/m^3$)		
		NATIONAL PRIMARY[a]	NATIONAL SECONDARY[b]	STATE OF HAWAII
Particulate Matter[c]	Annual	50	50	50
	24 Hours	150	150	150
Sulfur Dioxide	Annual	80	-	80
	24 Hours	365	-	365
	3 Hours	-	1,300	1,300
Nitrogen Dioxide	Annual	100	100	70
Carbon Monoxide	8 Hours	10,000	10,000	5,000
	1 Hour	40,000	40,000	10,000
Ozone	1 Hour	235	235	100
Lead	Calendar Quarter	1.5	1.5	1.5
Hydrogen Sulfide	–	–	–	35

[a]Selected to prevent adverse effects on public health.
[b]Selected to prevent adverse effects on public welfare including effects on comfort, visibility, vegetation, animals, aesthetic values, and soiling and deterioration of materials.
[c]Particles less than or equal to 10 microns aerodynamic diameter.

TABLE 5
MAXIMUM PREDICTED CO CONCENTRATIONS
(ppm)

A. 1-HR CO CONCENTRATIONS

YEAR	TIME	AMBIENT CONC.	MAXIMUM CO CONCENTRATION			
			WITHOUT PROJECT	WITH PROJECT	SAAQS	NAAQS
1993	am	2.0	7.7	-	9	35
	pm	2.0	5.7	-	9	35
2003	am	2.0	5.9	3.6	9	35
	pm	2.0	4.2	4.2	9	35
2013	am	2.0	6.1	3.6	9	35
	pm	2.0	4.2	3.8	9	35

B. 8-HR CO CONCENTRATIONS

YEAR	TIME	AMBIENT CONC.	MAXIMUM CO CONCENTRATION			
			WITHOUT PROJECT	WITH PROJECT	SAAQS	NAAQS
1993	am	2.0	5.4	-	4	9
	pm	2.0	4.0	-	4	9
2003	am	2.0	4.1	2.5	4	9
	pm	2.0	2.9	2.9	4	9
2013	am	2.0	4.3	2.5	4	9
	pm	2.0	2.9	2.7	4	9

Note: Existing or potential violations of AAQSs are highlighted.

The worst-case scenario for air quality degradation is the "no-build" alternative. Without construction of the bypass, present one-hour concentrations of CO approach the state ambient air quality standard. (They do not approach the national standard which is nearly four times the state standard.) Bypass construction would generally lower CO concentrations at the intersection, especially during the more congested AM peak hour. Without the bypass, the eight-hour CO state standard is violated at present and in the future in the AM. (The national standard is more than double the state standard, and all concentrations are well below this value.) The project will have a positive impact on air quality at the intersection due to a reduction of traffic congestion. Concurrently, air quality improvements could be expected also, due to improvements in fuel efficiency as mandated under the Clean Air Act Amendments. CO concentrations at the new bypass intersections are not expected to exceed the state standard. Long-term improvements to air quality could be realized by implementation of public mass transportation, expansion of ride-sharing programs, and encouragement of non-motorized means of transportation by adequate provisions for bicycle facilities.

Indirect impacts to air quality from implementation of the project include such things as increased emissions from electrical generating stations due to elevated power demand from street lighting, traffic signals, etc. These impacts would be very slight, and would be experienced in the vicinity of the generating stations, not in the project area. Mitigation of increased electrical demand by restricting lighting and signalization would have to be weighed against reductions in public safety.

3.8 TOPOGRAPHY, SOILS AND DRAINAGE

Topography

The land is predominantly gently sloping with minor variations due to the pattern of lava flows from Mauna Loa and Kilauea. Small depressional areas and drainage channels are occasionally formed, but due to the porous nature of the soil and substrate, surface erosion has not yet created great variations in slope or terrain. The overall slope follows the curvature of the general shield volcanos of which the region is a part (Group 70, 1993).

The area resides in the physiographic region described by geologists as the Mauna Loa Undissected Upland (University of Hawaii, Dept. of Geography, 1983). Such areas are characterized by geologically recent lava flows mantled thinly with soil, sloping terrain, few established drainage channels and only minor topographic features (Hahn and Associates, 1993).

Elevations range from approximately 235 to 335 feet above sea level. Slopes over the area average approximately 2.5 percent, ranging from less than 0.5 to 4.7 percent. The highest slopes occur immediately adjacent to the existing highways at the termini (connecting points).

Soils

Regionally, Keaau is located in an area where the ash soils of Mauna Loa meet the lava flows of Kilauea. The soils of the area are derived from geologically recent a`a and pahoehoe flows covered in places with layers of Pahala Ash. Certain areas, especially where Pahala Ash deposits are thickest, have obvious agricultural utility and have been farmed for cane and other crops for many decades. Much of this soil, however, is of fair or marginal value to agriculture because of its stoniness, acidity and poor structure (U.S. Soil Conservation Service, 1973). Only one soil (Olaa silty clay loam) of the five types found in the Keaau area bears a rating of IV or better in the U.S. Soil Conservation Service's capability subclass ratings. Most of the soil is subclass VI or VII, i.e., severely limited in terms of cultivation (Hahn and Associates, 1993).

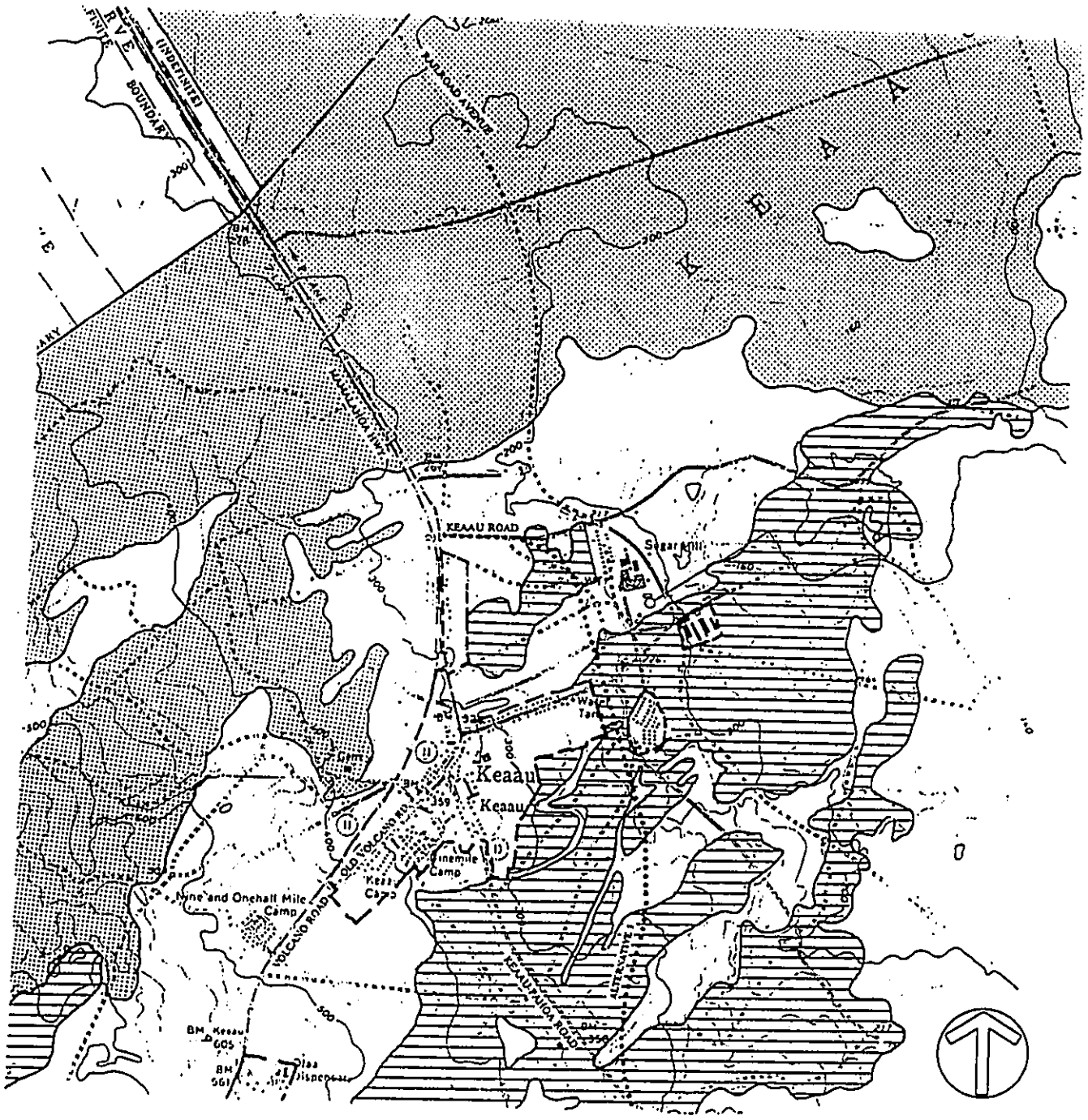
The *Detailed Land Classification - Island of Hawaii* (University of Hawaii, Land Study Bureau, 1965) classified all land on the Big Island into one of five master productivity ratings based on soil characteristics, slope, rainfall and miscellaneous site conditions. The ratings range from "A" (very good) to "E" (very poor). Lands around Keaau are assigned productivity ratings between "C" and "E".

A separate system rating the value of agricultural land is the ALISH classification (Agricultural Lands of Importance to the State of Hawaii) (see Baker, 1978). The project area contains some land that has been classified as either Prime or Other Important Agricultural Land in this system (Figure 11). The majority of alternative routes 1 and 2 would pass over "Prime Agricultural Lands." These are defined as "Land which has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed according to modern farming methods." Alternative 3 would, in addition, cross a broad area of lands classified as "Other Important Agricultural Lands." These are defined as "Land other than Prime or Unique Agricultural Land that is also of statewide or local importance for agricultural use." About half of Alternative 4, the mauka route, would pass over Prime Agricultural Lands, and widening of Keaau-Pahoa Road, Alternative 5, would also affect Prime Agricultural Lands which lie astride the existing right-of-way.

Drainage

The runoff potential of any given area is a function of a number of factors, including soil type, slope, vegetation and rainfall. Soils in the area are variable in terms of runoff potential (U.S. Soil Conservation Service, 1981). Slopes are low to moderate and the ground cover is mainly heavy woods with small, intermittent patches of dense scrub and overgrown sugar cane. Rainfall is high. In general, this combination leads to fairly high infiltration and modest surface runoff during light to moderate precipitation. No permanent streams have developed in the area, although small gullies transport excess runoff during high rainfall (Hahn and Associates, 1993).

FIGURE 11. ALISH LANDS IN THE PROJECT AREA



LEGEND:

PRIME AGRICULTURAL LAND - Land which has the soil quality, growing season, and moisture supply needed to produce sustained high yields of crops economically when treated and managed according to modern farming methods.

UNIQUE AGRICULTURAL LAND - Land that has the special combination of soil quality, location, growing season, moisture supply, and is used to produce sustained high quality and/or high yields of a specific crop when treated and managed according to modern farming methods.

OTHER IMPORTANT AGRICULTURAL LAND - Land other than Prime or Unique Agricultural Land that is also of statewide or local importance for agricultural use.

EXISTING URBAN DEVELOPMENT - Land which has been developed for urban type use.

U.S. GOVERNMENT - Land which is currently under the jurisdiction of the U.S. Government.

Rainfall that falls on the mauka side of Highway 11 and does not infiltrate travels overland as sheet flow. In the area between Keaau Village and the Shipman Industrial Park, storms rated as two years or less recurrence interval will generate sheet flow and shallow concentrated flows that reach the highway. During storms with longer return intervals, runoff arrives at the highway as a well-defined channel flow. There are currently a number of drainage structures that conduct these flows beneath the highway. Several drywells also exist nearby. Runoff from the largest storms also pass through an underpass formerly used for cane-haul truck access to the Puna Sugar Mill complex.

Roads such as the proposed bypass often serve to both increase surface runoff and provide drainage channels. Mitigation of drainage problems on the Big Island is often done with drywells or vertical drains. These are holes dug 20 feet or so deep to porous rock, sometimes filled with crushed rock and sometimes cased. In Puna the county has 96 drywells, most next to county roads and parks. Many farms also employ drywells. Drywells are particularly suitable for Puna because of the porosity of the rock. Installation of drywells comes under the regulations of the Underground Injection Control (UIC) program administered by the state Department of Health. (Note that a french drain - a hole wider than it is deep - does not come under the UIC regs.)(Community Management Associates, 1992). Adequate drainage structures will be required in final design of the bypass.

3.9 WATER RESOURCES

The project area is in an extensive groundwater recharge area. Surface drainage channels are scarce due to the high permeability of the soil. There are no known wetlands nearby (Group 70 International, 1994). Precipitation that is not subject to evapotranspiration from soil or plants flows to the sea as groundwater. It is estimated that about three quarters of the ambient rainfall reaches the ocean as groundwater (Hahn and Associates, 1993).

Keaau, along with a much larger area of the Puna and Hilo districts, rests atop a significant groundwater body that is designated the Keaau Aquifer System (Code 80402) by the Water Resources Research Center of the University of Hawaii (Hahn and Associates, 1993). This aquifer, which consists primarily of fresh basal water overlying saline groundwater, is thought to be capable of producing 393 million gallons per day (mgd) of sustainable yield. While the developable potable groundwater may be somewhat less, the water resource in Keaau is clearly enormous. Current groundwater withdrawals in Puna are capable of tapping only 2.34 mgd, while planners project demands in the near future to exceed 2.50 mgd (Yuen and Associates, 1992).

The water in the lens is moving toward the coast at about 40 feet per day, while normal groundwater travels about one foot per day (Bowles, 1984). It is estimated that about one billion gallons per day flow out to sea at the shoreline. The flow of water in the

aquifer has been estimated at over ten million gallons per day per mile of aquifer width (Kon, 1989).

The bypass road will increase the area of impermeable surfaces around Keaau. Runoff, however, will not be shunted into centralized storm sewers which would reduce groundwater recharge. Because of the extremely permeable soils characteristic of the area, surface infiltration and possibly dry wells will be used to allow excess runoff to percolate into the water table. Dissolved and suspended pollutants entrained within this flow will be filtered and adsorbed by soil particles, degraded by bacteria, and diluted by the huge subsurface freshwater flows. No significant impact on groundwater resources is anticipated.

3.10 NATURAL DISASTERS

The area surrounding Keaau is subject to volcanic hazard, particularly lava inundation from Mauna Loa. The United States Geological Survey classifies the area as Lava Flow Hazard Zone 3, on a scale of ascending risk 9 to 1. Zone 3 is considered "less hazardous than Zone 2 (which is adjacent to and downslope of active risk zones) because of greater distance from recently active vents and/or because the topography makes it less likely that flows will cover these areas" (Heliker, 1990). About 15 to 20 percent of Mauna Loa Zone 3 has been covered by lava in the past 750 years. The lava flow hazard to Keaau, although relatively severe, is among the lowest in Puna, equivalent to that of Hilo.

In terms of seismic risk, the entire Island of Hawaii has a Zone 3 Seismic Probability Rating (Hahn and Associates, 1993). Zone 3 areas are at risk from major earthquake damage, especially to structures that are poorly designed or built. Partly because of the firm local substrate, none of the several earthquakes of Richter magnitude 6.0 or greater that have occurred in the Puna area since 1950 has caused major damage to public roads or bridges in lower Puna (Community Management Associates, 1992).

The Federal Emergency Management Agency classifies flood hazard zones as part of the Flood Insurance Program for the County of Hawaii. The Keaau area has not been mapped in detail on a Flood Insurance Rate Map (FIRM), but the entire region is designated as flood hazard zone "X". This identifies areas of moderate to minimal flood hazard, i.e., outside the 100-year to 500-year flood plain. Nevertheless, small areas of flood hazard may still exist within areas designated as "X". In fact, the extremely heavy rainstorms of February 1979 and November 1990 produced local flooding at numerous unexpected locations in Puna (Community Management Associates, 1992).

The bypass road will be as vulnerable to lava inundation as other roads in the vicinity. Because, however, there are no structures (bridges, elevated ramps, etc.) anticipated in the final design, seismic risks will be minimal. Tsunami risks are not great near Keaau. The bypass will enhance the capabilities to evacuate lower Puna in the event of a natural disaster in that area.

3.11 FLORA AND FAUNA

A botanical survey of the bypass corridor was completed for this environmental assessment by Char & Associates, and is included here as Appendix F. The objectives of the survey were to: 1) describe the major vegetation types found within the proposed makai corridor; 2) inventory the flora; 3) search for threatened and endangered species as well as rare and vulnerable plants; and 4) identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

Three vegetation types were encountered along the corridor. The proposed bypass road corridor, from where it leaves Keaau-Pahoa Road to where it joins Mamalahoa Highway will cross over **Old Field Vegetation**. This vegetation type is found on most of the corridor, and is dominated by introduced or alien species. This vegetation type is characteristic of former sugar cane lands, and consists of weedy tree species, various grasses and weedy herbs and shrubs, interspersed with remnant patches of sugar cane.

A **Mixed Forest** vegetation type occupies only a small area north of Keaau Road along the Alternate 2 corridor. It is composed almost exclusively of introduced species, especially large, old specimens of gunpowder tree, 50 to 70 feet tall. Other tree species present include, guarumo, melochia, avocado, mango, breadfruit, kukui, Alexandra palm, hala and Chinese banyan. The hala is indigenous to Hawaii and elsewhere. A few ohia trees are present. The ohia is an endemic species, native only to Hawaii. It was the only such species identified in the survey.

A small area along the Alternate 2 corridor consists of **Macadamia Nut Orchard**. The rows of cultivated trees are bordered by paperbark trees.

Of a total of 107 plant species inventoried on the bypass road corridor, 91 (85%) are introduced or alien species; 8 (7.5%) are originally of Polynesian introduction; and 8 (7.5%) are native. Of the natives, 7 (5 ferns and 2 flowering plants) are indigenous, that is, they are native to the Hawaiian Islands and elsewhere.

None of the plants found on the corridor are listed threatened or endangered species, nor are any proposed or candidate for such status. The bypass road is not expected to have a significant negative impact on botanical resources, and no specific mitigation measures are proposed.

A faunal survey of the makai corridor was completed by Dr. Leonard Freed and is attached as Appendix G. The survey objective was to identify biologically significant habitats for birds and mammals, to thoroughly survey such habitats for bird and mammal species, and to sample the other habitats in the corridor.

No native habitats were found in the project area. Neither were there wetlands or other specialized habitats that might be used by native animals. No endangered or

threatened birds and no endangered bats were detected during the survey. The only native bird seen during the survey was the Pacific Golden Plover, abundant at five of ten stations sampled. A number of introduced birds and the mongoose were seen.

Several protected species are possibly or probably present in the area. The Hawaiian Hawk may use the exotic vegetation as feeding habitat. The Hawaiian Hoary Bat may also feed throughout the project area. The Dark-rumped Petrel and Newell's Shearwater may overfly the site to and from the ocean if breeding colonies exist on the northeast slope of Mauna Loa, as appears to be the case. The band-rumped Storm-Petrel may also overfly the site enroute to the ocean. The Hawaiian Owl may also forage through the grasslands and shrublands in the project vicinity.

The bypass should have little impact on populations of the Hawaiian Hawk, Hoary Bat or Owl. These species have all been detected elsewhere near roads, so aside from possible disturbance during construction, the road and traffic would not be expected to make this area more unsuitable than it is now. The footprint of the right-of-way represents a minor removal of vegetation. The only possible negative impact would be chance collision with vehicles on the new road. The lighting for the new road may attract insects and actually enhance the area for bats.

In contrast, lights are known to attract and disorient seabirds. Disoriented seabirds could collide with nearby objects such as utility poles, trees, or buildings. Mitigating actions to reduce the probability of collision include the use of shields on lights that reduce upward radiation. The Hawaii County lighting ordinance is one of the most stringent in the entire country, designed to protect night viewing from the Mauna Kea observatories. Application of these provisions will mitigate any potential lighting impacts to bird populations.

A safe breeding area for Hawaiian Geese (Nene) was established by Mr. Herbert Shipman in the 1940s and continues to exist along the coast makai of Keaau Town on Shipman property. The State Department of Land and Natural Resources (DLNR) administers funds from the Federal Forestry Stewardship program which assists with the Nene Sanctuary's operating expenses. The Sanctuary is a cooperative effort between the DLNR and W.H. Shipman Estate, Ltd. (Group 70 International, 1994). The bypass would not affect this sanctuary.

3.12 AESTHETIC CONSIDERATIONS

The gently sloping terrain of the Keaau area leads to generally subtle views from and towards the area. The absence of topographic barriers allows vistas of Mauna Kea, Mauna Loa and the sea from many nearby locations. Off-site views of the area consist of rural but not especially scenic vistas of abandoned cane land. No examples of natural scenic beauty as identified in the Hawaii County General Plan are present in or surrounding the project area (Hahn and Associates, 1993).

4.0 SUMMARY OF MAJOR IMPACTS

Most of the bypass corridor would pass through former cane fields, now fallow. A macadamia nut orchard near Keaau-Pahoa Road may be impacted, depending on specific alignment decisions. Alternative 2 could displace one residence and pass through areas planted in flowers and papaya. No parcels would be left without access, although some adjacent parcels may not be provided direct access to the bypass.

Grading operations during construction would alter the existing land-form and temporarily expose the soil to wind and water erosion. Mitigation measures such as watering and landscape plantings would be part of the project. Changes to existing topography, however, would be minor. Infiltration of rainfall would be reduced over the roadway width due to paving, compaction and drainage controls. The redistribution of recharge will be negligible and is not expected to adversely affect water supply or ground water levels. Adequate consideration of drainage and runoff will be included in final engineering design of the bypass.

8 ½ Mile Camp would be closer to major roadways and become more visible. Without mitigation, bypass traffic would significantly increase the noise levels at nearby residences. Various types of mitigation would be possible to reduce this potential impact. Conversely, both noise levels and air pollutant concentrations would be decreased in Keaau village. Air pollutant emissions will occur from vehicles using the bypass, but the concentrations are not expected to exceed State or Federal Ambient Air Quality standards as a result of the proposed project.

Operation of a bypass could reduce clientele for Keaau's merchants, however, new developments proposed by W. H. Shipman, Ltd. for Keaau will greatly increase both residential and commercial construction in coming years. The effect of the bypass would be cumulatively insignificant. The project itself is not expected to significantly affect community growth nor is it expected to alter the community profile of the Keaau area, although it could stimulate somewhat the build-out of existing residential subdivisions if traffic flow to and from lower Puna is substantially improved.

It is estimated that the project would generate about 186 to 264 person-years of construction-related employment, including direct, indirect and induced impacts. During construction, increases in noise, fugitive dust and vehicle emissions are unavoidable.

The bypass would lessen traffic congestion through Keaau, improving the accessibility of Lower Puna. The level-of-service would be improved from the present peak hour LOS E to LOS C or better. Benefits would include improved public safety and more efficient delivery of goods and services, including emergency services, to Puna residents. Evacuation of residents in the event of natural disaster may become easier after bypass construction.

Prior agricultural use of the bypass corridor lands probably eliminates the possibility of surface archaeological remains, but subsurface historical remains could be present in the areas near 8 ½ Mile Camp.

Impacts to utilities would be minor, with only a slight increase in electrical demand due to operation of street lights and traffic signals. Excavations near existing utility rights-of-way will be completed without service interruptions.

No endangered or threatened species of flora or fauna would be significantly negatively impacted by the bypass project. A small amount of habitat presumably used by the Hawaiian Hoary Bat, the Hawaiian Hawk and the Hawaiian Owl would be eliminated, but these species forage over wide ranges. Operation of street lights along the bypass may attract insects, benefiting the bats, but may also serve to disorient overflying seabirds. Shielding of upward radiation, in conformance with the County's lighting ordinance, would provide adequate mitigation.

The aesthetic quality of the area is not expected to be significantly or adversely reduced.

5.0 DETERMINATION AND JUSTIFICATION

The proposed project would not have a significant effect on the environment and therefore preparation of an environmental impact statement is not required. The "Significance Criteria," Section 12 of Hawaii Administrative Rules Title 11, Chapter 200, "Environmental Impact Statement Rules," were reviewed and analyzed. Based on the analysis, the following were concluded:

1. *No irrevocable commitment to loss or destruction of any natural or cultural resource would result.* The bypass corridor is primariiy in former cane lands, now unused. No significant natural resources are present. Protection of potential cultural resources would be accomplished through an archaeological mitigation program comprised of either advance subsurface testing or monitoring during construction. Such a program would require approval of the State Division of Historic Preservation.

2. *The action would not curtail the range of beneficial uses of the environment.* The project, while certainly curtailing use of lands within the corridor to transportation and utilities uses, would increase access to Lower Puna, thereby facilitating beneficial uses of other lands in the District.

3. *The proposed action does not conflict with the state's long-term environmental policies or goals and guidelines.* The State's environmental policies and guidelines are set forth in Chapter 344, Hawaii Revised Statutes, "State Environmental Policy." Two broad policies are espoused: conservation of natural resources, and enhancement of the quality of life. The proposed project does not consume significant natural resources. It would include mitigative measures to minimize various categories of pollution, while promoting general welfare and improving the efficiency of transportation allowing fulfillment of the social, economic and other requirements of residents. The project is further supportive of the following guidelines specific to transportation established in Chapter 344:

   - Encourage transportation systems in harmony with the lifestyle of the people and environment of the State;
   - Adopt guidelines to alleviate environmental degradation caused by motor vehicles; and
   - Encourage public and private vehicles and transportation systems to

conserve energy, reduce pollution emission, including noise, and provide safe and convenient accommodations for their users.

4. *The economic or social welfare of the community or state would not be substantially affected.* Construction of the bypass would result in temporary economic benefits to the construction industry and indirectly to other economic sectors as well. Operation of the bypass would reduce traffic through Keaau, perhaps decreasing revenues to merchants. The population base and degree of competition for customers, however, is expected to increase greatly as the development plans of W. H. Shipman, Ltd. are implemented. The net result to individual merchants will depend on their respective competitive situation. No significant social impacts are anticipated, although the rural character of 8 ½ Mile Camp may be lessened by the proximity of the bypass. Improved access and mitigation measures may offset this impact.

5. *The proposed action does not substantially affect public health.* The project would reduce both noise and emissions of air pollutants within Keaau village. It will facilitate provision of emergency and other public services.

6. *No substantial secondary impacts, such as population changes or effects on public facilities, are anticipated.* The bypass project arises from needs established by a rapidly growing population. To the extent that access to Lower Puna is improved, subdivision build-out may accelerate somewhat. This impact, however, may be more responsive to general economic conditions rather than simply improved traffic conditions. An improved roadway network will improve access to public facilities in and around Keaau.

7. *No substantial degradation of environmental quality is anticipated.* The project area is unremarkable in terms of environmental resources, and standard mitigation measures would suffice to protect ambient environmental quality. Some redistribution of noise and vehicle exhaust emissions would take place. While conditions within Keaau village would be improved, noise levels near 8 ½ Mile Camp would be elevated. Mitigation measures can be employed to reduce the impacts to acceptable levels. The project is not expected to result in concentrations of air pollutants exceeding State or federal standards for ambient air quality.

8. *The proposed action does not involve a commitment to larger actions, nor would cumulative impacts result in considerable effects on the environment.* The proposed project is self-contained and independent of other proposed highway improvements or other types of projects. It does however, address deficiencies in the roadway network recognized in various State and County planning documents.

9. *No rare, threatened or endangered species or their habitats would be affected.* A small amount of potential forage habitat for Hawaiian Hawks, Owls and Bats would be removed, but the large home ranges of these animals render the loss insignificant. No endangered, threatened or candidate floral species would be affected by the project.

10. *Air quality, water quality or ambient noise levels would not be detrimentally affected.* The net effect of the project on air quality would be to reduce emissions within Keaau village, while increasing emissions along the bypass corridor. Improved traffic flow, however, would reduce the possibility of "hot spot" formation. Potential violations of State Ambient Air Quality Standards within Keaau would be alleviated. Noise in Keaau would be reduced, but that at residences near the bypass would be significantly increased. Implementation of various mitigation measures will be necessary to minimize this impact. No significant water quality impacts are anticipated either during construction or operation of the bypass.

11. *The project would not affect environmentally sensitive areas, such as flood plains, tsunami zones, erosion-prone areas, geologically hazardous lands, estuaries, fresh waters or coastal waters.* No environmentally sensitive areas would be affected. The project site is on basically flat land well inland of the coast. Tsunami inundation is unlikely. Seismic risks are minimal; no structures are anticipated as part of the project. The volcanic hazards are comparable to those in Hilo.

6.0 LIST OF REFERENCES

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7.0 LIST OF CONSULTED PARTIES

7.1 PRE-ASSESSMENT CONSULTATION

The following agencies, organizations, utilities and individuals were consulted. Non-substantive (no comment) responses are indicated below with a single asterisk. Substantive responses are indicated below with a double asterisk, and reproduced following Section 7.1.

FEDERAL AGENCIES

U.S. Department of Agriculture, Soil Conservation Service
** U.S. Army Corps of Engineers, Pacific Ocean Division
U.S. Department of the Interior, Fish and Wildlife Service
U.S. Department of the Interior, National Park Service
U.S. Department of Commerce, National Marine Fisheries Service
** U.S. Department of Transportation, Federal Aviation Administration

STATE AGENCIES

** Department of Accounting and General Services
Department of Agriculture
** Department of Business, Economic Development and Tourism (Response from Land Use Commission)
Department of Business, Economic Development and Tourism, State Energy Office
* Department of Defense
** Department of Education
Department of Hawaiian Home Lands
** Department of Land and Natural Resources (Two responses)
** Department of Land and Natural Resources, State Historic Preservation Division
* Department of Health
Department of Health, Environmental Management Division
** Office of State Planning
Office of Hawaiian Affairs
University of Hawaii, Water Resources Research Center
University of Hawaii, Environmental Center

STATE LEGISLATORS

Senator Andrew Levin
Senator Richard Matsuura
Representative Harvey Tajiri
Representative Robert Herkes
Representative Jerry Chang

COUNTY AGENCIES

Planning Department
Police Department
* Department of Public Works
Department of Parks and Recreation
Department of Research and Development
** Department of Water Supply

UTILITIES

Hawaii Electric Light Company
Hawaiian Telephone Company
GASCO, Inc.
Jones Spacelink of Hawaii, Inc.

ORGANIZATIONS

** W.H. Shipman, Ltd.
** AMFAC/JMB Hawaii, Inc.
Sure Save, Inc.
Puna Community Management Association
Puna Traffic Safety Committee
** Puna Community Council
Puna Chamber of Commerce
Big Island Traffic Safety Council
American Lung Association
Hawaii's Thousand Friends
Life of the Land
Sierra Club, Hawaii Chapter
Outdoor Circle
Citizens Against Noise
Conservation Council for Hawaii
Natural Resources Defense Council
Rainforest Action Group

** The Nature Conservancy of Hawaii
** Hui Mālama I Nā Kūpuna 'O Hawai'i Nei
8 & ½ Mile Community Association, Inc.
Hawaii Island Humane Society
Hawaiian Macadamia Nut co., Inc.
Miko Meat Corporation
Pacific Floral Exchange (Returned as undeliverable)
Puna Sugar Company, Ltd.
Hawaii Brewery Development Co., Inc.

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF:

November 9, 1993

Planning Division

Mr. George Krasnick, President
GK & Associates
294 Awakea Road
Kailua, Hawaii 96734

Dear Mr. Krasnick:

Thank you for the opportunity to review and comment on the Pre-Assessment Consultation for the Keaau Bypass Road Project, Hawaii. The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act.

a. Any stream crossings or wetland fills associated with the project should be identified and coordinated with our Operations Division for DA permit requirements.

b. Due to the lack of site specific information, we are unable to provide a flood hazard evaluation at this time. However, any work performed within the floodway or an area inundated by the 100-year flood and tsunami-prone flooding will need to adhere to the rules and regulations of the National Flood Insurance Program.

Sincerely,

Kisuk Cheung, P.E.
Director of Engineering

60

US Department of Transportation
Federal Aviation Administration

Western-Pacific Region
P. O. Box 50109
Honolulu, Hawaii 96850-4983

November 30, 1993

Mr. George Krasnick
President
GK and Associates
294 Awakea Road
Kailua, Hawaii 96834

Dear Mr. Krasnick,

Your letter of October 25, 1993, requested input from our agency regarding the proposed bypass road routing the Keaau-Pahoa Road around the town of Keaau.

The Federal Aviation Administration (FAA) has two (2) facilities along the existing roadway which are operational on a 24 hour basis, the Pahoa Air Traffic Control Beacon Interrogator (ATCBI) and the Pahoa Non directional Beacon (NDB). Please provide in the design and construction of your project for adequate access for these facilities. Also, we ask that you coordinate the relocation of any existing fences and utility lines so that these facilities may continue to provide uninterrupted service to aircraft in the area.

We appreciate this opportunity to comment on your proposal. Please contact me at 541-1236, if there are any questions or ways we may be of assistance.

Sincerely,

Darice B. N. Young
Realty Contracting Officer, AHNL-56

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

ROBERT P. TAKUSHI
COMPTROLLER

LLOYD I UNEBASAMI
DEPUTY COMPTROLLER

LETTER NO. (P)1779.3

NOV 8 1993

GK & Associates
294 Awakea Road
Kailua, Hawaii 96734

Attention: Mr. George Krasnick

Gentlemen:

Subject: Keaau Bypass Road
Keaau, Hawaii
Pre-Assessment Environmental Consultation

This is in response to your October 25, 1993 pre-assessment consultation for the subject project and to inform you that the Department of Accounting and General Services is currently preparing a Site Selection/EIS study for the Keaau II Elementary School. Enclosed for your information and use is a copy of the Site Selection/EISPN study which shows the proposed sites.

Since the Keaau Bypass Road may have both positive and negative impacts on the proposed school sites, we want to be a consulted party.

Thank you for the opportunity to review the subject document and if there are any questions regarding the above, please call Mr. Ralph Yukumoto of the Planning Branch at 586-0488.

Very truly yours,

GORDON MATSUOKA
State Public Works Engineer

EY:jy
Attachment

61

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
Room 104, Old Federal Building
335 Merchant Street
Honolulu, Hawaii 96813
Telephone: 587-3822

November 1, 1993

SUBJECT: Director's Referral No. 93-312-B
Pre-Assessment Consultation for Keaau Bypass Road

We have reviewed the Pre-Assessment Consultation Notice for the subject Keaau Bypass Road project, and have the following comments:

1) We suggest that the environmental assessment (EA) include a map showing the proposed bypass road route in relation to the State Land Use Districts.

2) We would appreciate receiving a copy of the EA for our review.

We have no other comments to offer at this time.

EU:BS:th

CHARLES T. TOGUCHI
SUPERINTENDENT

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

November 26, 1993

Mr. George Krasnick
President
GK and Associates
294 Awakea Road
Kailua-Kona, Hawaii 96734

Dear Mr. Krasnick:

SUBJECT: Pre-Assessment Consultation
Keaau Bypass Road

62

In response to your letter of October 25, 1993 regarding the subject bypass road, the Department of Education (DOE) has the following comments:

1) The route of the road is preferred makai of Keaau town.

2) The DOE has plans to build a new elementary school and a high school in the area. Site selection projects for two new schools are currently in progress. Elementary school sites have been identified by the consultant - Group 70, International - and the project will be entering the Draft Environmental Impact Statement (DEIS) phase. The site should be at least 500 feet from any major roadway so as to reduce noise impacts on the school.

3) Plans for a new high school are in the preliminary site selection stage. A consultant has been assigned, and school site candidates of at least 50 acres will be determined. The school should also be located away from the bypass road.

4) The DOE requests that the Department of Transportation (DOT) communicate often regarding the possible routes of the bypass road to coordinate our distinct goals.

Should there be any questions, please call the Facilities Branch at 737-4743.

Sincerely,

Charles T. Toguchi
Superintendent

CTT:hy

cc: A. Suga, OBS
A. Garson, HIDO
R. Morita, DAGS
G. Atta, Group 70

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

Keith W. Ahue, Chairperson
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES
John P. Keppeler, II
Dona L. Hanaike

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION PROGRAM
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF:OCEA:SNK

FILE NO.: 94-291
DOC. NO.: 3792

NOV 29 1993

Mr. George Krasnick, President
GK & Associates
294 Awakea Road
Hilo, Hawaii 96734

Dear Mr. Krasnick:

SUBJECT: Pre-Assessment Consultation for a Draft Environmental Assessment (DEA): Keaau-Pahoa Bypass Road, Keaau, Hawaii

63

We have reviewed the pre-assessment information for the subject project contained in your letter dated October 25, 1993, and have the following comments:

Division of Land Management

The Division of Land Management (DLM) comments that this project will involve State-owned land and will require approvals from the Board of Land and Natural Resources.

DLM states that the alignment of the bypass road will create secondary existing roads whose public vehicular use may, or may not, be continued. Those roads earmarked for continued use should either be conveyed to the County of Hawaii, or remain within the Department of Transportation's jurisdiction. Roads to be abandoned, should be identified and the appropriate land disposition(s) should occur immediately.

DLM also feels that consideration should be given when deciding on the alignment of the bypass, as to whether the remainder of a property would be rendered economical or not. The acquisition of a whole property should occur if the alignment selected renders a property uneconomical.

We will forward our Historic Preservation Division comments as they become available.

We have no other comments to offer at this time. Thank you for the opportunity to comment on this matter.

Please feel free to call Steve Tagawa at our Office of Conservation and Environmental Affairs, at 587-0377, should you have any questions.

Very truly yours,

Keith W. Ahue

KEITH W. AHUE

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

P.O BOX 621
HONOLULU, HAWAII 96809

KEITH W. AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF:OCEA:RYB

FILE NO.: 94-291a
DOC. NO.: 3892

DEC 20 1993

Mr. George Krasnick, President
GK & Associates
294 Awakea Road
Kailua, Hawaii 96734

Dear Mr. Krasnick:

SUBJECT: Pre-Assessment Consultation for a Draft Environmental Assessment (DEA): Keaau-Pahoa Bypass Road, Keaau, Hawaii

The following are our additional comments on the DEA for the subject project which supplement those forwarded by our previous letter dated November 29, 1993:

Commission on Water Resource Management

The Commission on Water Resource Management's (CWRM) staff comments that the pre-assessment letter for the subject project does not present sufficient information to adequately describe how this project may have an impact on streams.

Stream permits are required when the bed or banks of stream channels are altered (Section 169-50, Hawaii Administrative Rules, (HAR)), or when stream diversion works are constructed or altered (Section 160-32, HAR). In addition, since interim instream flow standards have been adopted statewide, an amendment to the interim instream flow standards is required if the proposed project will alter the flow of streams (Section 169-40, HAR).

The environmental assessment should describe whether these permits will be required. For more information regarding permit requirements for streams, the applicant should call CWRM at 587-0249.

Division of Forestry and Wildlife

The Division of Forestry and Wildlife (DOFAW) comments that they support the construction of the bypass road.

Historic Preservation Division

The Historic Preservation Division (HPD) comments that portions of the project area not formerly in sugarcane, and thus possibly containing historic sites, need to undergo an archaeological inventory survey. HPD received a letter from Gwen Hurst dated November 19, 1993, of Ogden Environmental and Energy Services indicating that they will be conducting an archaeological inventory survey of portions of the by-pass corridor that: 1) have not been disturbed by sugar cane plantation, and 2) that are archaeologically sensitive, that is, likely to contain historic sites. Such a survey will indicate whether significant historic sites are present in the project area. The report will need to be submitted to HPD for adequacy review and for evaluation of any significant assessments, as initial steps in compliance with Chapter 6E, Hawaii Revised Statutes.

If significant historic sites are present, then an acceptable mitigation plan will need to be developed in consultation with HPD. Should Hawaiian burial remnants also be present, then the mitigation plan for the burials must also be approved by HPD's Hawaiian Island Burial Council.

We have no other comments to offer at this time. Thank you for the opportunity to comment on this matter.

Please feel free to call Steve Tagawa at our Office of Conservation and Environmental Affairs, at 587-0377, should you have any questions.

Very truly yours,

KEITH W. AHUE

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

KEITH AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES

JOHN P. KEPPELER II
DONA L. HANAIKE

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

LOG NO: 9872
DOC NO: 9310ks09

November 3, 1993

Mr. George Krasnick, President
GK & Associates
294 Awakea Road
Kailua, Hawaii 96734

Dear Mr. Krasnick:

SUBJECT: Chapter 6E Compliance–Pre-assessment Consultation for the Keaau Bypass Road
Multiple Ahupua'a, Puna, Island of Hawaii

Thank you for your letter of October 25, 1993, seeking our comments on the subject project.

For the most part, a large section of Puna has been landscaped for sugar cane plantation. In these areas, significant historic sites are not expected to be present. On the other hand, there also areas that did not undergo any extensive land modification and may contain historic sites. In Puna also, there is always the concern for lava tubes that were used in prehistoric times for refuge, temporary habitation, for human burial remains, and the like. Unfortunately, without any map clearly showing the various route for the proposed bypass, our office is not able to offer constructive comments on the effects of this project on historic sites. If you would like more specific comments from our office, please provide us with maps showing the proposed route(s) for the bypass, the width of right-of-way corridor, contour maps (if possible), etc. With such maps, we could check our records for the presence/absence of significant historic sites in the area and provide you with more relevant information on how the proposed bypass will affect historic sites.

If you should have any further questions on any of our comments, please contact Kanalei Shun at 587-0007.

Sincerely,

DON HIBBARD, Administrator
State Historic Preservation Division

KS:amk

65

JOHN WAIHEE
GOVERNOR OF HAWAII

OFFICE OF STATE PLANNING

Office of the Governor

MAILING ADDRESS: P.O. BOX 3540, HONOLULU, HAWAII 96811-3540
STREET ADDRESS: 250 SOUTH HOTEL STREET, 4TH FLOOR
TELEPHONE: (808) 587-2846, 587-2800

JOHN WAIHEE GOVERNOR
FAX: DIRECTOR'S OFFICE 587-2
PLANNING DIVISION 587-2

Ref. No. P-4654

November 4, 1993

Mr. George Krasnick
President
GK and Associates
294 Awakea Road
Kailua, Hawaii 96734

Dear Mr. Krasnick:

Subject: Pre-Assessment Consultation for Keaau Bypass Road

Thank you for informing us of the proposed preparation of an environmental assessment (EA) for the proposed design and construction of a bypass road around the town of Keaau.

Pursuant to Section 205-18, HRS, the Office of State Planning will be filing a petition to reclassify to the Urban District, approximately 660 acres of agricultural land in Keaau owned in fee simple by W.H. Shipman, Ltd. The petition implements the recommendations made by the State Land Use Boundary Review report for the island of Hawaii which recommends that certain lands around Keaau Town be reclassified to the Urban District.

We have no other comments to offer at this time, but we request a copy of the EA for our review.

Sincerely,

Harold S. Masumoto
Director

cc: Mr. Roy Blackshear, W.H. Shipman, Ltd.

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII
25 AUPUNI STREET • HILO, HAWAII 96720
TELEPHONE (808) 969-1421 • FAX (808) 969-6916

November 8, 1993

Mr. George Krasnick, President
GK & Associates
294 Awakea Road
Kailua, HI 96734

PRE ASSESSMENT CONSULTATION FOR KEAAU BYPASS ROAD

This is in response to your letter of October 25, 1993.

It is requested that a map showing the proposed routes for the bypass road be submitted to aid in our review.

H. William Sewake
Manager

WA

99

AMFAC/JMB HAWAII, INC
700 Bishop Street
P.O. Box 3230
Honolulu, Hawaii 96801
(808) 945-8111
Fax (808) 945-8153

Amfac

November 5, 1993

Mr. George Krasnick
President
GK & Associates
294 Awakea Road
Kailua, HI 96734

RE: Pre-Assessment Consultation for Keaau Bypass Road

Dear Mr. Krasnick:

I am writing in response to your letter dated October 25, 1993 regarding the proposed Keaau Bypass Road.

We have no objection to the proposed bypass alignment as shown on the attached map and as described on the back side of the map. For your info, it appears that the proposed bypass corridor will affect Tax Map parcels identified as (3) 1-6-003:005 and (3) 1-6-003:020 currently owned by Puna Sugar Company, Ltd.

Thank you for the opportunity to comment on the proposal.

Very truly yours,

Ann Lo-Shimazu
Manager, Land Administration

ALS:rmg
Attachment

W.H. SHIPMAN, LTD.

KEAAU
HAWAII ISLAND

November 10, 1993

Mr. George Krasnick, President
GK & Associates
294 Awakea Road
Kailua, Hawaii 96734

Dear Mr. Krasnick:

Subject: Pre-Assessment Consultation for Keaau By-Pass Road

Thank you for your letter of October 25, 1993 relative to the proposed Keaau By-Pass Road.

67

The Office of State Planning has already made you aware of the proposed reclassification of 660 acres of our agricultural land to urban designation. The central portion of the proposed by-pass will skirt the eastern portion of the proposed reclassification area. We see no environmental impact or problems associated therewith. The route will also pass west of 8 1/2 mile camp, the old Puna Sugar Co. Mill, and various other facilities intersecting with the present private roads that provide access to them. Unless there is access permitted from the By-Pass, there will definitely be an impact on everything located on the Eastern side thereof.

Towards the North, under either of the proposed alternative routes, the By-Pass traverses follow agricultural land with no discernible impact, although the westerly loop of Alternative Route 2 to link the By-Pass into Highway 11 could eliminate some papaya orchard.

The southern segment of the By-Pass as proposed will pass through and eliminate some macadamia orchard. Also, since proposed new elementary school sites in the Keaau area are all west of the route, coordination with DOE should be effected in order to provide access to or from any of the

[illegible]
Keaau, Hawaii 96749

Phone: (808) 966-9325
Fax: (808) 966-8522

proposed school sites should one of them be selected for the new Keaau Elementary School.

We appreciate the opportunity to offer these comments. We will be happy to meet with you at your convenience to respond to or discuss any questions you may have. We would also like to request a copy of the EA for our review when completed.

Yours very truly,

Roy S. Blackshear

Roy S. Blackshear, President
W. H. Shipman, Limited

FJK/RSB:dpb

cc: Mr. Harold S. Masumoto, Office of State Planning
Mr. John Kirkpatrick, Community Resources, Inc.
Mr. Alan Garson, Hawaii District Superintendent, Dept. of Education

P U N A
Community Council, Inc.
P.O. Box 1250, Keaau HI 96749

November 16, 1993

GK & ASSOCIATES
294 Awakea Road
Kailua, HI 96734

RE: PRE-ASSESSMENT CONSULTATION FOR
KEAAU BYPASS ROAD

Dear Mr. Krasnick:

Thank you for the opportunity to comment on this subject. The Puna Community Council is an umbrella organization whose membership consists of about 25 community organizations, and we have been involved in the question of traffic flow for a good many years.

I believe that Hugh Ono, of the State Dept. of Transportation, will agree that traffic on the Pahoa-Keaau Road begins backing up during morning rush hour at Ainaloa Drive, and gets progressively worse at Orchidland Drive and the 4 streets debauching out of Hawaiian Paradise Park. The two bypass alternates proposed do not address this situation, which is the root of the problem. Therefore the proposal is but a bandaid solution.

Another problem is that your map shows the bypass starting at a major flooding point, and this will have to be addressed.

Needless to say, without a Puna Community Development Plan firmly in place, your firm and the DOT are seriously hampered in the planning and development process. The Puna Community Council has been urging the County to bring the proposed Plan out for public hearings and get the ball rolling, as mandated by law. I suggest that you request this also, and that if you haven't already done so, read the Technical Reference Report of 1992. What we need most of all is another open town meeting where the entire community can give input. The best time to schedule this would be after the holidays, and I most strongly suggest that you do this, whether or not it is required by law or by your contract.

If you have any questions, please do not hesitate to contact either myself at 965-6626, or our President Ginny Aste at 933-4747.

Sincerely yours,

René Siracusa

(Ms.) René Siracusa, Chair
Planning & Economic Development
Committee

89

The Nature Conservancy of Hawaii

1116 SMITH STREET • SUITE 201 • HONOLULU, HAWAII • 96817 • PH: (808) 537-4508 • FAX (808) 545-2019

November 17, 1993

George Krasnick
GK & Associates
294 Awakea Rd.
Kailua, Hawaii 96734

Dear GK & Associates,

I received your letter requesting comments for the Pre-Assessment of the Keaau Bypass Road earlier this month. I reviewed the location described in your letter and have found there is a possibility of rare species in or adjacent to the proposed bypass road. I am not able to determine a definite answer without a more detailed map.

Also, I was wondering if your office is familiar with the Hawaii Heritage Program, Natural Diversity Database. The Heritage Program tracks all of the locations, federal status, and condition of rare and endangered species and natural communities throughout the state. The information within the database is available to developers and consultants. The information has been used by many state, federal, and private agencies. A fee is charged to cover expenses. The fee is based upon the number of records found within a project area. Charges are waived for project areas with no recorded locations of species or natural communities. For more information of what the Heritage Program can provide, please contact the Hawaii Heritage Program, Attn: Data Request Department at the above address.

I hope the information in this letter proves useful. If you have any further questions, please contact the Heritage Program, they would be glad to assist you.

Sincerely,
Roy Kam
Roy Kam

HUI MĀLAMA I NĀ KŪPUNA 'O HAWAI'I NEI
(GROUP CARING FOR THE ANCESTORS OF HAWAI'I)

November 12, 1993

George Krasnick, President
GK & Associates
294 Awakea Road
Kailua, Hawai'i 96734

Re: Letter of October 5, 1993 Relating to Keaau Bypass Road

Aloha mai e Mr. Krasnick:

I am Kūnani Nihipali, *Po'o* of Hui Mālama I Nā Kūpuna 'O Hawai'i Nei. *Mahalo* (thank you) for your letter of October 25, 1993 relating to the Keeau Bypass Road. Hui Mālama was established to care for the bones and burial sites of ancestral Hawaiians.

To the extent that this project may adversely affect unmarked Hawaiian burial sites, we would not be supportive of such an action. Moreover, some of our members sit on the Hawai'i Island Burial Council and we would support the action they may take on this project in the event Hawaiian burials are found in lava tubes or other such sites located within the project corridor.

69

If there are any questions, please do not hesitate to write us.

E ola nā iwi

Kūnani Nihipali
Po'o

Post Office Box 190 Hale'iwa, Hawai'i 96712-0190

7.2 DRAFT EA REVIEW

Notice of availability of the draft EA was published in the October 8, 1994 issue of the *OEQC Bulletin*. The deadline for comments was November 7, 1994. The following agencies, organizations, utilities and individuals were specifically consulted. Non-substantive (no comment) responses are indicated below with a single asterisk. Substantive responses are indicated below with a double asterisk. Non-timely responses (those dated, postmarked and received after the deadline) are indicated below with asterisks in parenthesis. All substantive comments and the DOT's responses are reproduced following Section 7.2.

FEDERAL AGENCIES

U.S. Department of Agriculture, Soil Conservation Service
U.S. Department of Agriculture, Ariculture Stabilization and Conservation Service
** U.S. Army Corps of Engineers, Pacific Ocean Division
(*) U.S. Department of the Interior, Fish and Wildlife Service
* U.S. Department of the Interior, National Park Service
U.S. Department of Commerce, National Marine Fisheries Service
** U.S. Department of Transportation, Federal Aviation Administration
U.S. Department of Transportation, Federal Highways Administration
U.S. Department of Housing and Urban Development, Honolulu Insuring Office

STATE AGENCIES

(**) Department of Accounting and General Services
Department of Agriculture
** Department of Business, Economic Development and Tourism (Response from Land Use Commission)
Department of Business, Economic Development and Tourism, State Energy Office
Department of Business, Economic Development and Tourism, Library
(*) Department of Defense
** Department of Education
Department of Hawaiian Home Lands
(**) Department of Land and Natural Resources
** Department of Land and Natural Resources, State Historic Preservation Division
Department of Health
Department of Health, Environmental Management Division
Office of State Planning
Office of Hawaiian Affairs
University of Hawaii, Water Resources Research Center
** University of Hawaii, Environmental Center
Legislative Reference Bureau
Hawaii State Archives
Hawaii State Library, Hawaii documents Center (15 Copies)

Mountain View Public and School Library
Keaau Public and School Library
Pahoa Public and School Library

STATE LEGISLATORS

Senator Andrew Levin
Senator Richard Matsuura
Representative Harvey Tajiri
** Representative Robert Herkes (Response to Public Hearing)
Representative Jerry Chang

COUNTY AGENCIES

(**) Planning Department
Department of Public Works
Department of Parks and Recreation
* Department of Research and Development
** Department of Water Supply
Hawaii County Council
** Office of the Mayor (Response to Public Hearing)

UTILITIES

Hawaii Electric Light Company
** Hawaiian Telephone Company

ORGANIZATIONS

W.H. Shipman, Ltd.
** AMFAC/JMB Hawaii, Inc.
Puna Community Management Association
Puna Traffic Safety Committee
Puna Community Council
American Lung Association
Sierra Club, Hawaii Chapter
Citizens Against Noise
Conservation Council for Hawaii
Puna Sugar Company, Ltd.
** Hawaii Speleological Survey

1150.

GTE Hawaiian Tel

Beyond the call

GTE Hawaiian Telephone Company Incorporated
P O Box 4249 • Hilo HI 96720 • 808 935-9411

October 19, 1994

State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097
Attn: Mr. Rex D. Johnson

RECEIVED
Oct 21 3 12 PM '94
DEPT OF TRANSPORTATION
HIGHWAYS DIVISION

Subject: Construction Timetables

Dear Mr. Johnson:

Thank you for allowing us to review and comment on the (Keaau-Pahoa Road, Keaau Town Section-Project No. 130B-01-92) which you are engineering. Your plans have been received and put on file.

In order to help you, as well as GTE Hawaiian Tel, meet the specified service date, we please request that the attached construction timetable sheet be completed.

Please note that an integral part of our review process depends on the ultimate line requirements be specified. With this information, we can adequately size the support structures for the project line requirements of the project. Also it is important to specify the scheduled date of construction and the expected completion date of the project.

Your project will be accessed upon receipt of the timetable. Therefore, your prompt and accurate response will be very helpful.

If you have any questions or problems in meeting our request, please contact Rodney Kelii at 933-6488.

Thank you very much.

Sincerely,

Gordon Yadao
Supervising Engineer

GY/RLK/pah
Enclosure
cc: Engineer
D. Lindsey
TPS #94099
GK & ASSOCIATES

RECEIVED
STATE DEPARTMENT OF TRANSPORTATION
Oct 24 11 10 AM '94
HIGHWAYS DIVISION
PLANNING BRANCH

BENJAMIN CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTOR
SAM CALLEJO
GLENN M. OKIMOTO

IN REPLY REFER TO:
HWY-PA
2.5793

MAY 24 1995

Mr. Gordon Yadao
Supervising Engineer
GTE Hawaiian Telephone Co., Inc.
P.O. Box 4249
Hilo, Hawaii 96720

Dear Mr. Yadao:

Subject: Keaau-Pahoa Road, Keaau Town Section
Project No. 130B-01-92
Draft Environmental Assessment

We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Mamalahoa Highway.

We are also deeply appreciative of your letter dated November 3, 1994, which requested the preparation of your construction timetable/contractor sheet.

We expect to complete the planning phase of this project within a few months and begin the design phase shortly thereafter. We will then coordinate our project with you.

Thank you for your continued support for this project and we trust that the above meets with your approval.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII
25 AUPUNI STREET • HILO, HAWAII 96720
TELEPHONE (808) 969-1421 • FAX (808) 969-6996

October 19, 1994

Mr. Rex D. Johnson, Director of Transportation
State of Hawaii
Department of Transportation
Highways Division
869 Punchbowl Street
Honolulu, HI 96813-5097

KEAAU-PAHOA ROAD, KEAAU TOWN SECTION
PROJECT NO. 130B-01-92 DRAFT ENVIRONMENTAL ASSESSMENT (DEA)
TAX MAP KEY 1-6-3:3.5, 15, 20, 26, 68 AND 73

73 We have reviewed the DEA for the proposed project.

We request that plans be submitted for review and approval during the design stage of the project.

H. William Sewake, P.E.
Manager

WA

copy - Mr. George Krasnick

... Water brings progress...

BENJAMIN CAYETANO
GOVERNOR

KAZU HAYASHI
DIRECTOR

DEPUTY DIRECTOR
ELAH CALLEJO
GLENN M. OKIMOTO

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO
HWY-PA
2.5799

MAY 24 1995

Mr. Milton Pavao, Manager
Department of Water Supply
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Pavao:

Subject: Keaau-Pahoa Road, Keaau Town Section
Project No. 130B-01-92
Draft Environmental Assessment

We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Mamalahoa Highway.

We deeply appreciate your letter dated November 29, 1994, which commented on the "Draft Environmental Assessment". As requested, we will transmit to your office our final plans for this project for your review and approval.

For your information, we believe that several utilities may be temporarily or permanently relocated. We will coordinate our construction plans with each utility company, including yours.

Thank you for your continued support of this project.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

DIRECTOR'S OFFICE
DEPT. OF TRANSPORTATION
Oct 31 1 00 PM '94

KEITH AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCE

DEPUTIES
JOHN P. KEPPELER II
DONA L. HANAIKE

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

October 20, 1994

LOG NO: 12962
DOC NO: 9410PM12

MEMORANDUM

TO The Honorable Rex D. Johnson, Director of Transportation
State of Hawaii Department of Transportation

FROM Keith W. Ahue, Chairperson
Department of Land & Natural Resources

RECEIVED
Nov 1 3 35 PM '94
DEPT. OF TRANSPORTATION
HIGHWAYS DIVISION

SUBJECT: Draft Environmental Assessment: Keaau-Pahoa Road, Keaau Bypass Section (Keaau Bypass Road)
Kea'au, Puna, Island of Hawaii
TMK: 1-6-03:

74

Thank you for your letter of October 11, 1994, and the Draft EA for our review and comments.

The information presented in the background section of Appendix A, the report on the archaeological survey of Alternative 1 of the proposed Keeau Bypass Road corridor, suggests that there are three potentially significant archaeological locales along this preferred route. The results of the archaeological survey indicate that there is only one potentially significant historic site or locale near the preferred corridor, the 8 1/2 Mile Camp. While we might agree with this latter assessment, there is no discussion of survey methods and techniques to allow us to concur with this evaluation at the present time. Until this information is presented we cannot agree that the 8 1/2 camp is the only significant site area meriting further work along the proposed corridor.

If you have any questions please have your staff contact Pat McCoy (587-0007).

PM:jk

c: GK & Associates, 294 Awaken Road, Kailua, Hawaii 96734
ATTN: Mr. George Krasnick

Nov 2 [illegible]
HIGHWAYS DIVISION
Planning Branch

JOHN WAIHEE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

KEITH W. AHUE, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTIES
JOHN P. KEPPELER II
DONA L. HANAIKE

AQUACULTURE DEVELOPMENT PROGRAM
AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
CONSERVATION AND ENVIRONMENTAL AFFAIRS
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

REF:OCEA:SOR

FILE NO.: 95-190
DOC. ID.: 5139

NOV 29 1994

MEMORANDUM

TO: Rex D. Johnson, Director
Department of Transportation

ATTN: Statewide Transportation Planning Office

FROM: Keith W. Ahue, Chairperson
Board of Land and Natural Resources

SUBJECT: Draft Environmental Assessment (DEA): Keaau-Pahoa Road (Keaau Bypass Road), Keaau, Puna, Hawaii, TMKs: 1-6-03: 3, 5, 15, 20, 26, 68, and 73

We have reviewed the DEA for the proposed project and reiterate the comments of our Historic Preservation Division that were previously forwarded by their memorandum of October 20, 1994 (enclosed).

We also note that should the intermittent stream described on page 43 be determined to be a "stream" as defined in Section 13-169-2, Hawaii Administrative Rules (HAR), any modification to the bed or banks of that "stream" will be subject to a Stream Channel Alteration Permit (SCAP) pursuant to Section 13-169-50, HAR.

We have no other comment to offer at this time. Thank you for the opportunity to comment in this process.

Should you have and questions, please feel free to call Steve Tagawa at our Office of Conservation and Environmental Affairs at 587-0377.

Enclosure

c: George Krasnick, GK & Associates
OEQC

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

MAY 24 1995

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
SAM CALLEJO
GLENN M. OKIMOTO

IN REPLY REFER TO
HWY-PA
2.5791

TO: MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

FROM: KAZU HAYASHIDA
DIRECTOR OF TRANSPORTATION

SUBJECT: KEAAU-PAHOA ROAD, KEAAU TOWN SECTION
PROJECT NO. 130B-01-92
DRAFT ENVIRONMENTAL ASSESSMENT

75

Thank you for your letters (FILE NO. 95-190, DOC. ID 5139 and LOG NO. 12962, DOC NO. 9410PM12) which commented on the "Draft Environmental Assessment" (DEA) for this project. We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Mamalahoa Highway.

One of your letters indicated that any modification to the bed or banks of an intermittent stream in the project area would be subject to a Stream Channel Alteration Permit (SCAP), pursuant to Section 13-169-50, Hawaii Administrative Rules. The intermittent stream which is mentioned on page 43 of the DEA would not be impacted by any of the project alternatives. Consequently, we do not anticipate a requirement for SCAP.

It was also stated that our report for the project's archaeological survey lacked a discussion of survey methods and techniques. The archaeological effort for the project consisted of a document search and a reconnaissance survey. The reconnaissance survey was an extensive on-site inspection of the surface features of the project area to determine the presence or absence of archaeological resources, to permit a realistic

assessment of the potential impacts of the project on such resources and to allow recommendations for future investigation, monitoring and mitigation, as necessary. Inadvertently, the description of the field methods was omitted from the archaeology report. This information has been added to the report which has been resubmitted to your office. The revised report will be included in the "Negative Declaration".

Your assistance with regards to the above requirements is greatly appreciated.

Hawaii Speleological Survey
of the
National Speleological Society

WILLIAM R. HALLIDAY
Chairman

P.O. Box 1526
Hilo, HI 96721

22 October 1994

Mr. Rex D. Johnson
Director of Transportation
Department of Transportation
869 Punchbovl Street
Honolulu, HI 96813-5097

re: HY-PA 2.3145

Dear Mr. Johnson:

Thank you for giving the Hawaii Speleological Survey an opportunity to comment on the Draft Environmental Assessment for the Keaau Town Section project of the Keaau-Pahoa road.

The files of the Hawaii Speleological Survey show no caves which would be affected by any of the alternatives outlined in the Draft assessment. Therefore the Hawaii Speleological Survey has no comment on the Draft assessment.

In the event that a cave is encountered unexpectedly during the construction of whatever alternative is chosen, it is likely that the Hawaii Speleological Survey could provide field investigation of its features, resources, and values on short notice, at no expense to the state of Hawaii. A consistent contact number in such a situation is that of Harlin Spike Werner, PhD, currently vice-chairman of the Hawaii Speleological Survey. His home phone number is (808) 964-5678, and his office phone number is 935-1299. Both have attached recorders.

If the Hawaii Speleological Survey can be of further service in this or any other project, please do not hesitate to contact us.

Sincerely yours,

William R. Halliday

cc: Executive Committee

76

BENJAMIN CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

MAY 24 1995

Mr. William R. Halliday
Chairman
Hawaii Speleological Survey
P.O. Box 1526
Hilo, Hawaii 96721

Dear Mr. Halliday:

Subject: Keaau-Pahoa Road, Keaau Town Section
Project No. 130B-01-92
Draft Environmental Assessment

We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Hamalahoa Highway.

We are deeply appreciative of your letter dated October 29, 1994, which commented on our "Draft Environmental Assessment". We were pleased to learn that no caves are likely to be affected by this project and that the expertise of your organization is readily available should a cave be uncovered.

Thank you for your participation in this project.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

DEPARTMENT OF THE ARMY
U.S. ARMY ENGINEER DISTRICT, HONOLULU
FORT SHAFTER, HAWAII 96858-5440

REPLY TO ATTENTION OF

October 24, 1994

Planning Division

Mr. Rex D. Johnson, Director
State of Hawaii
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Johnson:

Thank you for the opportunity to review and comment on the Draft Environmental Assessment for the Keaau-Pahoa Road Project, Keaau Town,, Hawaii (TMK 1-6-3: 3, 5, 15, 20, 26, 68, and 73). The following comments are provided pursuant to Corps of Engineers authorities to disseminate flood hazard information under the Flood Control Act of 1960 and to issue Department of the Army (DA) permits under the Clean Water Act; the Rivers and Harbors Act of 1899; and the Marine Protection, Research and Sanctuaries Act.

a. A DA permit may be required if work is conducted in navigable waters of the U.S. Please contact our Regulatory Branch for further information at 438-9258 and refer to file number PO95-003.

b. We concur with the flood information provided on page 44 of the environmental assessment.

Sincerely,

Ray H. Jyo, P.E.
Director of Engineering

Copy Furnished:

Mr. George Krasnick
GK & Associates
294 Awakea Road
Kailua, Hawaii 96794

77

DEPT OF TRANSPORTATION
STATEWIDE TRANS. PLANNING OFFICE
Oct 26 12 32 PM '94

BENJAMIN CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

MAY 21 1995

Mr. Ray H. Jyo, P.E.
Director of Engineering
Department of the Army
U.S. Army Engineer District, Honolulu
Fort Shafter, Hawaii 96858-5440

Dear Mr. Jyo:

Subject: Keaau-Pahoa Road, Keaau Town Section
Project No. 130B-01-92
Draft Environmental Assessment

We wish to inform you that, based on the information obtained during the public participation phase of this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Mamalahoa Highway.

We are also deeply appreciative of your letter dated October 24, 1994, which commented on the project's "Draft Environmental Assessment". We believe that a Department of the Army permit for this project may be unnecessary since there are no navigable waters in the project's vicinity.

Thank you for also confirming the flood hazard information provided in the environmental assessment.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

United States Department of the Interior

NATIONAL PARK SERVICE
Hawaii Volcanoes National Park
P.O. Box 52
Hawaii 96718-0052

IN REPLY REFER TO L7617

25 October, 1994

Mr. Rex C. Johnson
Director of Transportation
State Dept of Transportation
869 Pnchbowl St.
Honolulu, HI 96813-5097

Dear Mr. Johnson:

We greatly appreciate your solicitation of our comments regarding the Keaau-Pahoa Road widening and realignment project, No. 130B-01-92.

Inasmuch as this project does not have any impact on Hawaii Volcanoes National Park, we have no comment. However, we have informed a number of our employees who consitently travel this route. Some of them may comment as private and independent citizens.

We wish you success in completing the project. We hope that you will be sensitive to the rural and vintage qualities of Keaau town and vicinity as the project design advances.

Sincerely yours,

James F. Martin
Superintendent

cc: GK & Associates

78

BENJAMIN CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

MAY 24 1995

IN REPLY REFER TO
HWY-PD
2.5768

Mr. James F. Martin, Superintendent
U.S. Department of the Interior
National Park Service
Hawaii Volcanoes National Park
P.O. Box 52
Hawaii National Park, Hawaii 96718-0052

Dear Mr. Martin:

Subject: Keaau-Pahoa Road, Keaau Town Section
Project No. 130B-01-92
Draft Environmental Assessment

Thank you for your letter (ref: L7617) which commented on the "Draft Environmental Assessment" for this project. We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Mamalahoa Highway.

We appreciate your concern for the "rural and vintage" qualities of Keaau Town. Our preferred alignment, Alternative 1, will not impact any potentially historic structures in the town. Furthermore, the new highway should divert traffic from the existing route and Keaau Town and increase opportunities for the enhancement of this community.

Thank you for your kind words of encouragement and for your participation in this project.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM

JOHN WAIHEE
GOVERNOR

JEANNE K. SCHULTZ
DIRECTOR

RICK EGGED
DEPUTY DIRECTOR

TAKESHI YOSHIHARA
DEPUTY DIRECTOR

Central Pacific Plaza, 220 South King Street, 11th Floor, Honolulu, Hawaii
Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804 Telephone (808) 586-2423 Fax (808) 586-2377

October 25, 1994

The Honorable Rex Johnson
Director
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Johnson:

The Department of Business, Economic Development & Tourism is pleased to submit the enclosed comments on the Draft Environmental Assessment for the Keaau-Pahoa Road, Keaau Town Section (Keaau Bypass Road), Project No. 130B-01-92.

The comments were provided by the Land Use Commission. Questions regarding these comments may be directed to Esther Ueda, LUC Executive Officer at, 587-3826.

Thank you for the opportunity to comment.

Sincerely,

for Jeanne K. Schultz

Enclosure

cc: Mr. George Krasnick

79

STATE OF HAWAII
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
LAND USE COMMISSION
Room 104, Old Federal Building
335 Merchant Street
Honolulu, Hawaii 96813
Telephone: 587-3822

October 24, 1994

SUBJECT: Director's Referral No. 94-314-N
Keaau-Pahoa Road, Keaau Town Section (Keaau Bypass Road), Project No. 130B-01-92 - Draft Environmental Assessment

We have reviewed the subject draft environmental assessment ("Draft EA") and have the following comments to offer:

1) In regards to the Figure 4 on page 12 of the Draft EA, it appears that the State Land Use Districts are inaccurately depicted.

   We have enclosed a copy of a composite of the Land Use District Boundaries Map [USGS Quad H-66 (Hilo) and H-67 (Mountain View)] which shows the current State Land Use District Boundaries in the area for your information.

2) On page 10 of the Draft EA, reference is made to W.H. Shipman, Ltd. seeking State land use approval for approximately 660 acres in Keaau.

   For your information, the Office of State Planning, on behalf of W.H. Shipman, Ltd., petitioned the Land Use Commission to reclassify approximately 660 acres from the Agricultural District to the Urban District under LUC Docket No. BR93-699.

   On July 18, 1994, the Commission issued Findings of Fact, Conclusions of Law, and Decision and Order in Docket No. BR93-699 and granted the requested reclassification.

3) On pages 10 and 11 of the Draft EA, reference is made in regards to the W.H. Shipman Industrial Park.

   For your information, W.H. Shipman, Ltd. received reclassification of approximately 312 acres from the Land Use Commission on February 19, 1985 for the industrial park. [LUC Docket No. A84-570 (Increment I)]

On July 2, 1993, the Commission granted reclassification of the remaining approximately 176 acres (Increment II).

4) In Appendix B, page 2-18, the petition filed by the Office of State Planning on behalf of W.H. Shipman, Ltd. was granted by the Commission on July 18, 1994. (See Comment No. 2 above)

5) In Appendix C, page 4, Figure 2, the map inaccurately depicts the State Land Use Districts in the area. (See map attached for current State Land Use District Boundaries.)

6) For your information, the Commission imposed the following conditions relating to transportation in the reclassification of the approximately 660 acres under LUC Docket BR93-699:

Condition No. 9

The developer and/or landowner of the Property shall prepare a Traffic Impact Analysis Report prior to applying for County zoning or prior to the developer and/or landowner applying for County building permits if County rezoning is not required. The landowner and/or developer shall also participate in the funding and construction of local and regional transportation improvements and programs including dedication of rights-of-way as determined by the State Department of Public Works. Agreement by the State Department of Transportation on the level of funding and participation shall be obtained prior to the developer and/or landowner applying for County zoning or prior to the developer and/or landowner applying for County building permits if County rezoning is not required.

Condition No. 10

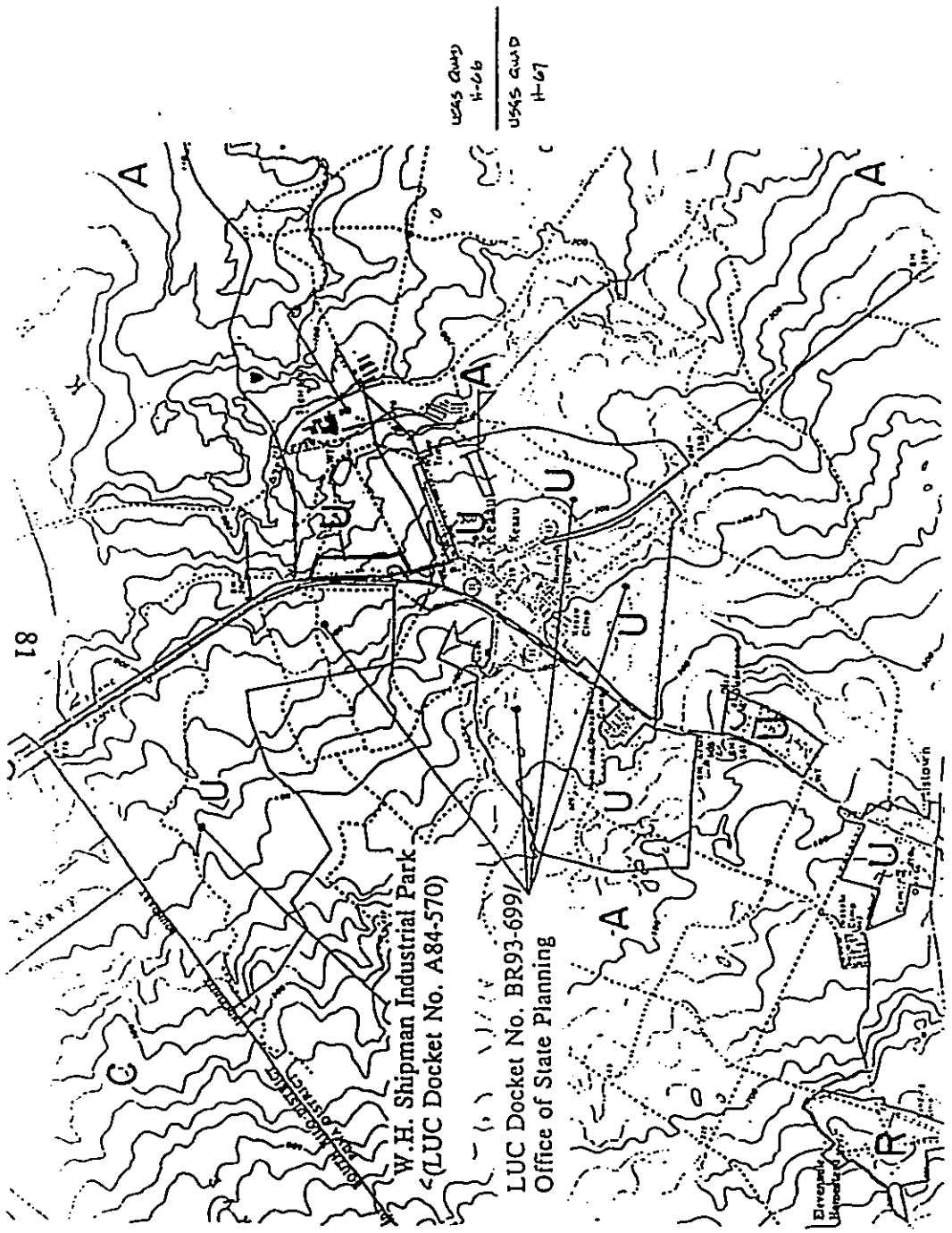
The developer and/or landowner of the Property shall monitor the traffic attributable to the proposed project at on-site and off-site locations and shall undertake subsequent mitigative measure that may be reasonable required. These activities

shall be coordinated with and approved by the State Department of Transportation.

We have no further comments to offer at this time.

EU:la:fl

att.



BENJAMIN CAYETANO
GOVERNOR

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
SAM CALLEJO
GLENN M. OKIMOTO

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:
HWY-PA
2.5769

MAY 24 1995

TO: SEIJI NAYA, DIRECTOR
DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT
& TOURISM

FROM: KAZU HAYASHIDA
DIRECTOR OF TRANSPORTATION

SUBJECT: KEAAU-PAHOA ROAD, KEAAU TOWN SECTION
PROJECT NO. 130B-01-92
DRAFT ENVIRONMENTAL ASSESSMENT

Thank you for your letter which commented on the "Draft Environmental Assessment" (DEA) for this project. We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Mamalahoa Highway.

The concerns which were expressed in your letter have been addressed and our responses are provided below and are numbered to correspond with the numbering of each of your comments:

1. Figure 4 and the accompanying text will be changed to reflect the information that you have provided. Please note that, at the time the DEA was prepared, several of the described petitions for land use boundary amendments had not yet been approved.

2. The project's "Final Environmental Assessment/Negative Declaration" will be revised to reflect this data.

3. The project's "Final Environmental Assessment/Negative Declaration" will be revised to reflect the reclassification of a second increment in the Shipman Industrial Park.

4. As indicated in paragraph #2, the DEA was being prepared before the petition was approved by the State Land Use Commission. It may not be appropriate to revise the report in Appendix B due to the completion date of the document; however, the text of the "Final Environmental Assessment/Negative Declaration" will reflect the information that you have provided.

5. The land use map which you have enclosed will be substituted for Figure 2 in Appendix C.

6. Thank you for the information regarding the conditions which have been imposed on the landowner or developer of the redistricted lands. We assume that the State Land Use Commission will be monitoring the developer/landowner for compliance with the conditions of the reclassification, and would appreciate your keeping us apprised of the status of compliance with respect to those conditions involving our participation.

We sincerely appreciate your assistance with regards to the land use element of this project.

US Department of Transportation
Federal Aviation Administration

DEPT. OF TRANSPORTATION
STATEWIDE TRANS.
PLANNING OFFICE
Nov 7 1 23 PM '94

TW47787
EXECUTIVE'S OFFICE
DEPT. OF
TRANSPORTATION
NOV 9 12 05 PM '94

Western-Pacific Region
P. O. Box 50109
Honolulu, Hawaii 96850-4983

November 3, 1994

Mr. Rex D. Johnson
Director of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Johnson:

Your letter of October 11, 1994, requested input from our agency regarding the draft Environmental Assessment for the proposed Keaau Town Section of the Keaau-Pahoa Road, Project No. 130B-01-92.

The Federal Aviation Administration (FAA) has no objection or comment on this portion of the project. However, as stated in our letter of November 30, 1993, sent to your contractor, GK and Associates, the FAA has two (2) facilities located further south along the existing roadway which are operational on a 24 hour basis, the Pahoa Air Traffic Control Beacon Interrogator (ATCBI) and the Pahoa Non directional Beacon (NDB). Please provide in the design and construction of that portion of your project for adequate access for these facilities. Also, we ask that you coordinate the relocation of any existing fences and utility lines so that these facilities may continue to provide uninterrupted service to aircraft in the area.

We appreciate this opportunity to comment on your proposal. Please contact me at 541-1236, if there are any questions or ways we may be of assistance.

Sincerely,

Darice B. N. Young
Realty Contracting Officer, AHNL-56

cc: Mr. George Krasnick, President
GK and Associates
294 Awakea Road
Kailua, Hawaii 96834

83

BENJAMIN CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:
HWY-PA
2.5799

May 25, 1995

Ms. Darice B. N. Young
Realty Contracting Officer, AHNL-56
U.S. Department of Transportation
Federal Aviation Administration
Western-Pacific Region
P. O. Box 50109
Honolulu, Hawaii 96850-4983

Dear Ms. Young:

Subject: Keaau-Pahoa Road, Keaau Town Section
Project No. 130B-01-92
Draft Environmental Assessment

Thank you for your letter which commented on the "Draft Environmental Assessment" (DEA) for this project. We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Hamalahoa Highway.

We believe that your facilities are considerably beyond the limits of our study and consequently should not be directly impacted by this project. However, our contractor will be required to maintain access routes to existing facilities and residences and provide uninterrupted utility services. In addition, your agency will continue to be consulted throughout our highway design process.

We sincerely appreciate your assistance and trust that your concerns have been addressed.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

AMFAC/JMB HAWAII, INC.
700 Bishop Street
P.O. Box 3230
Honolulu, Hawaii 96801
(808) 543-8900
Fax (808) 543-9616

AmFac

November 3, 1994

Mr. Rex Johnson, Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, HI 96813-5097

Dear Mr. Johnson:

I have had an opportunity to review the Draft Environmental Assessment prepared for the proposed widening or realignment of the 1.4 mile section of the existing Keaau-Pahoa Road. We have no objections to the alternatives or the preferred alternative. As was pointed out in the Assessment, several alternatives including the preferred alternative affect Puna Sugar Company property. In that regard, we are willing to work with the Department on the right-of-way acquisition.

Thank you for the opportunity to comment on this document.

Very truly yours,

Anne Lo-Shimazu
Manager, Land Administration

ALS:rmg

84

BENJAMIN CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
SAM CALLEJO
GLENN M. OKIMOTO

IN REPLY REFER TO:
HWY-PA
2.5796

May 25, 1995

Ms. Anne Lo-Shimazu
Manager, Land Administration
AMFAC/JMB Hawaii, Inc.
P. O. Box 3230
Honolulu, Hawaii 96801

Dear Ms. Lo-Shimazu:

Subject: Keaau-Pahoa Road, Keaau Town Section
Project No. 130B-01-92
Draft Environmental Assessment

We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Mamalahoa Highway.

We are deeply appreciative of your letter dated November 3, 1994, which commented on the "Draft Environmental Assessment" and expressed your willingness to work with us in securing the necessary right-of-way. We will be in further contact with you regarding this item during the project's design phase.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

[illegible] Yamashiro
[illegible]

DIRECTOR'S OFFICE
RECEIVED
'94 NOV 4 9 57 AM

Diane S. Quitiquit
Director

County of Hawaii

DEPARTMENT OF RESEARCH AND DEVELOPMENT
25 Aupuni Street, Room 219 • Hilo, Hawaii 96720-4252 • (808) 961-8366 • Fax (808) 935-1205
KONA: (808) 329-5226 • Fax (808) 326-5643

November 3, 1994

RECEIVED
'94 NOV 9 A 8 16
DEPT OF TRANSPORTATION
HIGHWAYS DIVISION

Mr. Rex D. Johnson
Director
Department of Transportation
869 Punchbowl Street
Honolulu, HI 96813-5097

Dear Mr. Johnson:

Subject: Keaau-Pahoa Road, Keaau Town Section
Project No. 13 0B - 01 - 92

Thank you for the opportunity to review the Draft Environmental Assessment for the referenced project. We have no comments to offer at this time.

Sincerely,

Raymond Carr
Economic Development Specialist

RECEIVED
'94 NOV 9 11 22 AM
HIGHWAYS DIVISION
PLANNING BRANCH

xc: Diane Quitiquit, Director

58

BENJAMIN CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTOR
SAM CALLEJO
GLENN M. OKIMOTO

IN REPLY REFER TO:
HWY-PA
2.5601

MAY 22 1995

Mr. Raymond Carr
Economic Development Specialist
Department of Research and Development
County of Hawaii
25 Aupuni Street, Room 219
Hilo, Hawaii 96720-4252

Dear Mr. Carr:

Subject: Keaau-Pahoa Road, Keaau Town Section
Project No. 130B-01-92
Draft Environmental Assessment

We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Hamalahoa Highway.

We sincerely appreciate your continuing interest in this project.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

STATE OF HAWAII
DEPARTMENT OF EDUCATION
P. O. BOX 2360
HONOLULU, HAWAII 96804

November 3, 1994

Mr. George Krasnick
GK and Associates
294 Awakea Road
Kailua, Hawaii 96734

Dear Mr. Krasnick:

SUBJECT: Draft Environmental Assessment (EA)
Keaau-Pahoa Bypass Road, Keaau Town Section
Project No. 130B-01-92

The Department of Education (DOE) has reviewed the subject EA and has the following comments:

1) W. H. Shipman, Ltd. has offered to dedicate a school site of approximately 50 acres to the DOE for a high school. The site is proposed to be located adjacent to the recommended bypass Alternative 1. The DOE is in favor of accepting the dedication of the site. If Alternatives 1, 2, or 3 is chosen, we request that the alignment of the highway be coordinated with the DOE and W. H. Shipman, Ltd. prior to beginning construction drawings to allow the best configuration for the high school site.

2) The location of the new elementary school site may be directly affected by the selection of Alternative 4. If this alternative is selected, mitigation measures to decrease noise for the elementary school should be coordinated with the DOE.

3) Any means of mitigating traffic noise of the highway affecting any school should be included into the design of the highway such as banking or sloping the road away from the school, noise barriers such as vegetation or physical walls.

4) The requirement such as traffic lights should not be required of the DOE to build the school. Fences or sidewalks will be provided only along the appropriate borders of the school.

5) Alternative 5 is the least desirable for the DOE since it would impact the proposed high school, new elementary school, and the existing Keaau Elementary and Intermediate School campus which will become the intermediate school campus. The increased traffic along this route would create more noise than already exists and traffic hazards for students wishing to cross the highway.

The DOE asks to be consulted during the design of the highway to allow input and suggestions for ways to decrease any impact which may result on the schools in the area. Open communication with the community and DOE staff will allow satisfactory resolution of any problems which may arise.

If there are any questions, please call the Facilities Branch at 733-4862.

Sincerely,

Herman M. Aizawa, Ph.D.
Superintendent

HMA:hy

cc: A. Suga, OBS
P. Bergin, HIDO
G. Matsuoka, DAGS
R. Johnson, DOT

86

JOHN WAIHEE
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
SAM CALLEJO
GLENN M. OKIMOTO

IN REPLY REFER TO
HWY-PA
2.5797

MAY 24 1995

TO: HERMAN M. AIZAWA, SUPERINTENDENT
DEPARTMENT OF EDUCATION

FROM: KAZU HAYASHIDA
DIRECTOR OF TRANSPORTATION

SUBJECT: KEAAU-PAHOA ROAD, KEAAU TOWN SECTION
PROJECT NO. 130B-01-92
DRAFT ENVIRONMENTAL ASSESSMENT

87

We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Mamalahoa Highway.

We also deeply appreciate your letter dated November 3, 1994, which commented on the project's Draft Environmental Assessment. Our responses to each of your concerns are provided below and are numbered to correspond with the numbering of each of your comments.

1. We are aware of and have been following the site selection process for the new high school and will continue to coordinate the alignment of the bypass road with your department and the Department of Accounting and General Services.

2. We have dropped Alternative 4 and will be proceeding with the development of Alternative 1.

3. All applicable noise regulations and standards will be adhered to in the design and construction of the bypass road.

4. The need for additional traffic facilities and improvement related to the construction of the high school will be determined after a review of plans for roadway access to the school and of projections of traffic generated from the facility.

5. As indicated in paragraph #2, we will be pursuing the development of Alternative 1.

Thank you for your early support of this project. We will continue to coordinate our project with your staff.

University of Hawai'i at Mānoa

Environmental Center
A Unit of Water Resources Research Center
Crawford 317 • 2550 Campus Road • Honolulu, Hawai'i 96822
Telephone: (808) 956-7361 • Facsimile: (808) 956-3980

November 7, 1994
EA:0099

Mr. Nelson Sagum
Department of Transportation
Highways Division
869 Punchbowl Street
Honolulu, Hawaii 96813

Dear Mr. Sagum:

88

Draft Environmental Assessment (EA)
Keaau Bypass Road
Puna, Hawaii

The construction of a four-lane bypass road directing Keaau-Pahoa Road around Keaau town on the Big Island is planned by the Department of Transportation (DOT), State of Hawaii, for the purpose of alleviating traffic problems in this growing area.

We have reviewed this Draft EA with the assistance of Eileen O'Hora-Weir, Agricultural and Resource Economics; and Malia Akutagawa of the Environmental Center.

Unrealistic Traffic Flow Projections

Studies completed on current traffic flows indicate usage at peak AM and PM hours. Traffic on the Keaau-Pahoa Road increased 90% in the decade from 1982 to 1992. However, the projected increase for the decade from 1993 to 2003 is around 17%, and the projected increase for the decade from 2003 to 2013 is 14.5%. This does not seem realistic when one considers the growth potential for the Puna District. The current estimate on build-out of existing subdivisions in Puna, which comprise 55,000 lots, is 15-20%. There is no indication that growth, in terms of requests for residential construction permits, has slowed down. Therefore, it might be more realistic to project an increase in traffic flows for the coming decade that is of the same magnitude as the increase over the decade from 1982 to 1992.

Inadequacies of Bypass Plan

The Bypass plan calls for traffic lights at both intersections (Appendix C). A traffic light at the intersection of the Keaau-Pahoa Road and the Bypass would cause even more delays for Hilo bound AM traffic. Likewise, a traffic light at the intersection of the Bypass and the Mamalahoa Highway would bring Puna bound PM traffic to a standstill on the highway. The additional left-hand turning lane will not be adequate to keep the flow going even with volume sensitive traffic lights. The only reasonable way around this problem is to construct a clover leaf.

Better Alternative Plan: Two-Lane Arterials

An alternative to the current bottleneck at Keaau which has not been addressed in this Draft EA is the construction of two or more two-lane arterials feeding into the highway directly from the sources of population (i.e., larger subdivisions) instead of the proposed construction of a four-lane bypass road. In particular, we recommend an arterial route from 17th Street in Hawaiian Paradise Park, following the old Railroad Avenue extending into Hilo and another arterial following the present path of 40th Avenue from its initiation in the Alualoa Subdivision, through Orchidland and feeding into the Mamalahoa Highway south of Keaau. More two lane arterials will ease congestion, promote the rural flavor that the residents of Puna desire, be less expensive to construct, and contribute less to air and noise pollution.

Need For Coordination With Proposed Bicycle Path

There is no mention of a recommended bicycle path and the conflict of the Bypass with the proposed bike route. The idea of a bicycle path, beginning from the south of Keaau, following the old railroad/hauling roads and extending into Hilo is being proposed and researched by Del Pranke, phone (808) 965-8169. The path would go under the current Keaau-Pahoa Road folowing an underpass already in existence. If either top-ranking Alternatives 1 or 2 are selected, a similar underpass would have to be constructed under the Bypass to accomodate this proposed bicycle path. Coordination of such plans should be considered before construction begins.

No Drainage Plan

It was mentioned that the Puna area receives heavy rainfall, but there is little runoff, since the soil is very permeable and percolation rates are good. The Draft EA also

discusses common mitigation measures employed in this area, e.g., drywells and vertical drains. However, the document does not discuss what drainage plan the state will implement for this specific project; it merely states, "Adequate drainage structures will be required in final design of the bypass ... [P]ossibly dry wells will be used to allow excess runoff to percolate into the water table" (pp. 43 and 44). This indefinite statement leaves an opening for future abuse once the bypass is constructed. A definite drainage plan should have been incorporated into this Draft EA.

Possible Groundwater Contamination

The Draft EA predicts that there will be no significant impact on groundwater resources by "dissolved and suspended pollutants" present in the runoff since they will be "filtered and adsorbed by soil particles, degraded by bacteria, and diluted by the huge subsurface freshwater flows" (p. 44). Before a blanket determination of no significant impact can be made, the anticipated pollutants must be identified and the amount of discharge into the environment must be quantified. How will the high porosity of the soils common in the project area affect the filtration of contaminants? Will chemicals be transported to the water table at too quick a rate to be properly filtered? Or is there a problem that the soil will become over-saturated with pollutants, thus losing its filtering capacity?

If dry wells will be implemented into the non-existent drainage plan, will there be a direct water flow diversion into the dry wells, thus adversely affecting groundwater quality? If dry wells are used, how can these unnamed pollutants filter out naturally? As mentioned in the Draft EA, the groundwater body that may be directly affected by this project is designated as the Keaau Aquifer System, a system carrying potable water and having a sustainable yield of 393 million gallons per day (mgd). Also, an increase in groundwater withdrawals is anticipated in order to support future demands (p. 43). Thus, water quality is a critical issue.

The document states that groundwater extrusion into the ocean is significantly high, occurring "at about 40 feet per day" and releasing approximately "one billion gallons per day" of water into the sea (p. 43). Will the pollutants generated from this project impact marine life?

Conclusion

We acknowledge that there is a need for resolution of existing traffic problems in the Keaau area and that this Draft EA proposes an answer. However, we believe that a four-lane bypass road is not the best alternative and recommend that the state consider

constructing two-lane arterials which would ease traffic congestion, reduce costs, keep noise and air pollution at a minimum, and maintain the rural character of Keaau.

We also recommend that a more detailed environmental analysis be made, especially with regards to project impacts on groundwater quality. A drainage plan should also be submitted so that a proper assessment of groundwater impacts on human consumption and on the health of the marine environment can be made.

Thank you for the opportunity to review this Draft EA.

Sincerely,

John T. Harrison
Environmental Coordinator

cc: OEQC
GK and Associates
Roger Fujioka
Eileen O'Hora-Weir
Malia Akutagawa

EDWARD T. YAMAMOTO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

May 30, 1995

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
SAM CALLEJO
GLENN M. OKIMOTO

IN REPLY REFER TO
HWY-PA
2.5795

TO: JOHN T. HARRISON, ENVIRONMENTAL COORDINATOR
UNIVERSITY OF HAWAII AT MANOA

FROM: KAZU HAYASHIDA
DIRECTOR OF TRANSPORTATION

SUBJECT: KEAAU-PAHOA ROAD, KEAAU TOWN SECTION
PROJECT NO. 130B-01-92
DRAFT ENVIRONMENTAL ASSESSMENT

90

Thank you for your letter which commented on the "Draft Environmental Assessment" (DEA) for this project. We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Hamalahoa Highway.

The concerns which were contained in your letter have been addressed as indicated below:

1. Unrealistic Traffic Flow Projections

Our traffic projections are generally based on the historical counts which you have described. However, the projections are also statistically tied into the growth factors of "Island of Hawaii Long-Range Highway Plan: Final Report" (1991) and "Hawaii County General Plan".

It should also be noted that your population growth rates are an indication of the trend of traffic growth. However, we believe that the traffic volumes along a given facility are affected by several conditions. These include but are not limited to job opportunities in the area, segment location, population demographics and other nearby developments. Master plans for a region are also a good resource in terms of community ideas and opinions on controlling conditions and probable growth patterns.

2. Inadequacies of Bypass Plan

Our traffic studies indicate that the proposed intersections will operate at a satisfactory level of service through 2013. Undoubtedly, an interchange at the Hamalahoa Highway/Bypass Road junction would improve traffic flow. However, a proposal for an interchange is premature in light of the results of our studies. At a later date, an interchange may be needed and should be studied along with other necessary improvements for Hamalahoa Highway.

3. Better Alternative Plan: Two-Lane Arterials

The primary objective of this project is the relief of the traffic situation in Keaau as quickly (and as economically) as possible. Consequently, the scope of this project has been limited to the immediate vicinity of Keaau and our proposed improvements directly address our project objective.

Construction of the Keaau Bypass will also implement a Tier 1 (high priority) project of the Hawaii Long Range Highway Plan. Hence, the proposed facility will also be consistent with other proposals from the long-range plan. On the other hand, two-lane arterials are not consistent with the long-range plan.

4. Need for Coordination with Proposed Bicycle Path

A 1994 statewide master plan for bikeways, "Bike Plan Hawaii", shows a bike route from lower Puna proceeding along the existing Keaau-Pahoa Road and connecting with Hamalahoa Highway in Keaau. This project will minimally affect this bike route.

As requested, we have contacted Mr. Del Pranke and have learned that his bike path proposal is in its early stages. Until this concept is officially adopted, we are uncertain of the acceptability of this proposal, and hence, we are unable to currently comply with its design requirements.

However, if it becomes desirable to designate a bicycle route along the alignment of the proposed bypass, a 10-foot shoulder will be provided and may be used by bicyclists.

5. No Drainage Plan

Specific drainage requirements will be determined during the final design stage when more project details are known. We believe that our "drainage plan" is adequately described in the environmental document. Although the plan seems very simplified, it presents a sound and effective approach to the control of erosion and the flow of water. A more detailed study will be needed to confirm the necessity for each item in the proposed "drainage plan".

In addition, within the proposed right-of-way, there are no unusual circumstances or situations (such as historic sites or concentrated water flows) which would require a more specific deliberate effort. If a problem develops during construction, our "Standard Specifications for Road, Bridge, Public Works Construction" adequately prescribes the procedures to be followed.

6. Possible Groundwater Contamination

The anticipated pollutants are those typical from vehicular traffic and exhausts, including rubber, asbestos, paint, metals and carbon particles.

We believe that most of the above pollutants will either evaporate or be filtered by the layers of substrata and plant life between the surface and the Keaau Aquifer. The portion of the chemicals reaching the aquifer will be miniscule and be further diluted to an insignificant level in this sizable water source. The project will be reviewed by the Department of Health to assure compliance with appropriate State and Federal laws and practices governing potable water sources.

We trust that your concerns and recommendations have been satisfactorily addressed. We are also deeply appreciative of your support for this project.

Hwy 7795

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

ROBERT P. TAKUSHI
COMPTROLLER

LLOYD I. UHEBASAMI
DEPUTY COMPTROLLER

LETTER NO. (P)1951.4

NOV 9 1994

RECEIVED
Nov 14 3 47 PM '94
DEPT. OF TRANSPORTATION
HIGHWAYS DIVISION

Honorable Rex D. Johnson
Director
Department of Transportation
State of Hawaii
Honolulu, Hawaii

Dear Mr. Johnson:

Subject: Keaau-Pahoa Road, Keaau Town Section
Keaau, Hawaii, Hawaii
Draft Environmental Assessment

This is in response to your October 11, 1994 request for comments to the subject project's Draft Environmental Assessment. Our comments are as follows:

1. The Department of Education (DOE) has selected a site for the proposed Keaau II Elementary School, which is shown as Site D (TMK 1-6-03:08) on the attached Figure. The exact location of the school site is still being negotiated between the DOE and the landowner.

2. In addition, the DOE is currently in discussions with the landowner to select a site for the proposed Keaau High School in the vicinity of Site F (TMK 1-6-03:03) on the attached Figure.

3. The possible locations of both Keaau schools may be impacted by the subject project's Alternatives 3 and 4.

Based on the above, this report's recognition of the need to coordinate the subject project's alternative choice with the location of the proposed elementary school should be extended to the choice of location of the proposed high school in order to minimize any possible environmental impacts.

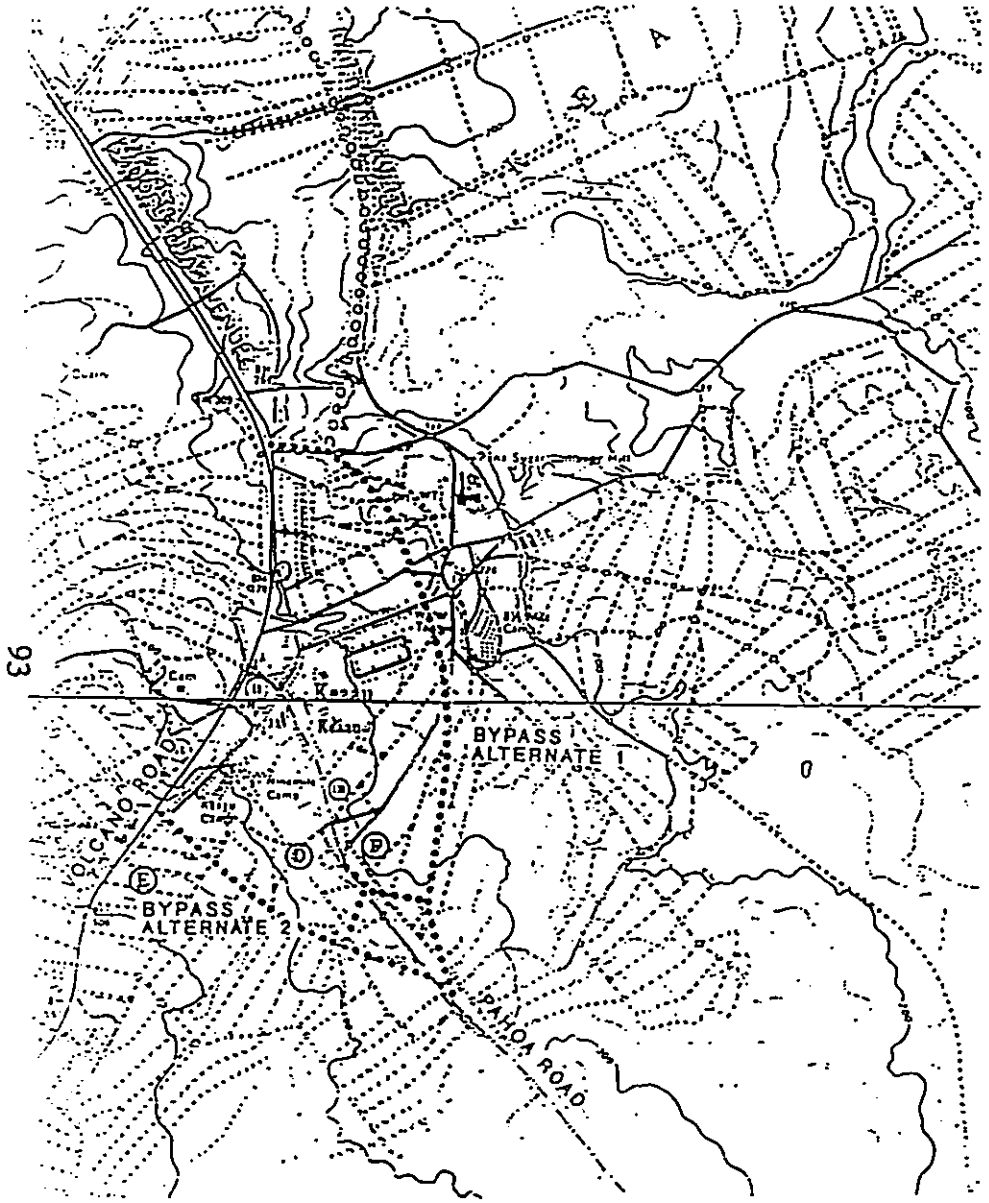
92

Thank you for the opportunity to comment. If there are any questions regarding the above, please have your staff call Mr. Ralph Yukumoto of the Public Works Division at 586-0488.

Very truly yours,

ROBERT P. TAKUSHI
State Comptroller

Attachment



Proposed Keaau By-Pass Road

KEAAU II ELEMENTARY SCHOOL 3-8

Figure 7

BENJAMIN CAYETANO
GOVERNOR

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
SAM CALLEJO
GLENN M. OKIMOTO

IN REPLY REFER TO:
HWY-PA
2.5794

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

MAY 22 1995

TO: EUGENE S. IMAI, COMPTROLLER
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES

FROM: KAZU HAYASHIDA
DIRECTOR OF TRANSPORTATION

SUBJECT: KEAAU-PAHOA ROAD, KEAAU TOWN SECTION
PROJECT NO. 130B-01-92
DRAFT ENVIRONMENTAL ASSESSMENT

We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits. and terminates at the intersection of Keaau Road and Mamalahoa Highway.

We deeply appreciate your letter dated November 9, 1994, which commented on the "Draft Environmental Assessment". Our responses are provided below and are numbered to correspond with the numbering of each of your comments.

1. and 2. We are aware of the Department of Education's (DOE) site selection for the proposed elementary school in Keaau. Also, we have been following the site selection process for Keaau's new high school. The location and design of the proposed highway will be coordinated with the plans of the new schools and we will maintain contact with your department and the DOE.

3. As indicated above, we will not be pursuing the development of either Alternative 3 or Alternative 4.

The location of the elementary and high schools is important information and will be shown on an appropriate figure of the

"Final Environmental Assessment/Negative Declaration". We are indeed concerned about the proposed sites for these schools and assure you that every effort will be made to minimize any potential highway-related impacts to their students and faculty.

Thank you for your continued support of this project.

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL

EDWARD V. RICHARDSON
MAJOR GENERAL

MYLES M. NAKATSU
BRIGADIER GENERAL
DEPUTY ADJUTANT GENERAL

November 10, 1994

Engineering Office

Honorable Rex D. Johnson
Director
Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Dear Mr. Johnson:

Subject: Keaau-Pahoa Road, Keaau Town Section
Project No. 130B-01-92

Thank you for the opportunity to review the subject project's Draft Environmental Assessment.

The project does not impact our department and, we have no comments at this time.

If there are any questions, please have your staff contact Lieutenant Colonel Jerry H. Matsuda, Contracting and Engineering Officer, at 735-3522.

Sincerely,

Edward V. Richardson
Major General
Hawaii Air National Guard
Adjutant General

c: GK & Associates

NATIONAL GUARD
Americans At Their Best.

BENJAMIN CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
SAM CALLEJO
GLENN M. OKIMOTO

IN REPLY REFER TO:
HWY-PA
2.5802

MAY 22 1995

TO: EDWARD V. RICHARDSON, MAJOR GENERAL
DEPARTMENT OF DEFENSE

FROM: KAZU HAYASHIDA
DIRECTOR OF TRANSPORTATION

SUBJECT: KEAAU-PAHOA ROAD, KEAAU TOWN SECTION
PROJECT NO. 130B-01-92
DRAFT ENVIRONMENTAL ASSESSMENT

We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Mamalahoa Highway.

We sincerely appreciate your continuing interest in this project.

Hwy 782

Stephen K. Yamashiro
Mayor

Virginia Goldstein
Director

Norman Olesen
Deputy Director

Nov 23

County of Hawaii
PLANNING DEPARTMENT
25 Aupuni Street, Room 109 • Hilo, Hawaii 96720-4252
(808) 961-8288 • Fax (808) 961-9615

November 10, 1994

Mr. Rex D. Johnson, Director
Department of Transportation
State of Hawaii
869 Punchbowl Street
Honolulu, HI 96813-5097

RECEIVED
'94 NOV 22 P3:26
DEPT OF TRANSPORTATION
PLANNING DIVISION

Dear Mr. Johnson:

Keaau Bypass Road Environmental Assessment Draft, Sept. 1994

We would like to offer the following comments on the draft Environmental Assessment for the Keaau-Pahoa Road/Keaau Bypass Road produced for your Department, dated September 1994.

1. Ranking of the Alternatives, pp. 6-8

We question the adequacy of analysis with regard to the evaluation and ranking of the six alternative routes (the sixth being a no-action alternative). The criteria, while apparently sound, are not discussed or explained fully. For instance, what does "immediate relief" mean? The definition of "immediate relief" is important in that the rankings of the various routes range from 1 (best) to 4 (worst). Secondly, some of the ratings lack internal consistency. For instance, both Alternatives 1 and 2 receive exactly the same ratings for length and cost, even though Alternative 2 would mean an additional half mile or so of roadway. Also, Alternatives 3, 4 and 5 receive poor ratings for "avoidance of downstream bottlenecks." How was this determined? The discussion should also clarify that the reason for the poor rating of Alternative 5 on "historic & cultural sites" is due to the cultural and social impacts of demolishing older structures for highway widening, rather than any historic impacts. The term "historic and cultural sites" is often interpreted as "historic," which is not the case here.

Due to the unsatisfactory analysis of alternative routes, the choice of the "preferred alternative" is cast in doubt. We suggest a more thorough review and discussion of the alternative routes.

From a planning standpoint, Alternative 2 merits consideration. Although the cost of land acquisition and construction would be

96

higher than Alternative 1, Alternative 2 is advantageous in that it bypasses the center of Keaau Town completely.

2. Relationship of Keaau Bypass Road to Future DOT Highway Improvements in Lower Puna

We understand that the scope of the current project is to plan and construct a bypass road that reduces the traffic congestion in the vicinity of Keaau Town and alleviates some of the bottleneck that occurs between lower Puna and the city of Hilo particularly during the peak morning and afternoon commuting hours. However, from a planning standpoint, the bypass road alone will not address the longer-term needs of the "upstream" residents whose commuting points of origin feed onto Highway 130, the Keaau-Pahoa Road. A new access route between lower Puna and Hilo will increasingly be needed as the population continues to grow, whether this means widening Keaau-Pahoa Road or developing an alternative corridor. Planning and construction of the Keaau Bypass should be viewed and carried out in the context of DOT's long-range plans for highway improvements in the region.

3. Use of Puna Population Projections

Since population projection numbers for the Island are currently undergoing review as part of the joint DOT-Hawaii County Land Transportation Master Plan update, the updated numbers should be incorporated into the final Environmental Assessment along with Hawaii County General Plan population projections (see Exhibit 2-K, p. 2-19, Appendix B).

4. Relationship of Keaau Bypass Road to Future DOE School Sites

The draft Environmental Assessment contains some discussion of sites for the new Keaau II Elementary School and a new Puna high school under consideration by the Department of Education (p. 26). The report notes the importance of coordinating the selection of school sites with the selection of a final Bypass Road route and alignment. However, it is not clear from the discussion exactly which of the alternative school sites has finally been selected for the Keaau II Elementary School. A Tax Map Key plat map showing the alternative sites for both schools would assist in the review.

5. Preliminary Determination of No Significant Impact

We question the preliminary determination that the proposed project would not have a significant effect on the environment, thereby eliminating the need for an Environmental Impact

Statement (Section 5.0, p. 49). While there do not appear to be significant historic or natural resource-related impacts, the new bypass road will be one factor in the decision of new residents to relocate to Lower Puna. In addition, the relationship between the Keaau Bypass Road and the location of the two new DOE schools is still unclear and has not received sufficient discussion or consideration in the current draft Environmental Assessment. It is possible that the above two concerns could be addressed through revisions to the Environmental Assessment.

In conclusion, we support the Keaau Bypass Road as an important capital improvement project for the district of Lower Puna. We hope that you find our comments useful in the preparation of the Final Environmental Assessment for the Keaau Bypass Road project.

Please feel free to contact me or staff planner Ann Usagawa if you should have any questions on the above comments.

Sincerely,

Virginia Goldstein

VIRGINIA GOLDSTEIN
Planning Director

97

AU:au
keaaurd.dea
cc: GC & Associates

BENJAMIN CAYETANO
GOVERNOR

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
SAM CALLEJO
GLENN M. OKIMOTO

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

IN REPLY REFER TO:
HWY-PA
2.5792

May 30, 1995

Ms. Virginia Goldstein
Director
Planning Department
County of Hawaii
25 Aupuni Street, Room 109
Hilo, Hawaii 96720

Dear Ms. Goldstein:

Subject: Keaau-Pahoa Road, Keaau Town Section
Project No. 130B-01-92
Draft Environmental Assessment

Thank you for your letter which commented on the "Draft Environmental Assessment" for this project. We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Mamalahoa Highway.

The concerns which were expressed in your letter have been addressed as indicated below:

1. Ranking of the Alternatives, pp. 6-8

We agree with your comment that some of the ranking criteria should be explained or developed in the final document. In particular, criteria such as "immediate relief", "safety, convenience and efficiency", "avoid downstream bottlenecks", "social" and "economic impacts" will be defined or briefly described. Other criteria may be more quantitative, and consequently, the ranking of alternatives should be apparent.

Regarding the identical scores for Alternatives 1 and 2 on the criteria of "length" and "cost", we believe that, for these criteria, Alternatives 1 and 2 are of the same relative magnitude. Also, the relative cost and length of these alternatives should be clearly distinguished from the lengthier Alternative 3 and shorter Alternatives 4 and 5.

We somewhat agree with your rationale regarding the low ranking of Alternative 5 in the "historic and cultural sites" criteria. As you have indicated, the impacts due to the proposed widening (Alternative 5) are cultural and social rather than historic impacts. However, several of the older structures in Keaau were designated as potential nominees to the Hawaii Register of Historic Places.

Contrary to statements in your letter, we do not believe that more studies are needed to select a "preferred alternative". Although Alternative 2 has distinct advantages, our selection of Alternative 1 is based on achieving the objectives of this project with the least community and environmental impacts.

2. Relationship of Keaau Bypass Road to Future Department of Transportation Highway Improvements in Lower Puna

The primary and only objective of this project is the immediate relief of traffic congestion in Keaau Town.

This project's purpose is not to address the broader long-term needs of the area, such as the widening of the existing Keaau-Pahoa Road or developing a new highway corridor. This broader need will have to be addressed in a separate project.

The overall transportation needs of the area will be addressed in the update of the Long Range Transportation Plan, which is also under development now and which you and your staff are involved with (you are on the Policy Committee and Rodney Nakano is on the Technical Advisory Committee, which among other tasks, is reviewing and guiding the work on the update).

The Keaau Town Bypass project is an integral part of the current Long Range Transportation Plan and can fit into either a future widened Keaau-Pahoa Road or a future new highway corridor (depending on its location).

3. Use of Puna Population Projections

Approved population projections of the Hawaii County General Plan, along with a transportation master plan, will probably not be available prior to the printing of our final document. As indicated in item no. 2, the project does consider various scenarios including a substantial population increase in Puna.

4. Relationship of Keaau Bypass Road to Future Department of Education School Sites

We have consulted with the Departments of Education and Accounting and General Services in the development of our highway plans. The sites selected for the schools are described on page 26 of the draft environmental assessment for this project. The elementary school site is just north of the Keaau Agricultural Lots, and the high school site is just north of the proposed intersection of the bypass road with the Keaau-Pahoa Road. The locations of the proposed schools will be shown on Figure 2 of our final document.

5. Preliminary Determination of No Significant Impact

The issue pertaining to the proposed school sites has been addressed in item no. 4. Every effort will be made to minimize highway-related impacts to these schools and their students and faculty.

We believe that the project's impact on the environment will not be significant for the following reasons:

a. Because of the shortness of this project (approximately 2.5 miles), very little land area will be directly affected and much of this land is being petitioned or has been rezoned for a "higher" use. As indicated in item no. 2, we are not "piecemealing" a major arterial; we believe that our highway objectives are explicit and vital to the well-being and orderly development of Keaau.

b. The project will restrict direct access to the new facility, and consequently, strip development is not likely.

c. Due to several other controlling conditions, such as job opportunities, water supply, etc., accelerated development of other areas is unlikely. For your information, Appendix B, the project's social and economic impact analysis, discusses the effect of the bypass road on the desirability of properties in lower Puna.

We deeply appreciate your concern for this project and look forward to your continued support.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

#HDH 7838

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Ecoregion
300 Ala Moana Blvd, Room 6307
P.O. Box 50167
Honolulu, Hawaii 96850

NOV 22 1994

In Reply Refer To: CAW

Mr. Rex D. Johnson
Director of Transportation
Hawaii Department of Transportation
869 Punchbowl Street
Honolulu, Hawaii 96813-5097

Re: Draft Environmental Assessment (EA) for Keaau-Pahoa Road, Keaau Town Section, Puna District, Island of Hawaii, Hawaii, Project No. 130B-01-92 (Federal-Aid Secondary Route 130)

Dear Mr. Johnson:

100

The U.S. Fish and Wildlife Service (Service) has reviewed the Draft Environmental Assessment (DEA) for the proposed Keaau-Pahoa Road, Puna District, Island of Hawaii, Hawaii. The applicant is the Department of Transportation (DOT), State of Hawaii. This letter has been prepared under the authority of and in accordance with provisions of the National Environmental Policy Act of 1969 [42 U.S.C. 4321 et seq.; 83 Stat. 852], as amended, the Fish and Wildlife Coordination Act of 1934 [16 U.S.C. 661 et seq.; 48 Stat. 401], as amended, the Endangered Species Act of 1973 [16 U.S.C. 1531 et seq.; 87 Stat. 884], as amended, and other authorities mandating Service concern for environmental values. Based on these authorities, the Service offers the following comments for your consideration.

The proposed project involves the construction of a bypass road routing Keaau-Pahoa Road (State Highway 130) around the town of Keaau in the Puna District on the island of Hawaii. The proposed widening or realignment will affect a 2.25-kilometer (1.4-mile) section of the existing Keaau-Pahoa Road, located in the vicinity of Keaau Town. The project consists of constructing paved shoulders, left and right turn lanes, a shoulder lane, retaining walls, sidewalks, and metal pipe railings; modifying the existing traffic signal system; installing a new 40.6-centimeter (16-inch) water line, signs and pavement markings; and stripping the old markings off.

The DEA adequately describes the existing environmental conditions at the project site. The Service has not identified any significant adverse impacts to fish and wildlife resources that will result from the proposed construction and widening of the bypass road . Therefore, based on the information presented in the *Draft Environmental Assessment for the proposed Keaau-Pahoa Road, Keaau Town Section, Puna District, Island of Hawaii*, the Service will concur with a Finding of No Significant Impact for this action.

The Service appreciates the opportunity to provide comments on the proposed project. If you have questions regarding these comments, please contact Fish and Wildlife Biologist Christine Willis at 808/541-3441.

Sincerely,

Brooks Harper

Brooks Harper
Field Supervisor
Ecological Services

cc: GK & Associates
DLNR, Hawaii

BENJAMIN CAYETANO
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
869 PUNCHBOWL STREET
HONOLULU, HAWAII 96813-5097

KAZU HAYASHIDA
DIRECTOR

DEPUTY DIRECTORS
SAM CALLEJO
GLENN M. OKIMOTO

IN REPLY REFER TO:
HWY-PA
2.5798

MAY 24 1995

Mr. Brooks Harper
Field Supervisor
Ecological Services
U.S. Department of the Interior
Fish and Wildlife Service
P.O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Harper:

Subject: Keaau-Pahoa Road, Keaau Town Section
Project No. 130B-01-92
Draft Environmental Assessment

101

Thank you for your letter (ref: CAW) which commented on the "Draft Environmental Assessment" for this project. We wish to inform you that, based on the information obtained during the public participation phase for this project, we will be developing the project's "Negative Declaration" based on Alternative 1. Alternative 1 begins along the existing Keaau-Pahoa Road, skirts Keaau Town on its southeasterly limits, and terminates at the intersection of Keaau Road and Mamalahoa Highway.

We will not be pursuing the widening alternative (Alternative 5) due to potential historic site impacts and the disruption of businesses, residences and public facilities. Our preferred alignment, Alternative 1, will not have similar community impacts. Our consultants also have not identified any fish and wildlife resources that may be affected due to the proposed bypass.

We deeply appreciate your continued assistance.

Very truly yours,

KAZU HAYASHIDA
Director of Transportation

7.3 PUBLIC HEARING AND INFORMATIONAL MEETINGS

A public hearing regarding the project was held at the Puna Hongwanji Mission, Old government Road, Keaau, Hawaii on Wednesday, October 19, 1994. Although not required by the state EIS process, the DOT chose to use the federal model in carrying out its community interaction program for the Keaau Bypass Road project. Hence, a formal public hearing as well as several public information meetings were held. At each of these meetings, the attendees were overwhelmingly in favor of the bypass road, and generally impatient for its completion. The focal point of most of the discussions was which alternative to support. The makai options received nearly unanimous support, but while the DOT favored Alternative 1 because it would be the easiest in terms of land consolidation and least expensive, the county favored Alternative 2 for its access to Shipman Industrial Park. Many lower Puna residents favored a new alternative route into Hilo, such as Alternative 3. Because of opposition by the DHHL and the potentially impacted Hilo community to the extension and upgrading of Railroad Avenue to an arterial road, it seems unlikely that Alternative 3 is viable in the foreseeable future. The Keaau Bypass Road is intended to alleviate a very immediate problem. As the Puna population continues to grow, other solutions, such as the county's planned connection of Hilo's Komohana Street into Keaau and the long envisioned coastal highway will be necessary.

APPENDIX A

EDWARD J. CAYETANO
GOVERNOR OF HAWAII

COPY

STATE OF HAWAII

DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE HISTORIC PRESERVATION DIVISION
33 SOUTH KING STREET, 6TH FLOOR
HONOLULU, HAWAII 96813

MICHAEL D. WILSON, CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES

DEPUTY
ALBERT COLOMA-AGARAN

AQUACULTURE DEVELOPMENT PROGRAM
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CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION DIVISION
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

March 23, 1995

Mr. Allan J. Schilz
Ogden Environmental & Energy Services
680 Iwilei Road, Suite 660
Honolulu, Hawaii 96817

LOG NO: 14166
DOC NO: 9503PM10

Dear Mr. Schilz:

SUBJECT: Revised Report: "Archaeological Survey of the Kea'au Pahoa Road, Keeau Town Section
Project No. 130B-01-92
Puna, Hawaii (TMK 1-6-03)" (Hurst and Schilz 1994)

Thank you for delivering this revised report for our review and approval.

This report, prepared for an Environmental Assessment, meets with our approval now that there is a section describing the archaeological survey methodology and limitations.

No significant historic sites were found in the survey, which was limited, however, to a survey of just a few areas along the proposed road corridor. While it is unlikely that there are many, if any, significant sites in the corridor because of historic land use practices, the lack of a complete survey prevents us from concluding at this time that the proposed project will have a "no adverse effect."

The recommendation to conduct test excavations in the vicinity of the 8 1/2 Mile Camp to establish the date and significance of remains found on the surface appears warranted. Depending on the results of the testing program, monitoring of a portion of the road corridor may or may not be warranted.

If you have any questions please contact Pat McCoy (587-0006).

Sincerely yours,

DON HIBBARD, Administrator
State Historic Preservation Division

PM:amk

cc: GK & Associates

Revised

Archaeological Survey of the Kea`au Pahoa Road Keaau Town Section Project No. 130B-01-92 Puna, Hawai`i (TMK 1-6-03)

By
Gwen Hurst, B.S.A.

Project Director
Allan Schilz, M.A.

Submitted To:
GK & Associates
294 Awakea Road
Kailua, Hawai`i 96734

Submitted By:
Ogden Environmental and Energy Services Co., Inc.
680 Iwilei Road, Suite 660
Honolulu, Hawaii 96817

December 1994

ABSTRACT

A four-lane divided highway to bypass the town of Kea`au, Puna District, Hawai`i, is proposed by the Hawai`i State Department of Transportation to alleviate traffic congestion. An archaeological survey of the proposed bypass corridor was undertaken by Ogden Environmental and Energy Services under contract to GK & Associates, Kailua, Hawai`i. Previous archaeological work in the area, and current historical research undertaken, indicates that the area was marginally used by native populations. Major historical impacts to the proposed route occurred during the turn-of-the-century for development of a sugar plantation, and in 1948 for the development of macadamia nut orchards. No significant cultural remains were found during the archaeological survey.

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INTRODUCTION

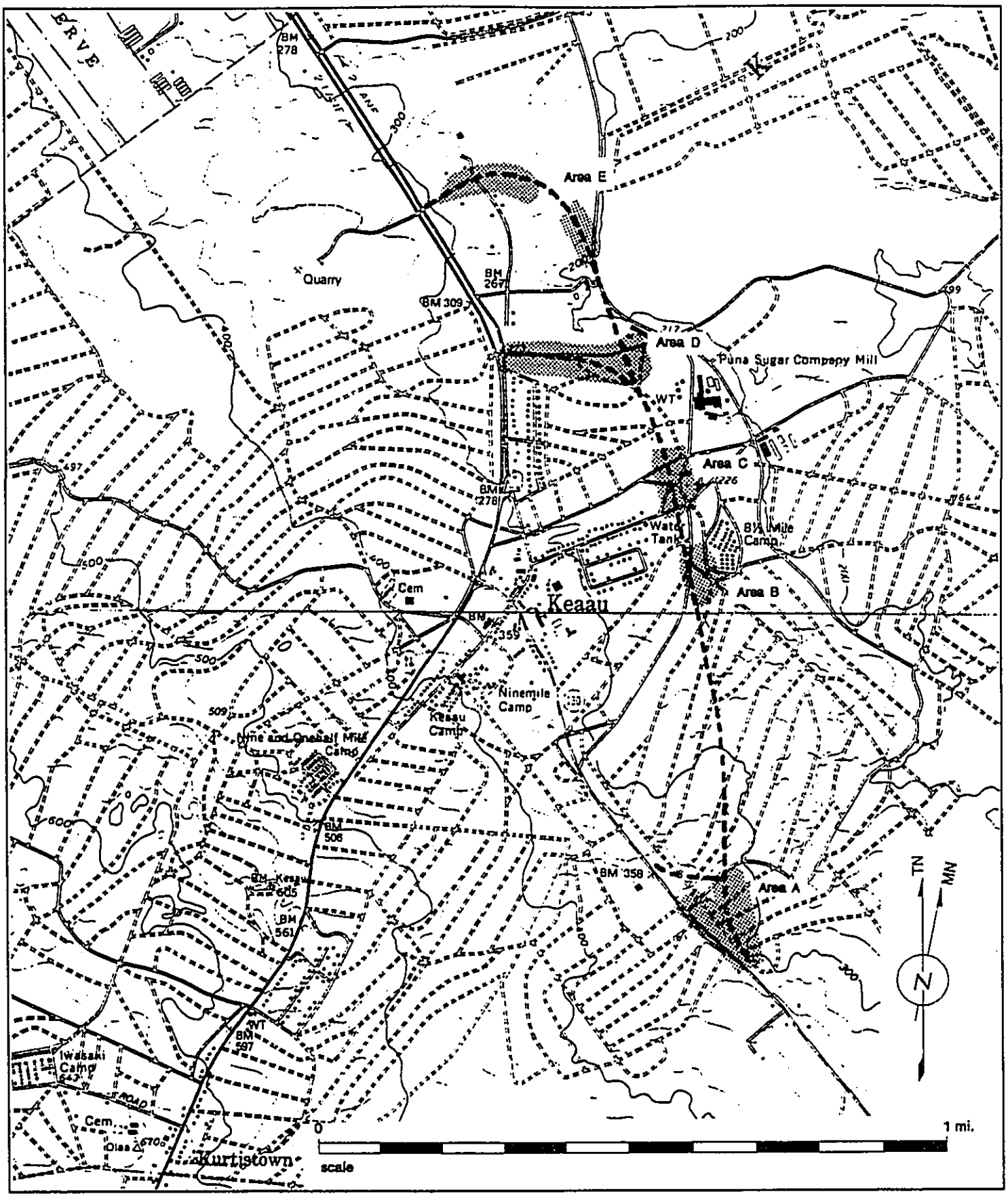
Under contract to GK & Associates of Kailua, Hawai`i, Ogden Environmental and Energy Services, Honolulu, conducted an archaeological survey of the proposed Kea`au Bypass corridor routed past the town of Kea`au, Puna District, Hawai`i (TMK 1-6-03). Objectives of the survey were to identify potentially sensitive archaeological areas that may be impacted during construction of the Kea`au Bypass. The assessment included:

a) A historical literature and background search.
b) Consultations and review of previous archaeological investigations.
c) Examination of land documents, maps, and aerial photographs.
d) A summary and evaluation of the historical background research, consultations, and results of the archaeological field work.
e) Assessment and recommendations for evaluation of archaeological resources.

ARCHAEOLOGICAL INVENTORY SURVEY

An archaeological survey of the proposed Kea`au Bypass corridor was undertaken by Ogden Environmental and Energy Services between 22 and 24 November 1993. Field crew conducting the survey were William Fortini, Jr. and Gwen J. Hurst, pre-historic and historic archaeologists. The field investigation was conducted by pedestrian survey and was recorded on maps, field notes, and photographic records.

The proposed Kea`au Bypass is routed along the eastern perimeter of Kea`au Town (Figure 1). From the south of Kea`au the route passes through old growth sugar cane fields to the southwest of 8 1/2 Mile Camp. From 8 1/2 Mile Camp, the route follows Railroad Avenue to macadamia nut orchards at the north of Kea`au. Two alternative routes to Mamalahoa Highway, a four-lane highway from Kea`au to Hilo, are proposed at the north end of Kea`au. Potential archaeologically sensitive areas within this corridor identified from the historical background research were located on current maps, and were designated Areas A-E for survey purposes (Figure 1).



FIGURE

1

OGDEN

Site Location
(U.S. Geological Survey, Hilo and Mountain View Quads, Hawaii, 1981)

SITE LOCATION AND DESCRIPTION

The Kea`au Bypass is proposed to be routed along the eastern side of the town of Kea`au, a sugar plantation community begun by the Ola`a Sugar Company on leased lands in 1899. Two alternate routes at the north end of Kea`au Town are proposed for the bypass through the Mauna Loa macadamia nut orchards planted on forested lands in 1948/1949. The town of Kea`au is located on the windward side of Hawai`i Island in Kea`au *Ahupua`a* (land division), in the Puna District nine miles south of Hilo. Kea`au is at an elevation of 360 feet above sea level on the northeastern slope of Mauna Loa mountain below Kilauea Volcano (Figure 1), and receives approximately 150 inches of annual rainfall.

The Kea`au Bypass corridor is routed between Kea`au, formerly known as 9 Mile Camp (or Ola`a), and 8 1/2 Mile Camp, situated east of 9 Mile Camp. Many of the early 1900s plantation buildings associated with the Ola`a Sugar Company are still in use in Kea`au, including those at 8 1/2 Mile Camp. In compliance with State Legislature Act 119 (1973) requiring urban design plans, the 1979 Puna Community Development Plan recommended a by-pass route to reduce the increase of traffic congestion. As a district, Kea`au Town and significant buildings associated with the early Ola`a Sugar Plantation were nominated as Site No. 7389 for the Hawai`i Register of Historic Places (Puna Community Development, 1979:8, 15, 29-30).

The slopes of Mauna Loa are characterized as undissected upland slopes having little or no established surface drainage. The soils are thin organic "histosols soils" that occur on recently forested lava rock. No volcanic activities have impacted the site area in historical times (Department of Geography 1973:31, 34, 40, 58). The upland, or southeast, section of Kea`au *Ahupua`a* was set aside for the Ola`a Forest Reserve in the 1920s (Figure 2). A section of the Ola`a Forest Reserve has been incorporated into the Ola`a Rain Forest under the jurisdiction of the Hawai`i Volcanoes National Park.

Models based primarily on precipitation and elevation place Kea`au in a species-rich mixed mesic forest zone (Sohmer and Gustafson 1987:41). Dense fern growth surrounded by forests were observed as the primary vegetation by early historical travelers. Remnants of the mesic forest zone are currently seen among the gullies at the north end of the proposed Kea`au Bypass route with remnants of the native fern growth on the perimeter and north of 8 1/2 Mile Camp. Escaped exotic plants have recently invaded the current old-growth sugar cane fields.

BACKGROUND RESEARCH

A historical background literature and documents search was conducted prior to the archaeological field survey to determine land ownership, land use, and land use impacts to the proposed bypass corridor. Locations of potential historical sites, indicated by the background research, were assessed to determine the extent of historical impacts to the current landscape and archaeologically sensitive areas remaining in the proposed bypass route. Research sources included previous archaeological research, archived land record documents, primary publications, and examination of maps and photographs.

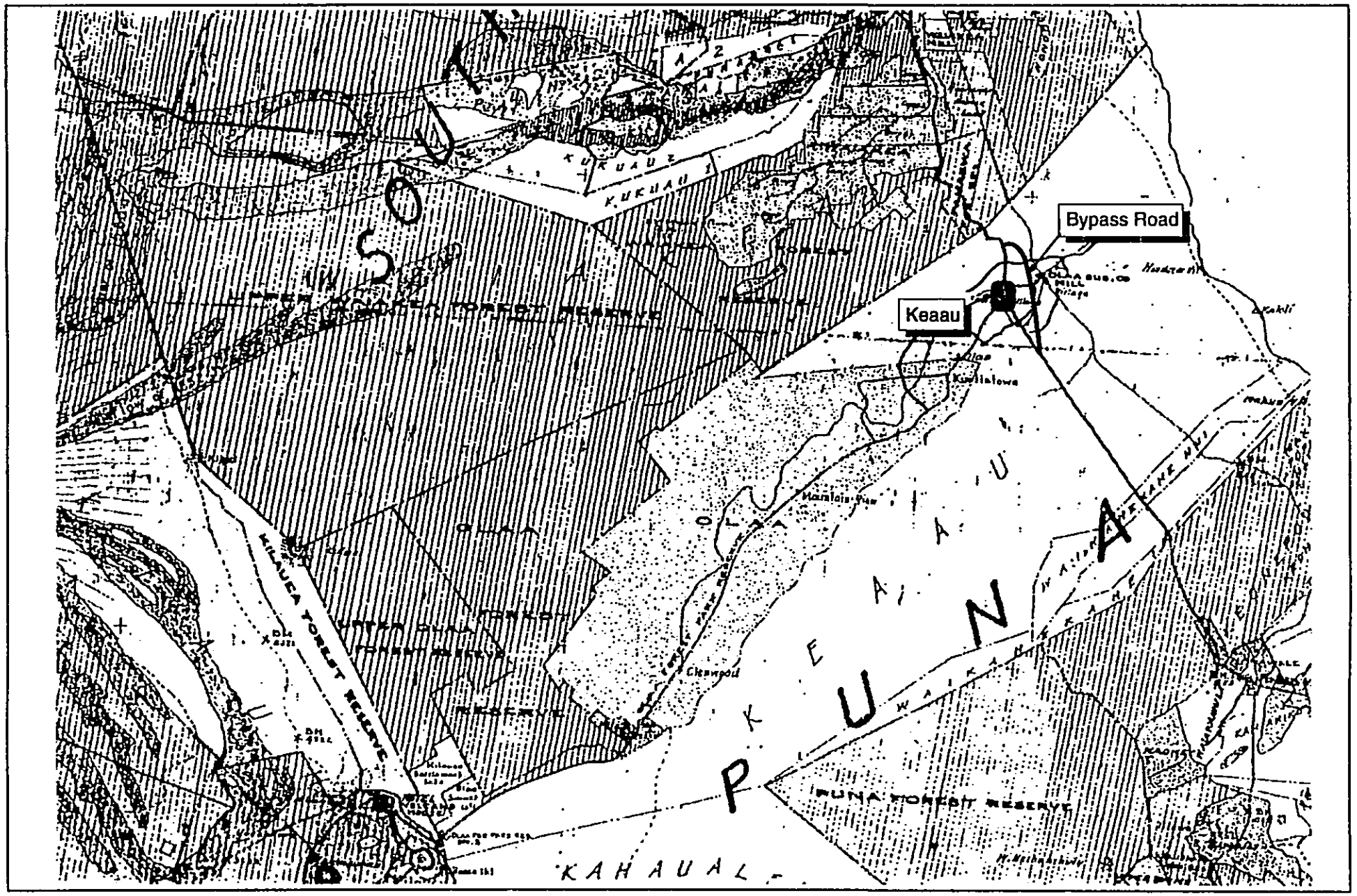
Archaeological survey and excavation reports for the Puna District filed with the Hawai`i State Historic Preservation Office, Honolulu, were consulted to obtain types of recorded archaeological remains and features within the Kea`au area. Historical areas of settlement and land use were documented through land records of the Board of Commissioners (1845-1855), deeds and leases filed with the Hawai`i Bureau of Land Conveyances after 1850, and archived Department of the Interior documents.

Land survey records and maps of Kea`au Town, used for general dating and location of the historical structures and roadways, were obtained from the Hawai`i Government Survey Office. Other maps of the Ola`a Sugar Plantation were located on the Sanborn Fire Insurance Maps on microfilm at the Hawai`i State Archives. Aerial photographs of the site indicating vegetation changes and disturbed areas were supplied by GK & Associates, Kailua, Hawai`i.

Histories of native traditions and published journals of early visitors were consulted for descriptions of population settlements in the Kea`au area prior to development. Published details specifically associated with the development of the site area were found in ethnic histories, annuals, agricultural reports, and newspaper articles.

PREVIOUS ARCHAEOLOGICAL RESEARCH

Previous archaeological surveys and research in the Puna District of Hawai`i indicate that traditional native settlements were located along the coastline of the Puna Coast. Associated with the traditional coastal settlements, agricultural terraces and burial sites on the upland slopes of



OGDEN

Section of Puna District, 1928
(Hawaii Government Survey Office)

FIGURE

2

Mauna Loa have been archaeologically recorded, and limited excavations have been conducted. Historical sites within Kea`au Town meeting criteria for preservation or archaeological investigations include structures, depositions, and land alterations associated with ranching, logging, the sugar cane and coffee industries, and roadway and railway construction.

A 2000 ft wide archaeological survey for the Kapoho Keaukaha Highway along six miles of the Puna coast, in the *ahupua`a* of Kea`au, Waikahekahe, Makuu, and Keoneopoko (Figure 2), was conducted by the Bishop Museum anthropology department in 1974. One hundred-eighteen sites were recorded during the survey, and include stone enclosures, wall remnants, trails, petroglyphs in Makuu *Ahupua`a*, mounds and depressions, and burials. Thirty sites were recorded in Kea`au *Ahupua`a* that were identified as rock enclosures, complexes, wall remnants, mounds, lava tube burials, and a roofed rock shelter. Sites located were presumed to be associated with Waikahiula Village, southeast of Kea`au *Ahupua`a* along the coastline. Remains of a large, possible *heiau* (religious temple), were mapped in Waikahekahe *Ahupua`a* (Ewart and Luscomb 1974).

A reconnaissance survey for the proposed Kings Landing Subdivision (TMK 1-6-01), along the coast of Kea`au *Ahupua`a*, was undertaken by Hallet H. Hammatt of Archaeological Research Center, Hawaii, Inc., in 1978. Twenty-seven sites located during Hammatt's survey were previously surveyed by Bishop Museum in 1974. Hammatt's survey grouped the sites into three functional types of sites classed as 1) pre-Contact stone structures, 2) habitation sites, and 3) post-Contact places (Hammatt 1978).

Site 10001, a lava tube system in the Puna District containing burials and archaeological remains was investigated by Larry G. Olson in 1984. The lava tube complex extends from Waikahekahe-Nui, south of Kea`au, through the Kazumura Cave to Kea`au *Ahupua`a* (Olson 1984). Specific location and other information on the site is restricted and confidential. Consultations with Ms. Holly McEldowney of the State Historic Preservation Division, Honolulu (November 1993) verified that the lava tube system is not within the proposed Kea`au Bypass site corridor.

A 200 acre parcel in Waikahekahe and Waikahekahe-Nui (TMK 3-1-6-04:21, 57), southeast of the proposed Kea`au-Pahoa Road Bypass (Figure 2), was surveyed and tested by Paul H. Rosendahl Inc. for the Ainaloa Development Corporation in 1992. Two sites were found during the survey and were interpreted as agricultural sites. The sites were a rock alignment extending from a lava blister (Site 50-10-44-1748), and a stacked terrace (Site 50-10-44-1749). Two excavation units

placed near the sites were excavated to bedrock and no portable cultural remains or charcoal for carbon-dating purposes were recovered (Franklin et al. 1992 and Appendix B).

Six hundred acres of W. H. Shipman Corporation lands in Kea`au on both sides of Mamalahoa Highway (TMK 1-6-03-3:7, 12, 58, 75, 86, 90 and TMK 1-6-03-3:8, 11, 27, 29, 73, 84) were assessed by Terry L. Hunt in 1992 for proposed zoning changes. Fifty sites recorded during the survey were found in areas of secondary-growth vegetation. The sites were identified as stone mounds (38), walls (3), enclosures (3), alignments (2), and facings (4) and were interpreted as associated with sugarcane field clearing activities. No evidence of surface archaeological remains was found in vegetation-free areas under cultivation (Hunt 1993).

Oral Traditions

The Puna District is believed to have once been "Hawaii's richest agricultural region and that it is only in relatively recent time that volcanic eruption has destroyed much of its best land..." (Handy et al. 1978:542). Much of the oral tradition of Hawai`i Island is related to the activities of Kilauea Volcano and events associated with original settlement, landmarks, and vegetation. Many of the histories are lengthy, with numerous variations and interpretations that have been compiled since ethnographic records were recorded by William Ellis in 1823 (Ellis 1979). Abstracted quotations from oral traditions of Kilauea Volcano and Kea`au *Ahupua`a* provide a general overview of the historical material available.

The former god of Kilauea Volcano, Ai-lauu, is claimed to have been displaced by Pele, the great goddess of fire, who came from a foreign land to permanently reside in Hawai`i. Destruction of the Puna district by the goddess Pele occurred during the travels of Ke-Lii-Kuku, the chief of Puna, to the island of O`ahu. On the island of O`ahu, Chief Ke-Lii-Kuku boasted of Puna's rich sandy plains and the abundance of sweet-scented trees and vines to Kane-a-ka-lau, a prophet of Pele from the island of Kaua`i. Kane-a-ka-lau predicted that upon Ke-Lii-Kuku's return to Puna that the country would be a "desolate...heap of ruins. Hastily returning to Puna:

> ...the oarsmen...took the chief back to his island. As he came around the eastern side of Hawaii he landed and climbed to the highest point...[of] Puna...There in the distance it lay under heavy clouds of smoke covering all the land. When the winds lifted the clouds, rolling them away, he saw that all his fertile plain was black with lava, still burning and pouring out constantly volumes of dense smoke...Pele had

> heard the boasting chief and had shown that no land around her pit of fire was secure against her will (Westervelt 1988:3, 30-31).

In Ola`a, an upland section of land in the southwest area of Kea`au, an *ohi`a lehua* (mountain apple) tree growing by a spring of water "...bears only two blossoms at a time. If a branch is broken blood will flow. The story of its origin is as follows:

> Ku-ka-ohia-a-ka-laka and his sister Ka-ua-kuahiwa (The rain on the ridges) come from Kahiki [a foreign country] to Hawaii and live, Ku with his wife at Keaau and Kaua with her husband in the uplands of Ola`a. When the sister brings vegetable food from her garden to her brother at the sea, her stingy sister-in-law pretends that they have no fish and gives her nothing but seaweed to take home as a relish. In despair at this treatment, Kaua transforms her husband and children into rats and herself into a spring of water. Her spirit comes to her brother and tells him of her fate. He visits the uplands, recognizes the spot as she has directed in the dream, and, plunging into the spring, is himself transformed into the lehua tree which we see today (Beckwith 1985:17; see also Green and Pukui 1936:147-149).

Ke`amalu Spring in the high uplands of Ola`a, is identified in the romance of a maiden known as "Clear-Shade":

> ...Birds guarded her [Clear-Shade] and fed her with la`-ma pi`-o`-i and ma-`ma`-ki berries and with the honey of the le-hu`-a blossoms. She did not eat ordinary food, she was brought up on the food of birds. A spring in the mountains of O-la'a is called the 'Spring-of-Clear-shade,' and there Clear-shade went to bathe. One day as she sat by the spring a young man appeared to her and asked her to become his wife. She refused, for she did not want to marry...The young man returned to Puna, to his sweetheart the-red-lehua-blossom...Clear-shade remained hidden until she thought that the young man had forgotten her, then she returned to the spring, but she was seized by the youth and released only when the hawk had scratched his face and arms. The supernatural guardians of Clear-shade heard of the slighting remarks made by Red-lehua's parents and they determined to have a test of beauty between their child and the beauty of Puna...Clear-shade...and Red-lehua [were] to place [their] flowers inside of a gourd, and the gourd over which the birds hovered would be the winner. When the day came for the contest, the Puna girl put pandanus blossoms and red lehua into her gourd, Clear-shade filled hers with ma`i-le vine and white lehua. I-i`-wi birds hung over Clear-shade's flowers, only a fly flew over Red-lehua's...The proposal of the young man for Clear-shade was accepted...As for the spring of Ke`-a-ma`-lu, it was hidden and very few are the persons to whom it is shown (Green and Pukui 1936:159-161).

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Among the early residents of Ola`a were cave dwellers and thieves of Ola`a who waylaid and robbed travelers through the district:

> If the number [of travelers] was few, they were killed on the road; if a larger number, they were invited to the cave to eat and sleep and large stones suspended above were dropped down on their heads where they were sitting, and thus they were killed (Green and Pukui 1936:133-135).

HISTORICAL LAND USE AND IMPACTS

In the initial Contact-period, and during the return trip of Captain James Cook's voyage of discovery to the Sandwich Islands in 1778/79, the ship *Resolution*, lying off and on the eastern side of Hawai`i in January 1779 found:

> ...both Wind and weather was exceedingly unsittled [sic] and there fell a great deal of rain. The Three following days [2-4 January 1779] were spent in running down the SE side (of the) island, for the night(s) were spent in plying and a part of each day laying to trading with the natives who some times came to us five leagues off to sea. But whether from a fear of loosing their goods in the Sea or the uncertainty of a Market, they never brought much with them, the Cheif [sic] article we got was salt, which was extremely good.

Searching for the companion ship, *Discovery*, the *Resolution* continued to the large village at the south point of Hawai`i Island, meeting the Discovery on 6 January 1779 (Cook 1967:486-487). This brief, first encounter of natives with foreigners on the Puna coast, was focused on obtaining "refreshments" (fruit, roots, and pigs) and no description of the eastern side of Hawai`i Island was published from the journals of Cook's voyage.

Early Historical Descriptions

Believed to be the first foreign exploration to circuit Hawai`i Island and "the first white men to visit the volcano of Kilauea," a missionary party consisting of Rev. Asa Thurston, Artemas Bishop, and Joseph Goodrich of the American Mission, and Rev. William Ellis, an English missionary from Tahiti familiar with Polynesian linguistics, made a tour of the island in 1823:

> Soon after five p.m. we reached Kaau [Kea`au], the last village in the division of Puna. It was extensive and populous, abounding with well-cultivated plantations

> of taro, sweet potatoes, and sugar cane, and probably owes its fertility to a fine rapid stream of water, which, ...runs through it into the sea... (Ellis 1979:212).

Several villages in the upland area of Kea`au *Ahupua`a* designated as Ola`a were visited by the missionaries including a village of interest described by Ellis:

> The construction of the swineherds' houses at the village of Ka-pu-o-ka-ahi (the hill of the fire), was singular. There were no walls, nor upright poles along the sides, but the rafters were fixed in the ground, united at the top, and thatched about half way down (Ellis 1979:214).

Considered by the missionary group to be indigenous plants were strawberry and raspberry in the "higher parts;" areas well wooded with "two or three extensive" forests, and a "wilderness of pandanus, that stretched along the eastern shore, between Kaau [Kea`au] and Hiro [Hilo]" (Ellis 1979:213, 214). On the eastern and northwestern parts of the island the missionaries reported that there were a few inland settlements, "but in general, the interior is an uninhabited wilderness." They found that the majority of the native population on Hawai`i Island, estimated as about 85,000, were "found near the sea shore, along which, the towns and villages of the natives are thickly scattered" (Ellis 1979:4). A settlement of about 100 residents in Ola`a was recorded in 1826 by Rev. Hiram Bingham (Bingham 1969:290).

Decline of the native population and abandonment of gardens and villages in the region during the early post-Contact period were attributed by the early missionaries to frequent wars during Kamehameha I's reign, two epidemics prior to 1823, and subjective opinions claiming infanticide practices and "the increase of depravity and vice" (Ellis 1979:16). Handy et al. (1978:542) propose that "the present devastation was largely brought about by the gradual abandonment of their country by Hawaiians after sugar and ranching came in." Settlements on the windward side of Hawai`i Island were additionally exposed to tsunami and wind storms and a particularly devastating tidal wave destroyed many settlements along the windward coast of Hawai`i and Maui Islands on 7 December 1837 (Bingham 1969:518).

A trip through Kea`au region in 1850 from Hilo to Kilauea Volcano mentions the site of Ola`a, but no settlement:

> July 22 [1850]. This morning, Dr. Wetmore, Mr. Bailey, Henry Lyman, mother, Abby and myself [Dwight Baldwin] started to pay our devotions to Pele...About four o'clock in the afternoon we...reached Olaa, a distance of 12 miles,...Our road

> hither lay for the first 6 miles [from Hilo] through an even plain covered with lois [taro patches] and ferns. We then passed through a forest of ohia trees and the rain, and the rest of the way through an immense tract of land covered with ferns... (Alexander 1953:175, 176).

Kea`au Land Ownership, 1848

Until the 1840s, Hawaiian lands were owned by the hereditary king and occupied by natives under a feudalistic land tenure system. King Kamehameha I, conqueror of all of the Hawaiian Islands (except Kauai and Ni`ihau) in the 1790s, divided Hawai`i Island into six districts among his principal chiefs. Parcels of land were then assigned by the principal chiefs to inferior chiefs known as *konohiki* (overseer), and were distributed by the *konohiki* to the common people for specialized labor services and garden plots maintained for their landlords.

Absolute monarchy land tenure systems changed as royal deaths, the influences and impact of foreign policies, and economics affected the islands. On 1 July 1840, the first Hawaiian Constitution was enacted followed by the governmental organization of a Privy Council in 1845 authorized to appoint a Board of Commissioners to divide the Hawaiian Lands in Quiet Land Titles. The Board of Land Commissioners, appointed by the approval of the King Kamehameha III on 9 February 1846 (Hawai`i Legislature 1846:107), divided the whole of the Hawaiian lands into three parts: "one to the Chiefs, one for the support of the Government, and a third for the King's personal use. These we know by the names of 'Konohiki' [chief], 'Government', and 'Crown Lands'" (Office of the Commissioner of Public Lands 1929:VII).

The transition period in acquiring fee simple titles to Hawaiian lands was known as the "Great Mahele." Under this land division system, Kea`au *Ahupua`a* was awarded to prince William C. Lunalilo by Land Claim Award 8559-B, *Apana* 16 (Parcel 16) (Board of Commissioners 1929:10.480). Kea`au *Ahupua`a* was mortgaged by the guardians of Lunalilo's estate during the 1860s to Honolulu banker, Charles R. Bishop (Bureau of Land Conveyances 20:124-125; 28:55). On 27 September 1872, 60,020 acres of Kea`au *Ahupua`a* were leased from the Lunalilo estate for a ten year period to O. B. Spencer. The lease was reassigned to Rufus A. Lyman on 14 September 1874 (Bureau of Land Conveyances 36:354-355; 40:240-242). During O. B. Spencer's lease of the lands, W. C. Lunalilo was elected king of Hawai`i, serving from 8 January 1873 until his death on 3 February 1874.

Within each chief's *ahupua`a*, native tenants were allowed to apply for small parcels of lands that they had occupied and improved prior to the appointment of the Board of Commissioners. Native claims, generally known as *kuleanas*, were applied for to the Board of Commissioners under Land Claim Applications (LCA), and if proven by testimonies, were awarded by Royal Patent (RP). One 13.64 acre *kuleana* in Kea`au *Ahupua`a* was awarded (LCA 8081, RP 4360) during the Great Mahele to Hewahewa.

Hewahewa's application for his claim (LCA 8081) in 1848 describes his parcel as a coffee *kihapai* (cultivated orchard) (Board of Commissioners, Native Register 1848:8.704). Native and foreign testimonies to Hewahewa's claim state that the *kihapai*, given to Hewahewa in 1842, was unfenced with no house (Board of Commissioners 1848, Native Testimony 4:471; Foreign Testimony 5:34). Hewahewa's claim was deeded by Hewahewa to Bishop L. Maigret, a Catholic priest, on 28 September 1865 (Bureau of Land Conveyances 46:233).

Kea`au Survey, 1875

As the lessee of Kea`au *Ahupua`a*, Rufus A. Lyman surveyed the boundaries of this section of land in 1875. Son of missionaries David B. Lyman and Sarah Joiner, Rufus A. Lyman served in various capacities in the Hawaiian Government, and as an advisor of Princess Ruth Keelikolani. The purposes of his lease of Kea`au are unknown.

R. A. Lyman's survey notes were filed with the Hawai`i Government Survey Office and were recorded on Boundary Certificate No. 61. No accompanying survey map was located. In the survey notes are survey points naming landmarks, vegetation zones, features, and "an old *heiau* [temple] named Kawiakawa." Most of the places and features named by Lyman are currently unknown.

Some of the stones from Kawiakawa *Heiau* were reported in oral history notes taken by Violet Hansen of Hilo in the 1950s to have been removed by W. H. Shipman during the late 1800s to build a cattle pen. Several stone walls were located in this area during the archaeological survey by Bishop Museum in 1974 but no enclosures or *heiau* were found in Kea`au *Ahupua`a* (Ewart and Luscomb 1974:52).

Other place names given by Lyman in his survey notes are: "Kaluaike water at the East side of the Puna and volcano road [sic] and at the head of this land;" Keahuakaliloa at the east corner of Kea`au on the sea shore; "a place called Kahooku where some Neneleau trees (see below) are growing and from where the houses at Kanekoa can first be seen in coming down from the volcano;" places called Kuhalau, Wainli, Keauhou, Makaulele; and "a well-known place called Mawai in the woods on the Hilo and Volcano Road." Roads or trails mentioned in the survey are: Government Road, the Puna and Volcano Road, and the "Hilo and Volcano Road below the junction of the Hilo and Puna Roads."

Vegetation survey points were a coconut grove at Keauhou on the Government Road along the coast, the "Pohakuloa koa (native hardwood; *Acacia koa*) grove" on the Hilo and Volcano Road, *Ohi`a* trees (mountain apple; *Eugenia malaccensis*), and the "*Omao* Woods" partially located in *pahoehoe* (smooth lava). "*Omao*" can be translated as either designating an area of green plants, or the habitat of the Hawaiian thrush (*Phaeornis obscurus obscurus*) (Pukui and Elbert 1986:287).

The "Panaewa woods" located by Lyman's survey notes south of the *heiau* apparently refers to a "place name in the Hilo District famous in legend and song" (Pukui and Elbert 1986:313). *Neneleau* trees, a native Hawaiian sumac (*Rhus sandwicensis*) stated by botanists to be found only on the older island of Kaua`i (Handy and Handy et al. 1968:725), were identified as growing at Kahooku in 1875.

William A. Shipman Estate, 1884-1899

A cattle ranch in Kapaho *Ahupua`a* in the Puna District, and a butchering co-partnership in Hilo (Hilo Meat Market), doing business together as "Elderts and Shipman" was formed between John (Johannes) E. Elderts and William H. Shipman in about 1874 (Department of the Interior 15:204). On 15 March 1878, a request to lease a portion of Wai`akea *Ahupua`a*, bordering the west side of Kea`au *Ahupua`a*, was submitted by Elderts and Shipman to the Commissioner of Crown Lands: "with a prospect of starting a sugar plantation" (Department of the Interior 1878). For this prospect, their herd of 1700 head of cattle, 24 horses and mules pastured on Kapaho *Ahupua`a* were mortgaged for $10,000.00 (Bureau of Land Conveyances 55:490-492).

Elderts and Shipman applied to the Minister of the Interior in 1881 to lease Ola`a, the upland land section in the southwestern part of Kea`au (Figure 2) stating that they were currently (1881) using

Kea`au for cattle pasturage. Ola`a at that time was reserved to the King for the collection of bird feathers:

> We do not care about the privilege of the bird feathers which we understand that His Majesty the King wished to reserve for himself. We would like the land of Olaa because we are in possession of the adjoining land of Keaau, and would like to prevent trespassing and all trouble and unpleasantness, and as a protection for our cattle which are running there (Department of the Interior, 1881).

Kea`au *Ahupua`a* (64,275 acres), presumed suitable for "growing cane, coffee, and coconut," (Department of the Interior, 1881) was deeded 2 January 1882 by trustees of the estate of William C. Lunalilo to Samuel Damon, William H. Shipman, and E. Elderts. A partnership between the three parties, filed concurrently with the deed to Kea`au, was dissolved on 17 July 1883 (Bureau of Land Conveyances (70:461-463; Department of the Interior 22:463).

Eldert's interests with Shipman in the Puna District ranch holdings were transferred by deed to Shipman on 30 June 1883. Samuel Damon's one-third share of the *ahupua`a* of Kea`au was sold to W. H. Shipman on 28 October 1884 (Bureau of Land Conveyances 80:274-75; 88:412). William H. Shipman is listed in the Hawai`i Island directories from 1884 through 1895 as the proprietor of the Hilo Meat Market and owner of Wai`akea Stock Ranch (McKenney 1884/85:294; Lane 1888:418; 1890:515, Husted 1894/95:294).

Construction of Volcano Road from Hilo through Kea`au to Kilauea Volcano (Figure 2), was proposed in 1888 by the Minister of the Interior to the Commissioner of Public Roads, J. M. Lydgate (Department of the Interior 36:165). A fifty-foot right-of-way across Kea`au was granted by W. H. Shipman in 1889 (as owner), and over the Crown land of Wai`akea (as lessee), stipulating that gates across the road be maintained (Department of the Interior 1899:35.523). With "five miles remaining of Volcano road to be built" in 1893, a stage was running three times a week from Hilo to the volcano (*The Friend*, 1893:87.3). The area between the 8th and 13th mile along Volcano Road from Hilo was described in 1899 being "several square miles of country covered with but small ferns and grass" (Thrum 1899:123).

"Extending from where the pahoehoe meets the a`a [stony lava] *makai* [towards the sea] of the Volcano Road to Olaa...3,182 acres...subject to reduction for rocky land...[and] a small mill site and sites for plantation buildings on the land of Keaau" were leased on 9 May 1899 by the Ola`a

Sugar Company from W. H. Shipman for 40 years. Covenants of Shipman's lease required the Ola`a Sugar Company to fence all of the lands under lease. The deed allowed the sugar company to "clear [the] demised premises of all trees except breadfruit, orange, mango, and lime trees" and allowed the cutting of firewood for "plantation and employees from Panewa Woods at $1.00 a cord" (Bureau of Land Conveyances 197:238-242).

In December 1899, approximately 200 additional acres at Waipahoehoe were leased by Shipman to the Ola`a Sugar Company (Bureau of Land Conveyances 219:76-77). A 40 foot right-of-way across Kea`au for a railway to Hilo was granted to the Hilo Railway Company on 14 December 1899; the right-of-way reverting to Shipman "at any time it shall cease to be so used" (Bureau of Land Conveyances 205:114-115).

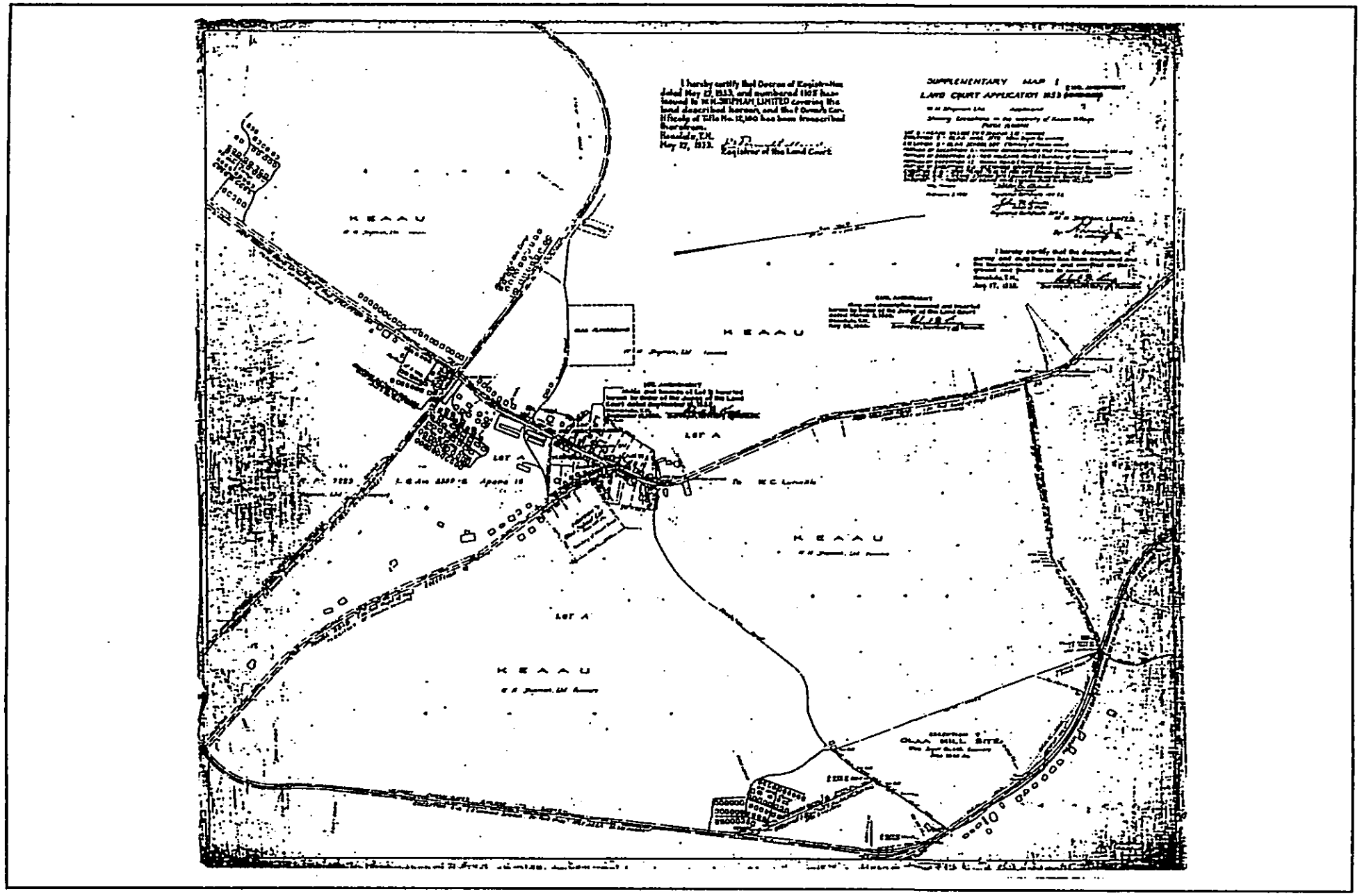
Ola`a Sugar Company, 1899-1994

The majority of the proposed Kea`au Road Bypass is routed through old growth sugar cane fields south of 8 1/2 Mile Camp to the southwest of 8 1/2 Mile Camp, and along Railroad Avenue to the macadamia nut tree groves. Intensive development of Ola`a Sugar Company between 1900 and 1905 included construction of the railroad, Ola`a Sugar Mill, shops and stores, public and Japanese language schools, churches, a cemetery, and labor camp housing. Buildings for laborers at 8 1/2 Mile Camp and at 9 Mile Camp were apparently built in 1899 or early 1900 to receive the first Japanese workers:

> Nine miles southeast from Hilo at the end of a dirt, gravel road was a coconut grove with its surrounding area known as Olaa. The Plantation [Ola`a Sugar Company] began recruiting laborers to cut down the thick ohia, tree fern and guava forests to prepare the land for sugar cane cultivation. Hundreds of [Japanese] immigrants flocked to Puna and although the Company dispatched the workers to different areas the largest group was kept in Olaa (Honpa Hongwanji Mission of Hawaii 1989:265).

Fifty-three buildings are shown at 8 1/2 Mile Camp in 1931 with the railroad tracks to the millsite south of the camp (Figure 3).

Employing 1100 men in 1901, Ola`a Sugar Company anticipated a yield of 25,000 tons of sugar from 4,000 acres of land under cane cultivation (Husted 1900/1901:572). Construction of the



FIGURE

3

OGDEN

8 1/2 Mile and 9 Mile Camps, 1931 (Hawai`i Government Survey Office)

Ola`a Sugar Mill, adjacent to 8 1/2 Mile Camp, was completed in 1902 (Honpa Hongwanji Mission of Hawaii 1989:265).

Hilo Railway Company

The Hilo Railway Company extended its railroad in 1900 from 8 1/2 Mile Camp to Mountain View, a 17 mile point on Volcano Road from Hilo to Kilauea Volcano (Honpa Hongwanji Mission of Hawaii 1989:265). Approximately two miles of additional tracks from the mill were extended in 1902 "...through the Waipahoehoe and contiguous lands as they [were] not conveniently located for fluming" (Conde' and Best 1973:92-93). Curtailed during World War II, portable tracks in the Ola`a sugar cane fields were eliminated in 1945. Extensive tsunami damages to the railway system in Hilo occurring on 1 April 1946 forced the railroad out of business. Ola`a Sugar Company railroad tracks and rolling stock were sold for scrap in 1949 (Conde' and Best 1973:99, 211, 388).

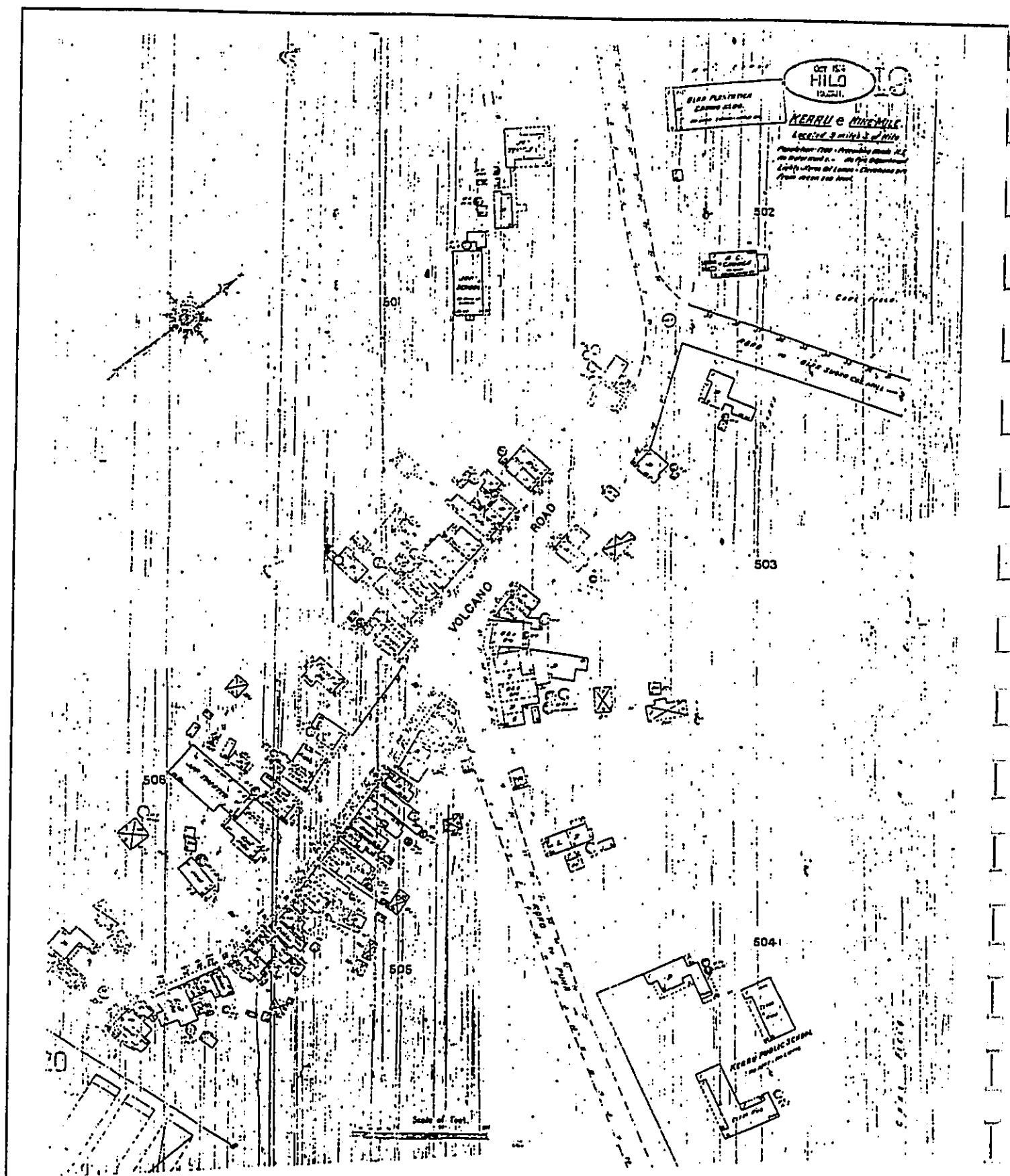
Filipino Laborers

The first group of Filipino workers brought to Hawai`i, to offset the loss of Chinese immigration in 1900 and the growing number of Japanese, arrived on 20 December 1906 for the Ola`a Plantation.

"The manager of the Olaa Plantation ... reported that he was pleased with the newcomers and recommended that more Filipinos be added to the plantation's labor force.." (Takaki 1983:27). Affecting Ola`a Sugar Company labor during the 1920s were the Filipino plantation labor strike in 1920, and the closure of Japanese immigration in 1924 (Odo and Sinoto 1985:209, 215).

Kea`au Town 1914-1921

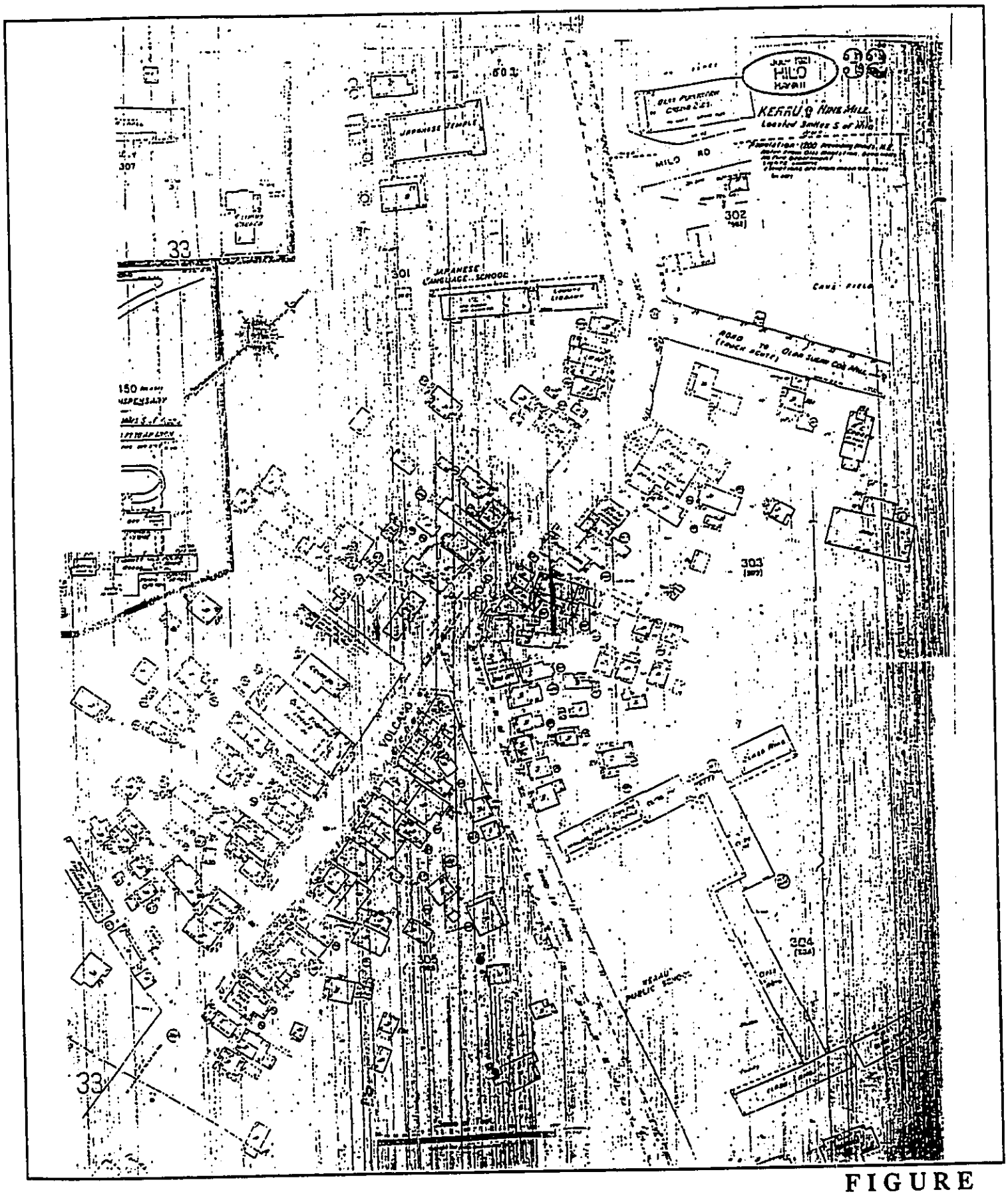
Kea`au Town, or 9 Mile Camp (excluding 8 1/2 Mile Camp), mapped by the Sanborn Fire Insurance Company in 1914 (Figure 4), was estimated as having a population of 1200 residents. The town was noted by the mapper(s) as having no electricity, water supply, or a fire department, and that lighting was obtained through the use of kerosene oil lamps. Remapped in 1921 by the Sanborn Fire Insurance Company (Figure 5), electrical power had been installed and water was available from Ola`a Plantation deep wells, but there was yet no fire department (Sanborn Fire Insurance Company 1921).



OGDEN

Kea`au or Nine-Mile Camp, 1914
(Sanborn Insurance Company)

FIGURE
4



FIGURE

OGDEN

Kea`au or Nine-mile Camp, 1921
(Sanborn Insurance Company)

5

Kea`au Residents, 1914

Listed in the 1914 Territory of Hawai`i Directory (Polk-Husted 1914:736-908) are shop keepers, tradesmen, and Ola`a Sugar Company personnel accounting for 66 persons, or 5 1/2% of the residential population of Kea`au given by the Sanborn Map Company (Table 1). Apparently plantation workers and their families were considered transients and excluded from directory listings.

Roman Catholic Church

Nine Mile Camp, mapped by the Sanborn Fire Insurance Company in 1914 (Figure 4), shows the Roman Catholic Church on the lot deeded by Hewahewa to Maigret in 1865. The church, identified by the initials "R. C. Church" with a 60' tower facing the eastern side of Volcano Road, was located at the junction of the "Road to Olaa's Sugar Co.'s Mill" (Milo Road). In 1921, the Roman Catholic Church site is shown as a gas and oil station with the Catholic Church relocated and facing the south side of the "Road to Olaa Sugar Co's Mill" (Figure 5). The Holy Rosary Catholic Church was "built around 1910 by Father Otto Duchting" (Puna Community Development 1979:15, 29).

Ola`a Hongwanji Temple

The original Ola`a Hongwanji Temple (Japanese Temple, Figures 3 and 4), was constructed at 9 Mile Camp west of the Roman Catholic Church on land subleased from the Ola`a Sugar Company in 1902:

> The ceremony was held toward the end of October 1902, the entire Olaa community and plantation dignitaries participated. It was one of the most colorful celebrations held in Olaa at that time...[later] the members decided to adorn their altar with a Buddhist image. The image of Amida Buddha arrived from Kyoto and the nyubutsu ceremony along with a celebration was held in June 1908. Bishop Imamura and a host of ministers from various temples on the Big Island took part in the ceremony attended by approximately three-thousand people (Honpa Hongwanji Mission of Hawaii 1989:266).

As Kea`au community outgrew the Hongwanji Temple, a "more spacious temple and two parsonages" were begun "in the early part of 1937." Although listed on the Puna Community

TABLE 1

KEA`AU DIRECTORY LISTINGS 1914

Name	Occupation	Page No.
Ah Kwong	Barber	736
Benton, Charles P.	Bookkeeper, Keaau Store	747
Bonde, Simon	Luna, Olaa Sugar Co.	748
Bothelho, Joseph	Clerk, Keaau Store	749
Cameron, A. R.	Stableman, Olaa Sugar Co.	752
Chun Po	Shoemaker	757
da Caito, Eugene	Station Agent, Hilo RR	758
Duncan, Mrs. Oma	Teacher, Keaau School	765
Fontes, Manuel	Clerk, Keaau Store	769
Fujisaki, K.	Confectionery	772
Fujisaki, M.	General Store	772
Grant, G. B.	Timekeeper, Olaa Sugar Co.	776
Hall, William J.	Luna, Olaa Sugar Co.	778
Haraga, R.	General Merchandise, groceries, provisions, dry goods, boots & shoes	780
Henry, Daniel F. B.	Painter	783
Hirano	Warehouseman, Keaau Store	786
Hollinger, Charles E.	Manager, Keaau Store	787
Hop Chong Chee Lee	Manager, Lum Chee Store	789
Ikeda, K.	Bartender for F. G. da Rosa	791
Imada, U.	General Store	792
Iokia, William	Police, Keaau	792
Ito, M.	Shoemaker & Watchmaker	794
Kaki, G.	Carpenter	803
Kazusa, F.	Clerk, Keaau Store	814

Table 1 (cont.)

Name	Occupation	Page No.
Keaau Bachelor's Club		814
Keaau Store	(Olaa Sugar Co.)	814
Kong Chong	General Store	822
Kong Sing	Shoes, harness & leggings made to order	822
Kong Sing Chong	General Store	822
Kuniyoshi, K.	Confectionery	825
Kwong Young	Manager, Planter's Meat Mkt.	827
Leong Poo	Drugs	829
Lum Chee	Manager, Hop Chong Chee Kee	833
Lum Choi Cho	Salesman, Hop Chong Chee Kee	833
Lum Tong Sau	Bookkeeper, Hop Chong Chee Kee	834
Masajiro, M.	Confectionery	840
Matsumura, K.	General Store	841
Matsumura, K.	Barber	841
Matsuyama	Tinsmith	841
Miyaki, R.	Clerk, Keaau Store	845
Miyaki, S.	Clerk, Keaau Store	845
Miyamoto, Henry K.	Miyamoto Art Studio (Kodak)	845
Morita, T.	Confectionery	848
Murakichi, I.	Pool Parlor	850
Naihe, Pinehakah K.	Luna, Olaa Sugar Co.	851
Nailima, William B.	Deputy Sheriff	851
Nakamoto, J.	Warehouseman, Keaau Store	851
Nakamura, T.	General Store & Drugs	852

Table 1 (cont.)

Name	Occupation	Page No.
Nakashima, S.	Shoemaker	852
Noble, John	Luna, Olaa Sugar Co.	855
Oishi, H.	Barber	858
Onuma	Barber	861
Onuma, Y.	Driver, Keaau Store	861
Otani, K.	Tailor & Pool Parlor	862
Oyama	Charcoal	862
Peterson, William	Station Agent, Olaa Mill	869
Shigaki, M. N.	Photographer	881
Sullivan, Florence J.	Warehouseman, Keaau Store	888
Takahashi Kichitaro	"First Class Watchmaker & Bicycle Repairer"	890
Takehara, K.	Ice Cream Parlor	890
Takeshima, Rev. H.		890
Tamashige, S.	Blacksmith & Horseshoer	891
Teves, Joseph P.	Clerk, Keaau Store	893
Uyehara, K.	Pool Parlor	897
Victorino, John	Clerk, Keaau Store	898
Williams, F. J.	Carpenter	904
Yamagata, Y.	Hotel	906
Yamayoshi, R.	Drugs	908
Yee Chong	Restaurant & General Store	908
Yet Sing	Tailor	908
Young, Kwong	Manager, Planters Meat Mkt.	870

Development Plan as a historic site (1979:15), the current Puna Hongwanji Temple was completed in 1974:

> After two years of working weekends...An elaborate 75th anniversary celebration was held in conjunction with the dedication of the temple grounds. A deed was officially presented by Roy S. Blackshear on behalf of the Shipman family on October 17, 1976 (Honpa Hongwanji Mission of Hawai`i 1989:268, 269).

Kea`au Schools

Ola`a Elementary and Intermediate School (Kea`au Public School), described as a three-room school was operating in 1903 when the Ola`a Nihonjin Shogakko (Olaa Gakuen) was opened for the children of the Japanese workers (Honpa Hongwanji Mission of Hawaii 1989:266). A thirty year lease of "subdivision #2 of Shipmans Reservation" at 9 Mile Camp was obtained by the Territory of Hawai`i in May 1905 for the Ola`a School lot (Bureau of Land Conveyances 263:428-430). In 1914 (Figure 4), the Kea`au Public School, on the east side of the "Road to Puna", was mapped as two separate classroom buildings. Entirely reconstructed by 1921 (Figure 5), the school premises and buildings are extensively spread in an I shape containing six groups of class rooms with a "Domestic Science" and "Manual Training" section.

The Ola`a Nihonjin Shogakko, or Japanese Language School built in 1903, in the rear section of the temple mission complex, was mapped in 1914 (Figure 3) as a small one room building. In 1921, the one room school site apparently was demolished, and the school relocated south of the temple (Figure 4). "Originally built for Japanese language school, the building is now used as an union office and hall, and for community activities and private gatherings" (Puna Community Development 1979:15, 29).

Ola`a Sugar Company/Puna Sugar Company 1948-1984

Significant changes in methods of harvesting sugar cane at Ola`a Sugar Company began with the railroad closure and replacement by automotive shipment of sugarcane from Ola`a Sugar Company fields in 1948. Mechanized harvesting of the fields was begun in 1953 (Conde' and Best 1973:94; Star-Bulletin 1953:21.1). Obtaining thirty-five year leases from W. H. Shipman, Ltd. for the period 1 January 1960 through 1 January 1994, Ola`a Sugar Company, Ltd. officially became "Puna Sugar Company, Ltd." in 1960 (Conde' and Best 1973:94). Citing continual economic

losses, the Puna Sugar Company announced closure of the firm in 1982. Puna Sugar Company's final harvest of sugar was taken from the fields on 20 September 1984 (Honolulu Star Bulletin, 18, 20 September 1984, A14:2-4; B4:1-3).

Kea`au Orchard (Mauna Loa Macadamia Nut Grove)

Two alternate routes for the Kea`au Bypass are proposed at the north end of Kea`au Town. These routes are currently planted in macadamia nut trees owned by the Mauna Loa Macadamia Nut Corporation. The history and development of the macadamia nut grove is taken exclusively from *Macadamia Nuts in Hawaii: History and Production* written in 1984 by Gordon T. Shigeura, associated with the development of the Kea`au orchard in 1948, and Hiroshi Ooka, a horticulturist at Kea`au Orchard.

One thousand acres of forested land in Kea`au owned by the W. H. Shipman estate were purchased in 1947/1946 by Castle and Cooke as a site for the commercial growing of macadamia nuts. Clearing of the selected virgin forested *a`a* (stony lava) land was completed in 1948, and the first macadamia nut tree was planted on 3 January 1949 in "Keaau Orchard." C. Brewer and Company, Ltd., currently the worlds largest producer of macadamia nuts, purchased Kea`au Orchard in 1974 (20, 21).

The macadamia nut trees were:

> ...planted on land classified as Tropofolist under the order of Histosols. This class of land is basically lava flows, aa and pahoehoe, with accumulated organic matter deposited on the surface...In clearing Histosols for tree planting, the land has to be ripped and leveled to a grade not to exceed 15 to 20 percent. A good tractor operator can initially 'skim' and 'store' the top organic layer, bulldoze the lava base thus exposed into a level terrain, and, in the end, cap this lava base with the stored organic-matter soil (23-24).

A photographic record of the impacts to the forest in preparing the land for planting are shown on pages 80 and 81 of Shigeura and Ooka's history. Initial preparation and impacts to this area of the proposed Kea`au Bypass as shown were:

1) "Clearing forest vegetation on aa lava land at Keaau..., December 1949" (Figure 103).

2) "Solid pahoehoe outcropping at Keaau Orchard being blasted with dynamite charges..., December 1949" (Figure 104).

3) "Leveling cleared land and pushing vegetation into huge piles to burn at Keaau Orchard, 1949" (Figure 105).

SUMMARY

The historical background and literature search undertaken to assist in predicting sensitive archaeological areas within the proposed Kea`au Bypass route indicate that the landscape was initially a tract of land covered with ferns (Alexander 1953:176; Thrum 1889:123). In the 1820s a large native settlement with cultivated gardens was located east of the site along the coastline of Kea`au *Ahupua`a*. South of the site in the uplands known as Ola`a were several villages with a population of about 100 (Ellis 1979:212, 214; Bingham 1969:290).

Several extensive forests between the native settlement on the coast, to a tract of ferns in Kea`au, and to the villages at Ola`a, were described by the early missionaries (Ellis 1979:212-214; Alexander 1953:175). The forest locations were surveyed by R. A. Lyman in 1875, and one of the remaining forests at the north end of Kea`au Town was removed in 1948 for development of a macadamia nut orchard (Shigeura and Ooka 1984:20, 80, 81).

Native populations and settlements in Kea`au *Ahupua`a*, identified as a large village on the coast, and the villages at Ola`a had apparently declined, were abandoned, or were possibly destroyed by tsunami prior to 1848. One parcel of land of containing less than 14 acres planted in coffee trees was claimed by a native during the Hawaiian division of lands in 1848 (Board of Commissioners, Native Register 1948:8.704). This parcel was sold to the Roman Catholic Church in 1865 (Bureau of Land Conveyances 46:233). The remainder of Kea`au *Ahupua`a*, set aside for the high chief, or Prince William C. Lunalilo (Board of Commissioners 1929:10.480), was used for livestock pasturage in the late 1800s (Department of the Interior 1881), with the construction of Volcano Road impacting the area between 1889 and 1893.

Over 3,000 acres of Kea`au *Ahupua`a*, purchased by W. H. Shipman and partners in 1882, were leased to the Ola`a Sugar Company for a sugar plantation in 1899 (Bureau of Land Conveyances 197:238-242). Major impacts after 1899 were the Hilo Railroad (1900/1902-1946/1949) and alteration of the landscape for the Ola`a Sugar Company cane fields, millsite, and plantation

buildings. Additional impacts were the deforestation, dynamite blasting, and leveling of 1,000 acres of forest lands in 1948 for commercial planting of macadamia nut trees.

Based on the results of the background and literature research it appears that most of the proposed Kea`au Bypass corridor has been heavily impacted by historic agricultural development. However, some historic sites have recently been recorded in areas of secondary vegetation growth (Hunt 1993). Based on these results, one factor was identified as an indicator of the potential for areas containing archaeological sites. This factor relates to the physical environment, and consists of areas containing little or no disturbance caused by construction, ranching, or agricultural activities. A total of three locales (Areas A, D, and E) along the proposed corridor were identified as having the potential to contain cultural remains, and thus were surveyed.

Also identified during the background and literature research was the location of one known historic resource in the general area which may have extended into the proposed corridor. Two areas (Areas B and C) were identified as possibly containing remnants of this resource, and were also surveyed.

METHODS AND PROCEDURES

The five areas identified as having potential to contain cultural remains were systematically surveyed by archaeologists walking approximately 5m apart following the natural contours and geomorphological features. This resulted in 100% coverage of these areas, except for Area D (Figure 1) which was not surveyed because the land is privately owned. The areas were examined for surface archaeological remains and areas likely to contain intact subsurface deposits were evaluated. Evaluations were based on surface indicators such as construction activities (e.g., grading, filling, underground utilities). No subsurface testing was conducted along the corridor or in the areas identified as sensitive archaeological areas. The results of the intensive archaeological survey are summarized below by work area.

RESULTS

AREA A

Topography of the site route is relatively level and crosses extensive old growth sugar cane fields (Area A) from Pahoa Road, south of Kea`au, to the residential area at 8 1/2 Mile Camp (Area B). The proposed bypass junction at Pahoa Road is vegetated with castor bean (*Rioinus communis*) trees, old growth sugarcane, and escaped exotic orchids (Figure 6). Field survey undertaken along the sugarcane field roads, from Pahoa Road towards 8 1/2 Mile Camp, found no evidence of cultural remains.

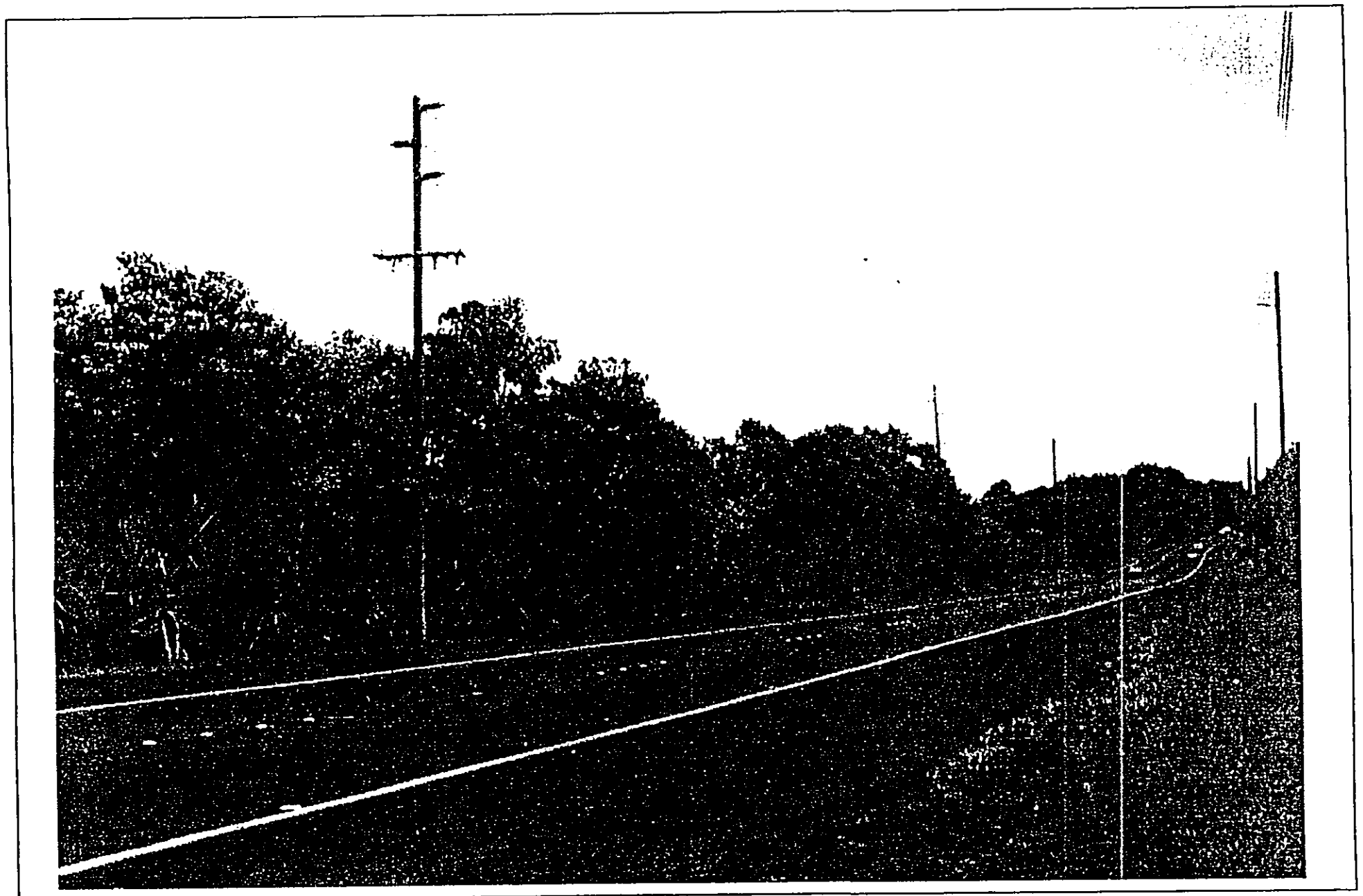
AREA B

At 8 1/2 Mile Camp (Area B), the proposed route intersects with Railroad Avenue, an elevated, secondary road leading to crossroads and the Puna Sugar Company mill. 8 1/2 Mile Camp is located east of Railroad Avenue at the base of an approximate 20 ft embankment (Figure 1). Between 8 1/2 Mile Camp and Railroad Avenue are garden plots cultivated by the current residents, and an unimproved dirt road (Figures 7 and 8). Undated historical cultural remains were found on the surface near the southeast area of the proposed bypass route intersection with Railroad Avenue. The surface remains included undated glass shards, deteriorated wooden fencing, an abandoned dresser or bureau, and modern bottles. The deposit area is partially marshy and overgrown with vegetation including ferns, legume vines, and abandoned banana plants.

North of 8 1/2 Mile Camp on the east side of Railroad Avenue is an area of dense sword ferns tentatively identified as *Nephrolepis exaltata*. The sword fern growth is replaced further east by large *koa* (*Acacia koa*) trees on a sloping embankment with little or no surface vegetation beneath the trees. Buried basalt cobbles are scattered throughout the ferns, and large, tumbled boulders appear on the embankment. The area appears to be a remnant of the original fern landscape that was replaced by sugar cane fields at the turn of the century.

AREA C

On the east side of Railroad Avenue from 8 1/2 Mile Camp to the power line right-of-way and Milo Road (Area C), the western side of Railroad Avenue is vegetated with sugar cane overgrown with legume vines and interspersed with ginger (Figure 9). Partially buried basalt cobbles and

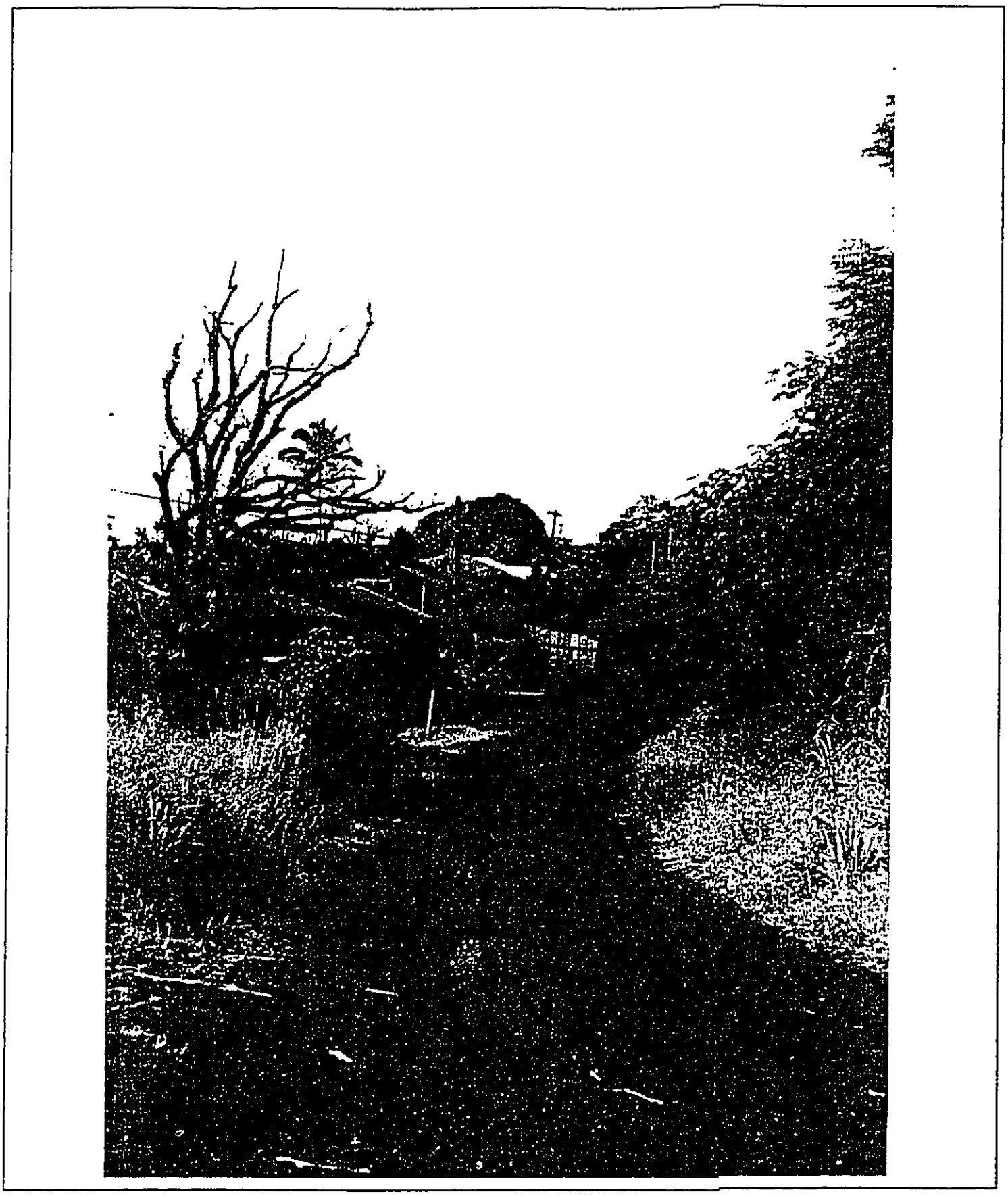


FIGURE

OGDEN

Kea'au-Pahoa Road Bypass Junction, Area A

6



OGDEN

8 1/2 Mile Camp, View from North, Area B

FIGURE

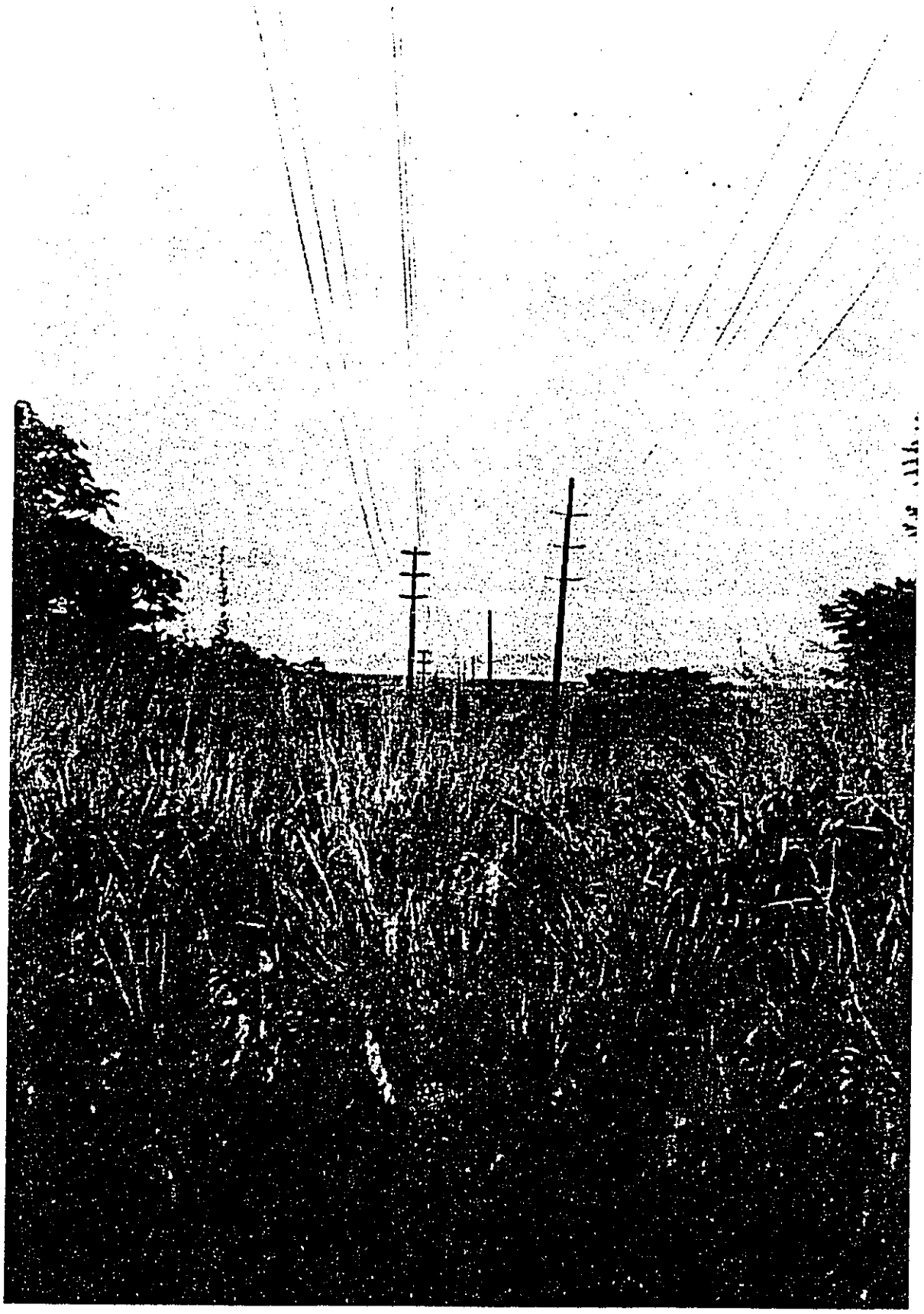
7

OGDEN

8 1/2 Mile Camp, View from Southwest, Area B

FIGURE

8



OGDEN

Power Line Right-of-Way, Area C

FIGURE

9

boulders present along the margins of Railroad Avenue appear to have been redeposited, possibly by construction of Railroad Avenue. No alignments or indication of cultural modification were observed.

AREA D

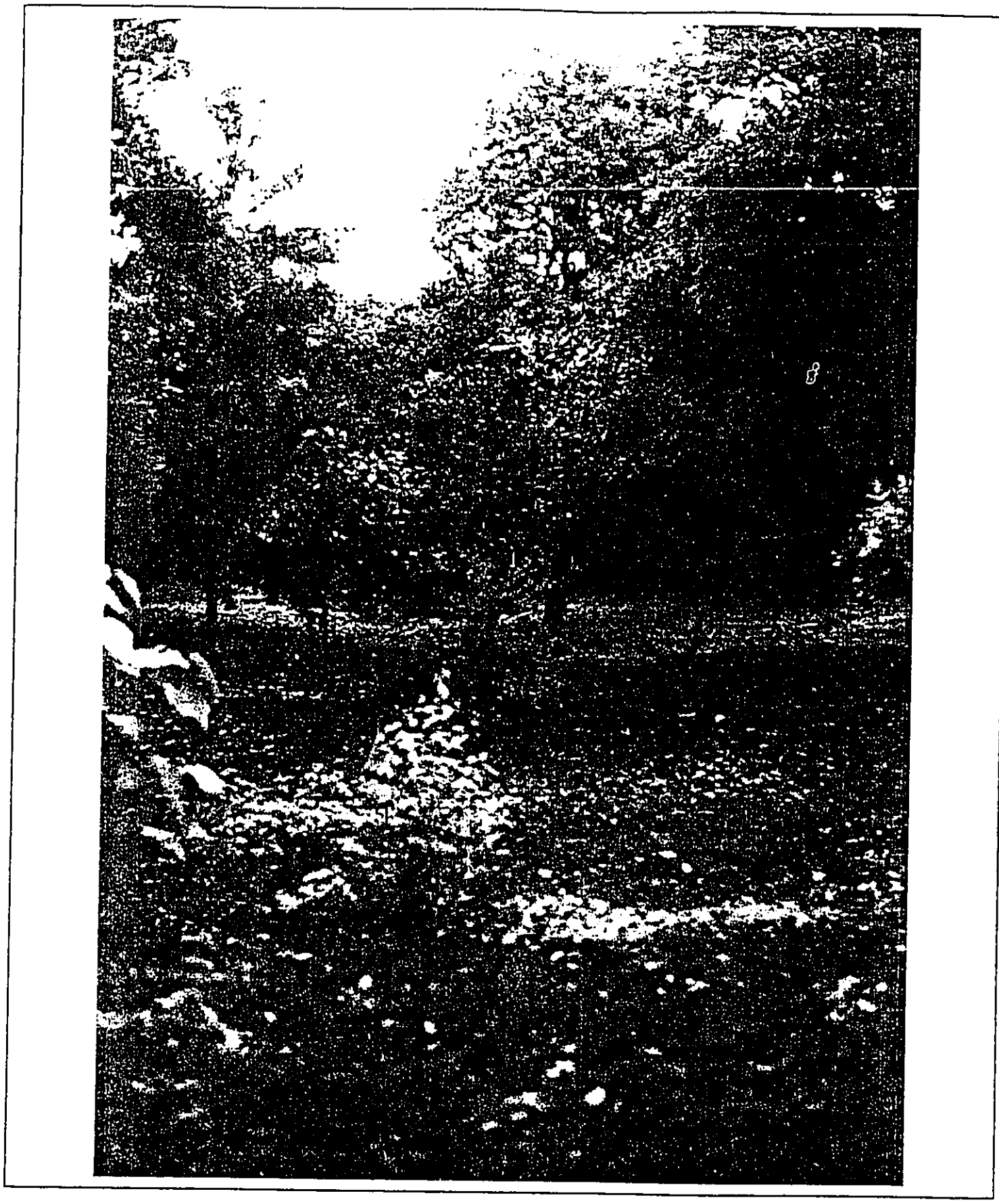
Alternate Route 1 along Slaughter House Road (Kea`au Loop) has been bulldozed, leveled, and cleared for development. The general area is occupied by occasional private residences and landscaping. A "For Sale" sign is posted on developed lots at the northeast intersection of Slaughter House Road and Mamalahoa Highway. A pedestrian survey of this area was not undertaken.

AREA E

Bypass Alternate 2 (Area E) crosses through the Mauna Loa macadamia nut orchards interspersed with orange trees (Figure 10). A tall cross-windbreak of paper bark (*Melaleuca leucadendron*) trees (Figure 11), planted by growers for macadamia tree protection from wind storms (Shigeura and Ooka 1984:31) crosses the orchard from southeast to northwest. The orchard is clear of undergrowth and vegetation, and leveling of the surface has partially filled in the two gullies in the area. Bypass route survey tags and flagging tape ("Corridor Lot 1092D") (Figure 12) were located crossing the southern gully. Located along the rim of the gullies are several large avocado and hala (*Pandanus tectorius)* trees. Tumbled, vesicular boulders and post-1940s bottle glass/trash are deposited on the sides and bottoms of the gulches. Bottle glass was dated by the presence of bottle-mold stippling known as "Duraglas," a technology patented by the Owens-Illinois Glass Company in 1940 for bottles and jars (U. S. Patent Office 523:280).

SUMMARY AND RECOMMENDATIONS

The proposed Kea`au Bypass and alternate routes have been heavily impacted by agricultural use of the areas for sugar cane fields, macadamia tree orchards, and more recent residential development. Archaeological field survey along the proposed Kea`au Bypass corridor found no significant cultural remains. Deteriorated wooden fence remains found on the surface near 8 1/2 Mile Camp indicate some former use of the area associated with 8 1/2 Mile Camp.

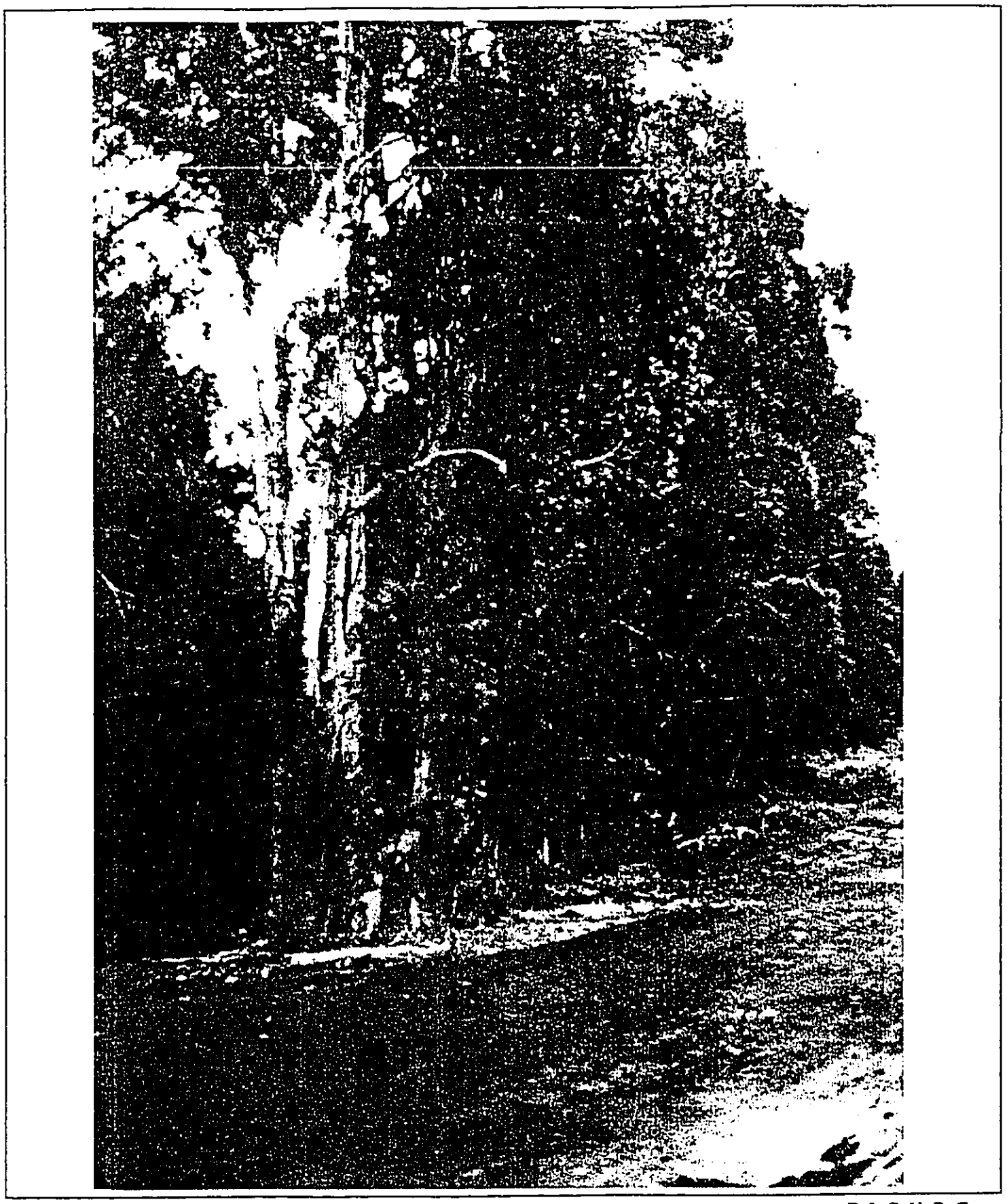


OGDEN

Mauna Loa Macadamia Nut Orchard, Area E

FIGURE

10



OGDEN

Paperbark Tree Cross-Windbreak, Area E

FIGURE

11

OGDEN

Kea'au-Pahoa Road Bypass Corridor, Area E

FIGURE

12

The State of Hawai`i historic preservation review process requires archaeological evaluation of the significance of each site under evaluation criteria. State of Hawai`i evaluation criteria are:

A) Association with events that have made an important contribution to the broad patterns of our history.
B) Association with famous people or Hawaiian deities.
C) Be an excellent example of a type of site.
D) Have yielded or is likely to yield information for research on prehistory or history.
E) Have traditional cultural significance to an ethnic group.

Historical remains near 8 1/2 Mile Camp in the proximity of the proposed Kea`au Bypass corridor are undated. Subsurface remains are indicated and are likely to yield information on the history (Criterion D) of 8 1/2 Mile Camp. To expedite environmental assessment of cultural resources in the Kea`au Bypass corridor it is recommended:

1) that limited subsurface testing be undertaken to determine the presence or absence of historical cultural remains near 8 1/2 Mile Camp, and the area function, and significance, if any.

An alternative recommendation will require coordination between the Kea`au Bypass field supervisor and archaeological crew:

2) archaeological monitoring during construction of the Kea`au Bypass in the area of 8 1/2 Mile Camp.

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APPENDIX B

SOCIO-ECONOMIC IMPACTS OF THE PROPOSED KEAAU-PAHOA ROAD, KEAAU TOWN SECTION

(Project No. 1308-01-92, Hawaii State Department of Transportation, Highways Division)

December 1994
Revised September 1994

Prepared for:

GK & Associates
Imata & Associates, Inc.
Hawaii State Department of Transportation, Highways Division

Prepared by:

Community Resources, Inc.

EXECUTIVE SUMMARY

The Keaau Town Section of the Keaau-Pahoa Road (Keaau Bypass) is proposed to link Routes 130 and 11, skirting the town of Keaau, Puna District, Hawaii County. The road alignment is still under consideration. Six alternatives have been studied by consultants for the State Department of Transportation. A route makai of Keaau town has been identified as preferred on the basis of technical studies (Imata and Associates, 1994). For this socio-economic impact assessment, two alternate makai alignments were assessed. Alternative 1 — the recommended alignment — meets Route 11 at the Keaau Road, while Alternative 2 extends further north, touching the Railroad Avenue right-of-way and meeting Route 11 at a private road that lies between Slaughterhouse Road and Macadamia Road. (The proposed routes are shown in Exhibit 1-B on page 1-3.)

The bypass is intended to make the flow of traffic into and out of lower Puna easier, faster, and safer. Community Resources, Inc. expects it to improve through traffic while having limited impacts along the bypass route and on Keaau. Those impacts are offset in part by improved traffic conditions.

As the central town of Puna District, Keaau provides commercial and public facilities for the people of the entire district. Puna has seen rapid population growth in the last two decades. New development has largely occurred in outlying subdivisions. Infrastructure development has not kept pace with population growth. Increasingly, Puna residents are employed in the regular economy, and many commute to jobs outside the district.

Route 11 is the sole link between Puna and the County seat at Hilo. Route 130 is the only major road giving Lower Puna access to Keaau and Hilo. At present, residents report severe congestion on Route 130, especially during morning commuting hours.

In the coming decades, additional growth is anticipated. Puna land remains inexpensive, and W.H. Shipman, Ltd. is proposing major development of residential and commercial areas around Keaau. Few new employment opportunities are likely in Lower Puna, so the number of residents commuting to Hilo and Shipman Industrial Park via Route 130 is likely to grow.

The proposed bypass will divert around Keaau much, but not all, of the traffic now moving between Route 11 and Lower Puna. Lower Puna residents will still go to Keaau to leave children at school or to shop. The bypass is expected to lessen congestion in the town appreciably. Additional impacts include:

- **Employment Impacts.** The project estimated as involving about 186 to 264 person-years of construction-related employment, including direct, indirect, and induced impacts.

- **Displacement of Existing and Planned Land Uses.** Most of the land traversed by the bypass route was once planted in cane, but is now unused. The project will displace at most one house (if Alternative 2 is selected). Alternative 2 also passes through areas planted in flowers and papaya. Also, Alternative 2 crosses a site where a concrete pad has been made for warehouse use (partly on an existing right-of-way). Near Route 130, the bypass route passes through a macadamia orchard.

  At all the sites mentioned, the project would displace existing or planned uses. The extent of impact will depend on specific alignment decisions which are still to be made. (Potential mitigations include compensation for property taken and designing the road alignment to minimize the taking of structures or other improvements.)

- **Loss of Access.** Bypass development would affect access of makai properties to Keaau. In most cases, access can be provided via a crossing at Milo Street. For a few parcels (near Puna Sugar Mill and along Alternative 2), other mitigation measures may be needed to assure that landowners can reach their property. Such mitigations could include provision of access to the bypass at points in addition to Milo Street or provision of access for remnant parcels to subsidiary roads.

- **Improved Access.** The proposed Keaau Bypass is planned as a limited access road, so properties immediately abutting the route will probably not have direct access to the bypass. However, properties in the general area would gain improved access to Route 11 by way of the Milo Street crossing and the Bypass.

- **Change in Neighborhood Character.** Eight and a Half Mile Camp, now a relatively isolated residential area, will be closer to major roadways and will be visible from the Keaau Bypass. Residents could perceive this as a loss of rural atmosphere. (Mitigation can be achieved through landscaping.)

  The Milo Street intersection could become a new, alternate way into Keaau for drivers seeking to avoid the congestion of the commercial district. This could lead to increased traffic through residential areas. (Mitigation could be achieved by designing the Route 130/Bypass junction to encourage easy and safe flow of traffic from Lower Puna and the Bypass into Keaau and vice versa.)

- **Impacts on Keaau Town.** With less traffic congestion in Keaau, merchants could see fewer customers. However, the impact of the bypass is likely small in relation to the overall impact of new developments proposed by W.H. Shipman, Ltd. The Shipman proposals call for a great increase in housing in Keaau, but also include a major competing commercial site.

  Mitigation of the bypass's impact on Keaau commerce could be achieved by designing the Route 130/Bypass junction to encourage easy and safe flow of traffic from Lower Puna into Keaau and vice versa. Also, Keaau merchants may benefit from redevelopment of the commercial district and advertising along major roadways similar to signage used near Pahoa. Such advertising would respond to project impacts and to other factors which have limited growth of the *commercial area.*

- **Impacts on Lower Puna.** The proposed bypass will lessen traffic congestion and hence help to make Lower Puna subdivisions attractive to persons working outside Puna District. It will not provide an alternate access road — that depends on the development of at least another mile of roadway along Railroad Avenue.

- **Impacts on South Hilo.** The project will have little or no impact outside Puna. A road connection between the Bypass and Railroad Avenue in South Hilo could provide a needed alternative road for Puna, while changing the volume and character of traffic along Railroad Avenue. Such a connection is not part of the project under study in this report.

CONTENTS

CONTENTS (continued)

LIST OF EXHIBITS

1.0 INTRODUCTION

1.1 PROJECT DESCRIPTION

The proposed Keaau Town Section of the Keaau-Pahoa Road (Keaau Bypass Road) will connect Route 11, or Mamalahoa Highway, and Route 130 without passing through the more developed areas of Keaau. The bypass is intended to make the flow of traffic into and out of lower Puna easier, faster, and safer.

Exhibit 1-A shows areas potentially affected by the bypass, and Exhibit 1-B shows the proposed route. In public meetings, a makai route, similar to Alternative A, was discussed, along with a mauka route that would meet Route 11 between Keaau Camp and Nine-and-a-Half Mile Camp. The mauka route was not considered for this socio-economic impact assessment, since a makai alignment *appears to be preferred. Two makai routing alternatives (differing in where they* meet Route 11) are assessed.

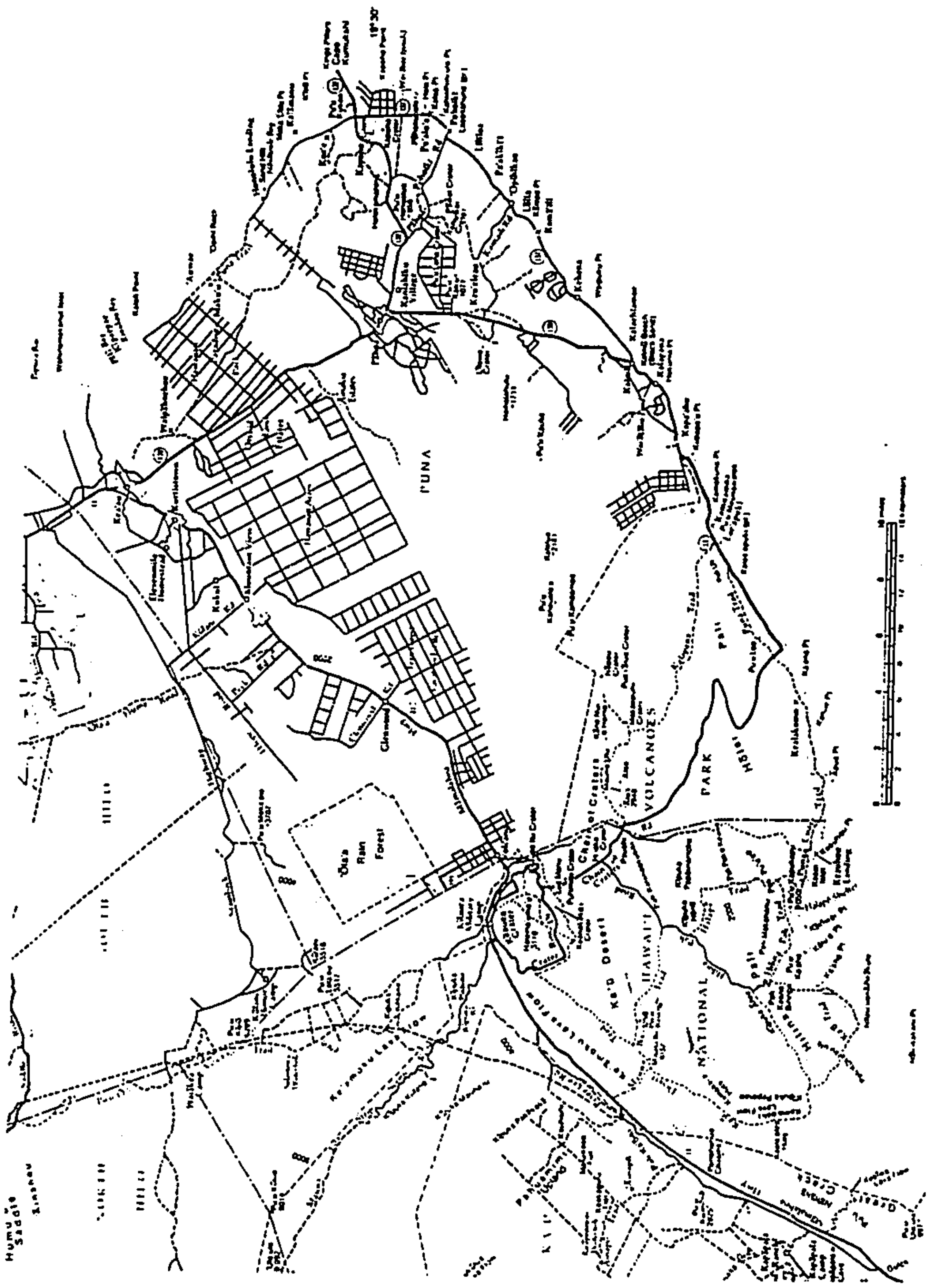
Route 11 is part of the island's belt highway. From the Hilo waterfront, it runs past the Airport, industrial areas, and commercial areas (including Prince Kuhio Plaza and Puainako Town Center). Outside Hilo, the road is well divided, with two lanes in either direction. In the Keaau area, it runs past Shipman Industrial Park. The divider narrows at the intersection of Routes 11 and 130, where a traffic light controls movement. To the south, traffic soon returns to highway speeds until reaching Kurtistown.

Route 11 continues south to Volcano, and then runs through Kau and South Kona to Kailua-Kona. The rest of the belt road, from Kailua back to Hilo, is identified by other highway numbers (Route 19 for the Queen Kaahumanu Highway, the Kawaihae-Waimea road, and the belt road from Waimea to Hilo; Route 190 for Mamalahoa Highway from Kailua-Kona to Waimea.)

Route 130 runs from Keaau, past Hawaiian Paradise Park, Ainaloa and Orchidland subdivisions to Pahoa, and on to the Kalapana area, where lava flows from the current eruption have covered the road. It is the major means of access to the towns and subdivisions of lower Puna.

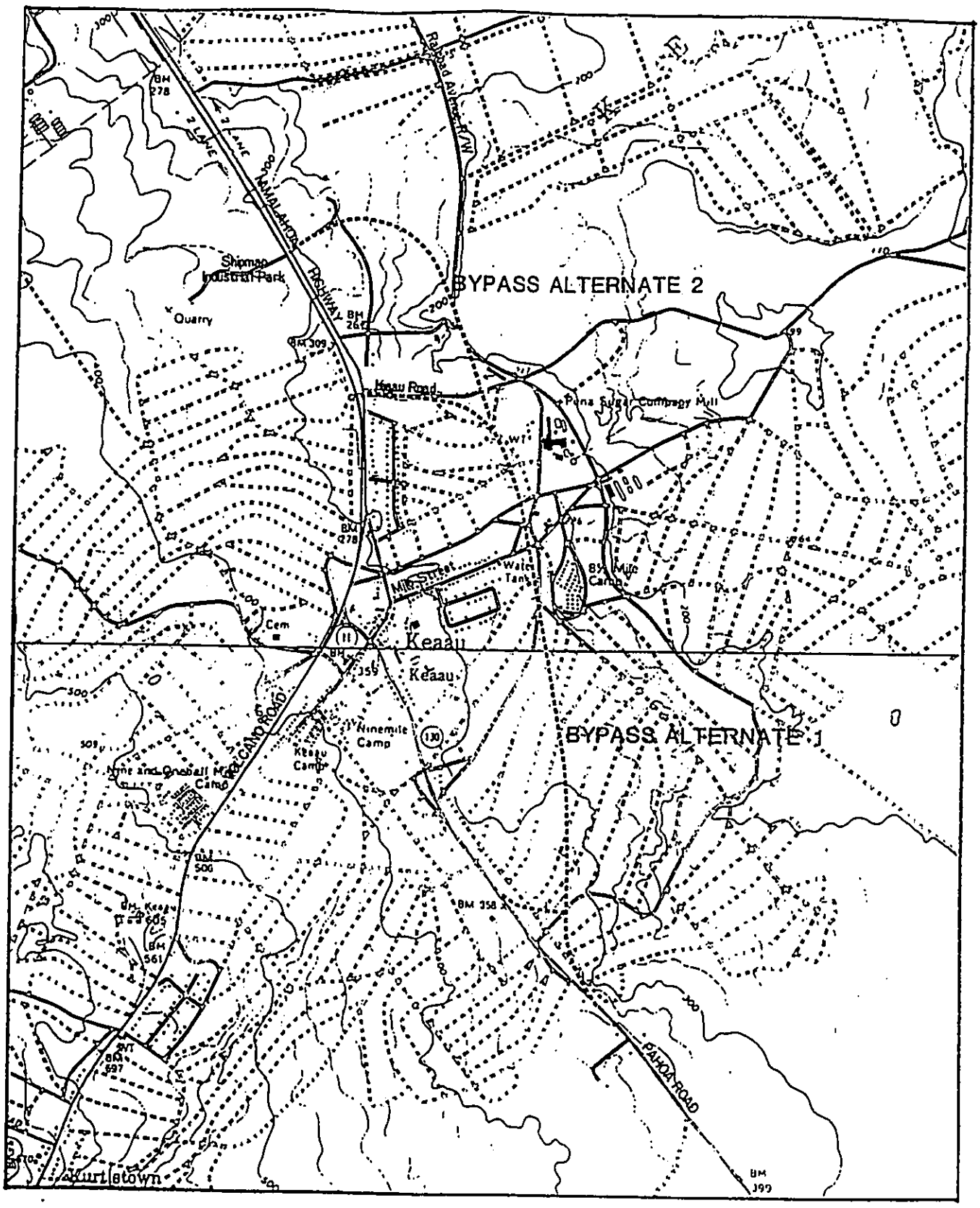
In Keaau, the public school (serving Kindergarten, and grades one to eight) is located on Route 130. Keaau's stores and public offices are nearly all on the Old Volcano Road, perpendicular to Route 130 and a short distance from Highway 11. A stop light is located at the intersection of Route 130 and the Old Volcano Road.

EXHIBIT 1-A: PUNA, HAWAII



SOURCE: University of Hawaii Department of Geography, 1983.

EXHIBIT 1-B: PROPOSED KEAAU BYPASS ROAD



Traffic on Route 130 is extremely congested in the morning, as commuters go to work in Hilo and parents from Keaau, Lower Puna subdivisions, and Upper Puna (Kurtistown, Mountain View, and even Volcano) take their children to school. Residents report lines of traffic extending along Route 130 up to six miles from the Route 11 intersection.

1.2 PURPOSE AND SCOPE OF THIS REPORT

This report provides an assessment of social and economic impacts of the proposed Keaau Bypass project. It is intended to identify and disclose information of use to members of the general public and to decision-makers as they evaluate the implications of the proposed development.

The report is being prepared for GK & Associates and Imata and Associates, Inc., planning and engineering consultants for the project, and for the Highways Division, Hawaii State Department of Transportation. It is intended as an Appendix to the Environmental Assessment for the project.

The report is organized into five chapters:

- This chapter includes introductory material;
- Next, existing conditions in the area affected by the project are described, and major trends shaping the future of the area are noted, thereby identifying the future context in which the project will have impacts;
- The third chapter deals with community issues and concerns, discussing both general concerns and ones arising in connection with the project;
- Socio-economic impacts are assessed in the fourth chapter, beginning with clearly quantifiable impacts and moving to more qualitative social and economic impacts; and
- The last chapter deals with possible mitigating measures.

This report draws on published and unpublished reports, and on research by Community Resources, Inc. That research included interviews aimed at learning about issues and concerns of Puna residents. While resident viewpoints are reported herein, the impact assessment is the product of an independent analysis, not simply a statement of community viewpoints.

2.0 EXISTING AND ANTICIPATED FUTURE CONDITIONS

2.1 GENERAL STUDY AREA DESCRIPTION

The proposed bypass will affect much of Puna District. Lying along the flanks of Mauna Loa and Kilauea, the district includes both forested areas and zones where lava flows have eliminated all vegetation.

In recent years, Puna has seen rapid population growth, largely because of in-migration. Relatively few jobs have been created in the district, so many residents commute to Hilo for work. Puna has a reputation as a wild frontier area, but its people tend increasingly to be stable householders with regular sources of employment. In the coming years, population growth, commuting, and local community organization in Puna are likely to continue.

2.1.1 Study Area Boundaries

Puna District can be divided into two major areas: Upper Puna (comprised of Census Tracts 210.01 and 210.02) and Lower Puna (Census Tract 211), as shown in Exhibit 2-A. For this study, the major impacts of the project are considered to occur in Puna. (An anticipated impact on South Hilo residents is discussed in Section 4.3.5.)

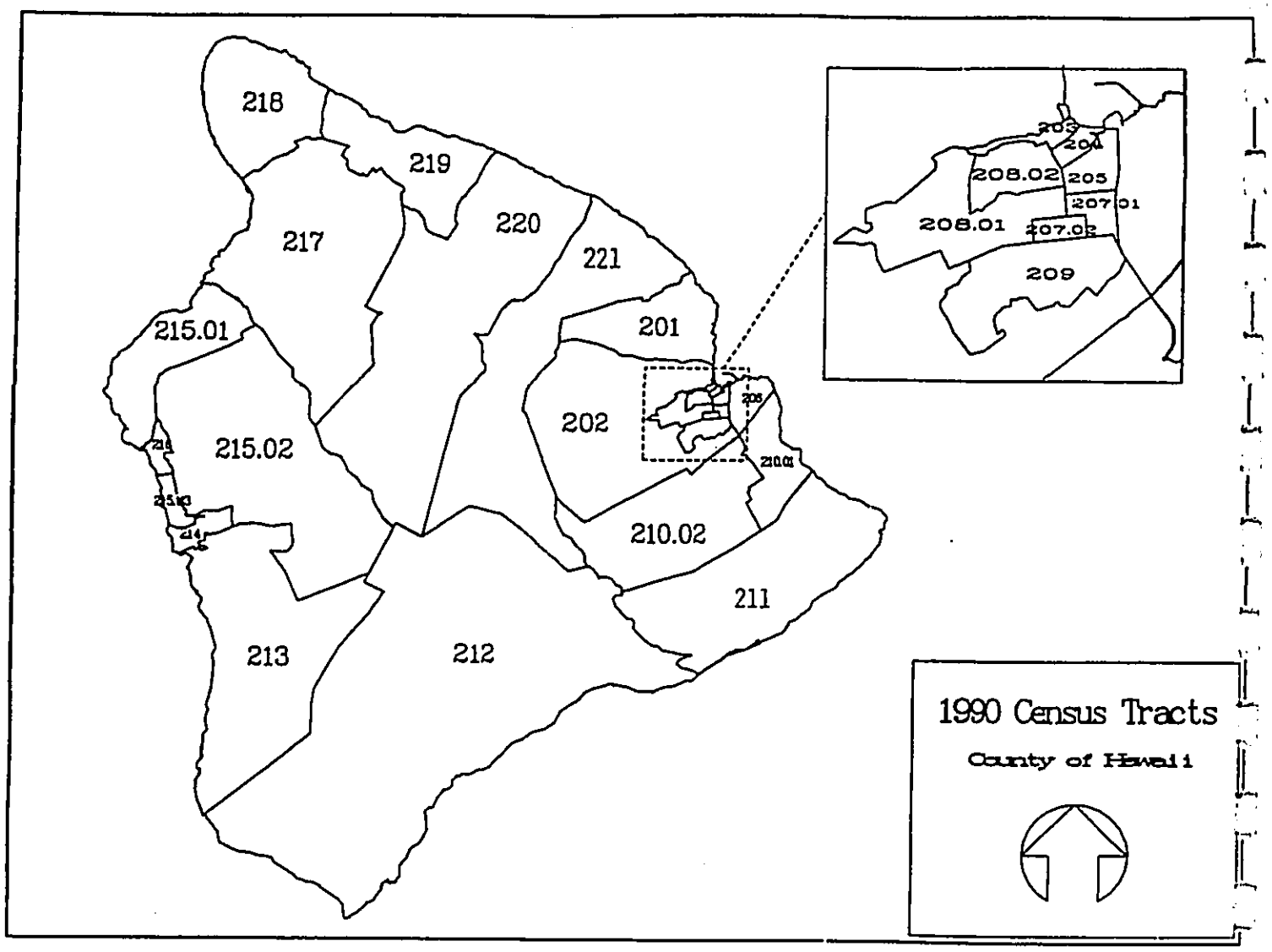
2.1.2 Historical Background

As the site of one of the world's most active volcanoes — Kilauea — Puna's history is mingled with accounts of the fire goddess, Pele. Puna's relative isolation from the centers of political power (Kona and Kohala, for the island of Hawaii), and Puna's reputation for natural disasters have long made it a sparsely populated region.

In the 1780s, when Kamehameha was consolidating his hold on the island, the ruler visited Papa`i Bay (now King's Landing), north of Keaau. There he proclaimed his "law of the broken paddle," guaranteeing the safety of the common people under his rule.

Inroads by Christian missionaries in Puna in the 1830s were so successful that much of the population migrated to Hilo in order to be closer to church authority. By 1878, Puna residents numbered only a little over a thousand, many of whom were recent foreign immigrants. Land-use activities for most of the nineteenth century included small-scale ranching and farming.

EXHIBIT 2-A: 1990 CENSUS TRACTS, COUNTY OF HAWAII



SOURCE: Hawaii County Department of Research and Development, 1992.

The 1890s heralded Puna's economic recovery with the mass cultivation of coffee in the region. At the decade's end, however, the numerous small coffee plantations gave way to sugar. As happened elsewhere in Hawaii, foreign laborers (mainly Japanese at first and then later Filipinos) were imported to work the plantations.

In 1899, private investors formed the Olaa Sugar Company, which became the major plantation in the district. Olaa Sugar was the scene of major strikes soon after its founding and again in the 1920s. The plantation was never highly profitable, partly because of Puna's wet growing conditions.

In 1959, many of the plantation's Filipino workers were sent home (Community Management Associates, 1992). Olaa Sugar changed its name to Puna Sugar in 1960. It sold off most of its land soon after, then finally closed in 1984.

From the 1950s to the 1970s, large tracts of Puna land were subdivided and offered for sale with little or no improvement. Buyers included many people on the Mainland who dreamed of a Hawaii retirement home. For Hawaii residents, the Puna subdivisions have been a place where people could make homes at little cost, but with few utilities and services provided.

2.1.3 Regional Economy

Puna is still an agricultural region. After the demise of sugar, small-scale diversified agriculture took on increased importance. Papayas, macadamia nuts, bananas, flowers, and foliage now rank among Puna's major agricultural products. Illicit marijuana cultivation also contributes to the regional economic base. The plant has been grown in fairly large amounts throughout the region, but efforts by law enforcement agencies to curb marijuana production seem to have resulted in reduced harvests.

Commercial and retail activities are found in Keaau, Pahoa, Kurtistown, Mountain View, Glenwood, and Volcano. Keaau has a regional shopping center, but the majority of commercial operations in the district are small family-operated affairs that cater to the immediately surrounding community.

Puna's industrial sector is small, with facilities mainly located in Keaau. Keaau's industrial activities include the processing of agricultural products (particularly macadamia nuts), and the production of electrical energy at the former Puna Sugar mill. Shipman Industrial Park provides space for industrial and commercial growth.

Attempts at development of geothermal energy have led to the development of a modest well and power plant system at Pohoiki, providing 25 kilovolts to the Hawaii island power grid.

While tourism is the largest single source of income for the County as a whole, Puna itself lacks major tourism investment. Its visitor industry is basically limited to bed and breakfast establishments and tourists visiting the Volcanoes National Park (Volcano House and the Park headquarters are actually in Kau District.) Some tourists traveled between Volcano and Hilo through lower Puna until Chain of Craters Road from Volcano was cut in the mid-1980s. At that time, most of those who hoped to see the ongoing eruption still came through Lower Puna. The lava flow areas are now more accessible from Volcano, so tourist traffic is very light in Lower Puna.

2.1.4 Existing Communities

Many of the towns and subdivisions which dot the Puna District serve as bedroom communities for people who commute to Hilo. The largest of these towns are Keaau and Pahoa. Since the residential subdivisions offer some of the cheapest land in the State, Puna's population has grown tremendously over the last 20 years. Infrastructure development has lagged behind population growth. These trends have had very different impacts on different Puna communities:

- Keaau includes a larger share of long-time residents than is true for the rest of Puna. Ex-plantation workers and current agricultural workers, many of whom are foreign-born, comprise much of the population. Nearly a fifth of the population was over 65 years old in 1990. Little of Puna's recent population growth has occurred in the town, although the town's stores attract business from all over the district.

  In interviews, Puna residents noted that Keaau and the camps surrounding the town now house few plantation retirees. As the older population dies or moves away, their place has been taken by Filipino agricultural workers.

- Pahoa has seen both population growth in recent decades and economic decline since about 1985. The decline has been blamed by some on a new bypass road. Other causes include loss of tourist trade and, it seems likely, loss of resident trade due to competition from Keaau and shopping areas along Route 11.

- Subdivision areas between Keaau and Pahoa (Hawaiian Paradise Park, Orchidland, and Ainaloa) have seen increasing development in recent years, with some improvements in infrastructure and growth in

community organization. Residents interviewed for this study emphasized that subdivision residents are now likely to be involved in the regular economy, and are increasingly active in community affairs.

- The area between Pahoa and Kalapana has been greatly affected by volcanic activity and geothermal development. Much of Kalapana has been overrun by lava in the current eruption. Wells to tap geothermal energy have been dug near Leilani Estates, Lanipuna Gardens, and in the Wao Kele o Puna forest area.

  Community groups have been energized in reaction to geothermal projects, as residents have worked to gain information, control or stop emissions and perceived health impacts, or oppose development.

- Upper Puna subdivisions along Route 11 south of Keaau have grown during the 1980s. Volcano has developed active community groups, uniting town and nearby subdivision residents.

Growth in Puna affects Hilo as well. Commercial areas have prospered along Route 11 in the South Hilo District. While these serve residents of both Puna and Hilo, they are clearly positioned for the convenience of Puna commuters.

In 1982, a survey showed many in Puna to be new to the district (as shown in Exhibit 2-B). Most "chief wage earners" did not go outside the district for work (if they worked at all). However, residents depended overwhelmingly on Hilo stores for their regular shopping needs. (While this survey is dated, it is the only published study describing Puna residents' shopping preferences.)

When asked which town in Puna needs more stores and businesses, Puna respondents named Keaau first (35%). Pahoa was mentioned by 23%, while 25% thought that no more are needed. Keaau residents felt most strongly that new stores should be located in Keaau, but about 40% of the subdivision residents and people living between Mountain View and Volcano also chose Keaau. Clearly they viewed Keaau as Puna's business and commercial center.

2.2 POPULATION AND HOUSING TRENDS

Puna's 1990 population was just below 21,000, some four times its 1970 count. The region experienced an average annual growth rate approximately double the County rate for the years between 1970 and 1990. (See Exhibits 2-C and 2-D.)

EXHIBIT 2-B: PROFILE OF PUNA COMMUNITY SURVEY RESPONDENTS, 1982

How long have you lived in the Puna District?	
Under 5 years	47%
6 to 10 years	23%
11 to 20 years	8%
Over 20 years	8%
Whole life	13%
Do you rent or own the place you are living now?	
Rent	22%
Own	78%
How likely is it that you would move out of the Puna area in the next five years?	
Definitely or probably move	80%
Definitely or probably stay	10%
Uncertain	10%
In what part of the island does the chief wage earner in your household work?	
Doesn't work/works at home	30%
[Elsewhere in] Puna	32%
Hilo	27%
Other	11%
In what town do you usually shop?	
Hilo	72%
Keaau	18%
Pahoa	2%
Many places	7%
Other, no answer	1%
Sample size	(778)

NOTES: The 1982 survey was a random telephone survey aimed at learning about attitudes towards policy issues. The recent Puna Community Plan included a draft survey, but this has not been administered to a random sample.

SOURCE: SMS Research, 1982.

EXHIBIT 2-C: POPULATION TRENDS, 1930–1990

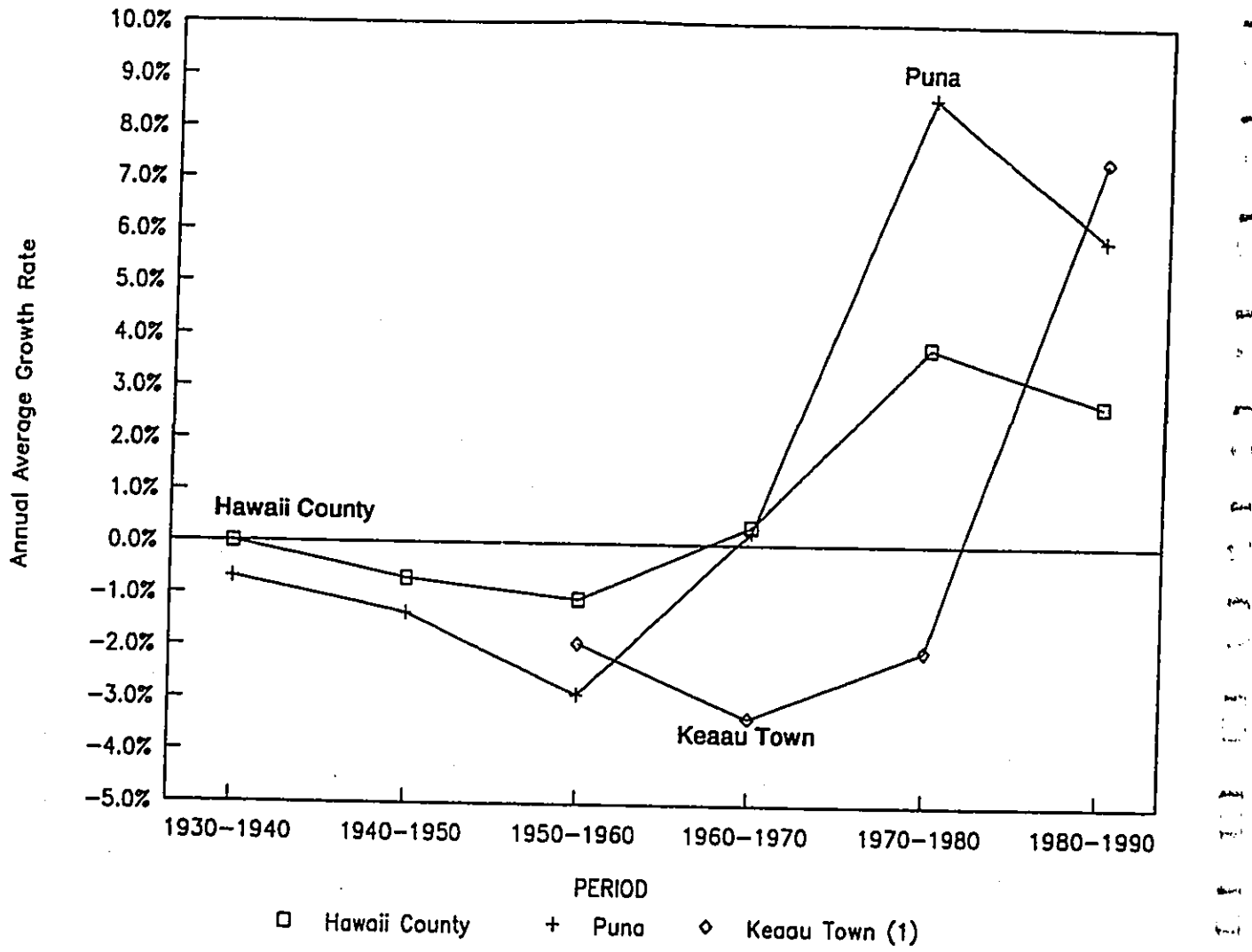
AREA POPULATION	1930	1940	1950	1960	1970	1980	1990
HAWAII COUNTY	73,325	73,276	68,350	61,332	63,468	92,053	120,317
PUNA	8,284	7,733	6,747	5,030	5,154	11,751	20,781
Upper Puna (1)	5,563	5,258	4,912	3,704	3,802	7,055	14,079
Lower Puna (2)	2,721	2,475	1,835	1,326	1,352	4,696	6,702
Keaau Town (3)	N/A	N/A	1,620	1,334	951	775	1,584

AVERAGE ANNUAL GROWTH RATE	1930–40	1940–50	1950–60	1960–70	1970–80	1980–90
HAWAII COUNTY	0.0%	–0.7%	–1.1%	0.3%	3.8%	2.7%
PUNA	–0.7%	–1.4%	–2.9%	0.2%	8.6%	5.9%
Upper Puna (1)	–0.6%	–0.7%	–2.8%	0.3%	6.4%	7.2%
Lower Puna (2)	–0.9%	–2.9%	–3.2%	0.2%	13.3%	3.6%
Keaau Town (3)	N/A	N/A	–1.9%	–3.3%	–2.0%	7.4%

NOTES: N/A Data not available.
(1) Coterminous with Census Tract H2 prior to 1960, Census Tract 210 from 1960 to 1980, and Census Tracts 210.01 and 210.02 in 1990.
(2) Coterminous with Census Tract H1 prior to 1960, and Census Tract 211 from 1960 to 1990.
(3) Also known as Keaau CDP (Census Designated Place).

SOURCES: U.S. Bureau of the Census, 1991, 1981a, 1961, 1952a, 1952b, 1943, 1931; Hawaii State DPED, 1973.

EXHIBIT 2-D: POPULATION GROWTH RATE, 1930-1990



NOTE: (1) Population counts for Keaau Town are unavailable for years prior to 1950.

While Lower Puna (Census Tract 211), in particular, boasted a booming average annual growth rate of more than 13% between 1970 and 1980, the bulk of Puna's population is located in Upper Puna (Census Tracts 210.01 and 210.02). The increase in the number of housing units in Puna actually outpaced population growth in the 1980s. By 1990, the whole Puna region had over 8,500 units.

Puna is sometimes viewed as a "frontier" area, where self-sufficient, independent homesteaders have settled. Part of this "frontier" image are (exaggerated) ideas that marijuana cultivation is widespread and isolated areas are lawless. While Puna is growing quickly, Census data discussed in the next sub-sections suggest that the "frontier" stereotype is becoming out of date.

2.2.1 Demography

The 1990 Puna population was slightly younger than the County population, with median ages for the Puna sub-districts below the County median of 34.3. However, the percentage of young adults (aged 18-34) in Puna declined dramatically from 1980 to 1990. (See Exhibit 2-E.) Both continuing residents and newcomers to Puna are increasingly middle-aged, not young people.

As in Hawaii County as a whole, Caucasians were the largest single ethnic group in Puna in 1990. Hawaiians composed almost a fifth of both the Puna and County populations, but the proportion of Hawaiians in Puna increased more from 1980 to 1990 than it did in the County as a whole. There were slightly higher concentrations of Filipinos in Puna than in the County, and proportionally fewer Japanese.

Despite the impression that many in Puna are newcomers, the share of people who have lived in the same county for five years or more was the same in Puna in 1990 as in the County as a whole, as shown in Exhibit 2-F. In contrast, the 1980 Census showed a higher proportion of Puna residents coming from the Mainland or elsewhere in Hawaii, and the 1982 survey showed a higher share of newcomers (in Exhibit 2-B).

Keaau residents were more settled than the average in Puna, but even in Keaau the share of residents who had lived in their current home five years or less increased from 1980 to 1990.

2.2.2 Incomes and Employment

Puna incomes tend to be low. Throughout Puna, the share of the population in poverty is well above the county average (as shown in Exhibit 2-G).

EXHIBIT 2-E: DEMOGRAPHIC CHARACTERISTICS, 1980–1990

	HAWAII COUNTY		Total Puna		Upper Puna (1)		Lower Puna (2)		Keaau Town	
	1980	1990	1980	1990	1980	1990	1980	1990	1980	1990
POPULATION	92,053	120,317	11,751	20,781	7,055	14,079	4,696	6,702	775	1,584
ETHNICITY										
Caucasian	34%	40%	43%	46%	45%	46%	41%	45%	21%	15%
Japanese	27%	21%	19%	12%	22%	14%	15%	9%	35%	24%
Filipino	14%	13%	17%	15%	17%	15%	17%	16%	34%	46%
Hawaiian	19%	19%	15%	19%	11%	18%	22%	22%	8%	11%
Other	7%	7%	6%	8%	6%	8%	6%	8%	3%	5%
AGE										
Less than 5 years	9%	8%	10%	9%	9%	9%	12%	9%	6%	8%
5 to 17 years	22%	21%	21%	24%	20%	23%	24%	25%	22%	19%
18 to 34 years	29%	22%	30%	22%	30%	22%	31%	22%	21%	23%
35 to 64 years	30%	36%	29%	35%	31%	36%	26%	33%	35%	32%
65 or more years	10%	13%	10%	11%	11%	10%	8%	11%	15%	18%
Median age (years)	29.4	34.3	N/A	N/A	30.3	N/A	27.3	32.0	35.6	34.8
EDUCATION OF PERSONS AGED 25 & OVER (3)										
High School Diploma	N/C	31%	N/C	30%	N/C	28%	N/C	32%	N/C	27%
College Degree (4)	N/C	28%	N/C	23%	N/C	24%	N/C	21%	N/C	15%
PERSONS AGED 5 & OVER WHO SPEAK A LANGUAGE OTHER THAN ENGLISH AT HOME (3)	22%	18%	23%	18%	24%	17%	22%	21%	39%	49%
PERSONS WITH MOBILITY OR SELF-CARE LIMITATIONS (3)										
% of persons aged 16 to 64	N/A	3%	N/A	4%	N/A	3%	N/A	6%	N/A	1%
% of persons aged 65 or more	N/A	15%	N/A	13%	N/A	13%	N/A	14%	N/A	12%

NOTES: N/C 1980 and 1990 categories are not comparable.
(1) Coterminous with Census Tract 210 in 1980, and Census Tracts 210.01 and 210.02 in 1990.
(2) Coterminous with Census Tract 211.
(3) Based on 15% sample; hence, figures represent estimates only.
(4) Includes Associate, Bachelor's, and graduate degrees.

SOURCES: U.S. Bureau of the Census, 1992, 1991, 1981a, 1982b.

EXHIBIT 2-F: GEOGRAPHIC MOBILITY, 1980-1990 (1)

	HAWAII COUNTY		Total Puna		Upper Puna (2)		Lower Puna (3)		Keaau Town	
	1980	1990	1980	1990	1980	1990	1980	1990	1980	1990
PERSONS (4)										
PLACE OF BIRTH										
Born in Hawaii	71%	66%	59%	58%	57%	60%	61%	55%	63%	60%
Other U.S.-born (5)	20%	26%	28%	30%	27%	30%	29%	32%	4%	9%
Foreign-born	9%	9%	13%	11%	16%	10%	10%	14%	33%	31%
RESIDENCE 5 YEARS PREVIOUS FOR PERSONS AGED 5 & OVER										
Same house	53%	53%	44%	52%	46%	51%	41%	54%	65%	53%
Same county, different house	25%	26%	22%	26%	24%	27%	19%	24%	25%	26%
Same state, different county	8%	7%	11%	9%	8%	9%	14%	7%	3%	7%
Different state	11%	12%	17%	11%	16%	11%	17%	13%	2%	6%
Lived abroad	3%	2%	6%	2%	4%	2%	9%	3%	6%	7%
HOUSEHOLDERS (4)										
WHEN HOUSEHOLDER MOVED INTO UNIT										
In the last 5 years	53%	51%	60%	55%	60%	57%	61%	50%	29%	40%
6 to 20 years ago	31%	32%	30%	37%	28%	35%	33%	43%	48%	34%
21 to 30 years ago	9%	7%	5%	3%	7%	4%	1%	3%	16%	8%
31 years ago or more	8%	9%	5%	5%	5%	5%	5%	4%	7%	17%

NOTES: (1) Based on 15% sample; hence, figures represent estimates only.
(2) Coterminous with Census Tract 210 in 1980, and Census Tracts 210.01 and 210.02 in 1990.
(3) Coterminous with Census Tract 211.
(4) Base figures used in calculating these data may be different than in 100% count.
(5) Includes persons born in U.S. territories, and persons born abroad or at sea to American parents.

SOURCES: U.S. Bureau of the Census, 1992, 1981b.

EXHIBIT 2-G: INCOME CHARACTERISTICS AND COSTS, 1980–1990 (1)

	HAWAII COUNTY		Total Puna		Upper Puna (2)		Lower Puna (3)		Keaau Town	
	1980	1990	1980	1990	1980	1990	1980	1990	1980	1990
HOUSEHOLDS (4)										
INCOME LEVELS										
Lowest (5)	25%	24%	30%	36%	27%	33%	37%	43%	19%	38%
Highest (6)	18%	24%	14%	15%	15%	16%	11%	13%	22%	19%
Median Income (7)	$26,775	$29,712	N/A	N/A	$24,234	N/A	$20,076	$18,360	$33,518	$23,839
WITH SELECTED INCOME SOURCES										
Social Security Income	23%	30%	23%	30%	24%	29%	23%	33%	33%	50%
Retirement Income	N/A	20%	N/A	20%	N/A	20%	N/A	19%	N/A	26%
Public Assistance Income	11%	10%	17%	15%	13%	14%	24%	15%	9%	12%
OWNER HOUSING COSTS										
35% or more of Household Income (8)	11%	12%	16%	12%	17%	11%	14%	15%	0%	3%
Median Monthly Costs (8)	$371	$669	N/A	N/A	$360	N/A	$296	$472	$197	$636
RENTER HOUSING COSTS										
35% or more of Household Income (9)	36%	35%	51%	46%	42%	43%	61%	52%	31%	35%
Median Gross Rent (9)	$266	$490	N/A	N/A	$299	N/A	$324	$501	$136	$381
Median Contract Rent (10)	$223	$428	N/A	N/A	$224	N/A	$263	$419	$110	$275
POPULATION (4)										
PERSONS BELOW POVERTY LEVEL	13%	14%	17%	24%	16%	20%	19%	32%	10%	17%
% of persons aged 18 to 64	N/A	12%	N/A	21%	N/A	17%	N/A	29%	N/A	14%
% of persons aged 65 or more	14%	9%	15%	15%	15%	13%	15%	18%	20%	12%
% of related children aged less than 18	16%	20%	20%	32%	20%	27%	21%	41%	12%	26%
% of unrelated individuals	34%	27%	40%	36%	39%	35%	41%	38%	41%	51%

NOTES:
(1) Based on 15% sample (except "Median Contract Rent"); hence, figures represent estimates only.
(2) Coterminous with Census Tract 210 in 1980, and Census Tracts 210.01 and 210.02 in 1990.
(3) Coterminous with Census Tract 211.
(4) Base figures used in calculating this data may be different than in 100% count.
(5) For 1990, incomes of less than $15,000; for 1980, incomes of less than $10,000. (Based on a CPI increase of 57.73% from 1979 to 1989, $15,000 was worth $8,660 in 1979.)
(6) For 1990, incomes of $50,000 or more; for 1980, incomes of $30,000 or more. (Based on a CPI increase of 57.73% from 1979 to 1989, $50,000 in worth $28,866 in 1979.)
(7) 1980 median in 1989 dollars. (Based on a CPI increase of 57.73% from 1979 to 1989).
(8) Owner costs include (but are not limited to) mortgage, real property tax, property insurance, utilities, and fuels.
(9) Renter costs include (but are not limited to) rent, utilities, and fuels.
(10) Monthly cash rent only. Does not include other costs.

SOURCES: U.S. Bureau of the Census, 1992, 1991, 1981a, 1981b.

Hawaii County median household incomes were about 75% of the median income statewide for 1989. Median incomes for Upper Puna were in turn about 75% of the County median, while the median income reported from Lower Puna was only about 60% of the County median.

In 1980, the disparity between Puna and the rest of the County was smaller than in 1990. Moreover, the median household income for Keaau had been higher than the County median.

In 1990, Puna residents were slightly less likely to be in the labor force than Hawaii County residents as a whole, and Puna residents experienced higher unemployment than the County average (as shown in Exhibit 2-H). However, the difference in unemployment rates had been much greater in 1980.

Puna residents continue to be active in agriculture. The share of the workforce in blue collar occupations is somewhat higher than Countywide. Keaau shows the greatest change in industry between 1980 and 1990, with far more workers active in agriculture as of 1990.

Puna residents face longer commutes than others in Hawaii County. (See Exhibit 2-I.) Most drive alone to work.

2.2.3 Housing

As shown in Exhibit 2-J, the Puna housing stock was quite different from the County's in 1990. Proportionally more Puna units stood vacant than islandwide. The share of units occupied by owners, rather than renters, was significantly higher in Puna. Compared to the County average, houses in Upper Puna tended to be small and more likely to be crowded. In these respects, Lower Puna homes were comparable to the County's.

Housing costs in Puna were generally low compared to the rest of the Big Island. The 1990 median values for the homes in the Puna census tracts were all under $80,000, while the Hawaii County median was $113,000. Median contract rents for Lower Puna and much of Upper Puna (C.T. 210.02) were below the County median. However, the gross cost of housing for renters was high in Lower Puna, while Keaau rents were appreciably lower.

EXHIBIT 2-H: LABOR FORCE CHARACTERISTICS, 1980-1990 (1)

	HAWAII COUNTY		Total Puna		Upper Puna (2)		Lower Puna (3)		Keaau Town	
	1980	1990	1980	1990	1980	1990	1980	1990	1980	1990
POPULATION AGED 16 & OVER	67,205	88,999	8,367	14,459	5,204	9,826	3,163	4,633	646	1,206
In Armed Forces	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
POTENTIAL CIVILIAN LABOR FORCE	66,997	88,856	8,341	14,453	5,188	9,820	3,153	4,633	646	1,206
In Civilian Labor Force	61%	64%	55%	58%	57%	59%	52%	57%	59%	57%
CIVILIAN LABOR FORCE	41,006	56,986	4,603	8,432	2,968	5,779	1,635	2,653	379	691
MALE										
Labor force participation (4)	71%	70%	67%	64%	66%	63%	68%	66%	68%	66%
Unemployed	7%	5%	11%	8%	13%	7%	8%	9%	7%	11%
FEMALE										
Labor force participation (4)	51%	59%	43%	52%	47%	54%	35%	49%	48%	49%
Unemployed	7%	5%	14%	7%	12%	6%	19%	9%	4%	4%
EMPLOYED CIVILIAN LABOR FORCE	38,150	54,348	4,039	7,801	2,598	5,379	1,441	2,422	357	635
BY SELECTED INDUSTRY										
Agriculture, forestry, fisheries, mining	11%	10%	16%	19%	16%	17%	17%	23%	10%	41%
Construction	9%	9%	11%	11%	11%	11%	12%	12%	3%	2%
Manufacturing	8%	5%	10%	6%	11%	6%	10%	5%	38%	8%
Transportation	4%	4%	4%	3%	4%	3%	4%	3%	2%	0%
Retail trade	18%	19%	13%	15%	13%	16%	13%	13%	11%	18%
Finance, insurance, real estate	6%	5%	5%	4%	6%	3%	2%	5%	2%	4%
Personal, entertainment, recreation	11%	13%	5%	6%	5%	7%	6%	4%	3%	4%
Health, education, professional	17%	19%	16%	20%	17%	18%	13%	23%	18%	12%
Public administration	7%	6%	8%	6%	8%	7%	7%	5%	3%	1%
BY OCCUPATION										
Managerial, professional	20%	24%	15%	19%	18%	20%	11%	18%	11%	9%
Technical, sales, support	26%	26%	22%	22%	23%	23%	19%	20%	17%	19%
Service	16%	18%	13%	14%	12%	14%	14%	16%	20%	14%
Farming, forestry, fishing	10%	8%	16%	17%	16%	14%	16%	23%	11%	30%
Precision, craft, repair	13%	12%	15%	15%	13%	16%	20%	13%	9%	11%
Operators, cleaners, laborers	14%	12%	19%	13%	18%	14%	20%	11%	32%	18%

NOTES: (1) Based on 15% sample; hence, figures represent estimates only.
(2) Coterminous with Census Tract 210 in 1980, and Census Tracts 210.01 and 210.02 in 1990.
(3) Coterminous with Census Tract 211.
(4) Calculated by dividing "Civilian Labor Force" by "Potential Civilian Labor Force."

SOURCES: U.S. Bureau of the Census, 1992, 1981b.

EXHIBIT 2-I: COMMUTING CHARACTERISTICS, 1980–1990 (1)

	HAWAII COUNTY		Total Puna		Upper Puna (2)		Lower Puna (3)		Keaau Town	
	1980	1990	1980	1990	1980	1990	1980	1990	1980	1990
COMMUTE TIME										
Less than 15 minutes	51%	39%	26%	20%	29%	21%	21%	20%	52%	36%
15 to 29 minutes	32%	34%	37%	35%	42%	41%	30%	24%	46%	44%
30 to 59 minutes	13%	21%	33%	40%	25%	34%	45%	50%	3%	15%
An Hour or more	4%	6%	4%	5%	4%	4%	4%	6%	0%	4%
Mean travel time (minutes)	17	21	N/A	N/A	21	N/A	26	29	12	19
MEANS OF TRANSPORTATION										
Drive Alone (4)	67%	69%	62%	66%	60%	66%	65%	64%	76%	68%
Carpool (4)	20%	19%	26%	23%	25%	22%	27%	22%	22%	26%
Public Transportation (5)	2%	1%	0%	1%	0%	1%	1%	0%	0%	1%
Walked	6%	4%	4%	3%	4%	3%	4%	4%	1%	3%
Other (6)	2%	2%	3%	2%	3%	2%	1%	4%	1%	1%
No Commute (7)	4%	5%	5%	6%	7%	6%	2%	7%	0%	1%

NOTES: (1) Based on 15% sample; hence, figures represent estimates only.
(2) Coterminous with Census Tract 210 in 1980, and Census Tracts 210.01 and 210.02 in 1990.
(3) Coterminous with Census Tract 211.
(4) In a car, truck, or van.
(5) Bus or taxicab.
(6) Includes motorcycles and bicycles.
(7) That is, persons who worked at home.

SOURCES: U.S. Bureau of the Census, 1992, 1981b.

EXHIBIT 2-J: HOUSING CHARACTERISTICS, 1980-1990 (1)

	HAWAII COUNTY		Total Puna		Upper Puna (2)		Lower Puna (3)		Keaau Town	
	1980	1990	1980	1990	1980	1990	1980	1990	1980	1990
HOUSING UNITS	34,215	48,253	4,575	8,597	2,863	5,875	1,712	2,722	261	528
TOTAL VACANT UNITS	15%	14%	16%	17%	17%	17%	15%	17%	2%	8%
Seasonal/recreational	3%	4%	7%	4%	6%	4%	9%	5%	0%	1%
AGE OF STRUCTURE (3)										
1 year	9%	6%	15%	8%	16%	8%	13%	7%	8%	11%
2 to 10 to years	39%	29%	51%	43%	44%	46%	62%	38%	12%	24%
11 to 20 years	15%	30%	11%	30%	13%	26%	8%	38%	14%	13%
21 years or more	37%	35%	24%	19%	27%	19%	18%	17%	66%	52%
UNITS IN STRUCTURE										
1 unit	75%	79%	95%	96%	95%	96%	95%	96%	87%	92%
2 to 4 units	6%	4%	3%	2%	3%	2%	3%	2%	0%	8%
5 or more units	18%	15%	2%	0%	2%	0%	2%	1%	13%	0%
Trailer, other	0%	2%	0%	2%	0%	2%	0%	1%	0%	0%
NOT COMPLETE PLUMBING (4)	7%	4%	14%	10%	15%	11%	13%	7%	5%	7%
HOUSEHOLDS	29,237	41,461	3,831	7,136	2,381	4,865	1,450	2,271	256	484
HOUSEHOLD TYPE										
1 or more non-relatives	10%	12%	11%	12%	11%	12%	10%	11%	6%	9%
No non-relatives	90%	88%	89%	88%	89%	88%	90%	89%	94%	91%
TENURE										
Owner-occupied	61%	61%	74%	71%	76%	72%	71%	69%	64%	72%
Renter-occupied	39%	39%	26%	29%	24%	28%	29%	31%	36%	28%
PERSONS PER HOUSEHOLD	3.09	2.86	3.07	2.90	2.96	2.89	3.24	2.92	3.03	3.27
CROWDED HOUSEHOLDS										
Mildly crowded (5)	8%	7%	8%	8%	8%	7%	9%	8%	9%	9%
Very crowded (6)	5%	5%	7%	7%	7%	8%	7%	4%	4%	9%
MEDIAN VALUE (7)	$70,300	$113,000	N/A	N/A	$53,100	N/A	$47,600	$68,300	$54,200	$80,500

NOTES: (1) Based on 15% sample; hence, figures represent estimates only.
(2) Coterminous with Census Tract 210 in 1980, and Census Tracts 210.01 and 210.02 in 1990.
(3) Coterminous with Census Tract 211.
(4) Based on 100% sample in 1980, but 15% sample in 1990.
(5) Indicated by households with 1.00 to 1.50 persons per room.
(6) Indicated by households with 1.51 or more persons per room.
(7) For owner-occupied, non-condominium housing units.

SOURCES: U.S. Bureau of the Census, 1992, 1991, 1981a, 1981b.

2.3 FORCES FOR CHANGE

2.3.1 Population Growth

The low cost of house lots in Puna will likely continue to attract residents. People interviewed for this report thought that land sales in mauka subdivisions (with access to Route 11) were increasing, while both conditions and values in the subdivisions between Keaau and Pahoa were improving. Hence population growth may be stronger in Upper Puna than in Lower Puna in the next few years. (The last trend is already visible in rates of change for the 1980s, in Exhibit 2-B.)

However, Puna has little prospect of new employment opportunities. Even if plans to produce 500 Megawatts of geothermal energy were implemented, only 200 jobs would be created (MCM Planning, 1989). Diversified agriculture has created new jobs, but at a modest rate.

Few new employment opportunities are evident elsewhere in East Hawaii. Instead, the closing of the Hilo Coast Processing mill and Hamakua Sugar Company are eliminating agricultural jobs. At the same time, West Hawaii's growth in jobs (and presumably in population) has been checked recently. Overall, the total average jobcount in Hawaii County declined by 1% between 1991 and 1992 (Hawaii State Department of Labor and Industrial Relations, 1992, 1993).

Tourism continues to decline on a statewide basis in 1993. The most recent expert forecast calls for slow growth in visitor arrivals through 1995 (Toy, 1993). Even with this growth, the projected 1995 figure is still below 1989 to 1991 levels.

The current recession can be seen either as evidence of structural change in Hawaii's economic situation or as a momentary downturn of a sort to be expected in a context of continuing growth. Such economic and population growth has been projected in official forecasts, notably the State's "M-K Series" projections (Hawaii State Department of Business and Economic Development, 1988).

In light of both regional and statewide trends, Community Resources, Inc. anticipates:

- Puna's population will continue to grow due to the availability of land for homes and small-scale farming;
- The rate of growth will be lower than that of the last two decades; but
- The rate of growth cannot be further specified at this time.

This uncertainty matches much of the variation in past population projections for Puna (as shown in Exhibit 2-K). The County's conservative estimate for 2005 and the State's estimates for 2000 and 2010 (based on data supplied by the County) imply growth over 1990 population figures at rates well below recent levels. The County's midrange estimate implies district population growth at much the same rate as in the 1980s. While this seems optimistic in the current economic climate, the estimate still could be close to the eventual trend.

2.3.2 Planned and Proposed Development Projects

New development is proposed for Keaau by W.H. Shipman, Ltd. A Conceptual Development Plan has been developed for some 2,500 acres of its land in and around Keaau. Over the long term, the landowner hopes to create a cohesive planned community where new residential, employment, and business opportunities for the Puna and South Hilo District communities will be located. In the planned area, the Shipman Industrial Park is already open and partly developed.

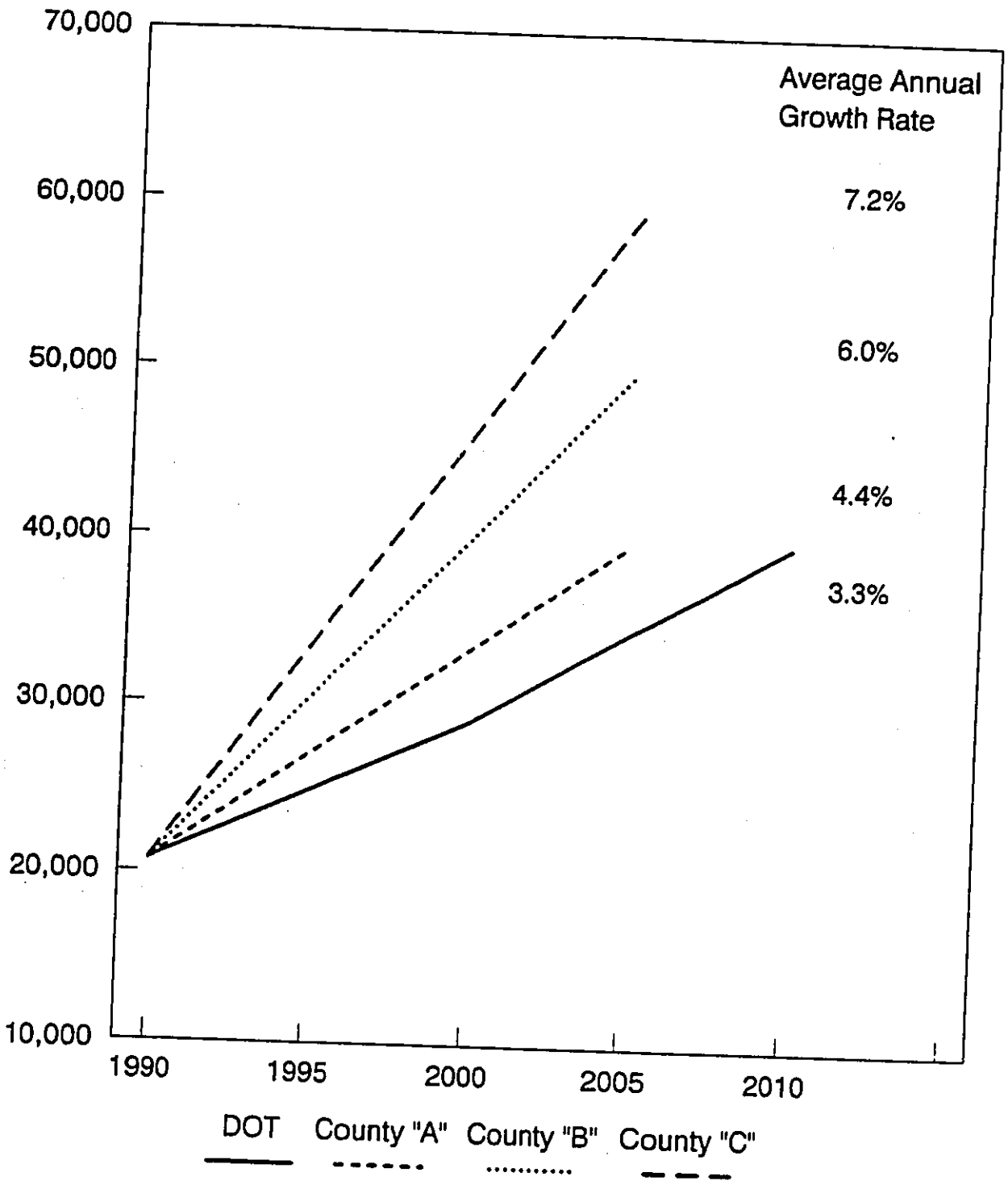
On behalf of W.H. Shipman, Ltd., the Office of State Planning is now petitioning the State Land Use Commission for redesignation of 660 acres, which the landowner plans to develop within five years' time (personal communications, Robert E. Cooper, Development Manager, W. H. Shipman, Ltd., October 1993; William L. Moore, Planner, November 1993; Hahn, 1993). (The "petition area" is only part of the total area in the Conceptual Development Plan.) Proposed uses of the petition area include:

Proposed Land Uses, Shipman Petition Area

USE	ACREAGE
Residential	451
Commercial/Industrial	109
Parks/Open Space	35
Schools/Public Facilities	65
TOTAL	660

Sites for some 1,500 housing units would be developed in the petition area. Presumably, these could be sold or built out over a period lasting longer than five years — but the petition indicates that the landowner expects enough demand to absorb all these units in the next ten years. (New dwelling permits issued for Puna homes totaled 332 in 1984 and 747 in 1990 [Community Management Associates, 1992]. The proposed development could be filled quickly if it could capture much of the regional demand for new housing.)

EXHIBIT 2-K: PUNA POPULATION GROWTH PROJECTIONS



SOURCES: 1990 U.S. Census (for actual 1990 population); DOT Highway Plan (1991); County General Plan (1989)

Residential development could also occur throughout the subdivisions, as lot owners build on their parcels. (The General Plan noted that Puna had over 50,000 vacant parcels, and hence ample potential for further infill in the subdivisions (County of Hawaii, 1989). Puna planner Bonnie Goodell estimates that about 20,000 subdivision lots remain to be developed (personal communication, October 1993).

The Department of Hawaiian Homelands has plans for 177 agricultural lots at Makuu, on 1,500 acres of its land between Ainaloa and Hawaiian Paradise Park. The lots have been awarded and infrastructure construction will begin in 1994 (personal communication, Ben Henderson, Administrator, Planning Office, Hawaii State Department of Hawaiian Homelands, November 1993).

Outside Keaau, little new planned development is under way. Golf courses have been proposed for land at Oneloa and Ainaloa, but neither is under construction. No major new geothermal plant construction is likely. The State's effort to develop a 500 MW geothermal capacity has been abandoned (personal communication, Dean Nakano, Geothermal Coordinator, Hawaii State Department of Business, Economic Development, and Tourism, November 1993). Puna Geothermal Venture could expand operations somewhat without major changes in plant area or the area used for transmission lines. True/MidPacific, the other potential geothermal developer has preliminary agreements to supply power to the Hawaii Electric Light Company, but no action to develop the geothermal resource is expected soon.

2.3.3 Plans for Infrastructure Development

With population growth continuing, but little new employment in Puna, problems of supplying infrastructure and public facilities are likely to continue.

The County of Hawaii set out plans to improve Puna's infrastructure in the 1989 General Plan. Specifically, the County identified the following among its planned courses of action:

- Development of the Puna Coast Road as a scenic parkway from Kalapana to the Hilo Airport area;
- Development of major collector roads from:
  - Opihikao to the Puna Road (Route 130);
  - Volcano Road (i.e., Highway 11) to the Coast Road along the Puna/South Hilo boundary (just north of the project considered in this study); and

- Kulani Road, from Volcano Road to the Saddle Road;

- Consideration of improvements to transportation infrastructure in the subdivisions, in conjunction with community associations and landowners;

- Flood control and drainage improvements as set out in the County's Drainage Master Plan;

- Expanded police services and facilities;

- Improvement of water system facilities; and

- Development of neighborhood parks in the subdivisions between Keaau and Pahoa.

This list includes significant capital improvements, if not the full range of improvements needed to bring infrastructure and public services throughout the subdivisions up to the level desired by many residents. It is likely that the tax base for Hawaii County will shrink in the next few years, thanks to a new homeowner tax assessment category and lowered values for resorts. In this context, it will be even more difficult than in the past to find money for the improvements needed to provide improved facilities and services throughout Puna.

The Long Range Highway Plan prepared for the State and County (Parsons Brinckerhoff Quade & Douglas, 1991) prioritized highway needs to 2010 and beyond. "Tier 1" projects responded to the greatest capacity needs; "Tier 2" projects were ones that deserved consideration for improvement within the time line of the plan; "Tier 3" projects were seen as responding to needs arising after 2010. Puna projects were assigned as follows:

- **Tier 1**:

  - Keaau Bypass: planned as two-lane arterial;

  - Route 130, Keaau Bypass to Pahoa Bypass: widen to four lane arterial;

- **Tier 2**:

  - Pahoa-Kapoho Road: provide standard width lanes and shoulders; and

- **Tier 3**:
  - Kapoho Beach Road: construct and new two-lane road between Hilo and Kapoho.

The major new road on this list is given low priority. In contrast, major development of urban road systems in the Hilo and Kailua regions is proposed. (Some of the Hilo roads could well benefit Puna residents.)

The State Department of Education is planning a new elementary school and a high school in the Keaau region. Site selection for the elementary school is in process. A Draft EIS is scheduled for publication in December 1993. The new school is scheduled to open in August 1997 (personal communication, George Atta, Planner, Group 70 International, October 1993). Six sites — one in Kurtistown, three in Keaau, and two in Hawaiian Paradise Park — are under consideration. Upon construction of the new school, the existing elementary-intermediate school would be used only as an intermediate school.

The W.H. Shipman proposal for development at Keaau includes acreage for new elementary and high schools, although the State has not determined which sites would be best for these projects.

3.0 RESIDENT ISSUES AND CONCERNS

The impact of the project must be assessed in light of the situation and outlook of the people it affects. This chapter deals with issues and concerns of Puna residents. It summarizes general concerns and then identifies concerns expressed about the proposed bypass in light of more general issues. Specific impacts anticipated by residents are mentioned briefly here, but discussed in detail in the next chapter.

Data for this chapter come from surveys, public documents, minutes of public meetings concerning plans for the Keaau Bypass, and a series of interviews conducted by Community Resources, Inc. staff in October and November 1993. Interviews were with 25 "key informants," persons with extensive knowledge of their community, who could speak not only about their own concerns, but also the views of others in the community. The informants are not a representative sample of the community. Appendix A provides a list of key informants.

Key informants were asked to comment on trends affecting Keaau and Puna, then to discuss the proposed bypass and the two alternate routes shown in Exhibit 1-B.

Informants expected continuing growth in Puna, and thought that comprehensive solutions to traffic and other problems would, sooner or later, be needed. They saw the proposed bypass as helping to relieve traffic problems, and thus as valuable for Lower Puna and Keaau residents. They added that it is only part of the infrastructure needed to address the region's problems. Most stressed that government agencies have not responded to Puna residents' needs. Hence some saw the project as a welcome exception to this trend. Nearly all informants saw the project as likely to divert customers from Keaau businesses.

3.1 ISSUES AND CONCERNS INDEPENDENT OF THE PROJECT

Key informants viewed Puna's future in terms of a few issues:

- **Population Growth.** Most saw recent growth as changing Puna from an area of isolated homes to one with a large population and few services. Several commented that they expected growth to continue in Puna, largely because of the availability of home sites.

- **Lack of Power in the County and State Governments.** Decision-makers in Hilo and Honolulu are often thought to care little about the well-being of Puna residents. State support for geothermal production is cited as showing disregard for the community in Puna, while the

County is widely seen as supplying infrastructure in Hilo funded by taxes from the whole island.

(Along related lines, Aste [1993] voices concern that Puna will only get infrastructure paid for by Puna residents' taxes, while other areas have not been subjected to this rule. Again, some Puna residents think it likely that State officials will situate a new Keaau school to meet the needs of a major landowner, ignoring subdivision residents whose children need a neighborhood school now [Morton, 1993].)

- **Need for Planning and Services in Puna.** Various informants commented on the need for County services, notably emergency services (made evident by the death of Dana Ireland in 1992, when an emergency service vehicle could not find her on a subdivision road). Additional needs mentioned by informants include road improvements, increased water services, police and fire services, and schools.

- **Risks of Life in an Active Volcanic Area.** A few informants viewed Puna as a dangerous area, where volcanic activity can threaten property at any time. On this view, investments in infrastructure in the area are ill-advised.

- **Diversity of the Puna Community.** Many informants commented on differences among and within Puna communities. Residents of older communities differ in outlook from subdivision residents. Within the subdivisions, some seek an urban or suburban way of life, while others seek isolation.

A leader of the Hawaiian Paradise Park community association recently described that diversity, while claiming that it did not stand in the way of local-level planning:

> Some of us want to be near shopping, schools, ballfields, workplaces. Some don't. Some of us like having homes and businesses mixed, some don't. Some want water and good roads, some don't. We can't all get exactly what we want exactly where we want it but we can include just about every lifestyle if we plan for it. Otherwise, no one will get what they want, we'll spend a lot of money destroying this beautiful place, and we'll all end up mad at each other. (Brooks Maloof, Chair of Hui Hanalike Community Action Committee, Hawaii Tribune-Herald, 1993).

Diversity of opinion is even greater than portrayed here, since one Hawaiian Paradise Park resident has already protested planning by

community association leaders, calling for County action to develop a comprehensive plan (Eger, 1993).

No recent survey of the concerns of a wide, representative sample of Puna residents is available. Two telephone surveys conducted in the 1980s provide information about the concerns of fairly large samples of Puna residents when these were conducted. A non-representative "survey" from 1991 gathered information mainly from active participants in community groups. None of these data sources is a satisfactory indicator of current opinions, but they can be taken to indicate broad trends in community attitudes.

In response to the 1982 and 1988 surveys, Puna residents have expressed satisfaction with the low density and lack of congestion in their home area. (See Exhibits 3-A and 3-B.)

The 1982 Puna Community Survey showed differences between responses from five sub-areas of Puna. Keaau stands out (in Exhibit 3-A) as a place where people recognize personal ties to their community and are less concerned than others about development.

In a 1988 survey, Puna residents were distinctive in comparison to other Hawaii County respondents in the value they placed on lack of congestion and housing affordability in their district. Residents of other districts were much more likely to mention family or roots in the area, and proximity to jobs, schools, or shopping, as reasons to live in their community.

When asked about problems facing the community, respondents in the 1980s gave great weight to the lack of jobs in Puna. By 1988, problems of crime and traffic were also mentioned often, and mentioned more frequently by Puna residents than by others on the Big Island (as shown in Exhibit 3-B).

Active participants in community meetings responded to questions about community planning in 1991 (as shown in Exhibit 3-C). Their list of major community needs combine concerns of homeowners — insurance and emergency services — with interest in protection of the rainforest. (The last concern may express opposition to geothermal development.)

In 1991, respondents saw little need or opportunity to get new jobs in Puna. Similarly, road improvements ranked low among priorities. These results contrast with the earlier emphasis on jobs and traffic as leading problems for Puna. In part, the difference may because the lack of jobs and traffic congestion are not problems which community leaders can "work on" effectively by themselves.

EXHIBIT 3-A: ADVANTAGES AND PROBLEMS OF LIFE IN PUNA, 1982

	Puna District	Kapoho-Kalapana	Pahoa	Subdivisions	Keaau	Kurtistown to Volcano
"What are the two or three best things about living in Puna today?" (Collapsed answers)						
Population, Development (or lack of these)	49%	48%	53%	51%	30%	49%
Other Physical or Environmental Attributes	40%	60%	36%	45%	24%	38%
Social Environment or Attributes	33%	38%	31%	35%	21%	38%
Personal Associations or Commitments	19%	20%	17%	12%	34%	21%
Economic Environment or Attributes	11%	7%	14%	14%	4%	6%
Location, Convenience	11%	12%	10%	12%	22%	7%
No Response	5%	0%	4%	4%	14%	6%
"What are the two or three most important problems facing Puna today?" (Collapsed answers)						
Puna Sugar Closing	23%	13%	16%	20%	46%	31%
Other Economic Problem	26%	35%	26%	28%	26%	22%
Problems with Services and Facilities	27%	22%	29%	38%	8%	21%
Social Problems	21%	22%	30%	19%	9%	17%
Population/Development	15%	27%	16%	16%	10%	12%
Geothermal Development	11%	27%	11%	11%	7%	9%
Physical/Environmental Problems	3%	3%	2%	5%	4%	3%
No Response	16%	12%	17%	12%	20%	21%
BASE	(778)	(60)	(258)	(204)	(76)	(180)

NOTE: Percentages sum to more than 100% because of multiple answers.

SOURCE: SMS Research, 1982.

EXHIBIT 3-B: VIEWS OF COMMUNITY LIFE, FROM THE 1988 STATEWIDE TOURISM IMPACT CORE SURVEY

	Puna District	Hawaii County
QUALITY OF LIFE COMPARED TO 5 YEARS AGO		
Same	54%	45%
Better	22%	35%
Worse	20%	18%
Not Sure	4%	2%
WHY THE RESPONDENT CHOOSES TO LIVE IN THIS PARTICULAR COMMUNITY		
Lack of congestion, traffic	34%	24%
Housing value/affordability	29%	11%
Convenient/close to jobs, schools, shopping, etc.	16%	27%
Climate/health	16%	16%
Family/roots in area	16%	32%
(No sense of choice)	10%	9%
Outdoor character of area	9%	10%
Social character of area	7%	6%
Like neighborhood character	2%	1%
ISSUES RATED A BIG PROBLEM IN THE RESPONDENT'S COMMUNITY		
Lack of nearby jobs	55%	33%
Crime	39%	22%
Traffic	37%	28%
Cost of food & clothing	35%	44%
Not enough sports & recreational facilities	30%	33%
Population growth	27%	22%
Housing cost	24%	48%
Pollution of ocean or natural areas	24%	26%
Not enough nearby stores, restaurants & entertainment	20%	18%
Crowded beach parks	18%	21%
Beauty of area being destroyed by development	14%	20%
Problems between people of different backgrounds	9%	7%
Too many tourists	2%	3%
BASE	(161)	(789)

NOTE: Columns may total more than 100% due to multiple responses.

SOURCE: Community Resources, Inc., 1989.

EXHIBIT 3-C: COMMUNITY NEEDS, FROM 1991 COMMUNITY SURVEY (1)

As you imagine Puna in the year 2000, what is most important for us to work on to prepare?	First Priority	Second Priority	Third Priority	Weighted Average (2)
Homeowner's insurance	40	9	3	141
Emergency services	37	8	1	128
Rainforest protection	31	9	6	117
School development	27	6	5	98
Energy self-sufficiency	27	2	9	94
Jobs in Puna	14	14	16	86
Health services	21	6	9	84
Recreational facilities	14	14	13	83
Extension of water service	16	12	8	80
Stores in Puna	14	14	9	79
Agricultural supports	12	14	8	72
Disaster relief	15	7	8	67
Subdivision organization	14	8	9	67
Elderly services	14	8	8	66
Keep land affordable	12	12	5	65
Lower potential population	11	8	9	58
Social services	10	11	10	62
Single parent support	6	9	15	51
Road improvements	7	10	3	44
Other	N/A	N/A	N/A	N/A

NOTES: (1) Questionnaires were returned by 82 persons. This "survey" was essentially a pretest for a random sample survey that has not yet been conducted. Data were gathered in connection with community meetings for the Puna Community Plan. Persons active in community affairs and politics are likely to be strongly represented.

(2) Weighting done by Community Resources, Inc. First priority items were given three points, second priority items two points, and third priority items one point.

SOURCE: Community Management Associates, 1992.

3.2 ISSUES AND CONCERNS WITH REGARD TO THE PROJECT

Interviewees evaluated the project in light of a few very specific concerns. Most of these directly follow from the general concerns with growth and inadequate infrastructure noted above. The rest have to do with the particular location of the bypass.

- **Need to Relieve Traffic Congestion.** Interviewees told of miles of bumper-to-bumper traffic in the morning, and welcomed the bypass as helping to alleviate the problem. Many also thought that some congestion would still occur, for various reasons:

  - With the continuing growth in Puna's population, a bypass was seen as a short-term measure or "Band-Aid." Improvement of the entire road system would sooner or later be needed.

  - Some thought the bypass would simply relocate congestion onto Route 11.

  - The volume of traffic making a four-lane bypass necessary will leave the rest of Route 130 — a two-lane road between Keaau and Pahoa — congested.

  - Some noted that many commuters will not use the bypass, because they will have to leave (or pick up) children at school in Keaau.

  - Some wanted an overpass at the Route 11 intersection of the Bypass, arguing that it would be needed to avoid congestion at that point.

- **Need for an Alternate Route out of Lower Puna.** The project was seen as a first step towards developing an alternate road from lower Puna to Hilo, by way of Railroad Avenue. Some welcomed this as needed in an emergency. However, several found the alternate route insufficient, since the alternate route would begin near Keaau, while disasters forcing residents to evacuate would likely occur further south.

  All who discussed this issue noted that residents of the Hawaiian Home Lands along Railroad Avenue in South Hilo District were opposed to making their neighborhood Street into a major roadway linking Puna with Hilo.

- **Government Contribution to Address Puna's Needs.** Puna residents largely welcomed the project as an attempt to respond to the problems

of population growth in Puna. It was seen as an exception to the perceived pattern of refusing infrastructure and services to Puna residents.

- **Anticipated Impacts on Keaau Business.** The bypass was expected by many to reduce the number of customers using Keaau retail businesses. A mauka route was preferred by a few as leading potential customers past the Keaau commercial area.

  A few interviewees thought that the Keaau town area would be more commercially successful in time, with improvements to older buildings and efforts to sell to both Puna residents and tourists. From this viewpoint, the bypass would have little impact on the merchants' eventual success.

- **Anticipated Impacts on Adjacent Land Uses.** Representatives of landowners noted potential impacts of the project on adjacent lands. (Specifics are discussed in the next chapter.) They were concerned that the land taken for the project would affect a few productive uses. On the other hand, they found that it might improve access to property, making development feasible.

  Several interviewees viewed the bypass as part of plans by W. H. Shipman Ltd. They noted that new residential development in Keaau would benefit from improved traffic flow through the town, and thought that Alternative 1 or 2 would be preferred by Shipman as furthering the landowner's interests.

3.3 EVALUATION OF ALTERNATIVES

Informants discussed five different routings for the proposed bypass:

- **Alternative 1** (in Exhibit 1-B) was seen as shorter, and hence less expensive than Alternative 2. Nearly all the route would be on land owned by the Shipman Estate — a factor simplifying the development process. Access to Route 11 would be located across that road from the entrance to a planned commercial area — an advantage from the point of view of the landowner, but not from the viewpoint of merchants in Keaau seeking to keep their current customer base.

- **Alternative 1 with a connection to Railroad Avenue:** This was mentioned as a way to combine the savings of Alternative 1 with potential emergency access by way of Railroad Avenue.

- **Alternative 2** was preferred by some because it would permit eventual access to Hilo via Railroad Avenue. It was considered potentially advantageous for some landowners with property nearby. However, the extent of that advantage would depend on sitting, and whether access were limited. A road connection with Route 11 opposite the entrance to Shipman Industrial Park was thought useful by some interviewees.

- **A Mauka Alternative** (reaching Route 11 between Keaau Camp and Nine and a Half Mile Camp [Alternative 4 in the 1994 evaluation of alternatives {Imata, 1994}] — not shown on Exhibit 1-B) was mentioned by a few interviewees as helping Keaau merchants, since commuters would pass in sight of the town. It would also be shorter than the makai alternatives, and hence cost the State less.

- **Another Makai Alternative** (reaching Route 11 along the Macadamia Road to the Mauna Loa macadamia nut factory) was mentioned by one informant. He argued that such a route, while longer, would (a) minimize the eventual cost of developing the Railroad Avenue right-of-way for an alternative route to Hilo and (b) avoid crossing the smaller holdings along Alternative 2, minimizing problems of land acquisition.

4.0 SOCIO-ECONOMIC IMPACTS

This chapter contains Community Resources, Inc.'s assessment, as an independent consultant, of anticipated socio-economic impacts of the proposed Keaau Bypass. It draws on CRI's experience in studying communities and proposed developments throughout Hawaii.

Potential impacts of the proposed bypass range from easily quantified impacts to ones that are best discussed qualitatively. The severity of some impacts will depend on future planning or on future interactions between the community and the Department of Transportation.

Community Resources, Inc. emphasizes that social impacts are often not inevitable. They are potential consequences, many of which can be avoided, minimized, or even turned to advantage with foresight and discussion of community needs. Mitigation of potential adverse impacts is discussed in the next chapter.

4.1 OVERVIEW OF FUTURE WITHOUT THE KEAAU BYPASS

An impact of a project is the difference between future conditions with the project and future conditions without that project. Both current problems and future ones that would arise anyway are not "impacts." However, a project may speed or intensify a change that would happen otherwise — and the new timing or intensity is a project impact.

If the project is not built, the following future conditions appear likely:

- Growth in population in both Lower and Upper Puna;
- Little growth in jobs in Puna;
- Increased commuting by Puna residents and increased traffic volumes on Routes 11 and 130;
- Development (or redevelopment) of commercial sites to capture the commuter trade;
- Eventually, some tourist traffic through Keaau when Chain of Craters Road is restored between Volcano and lower Puna and when local efforts to encourage small-scale tourism bear modest fruit; and

- Increased traffic congestion in Keaau.

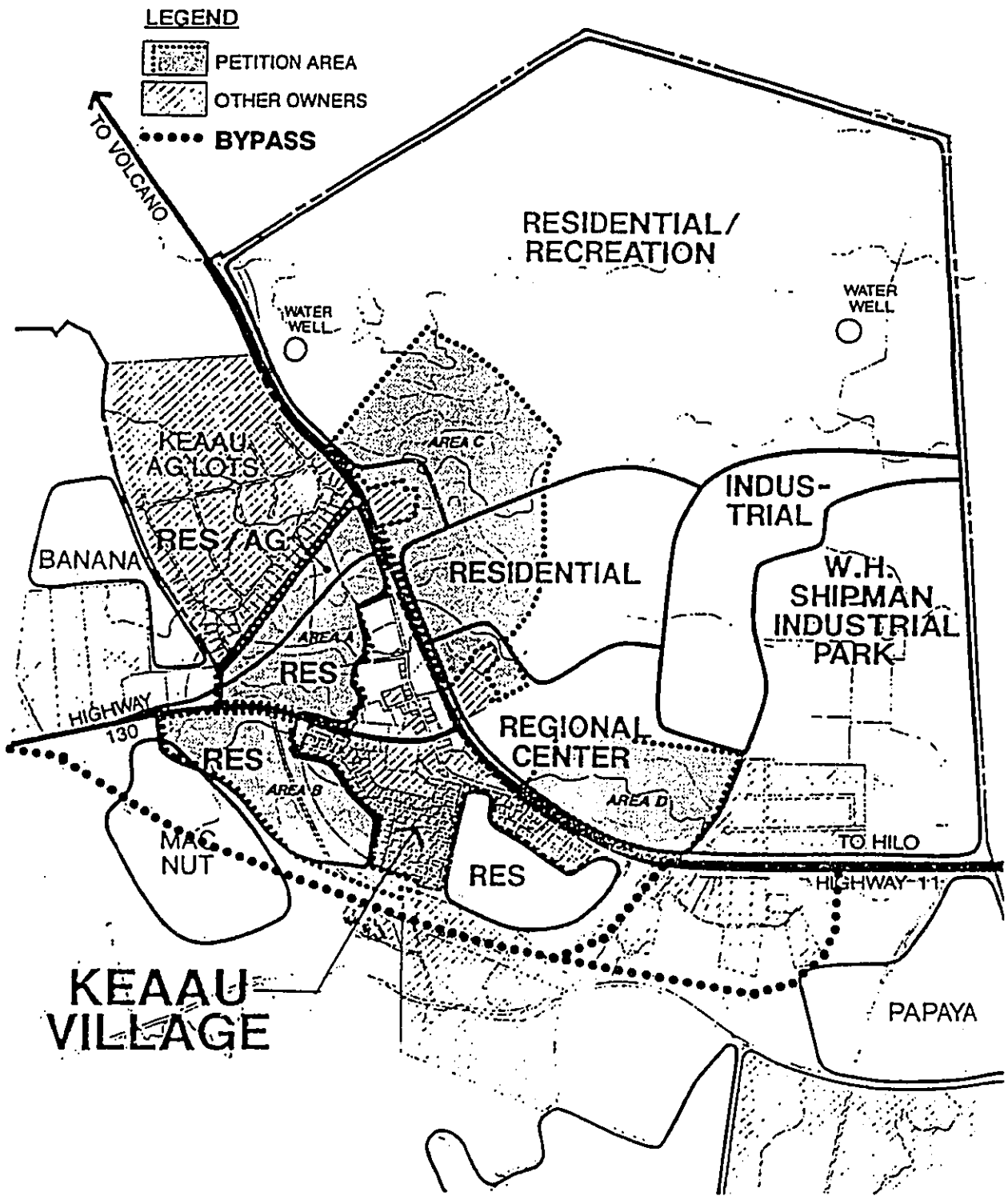
The future of Keaau also depends on the Shipman Development Plan. That consists of a long-range conceptual plan and a proposal for near-term development of part of the Shipman lands. Exhibit 4-A shows both the "petition area" for which the Office of State Planning and Shipman are now seeking redesignation — shaded areas A, B, C, and D in the exhibit — and the outlines of the overall concept. (The proposed bypass route is shown in overlay on the Conceptual Development Plan in Exhibit 4-A. The route is not part of the Shipman plan.)

If W.H. Shipman, Ltd. gains government approvals for its current petition, and if the landowner is correct in judging that new planned subdivision areas around Keaau can attract much of the residential demand that has, up to now, been captured by lots in more isolated areas, then:

- With 1,500 additional housing units, the population of Keaau would, over decades, be three to four times as large as at present;
- New retail jobs could be created in the expansion area;
- The expansion area would include the major commercial area of Keaau;
- Much of the land alongside the Keaau Bypass would be slated for residential development; and
- New roads could provide alternate ways to travel through Keaau. One such road would cover a route similar to the proposed mauka bypass route. (The road in the Shipman petition area would likely not be the major thoroughfare considered by DOT.)

If the petition does not succeed, the demand for housing and commercial space to which the Shipman proposal responds may not be located in Keaau. It seems likely that much of the housing demand would be directed toward the subdivisions. Small-scale retail stores would likely be found throughout Puna's subdivisions and small towns, but major commercial development would occur where the combined markets of Upper and Lower Puna could be tapped. Without further land use permissions, such development would likely occur along Route 11 in South Hilo.

EXHIBIT 4-A: CONCEPTUAL KEAAU DEVELOPMENT PLAN



SOURCE: Adapted from Y.K. Hahn & Associates, 1993.

4.2 OVERVIEW OF MAJOR SOCIO-ECONOMIC IMPACTS OF THE PROJECT

The project will lessen traffic congestion in Keaau, providing benefit to Keaau residents and Lower Puna commuters.

The Keaau Bypass will tend to direct potential customers away from Keaau stores. However, many Lower Puna commuters will still visit Keaau Town, whether solely for shopping or to take children to and from school. Also, population growth trends will tend to counter the adverse impact of the bypass on Keaau stores.

The design of the junction of the Bypass with Route 130 could affect Keaau and Lower Puna residents. If the turn into Keaau is seen as difficult or unsafe, then Lower Puna drivers traveling to the town may feel the bypass has not helped them. Some will look for alternate routes into Keaau, and may use Milo Street instead of Route 130 to get to the center of town.

Impacts on sites adjacent to or traversed by the project depend on details of routing and alignment still to be determined. If Alternative 2 is chosen, a house, some orchards, and a warehouse site will be taken. Alternative 1 appears not to displace existing uses. On the rest of the bypass route, the route crosses land now in macadamia nuts near Route 130, but plans of the landowner already call for urbanization of some of that plantation.

The project will bring a major roadway near areas now distant from urban life. However, more extensive plans to urbanize the area have already been submitted (Hahn, 1993). The project, which would bring commuters through the area but do little to change local access, would have less of an urbanizing impact than the W.H. Shipman, Ltd. proposal to quadruple the population of Keaau.

The project will generate construction jobs for a period of about a year. Direct, indirect, and induced employment impacts of the project are estimated as some 123 to 172 person-years of employment for Big Island residents, and another 63 to 92 person-years for persons in the rest of Hawaii.

4.3 ECONOMIC IMPACTS

4.3.1 Employment and Income

Employment and income impacts will arise during planning and construction of the Keaau Bypass Road. After construction, no such impact will be measurable.

Any project generates three sorts of jobs in the island and State economy:

- Direct employment, on the project's construction and operations;
- Indirect employment, generated when the project or its builders order goods and services from elsewhere in the economy; and
- Induced employment, generated as direct and indirect workers spend their incomes.

Normally, direct jobs are highly concentrated near the job site. Indirect jobs are located where suppliers and providers of specialized services are to be found, while induced jobs are located near workers' home areas and in the Statewide distribution system. In a project such as the Keaau Bypass, the bulk of jobs generated by construction would be located on the island of Hawaii.

(Construction supports jobs for a short term. All estimates of job creation in this assessment are for a year's time, after which the construction industry will need other projects to support its workforce.)

Exhibit 4-B provides an estimate of employment impacts of building the road, based on a preliminary estimate of development costs. It shows that some 74 to 95 direct jobs would be supported by the project (including off-site workers in construction offices and baseyards). These jobs are "full-time-equivalent person-years" — the average number of jobs that would be filled daily for a year. If construction takes less than a year, the actual number of workers could be greater.

The total number of direct, indirect, and induced jobs associated with the Keaau Bypass would range from approximately 204 to 267 jobs, of which some 123 to 172 jobs would be located in Hawaii County.

The direct, indirect, and induced workers' wages associated with the project are estimated as ranging from $6.2 million to $8.2 million, as shown in Exhibit 4-B, most of which would be earned by Big Island residents.

CRI stresses that simplifying assumptions are used in Exhibit 4-B. Notably, it is by no means certain that costs will vary simply according to the length of the bypass. This approach fails to cost out junctions with the two highways. Costs of the Route 11 intersection for Alternative 1 could be appreciably greater than for Alternative 2, due to grade separation near Alternative 1. Refined cost data will not be available until far more detailed planning and design work has been completed.

EXHIBIT 4-B: EMPLOYMENT AND INCOME IMPACTS OF PROJECT DEVELOPMENT

	Alternative 1			Alternative 2		
Roadway Length	About 2.5 miles			About 3.0 miles		
Planning and Design	$1.6		$1.6	$1.6		$1.6
Construction Cost (Million $s) (1)	$7.5	to	$8.8	$9.0	to	$10.5
Employment						
Direct Jobs: Plan/Design (2)	21	to	21	21	to	21
Direct Jobs: Construction (3)	53	to	62	64	to	75
Subtotal: Direct Jobs	74	to	83	85	to	95
Indirect and Induced Jobs (4)	130	to	147	151	to	172
TOTAL	204	to	230	235	to	267
Hawaii County Share (5)	123	to	144	148	to	172
Rest of State Share (5)	80	to	86	87	to	95
Personal Income (Million $s) (6)						
Direct Jobs	$2.9	to	$3.3	$3.4	to	$3.8
Indirect and Induced Jobs (4)	$3.3	to	$3.8	$3.8	to	$4.4
TOTAL	$6.2	to	$7.0	$7.2	to	$8.2
Hawaii County Workers' Share	$4.7	to	$5.4	$5.5	to	$6.3
Rest of State Workers' Share	$1.5	to	$1.7	$1.7	to	$1.9

NOTES:

(1) Based on preliminary estimate by Hawaii District Highways Engineer Hugh Ono (personal communication, November 3, 1993), of construction costs averaging $3 to $3.5 million per mile.

(2) Based on estimate that direct wages make up 50% of planning and design costs, and average wage for engineering and management services ($38,894 in 1992 [State Department of Labor and Industrial Relations, 1993]

(3) Based on relation between construction spending and employment statewide. (1992 data from State Department of Labor and Industrial Relations, 1993 [average employment and wages] and State Data Book [construction tax base].)

(4) Calculated from State Input-Output model, using employment multipliers for "Professional Services" for planning and design, and "Other Construction" for construction:

	Multipliers: Type I (Direct + Indirect)	Type II (Direct, Indirect, + Induced)
Professional Services	1.17	2.19
Other Construction	1.67	2.97

(5) Estimated by Community Resources, Inc. assuming that all direct construction jobs, 40% of indirect jobs, and 80% of induced jobs are located in Hawaii County.

(6) Income estimated from average annual wages (Statewide) for engineering and construction (for direct jobs) and for all jobs (for indirect and induced jobs). Statewide averages were preferred to County ones as the latter are more likely to be reduced by underemployment. By definition, the jobs estimated here are full-time, all-year jobs.

4.3.2 Impacts on State Revenues

The gross cost of project development for the State is estimated as in the range of $10.1 million to $13.4 million, as follows:

Preliminary Estimate of State Outlay for Bypass Development

PHASE	ESTIMATED OUTLAY
Planning and Design	$1.6 million
Land Acquisition	$1.0 to $1.3 million
Construction	$7.5 to $10.5 million
TOTAL	$10.1 to $13.4 million

Planning and Design Costs. Planning and design costs are estimated here on the basis of Department of Transportation staff estimate.

Land Acquisition Costs. These can be estimated by using land values in the area where the bypass is planned. Average value can be taken as a floor for projecting amounts to be paid in compensation. (Average values provide only a floor because the State may have to compensate for loss of value of crops, buildings, and remnant parcels.) Real property tax values were noted for 23 parcels under or adjacent to the proposed bypass route. (Parcels with nominal values were excluded.) Current assessments range from $1,500 to $85,000 per acres. The average, slightly above $19,000 per acre, gives a floor value of $0.44 per square foot. Using the estimated bypass lengths in Exhibit 4-B, the land acquisition would be about $1.0 to $1.25 million:

Estimated Cost of Land Acquisition

AREA AFFECTED	ALTERNATIVE 1	ALTERNATIVE 2
Project length (miles)	2.5	3.0
Project length (feet)	13,200	15,840
Project width (feet)	150	150
Project area (sq. ft.)	1,980,000	2,376,000
Floor cost (@ $0.44/sq. ft.)	$871,200	$1.045,440
Adjustment (20%) for improvements and remnants	$174,240	$209,088
TOTAL	$1,045,440	$1,254,528

Construction Costs. Construction costs are estimated in Exhibit 4-B.

Revenues. Exhibit 4-C estimates the tax revenues associated with project development. These amount to about nine percent of total development costs. Hence, the net impact of the project on State revenues would be an outlay amounting to more than 90% of the State moneys allocated for project development.

EXHIBIT 4-C: STATE REVENUES ASSOCIATED WITH PROJECT DEVELOPMENT

(IN THOUSANDS OF $s)

	Alternative 1			Alternative 2		
Corporate Income Tax (1)	$22.8	to	$26.0	$26.6	to	$30.4
Excise Tax						
Development Spending (2)	$364.0	to	$414.0	$424.0	to	$484.0
Workforce Spending (3)	$249.6	to	$281.7	$281.7	to	$288.1
Personal Income Tax (4)	$291.4	to	$328.9	$328.9	to	$336.4
TOTAL	$927.9	to	$1,050.6	$1,061.2	to	$1,138.9

NOTES:
(1) Based on ratio (0.25%) between total business receipts in Hawaii for domestic and foreign corporations and corporation income tax collected in 1989 (Hawaii State Department of Taxation, 1992).
(2) Calculated at 4% of direct spending.
(3) Calculated at 4% of total workforce income spent on taxable items. Share of income spent on taxable items calculated from 1989–1990 study of Oahu consumers. (U.S. Bureau of Labor Statistics, reported in State Data Book (Hawaii State Department of Business, Economic Development and Tourism, 1993).
(4) Calculated at 4.67% of wages, based on ratio between total laborers' and proprietors' income and personal income tax collected, in Fiscal Year 1991 (Tax Foundation of Hawaii, 1992).

4.3.3 Impacts on County Revenues

County revenues would be affected directly by the loss of property taxes on lands taken for the project. The loss in annual revenues would amount to about $10,000 to $12,500.

Estimated Impact on Property Taxes

Value of land acquired by State	$1,045,440 to $1,254,528
Tax Rate (Agricultural or Industrial)	$10 per $1,000 in value
Annual Taxes	$10,454 to $12,545

4.4 SOCIAL IMPACTS

Social impacts range from direct impacts of the project, such as displacement from sites used for the bypass road, to more long-term and indirect impacts. The analysis in this section is organized geographically, from impacts on sites along the bypass corridor to general, long-term impacts. Impacts limited to the two areas proposed for alternate routes to Route 11 are discussed first, followed by impacts associated with part or all of the remainder of the proposed bypass corridor. (Thus "Alternative 1" and "Alternative 2" refer only to those proposed roadway sections that are different under the two alternatives. The rest of the project, from Route 130 to the area near Puna Sugar Mill, is discussed as a third area.)

Exhibit 4-D shows the parcels traversed by the proposed Bypass alternatives.

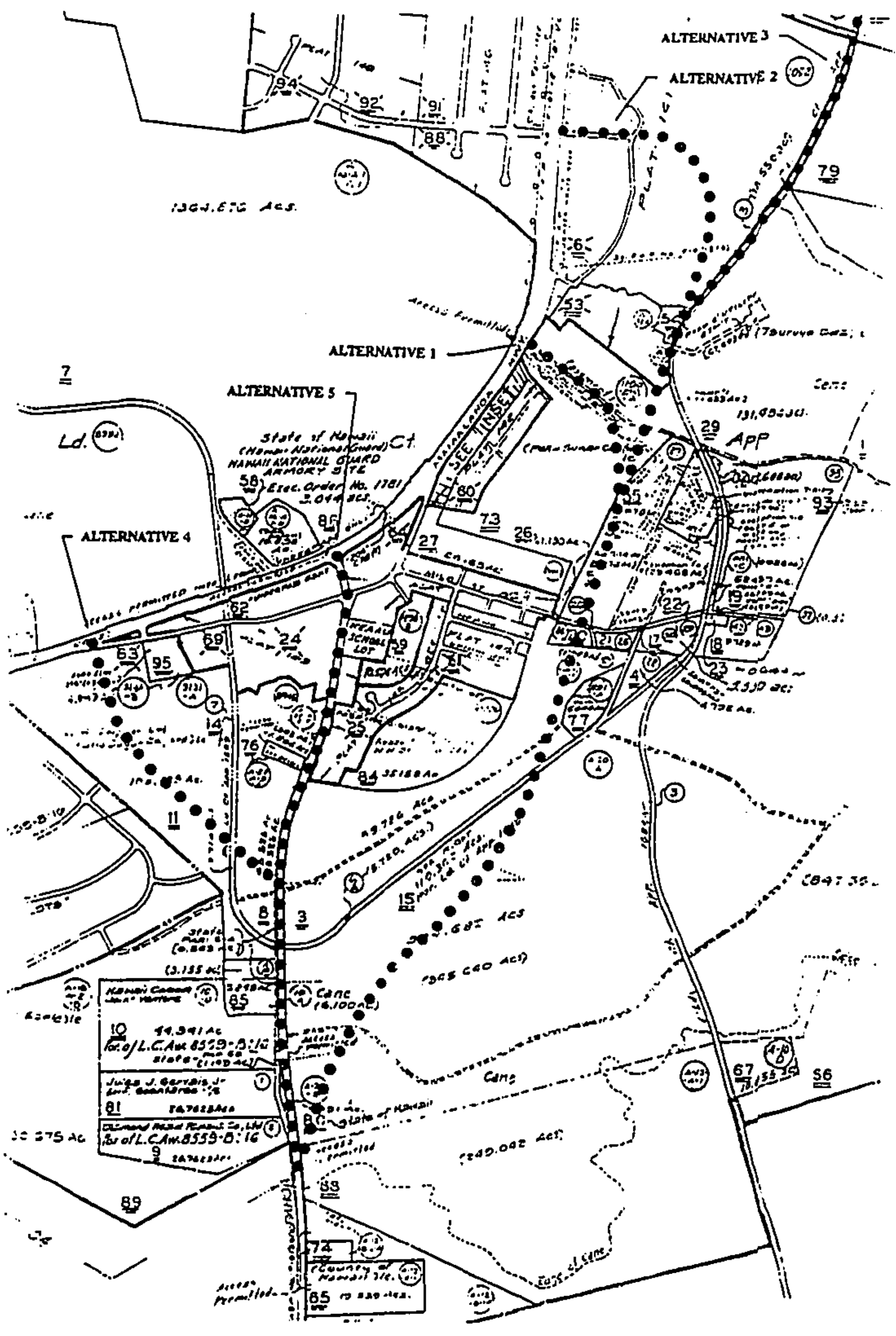
The project will have significant impacts on landowners whose land is taken for the bypass. Others will see less severe impacts, and/or will find traveling easier and faster with the new road in place. Keaau will see less traffic (unless new development increases the town's population, apart from the Keaau Bypass).

4.4.1 Displacement

The bypass route is largely designated Agricultural, and consists of land which was once in sugar but is now uncultivated. Potential exceptions, involving displacement of land uses, include:

- **Alternative 1:** No displaced use is evident.

EXHIBIT 4-D: PARCELS AFFECTED BY BYPASS ALTERNATIVES



- **Alternative 2:** The extent of displacement depends on the roadway alignment. Land uses at risk include:

  - Near Route 11, a house site and surrounding yard;

  - Acreage along the alternative roadway planted in flowers and papayas;

  - A warehouse site on the Hawaii Brewery Development Co. property. (Some of the site extends into the existing right of way.) Depending on the road alignment, additional land between the warehouse and the old slaughterhouse could be taken.

    Removal of the warehouse would rule out improvement and use of an existing concrete pad for storage — but the owner has no right to expect unimpeded use of land in the right-of-way. Taking of additional land closer to the slaughterhouse building would have a more serious impact on development of the brewery and associated beer garden.

- **Remainder of Bypass Route:**

  - The route passes over or very close to land identified for tax purposes as Industrial, near the Puna Sugar Mill.
  - Near the junction of the bypass route with Route 130, the bypass route enters a macadamia nut grove. The owner, W.H. Shipman, Ltd. is petitioning to change the designation of about two acres to Urban, to accommodate the proposed Keaau town expansion. The displacement impact of the bypass itself on the grove would be limited to lands not covered in the Shipman petition, if that petition is accepted by State and County authorities.

    The simplified map of land uses shown in Exhibit 4-A suggests that the bypass would pass through much of the macadamia nut orchard, and hence would have considerable impact.

4.4.2 Potential Loss of Access

- **Alternative 1:** Keaau Road leads to agricultural areas, to private lands of the Shipman Estate and Shipman family, and to roads leading to the Puna Sugar Mill site. Development of the Keaau Bypass could close off this point of access for the above sites. They could, however, have access to Keaau through private roads to the Milo Street crossing.

A road link between Keaau Road and Slaughterhouse Road would presumably be closed if Alternative 1 were chosen.

- **Alternative 2:** With development of this alternative, the various landowners using the existing short road leading makai from Highway 11 could need alternate forms of access. Private owners with land on the Hilo (north) side of the road have no clear alternate access. Owners of land on the Keaau side of this roadway could reach their land through improvement or extension of the road linking this area to Slaughterhouse Road.

- **Remainder of Bypass Route:** The private roads on Shipman Estate land now serve agricultural and industrial users located at the Sugar Mill, along with residents of Eight and a Half Mile Camp. Since the bypass is a limited access road, a single crossroads will be needed, allowing users of the lands makai of the bypass to reach Keaau. Such an access point could also serve users of land on the Keaau Road whose current major access would be cut if Alternative 1 is chosen.

  An access point is planned at Milo Road.

  The bypass could, depending on its final alignment, bisect AMFAC/JMB Hawaii land (TMK 1-6-3-05), leaving a remnant parcel in need of alternate access.

4.4.3 Improved Road Access

The bypass road would increase the visibility of the Puna Sugar Mill and, if Alternative 2 were chosen, the Hawaii Brewery site. It is far from certain that visibility would translate into improved access. However, County planners have urged the brewery's managers to route truck traffic to the brewery by using the bypass (personal communication, Marcus Bender, Hawaii Brewery Development Co., October 1993).

Reportedly, members of the Kauinui family requested subdivision of their property (TMK 1-6-141-10), but had no success since they would have to pay the costs of improving the adjacent road in order to subdivide. Development of Alternative 2 would involve a taking of part of their land (including, it is likely, the site of an existing house), but also a major road improvement without cost to them. This might make subdivision possible. (They could have access to their property via the new road, if safety and design considerations do not rule this out, or via an extension of the road that now links Slaughterhouse Road and Keaau Road.)

Residents of Eight and a Half Mile Camp would have improved access to Route 11 with the bypass.

4.4.4 Other Impacts on Adjacent Properties

- **Alternative 1:** This area is owned by the Shipman Estate. In the long term, the Conceptual Keaau Development Plan indicates that residential development could occur along the Keaau side of this route. Development of the Alternative appears in keeping with the landowner's plans.

- **Alternative 2:** This route passes through a small area with agricultural and residential uses. This area is effectively isolated now by its substandard roadway; bypass development would change the character of the area.

- **Remainder of Bypass Route:** The bypass route adjoins existing areas devoted to macadamia nuts, mixed agricultural and industrial uses, and, at Eight and a Half Mile Camp, residential use. It will make the camp and mill site less isolated than now. Access to the bypass will depend on decisions by DOT and the Shipman Estate (as owner of private roads leading to the Milo Street crossing) — access may change little.

  Shipman Estate plans call for residential development near the Keaau side of the bypass corridor in the next few years. That area would benefit from access to the bypass, if allowed.

  The overall impact on this area seems small, in that (a) development of the area near town is already planned; and (b) the bypass would provide little additional access for nearby properties.

4.4.5 Implications for Surrounding Areas

Traffic Flow. A traffic engineer's report (Barton-Aschman, 1993) provides a quantitative projection of traffic volumes and flow along the Keaau Bypass. The social composition of the new traffic flows deserves note:

- Many commuters would pass from Lower Puna to jobsites in Hilo or at Shipman Industrial Park without entering Keaau Town.

- However, Lower Puna residents with children in the schools in Keaau would enter the town area by Route 130. If a high school is located in

Keaau, the number of cars entering Keaau to take students to public schools could increase.

- In small numbers, tourists would travel through the area. Unless steps are taken to market Keaau as a site of tourist attractions, it seems likely that tourists would largely use the bypass, and not venture into the town.

As a result, the Keaau Bypass will result in only a partial reduction of the traffic now flowing through Keaau.

Impacts on Keaau Town — Commercial Area. The bypass will reduce through traffic in Keaau. Bypass development could occur at much the same time as redevelopment of the older commercial area — but this may be coincidental, since implementation of the *Shipman Development Plan* will probably have a greater impact than the bypass on the size of Keaau and the clientele for its stores.

CRI addressed the concern that the bypass will take much of the customer base of Keaau stores by reviewing information about other bypass routes in Hawaii and discussing the impacts of bypasses with businesspeople with experience of changes following bypass development at Pukalani on Maui and at Pahoa. On the central question — Would a bypass take away Keaau's customers? — interviewees agreed that some customers would be lost, but disagreed on the severity of the problem.

According to Big Island commercial interviewees (included in Appendix A), the **Pahoa Bypass:**

- Succeeded in directing traffic around town, reducing congestion;
- Lowered stores' clientele by 20% or more, but
- Motivated storeowners to put up signs advertising Pahoa and to improve the appearance of the town, with long-term impact for both local customers and tourists.

On Maui, the new **Pukalani Bypass** road is thought to have reduced merchants' customer base (personal communications, Sandy Yamada, Manager, Pukalani Town Center, and Eric Nakashima, Manager, Pukalani Superette, November 1993). Pukalani stores have few competitors nearby, so residents of the area are still motivated to visit the town. It is too soon to know if the bypass is encouraging many Upcountry residents to shop in Kahului and speed home.

Perhaps more importantly, the safety problems of the Pukalani Bypass may make some area residents unwilling to go to Pukalani to shop. Unsignalized intersections have been the scenes of accidents, risky crossings, and long waits at peak traffic times.

Similarly, merchants in **Haleiwa** on Oahu have stressed that a left turn access planned for their town will make it difficult for travelers to drive to Haleiwa, even if they want to visit (Huddleston, 1993).

These examples suggest that two factors are important for Keaau's businesses: (a) safe and fairly easy access to the town area (by Route 130, the Milo Street intersection with the bypass, or the existing signalized intersection on Route 11) and (b) signage to advertise the town to passersby.

Keaau retailers have strong customer loyalty from people who see the town as very different from Hilo. However, such loyalty could be short-lived if new commercial alternatives open nearby. As one informant said, Puna residents are all "potential K-Mart customers." Informants stressed that the bypass would make properties along its length potentially valuable for commercial use. Development of these properties could affect Keaau stores markedly.

No major site along the length of the bypass is now zoned for major commercial use. However, W.H. Shipman Ltd. has proposed development of a regional commercial center mauka of Route 11, opposite the point where Alternative 1 meets the highway. If the Shipman petition is approved, the Keaau shopping area will have strong competition with or without the bypass.

In sum, the Keaau Bypass will likely reduce the customer base for Keaau stores. Its impact will be magnified if road design makes access to Keaau Town through unsignalized intersections (on Route 130 and at the Milo Street crossing) seem difficult or hazardous. This impact should be viewed in relation to the Shipman development petition, which involves potentially greater impacts on Keaau in the form of many more resident customers and a large, competitive commercial area.

(The Bypass will be a mixed blessing for the Shipman Estate's development plans. While it will speed customers to the proposed commercial area, it will also improve access to the subdivisions, making these residential areas more competitive with the new proposed Keaau residential sites.)

Impacts on Keaau Town — Residential Areas. Less through traffic on Route 130 should lessen stress and the difficulty of travel in Keaau for residents. However, bypass design could affect the routes taken by commuters into and out of Keaau. If the junction between Route 130 and the bypass is seen as unsafe or

hard to use, then some Lower Puna commuters are likely to prefer the Milo Street route into Keaau. They would increase traffic in residential areas of the town.

Impacts on Railroad Avenue Lots (S. Hilo). Connection between the Keaau Bypass and the Railroad Avenue right of way make possible future development of Railroad Avenue in Puna. With such development, Railroad Avenue could serve as an alternate route to Hilo.

Railroad Avenue lot owners and residents have made their opposition to this plan known. Much of the land adjoining Railroad Avenue in South Hilo has been developed as Hawaiian Home Lands agricultural lots. Residents largely view this as a separate community, which would be adversely affected if their road were open to traffic between Puna and Hilo shopping areas.

Furthermore, residents of Hilo's homestead areas are ready to contest what they take to be incursions of outside authority. Owners of homes in a residential area near Railroad Avenue are withholding mortgage payments until the Department of Hawaiian Homelands (DHHL) fixes major problems in the homes in the subdivision (Kua, 1993a). Other Homelands residents have protested both the use of DHHL land for public parks and commercial uses, and are challenging the jurisdiction of State courts (and, presumably, County police) over DHHL lands (Kua, 1993b).

Strictly speaking, the proposed Bypass has no impact on Railroad Avenue in South Hilo. Any connection with Railroad Avenue in South Hilo would demand a separate allocation of government funds and hence a separate environmental review.

Impacts on Lower Puna. The Keaau Bypass will shorten commuting time between Lower Puna and Hilo, aiding residents of Lower Puna who commute or travel to Keaau at peak periods. The bypass will also stand as evidence that the State can respond to needs of Lower Puna residents, countering, to an extent, the sense of powerlessness residents express.

By lessening congestion around Keaau, the bypass will help to make Lower Puna subdivision areas attractive to people with employment outside the Puna District.

5.0 MITIGATIONS

The proposed Keaau Bypass will have desired impacts, such as reduced congestion in Keaau Town, but can also lead to undesirable results if steps are not taken to mitigate potential adverse impacts. This chapter identifies possible mitigations for potential adverse socio-economic impacts. Since the choice of alternative routes and actual road alignment remain to be decided, mitigation strategies, rather than specific measures for particular sites, are emphasized here.

Community Resources, Inc. stresses that mitigations suggested here may not be the only appropriate ones. The finding than an impact needs mitigation depends on both specifics of project design that remain to be worked out and judgments of the affected community concerning both the nature of the impact and appropriate means to mitigate it.

Exhibit 5-A summarizes mitigation strategies for potential socio-economic impacts of the bypass.

Taking of Land and Displacement of Uses. Land taken for the bypass right of way can no longer be used by the former owner. Just compensation is appropriate for land and improvements taken for the Keaau Bypass Road. Since project design is still in process, it may be possible to minimize taking of improved land or creation of remnant parcels as the alignment is finalized. Sites for which alignment decisions can have important impacts include:

- The Shipman land planted in macadamia nuts along Route 130 (TMK 1-6-03-68);
- The AMFAC Hawaii parcel (Tmk 1-6-03-05); and
- Lands along Alternative 2, owned by Hawaii Brewery Development Co. and various private landowners, with existing or planned and permitted uses.

Loss of Access. Loss of access can be mitigated through:

- Development of a new connection between lands makai of the project and Keaau, at Milo Street;

EXHIBIT 5-A: SUMMARY OF POTENTIAL MITIGATIONS

Potential Impact	Mitigation Strategies
Taking of Private Land Displacement of Improvements	Compensation Design: develop alignment to minimize impact on improved areas
Loss of Access	Milo Street crossing Development of access roads for isolated parcels Acquisition of small isolated parcels
Loss of Perceived Isolation	Landscaping
Impacts on Keaau Town	Design of Route 130 intersection Signage for Keaau commercial area

- Development, as necessary, of small access roads for parcels losing their access to the island road system.

  Alternate access may be a problem for only a few parcels along the road corridor until the road approaches Route 11. However, the problem arises for parcels on both sides of the Alternative 2 route near Route 11.

- Possibly, acquisition of small parcels along the bypass route if provision of access turns out to be extremely costly.

Since the existing roads are largely private roads owned by W.H. Shipman, Ltd., creation of new means of access to parcels cut off by the bypass will involve discussion and agreements among DOT, Shipman, and owners of the parcels denied access.

Loss of Isolation. It is not clear that the loss of a sense of isolation is an adverse impact for many of the parcels along the bypass route. Residents of Eight and a Half Mile Camp may find traffic noise and their visibility to passersby undesirable. The impact of the project can be lessened by landscaping.

Impact on Keaau Town. Both Keaau retailers and all those regularly driving to and from Keaau via Route 130 may seek assurance that access to the town will be easy and safe. Keaau residents may be concerned to minimize through traffic on residential streets. Such traffic could well increase if the Milo Street intersection is regularly used by Lower Puna drivers to as a way to get into Keaau.

Mitigation consists above all of design features adequate to minimize waiting at the Route 130/Bypass intersection for drivers turning to Keaau on Route 130.

To make up for the potential loss of customers associated with the new bypass, Keaau commercial interests may seek to attract new customers by means of signage along Route 11, Route 130, and the Keaau Bypass. Such signage should express design themes used by landowners and retailers throughout the Keaau retail area. In light of both Keaau's past and the existing wheel-and-gear decorations at Keaau Shopping Center, designs referring to Keaau's past as a mill town could be appropriate.

Redevelopment of Keaau's commercial area is a response to long-term deterioration of some of the commercial properties, to existing and future competition from other commercial areas, and to opportunities which will arise with increases in the numbers of residents and tourists — not just to the Keaau Bypass. Hence the Bypass should not be held accountable for more than a small share of the costs of redevelopment and advertising.

APPENDIX A:

KEY INFORMANTS

APPENDIX A: KEY INFORMANTS

The following list includes persons interviewed by Community Resources, Inc. staff in October and November, 1993. Positions and/or organizational affiliations are mentioned to indicate the scope and variety of knowledge that these informants have. They were not asked to speak for the groups, but to discuss issues and concerns for people they knew in the community.

KEY INFORMANT	POSITION AND/OR ORGANIZATION
Ginny Aste	President, Puna Community Association Member, Puna Traffic Safety Council Resident, Hawaiian Beaches
Marcus Bender	President, Hawaii Brewery Development Co., Inc. Owner of parcel near Bypass
Robert E. Cooper	Development Manager, W. H. Shipman, Ltd.
Dale Fergerstar	Lieutenant, Hawaii County Police Keaau Station Head
Dr. Alan Garson	Superintendent, Hawaii District Hawaii Department of Education
Diane Gentry	President, Puna Traffic Safety Council Chair, Public Health and Safety Committee, Puna Community Council
Virginia Goldstein	Planning Director, Hawaii County
Bonnie Goodell	Principal, Community Management Associates Volcano resident
Robert Herkes	Representative, Hawaii State Legislature
Fay Hovey	Project Director, Mainstreet Pahoa Association, Inc. Volcano resident
Harry Kim	Administrator, Civil Defense Agency, Hawaii County Owner of parcel near Bypass
Andrew Levin	Senator, Hawaii State Legislature

KEY INFORMANT	POSITION AND/OR ORGANIZATION
Anne Lo-Shimazu	Manager, Land Administration, Asset Management Division, AMFAC/JMB HAWAII, Inc.
Lloyd Matsunami	Principal, Keaau Intermediate School
Richard Matsuura	Senator, Hawaii State Legislature
Kimberley Miyasaki	Vice President, Chaney Brooks & Company, Commercial Management Past manager, Keaau Shopping Center
Gladys Nakamura	President, Keaau Senior Citizens' Club Representative, Keaau Village Association Keaau resident
Narikiyo, Steven	Hawaii County Fire Department Captain, Keaau Station
Carl H. Okuyama	President and CEO, Sure Save Supermarkets and WikiWiki Marts
Norman Oleson	Deputy Director, Hawaii County Planning Department
Donald Pakele	District Supervisor, East Hawaii District Office, Hawaii State Department of Hawaiian Homelands
Tate Robinson	Vice President, Hawaii Brewery Development Co., Inc.
Pat Rocco	Member, Puna Community Council Member, Board of Directors, Mainstreet Pahoa Past President, Puna Chamber of Commerce Seaview Estates resident
Harvey Tajiri	Representative, Hawaii State Legislature
J.D. Watumull	Lessor, Keaau Shopping Center

APPENDIX B:

REFERENCES

APPENDIX B: REFERENCES

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APPENDIX C

TRAFFIC IMPACT ANALYSIS REPORT FOR

KEAAU-PAHOA ROAD

KEAAU TOWN SECTION

KEAAU, HAWAII

PROJECT NO. 130B-01-92

Prepared For

GK & ASSOCIATES, INC.

KAILUA, HAWAII

Prepared By

BARTON-ASCHMAN ASSOCIATES, INC.

HONOLULU, HAWAII

DECEMBER 1993

TRAFFIC IMPACT ANALYSIS REPORT FOR

KEAAU-PAHOA

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HONOLULU, HAWAII

December, 1993

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1. INTRODUCTION

Barton-Aschman Associates, Inc. has been retained to prepare a Traffic Impact Analysis Report (TIAR) for the proposed Keaau-Pahoa Bypass Road on the island of Hawaii. The proposed project, referred to as "Bypass Road," is a new roadway that will bypass the community of Keaau. This introductory chapter describes the proposed project and the study methodology.

PROJECT DESCRIPTION

A new four-lane divided highway is proposed as an alternate route to bypass Keaau town to alleviate congestion through the town. The bypass road will primarily serve through traffic between Puna and Hilo. Restricted access and fewer intersections will provide better traffic flow with greater roadway capacities. Widening the existing roadway through the town is constrained by existing development adjacent to the roadway. A mauka route would skirt the northerly boundaries of the Keaau Agricultural Lots and intersect Volcano Road at an existing connection with Old Volcano Road. A makai route would better

accommodate the major direction of traffic flow and is proposed to meet Mamalahoa Highway at either Keaau Road or Shipman Industrial Park.

The proposed location of the project is shown on Figure 1. A more detailed map of the study area is shown as Figure 2.

STUDY METHODOLOGY

In order to conduct this traffic study, a number of tasks were performed, which are discussed in the following paragraphs.

1. Data Collection

The source of the data used in this study was traffic projections provided by Hawaii Department of Transportation (HDOT) and mapping provided by Imata and Associates. Additional information collected by Barton-Aschman included traffic conditions at various streets, geometrics, and traffic signal phasing and timing.

2. Analysis of Existing Traffic Conditions

Using the data collected, the existing traffic conditions in the vicinity of the project were determined. Traffic conditions can be described by the level-of-service (LOS) at each study intersection.

The planning method described in the 1985 Highway Capacity Manual (HCM) was used to determine the level-of-service at the intersections. A comparative analysis is presented for each scenario (i.e., existing and future conditions without and with the project) using this method.

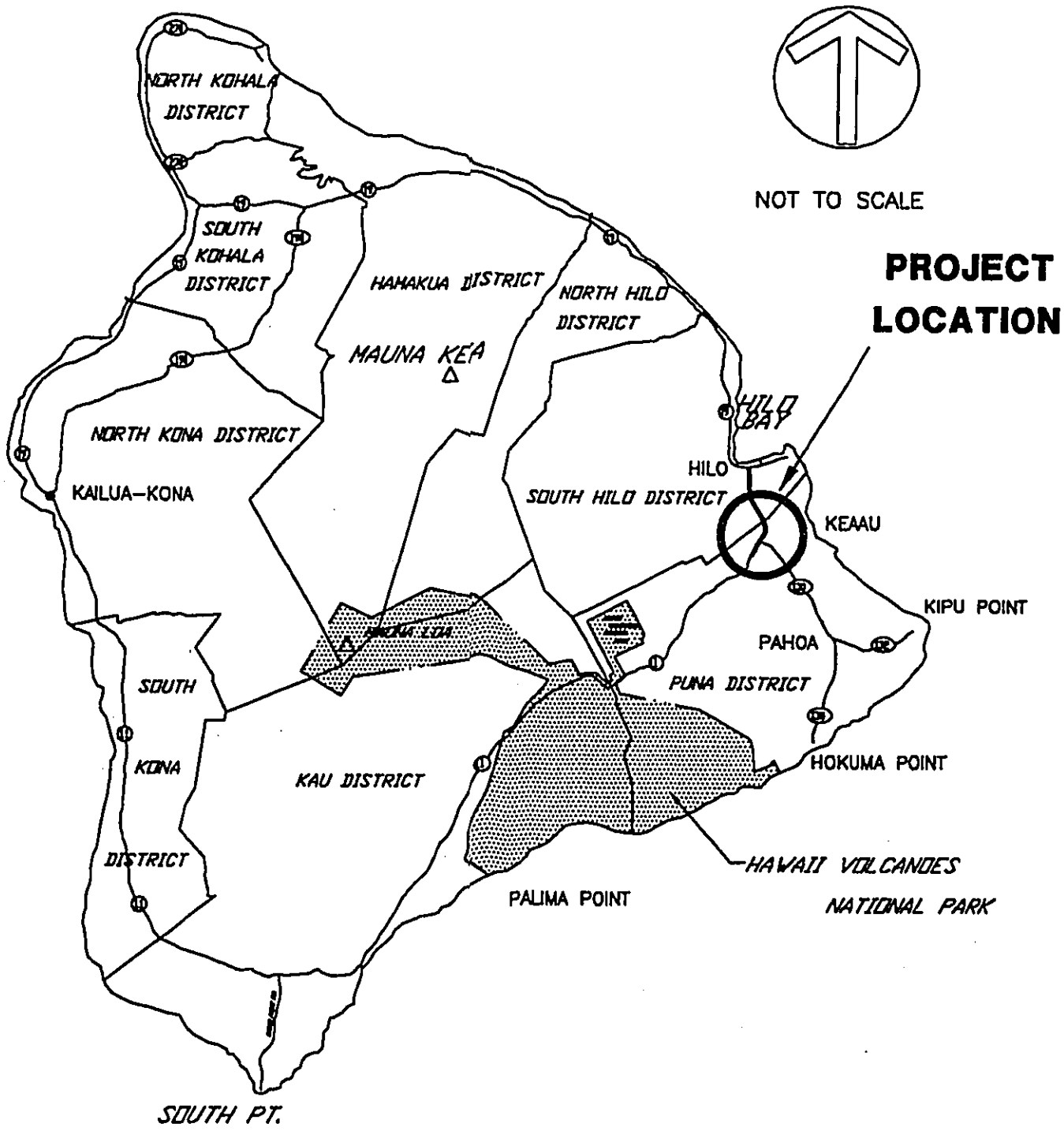

Figure 1

PROJECT LOCATION

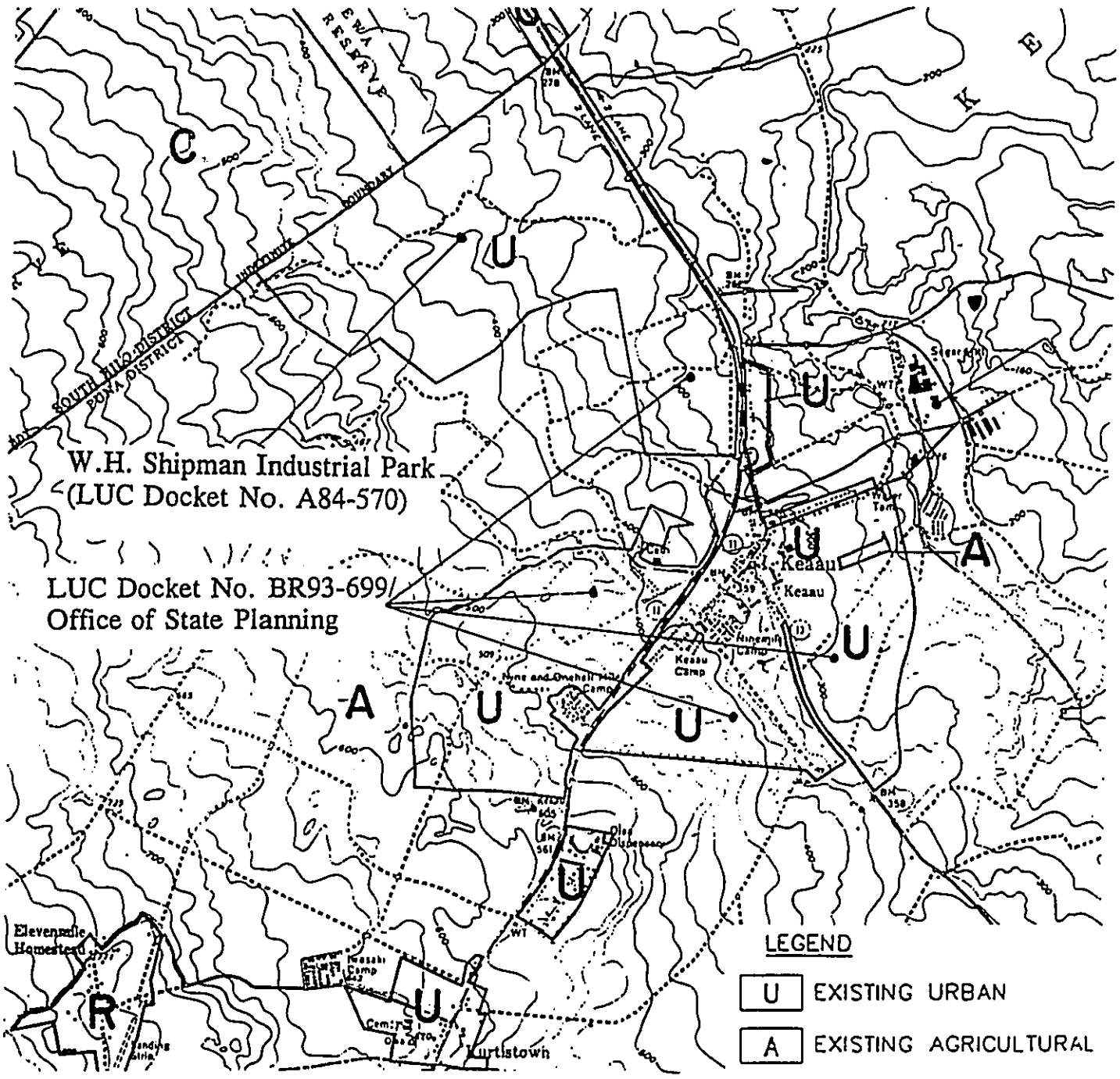

Figure 2

KEAAU BYPASS STUDY AREA

3. Analysis of No-Build Alternative

The no-build alternative is the scenario under which the bypass road is not built. The HDOT traffic projections for 2003 and 2013 were modified to determine future traffic at the intersection of Mamalahoa at Keaau-Pahoa Roads. Traffic conditions were then analyzed to determine the improvements required to accommodate future traffic without the Bypass Road. This analysis and the results are presented in Chapter 4.

4. Analysis of Project-Related Traffic Impacts

Since the proposed alignments created two intersections, which are the same for either alignment, an analysis was conducted to determine the number of lanes required for the Bypass Road, and a signal warrant analysis was conducted to determine if the intersections should be signalized. The HCM method of capacity analysis was used to analyze various lane configurations for the intersections to determine the most effective configuration. The recommended intersection configurations and signal phasing are presented in Chapter 4.

2. EXISTING CONDITIONS

ROADWAY CONFIGURATION

Since the Bypass Road is the subject of this study, the discussion of existing roadway configuration must be limited to Mamalahoa and Keaau-Pahoa Roads. It should also be noted that it is not the intent of this study to determine the exact location of the intersections of the bypass. The exact alignment of the roadway and the location of the proposed intersections will be determined by other team members. This study will provide input into that task.

The following description is based on field reconnaissance, traffic counts provided by HDOT, and the roadway inventory provided by HDOT.

Keaau-Pahoa Road is generally a straight, high-speed, two-lane roadway with a posted speed of 55 miles per hour (mph) providing access to the lower Puna region and linking the towns of Kalapana, Pahoa and Keaau with Hilo. At its northerly end, the Keaau-Pahoa Road is a narrower two-lane road with reduced speeds of 25 mph and 35 mph passing through Keaau to its intersection with the Hawaii Belt Road (Mamalahoa Highway) at a signal controlled intersection. Between Keaau and Hilo, Mamalahoa Highway is a four-lane divided expressway with a posted speed limit of 55 mph. Between the Hawaii Volcanoes National Park and Keaau, the Hawaii Belt Road (Volcano Road) is a high-speed, two-lane roadway designated as a minor arterial.

EXISTING TRAFFIC VOLUMES

Existing traffic volumes were calculated from background traffic provided by HDOT. The counts as provided were based on a network which incorporated the bypass road. Therefore, the projections had to be reworked to provide as estimate of traffic along Mamalahoa and Keaau-Pahoa Roads without the bypass road.

The resulting morning and afternoon peak hour traffic volumes are shown as Figure 3.

HISTORICAL TRAFFIC VOLUMES

Traffic count summaries provided by HDOT were reviewed to determine historical increases in traffic volumes along Mamalahoa Highway, Volcano Road and Pahoa Road. The historical daily traffic volumes are summarized in Table 1 and are shown graphically in Figure 4. Historical traffic volume characteristics are shown in Table 2.

EXISTING INTERSECTION CONFIGURATION

The only relevant existing intersection is Mamalahoa Highway at Keaau-Pahoa Road. This intersection is traffic signal controlled. The lane configuration is shown in Figure 5.

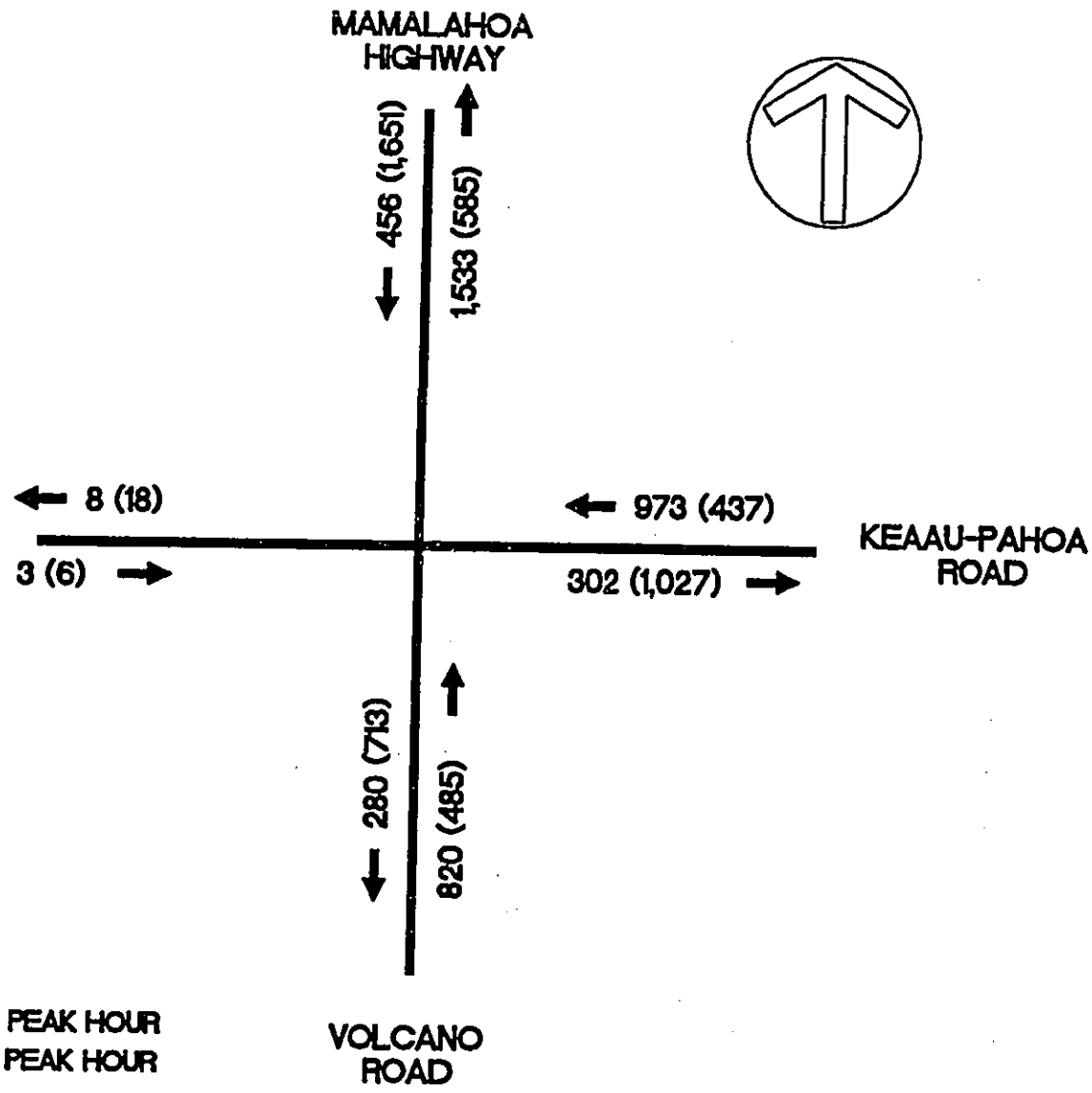

Figure 3

EXISTING TRAFFIC VOLUMES

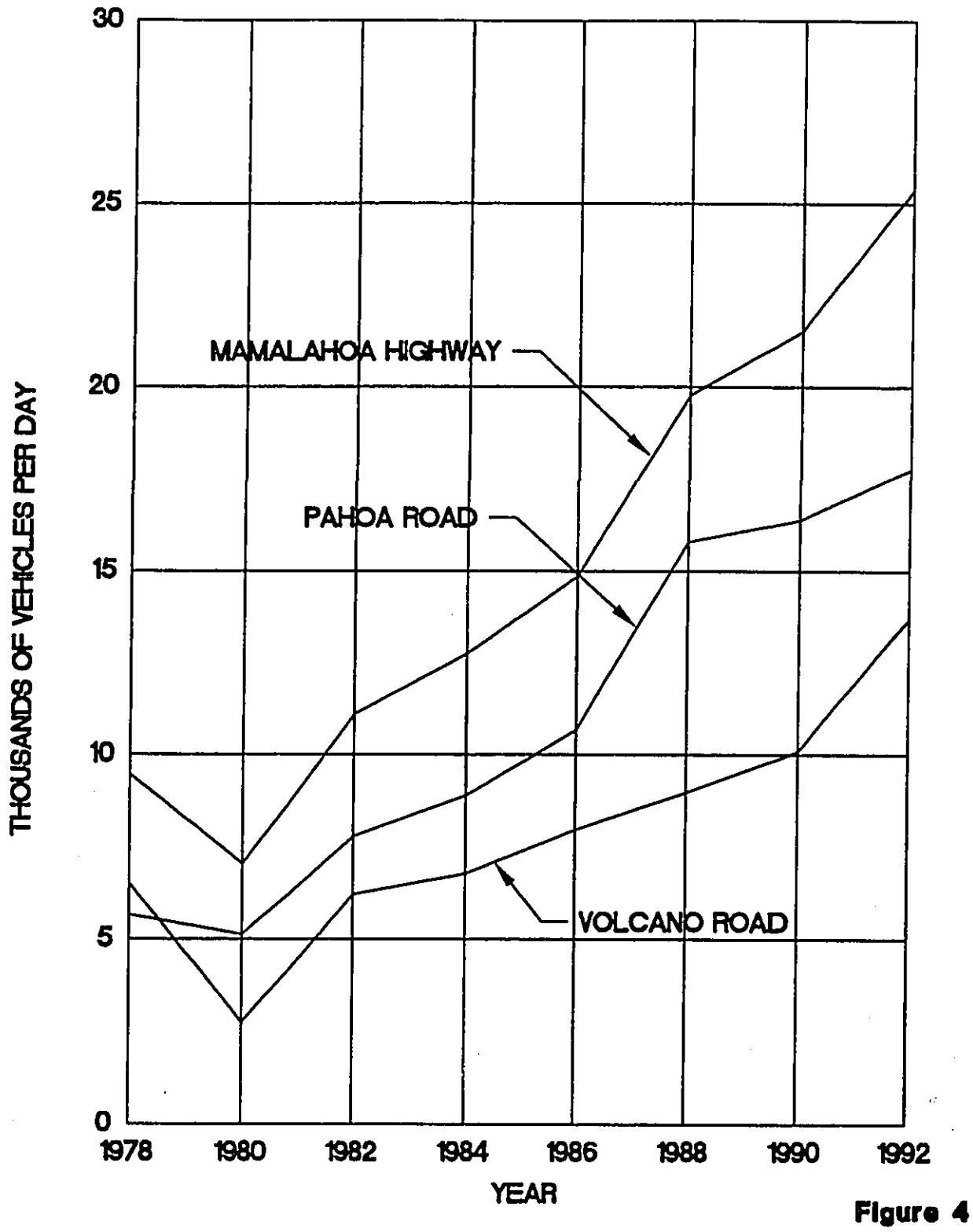

Figure 4

HISTORICAL TRAFFIC VOLUMES

Table 1 Historical Traffic Volumes

Year	Mamalahoa Road	Volcano Road	Pahoa Road
1978	9,468	6,518	6,124
1980	7,036	3,766	5,658
1982	11,081	6,212	7,785
1984	12,744	6,777	8,889
1986	14,855	7,959	10,654
1988	19,767	8,977	15,798
1990	21,518	10,081	16,387
1992	25,362	13,687	17,747

Note: Source: HDOT, 1992 Traffic Survey Data

Table 2 Historical Traffic Volume Characteristics

Characteristic	Mamalahoa Road			Volcano Road			Pahoa Road		
	North-bound	South-bound	Total	North-bound	South-bound	Total	East-bound	West-bound	Total
1992 ADT	12,355	13,007	25,362	6,879	6,808	13,687	8,496	9,251	17,747
AM Peak Hour		7-8 AM			7-8 AM			6:45-7:45 AM	
AM Peak Volume	1,533	456	1989	820	280	1,100	973	302	1275
k		7.84%			8.04%			7.18%	
D	77%	23%	100%	75%	25%	100%	77%	23%	100%
PM Peak Hour		4:45-5:45 PM			4:15-5:15 PM			4:45-5:45 PM	
PM Peak Volume	585	1,651	2,236	485	713	1,198	437	1,027	1,464
k		8.82%			8.75%			8.25%	
D	26%	74%	100%	40%	60%	100%	30%	70%	100%

Notes:
ADT = Average Daily Traffic
k = Peak Hour Factor (Percent of ADT during peak hour)
D = Per Cent of peak hour traffic in the direction noted
Source: HDOT, 1992 Traffic Survey Data

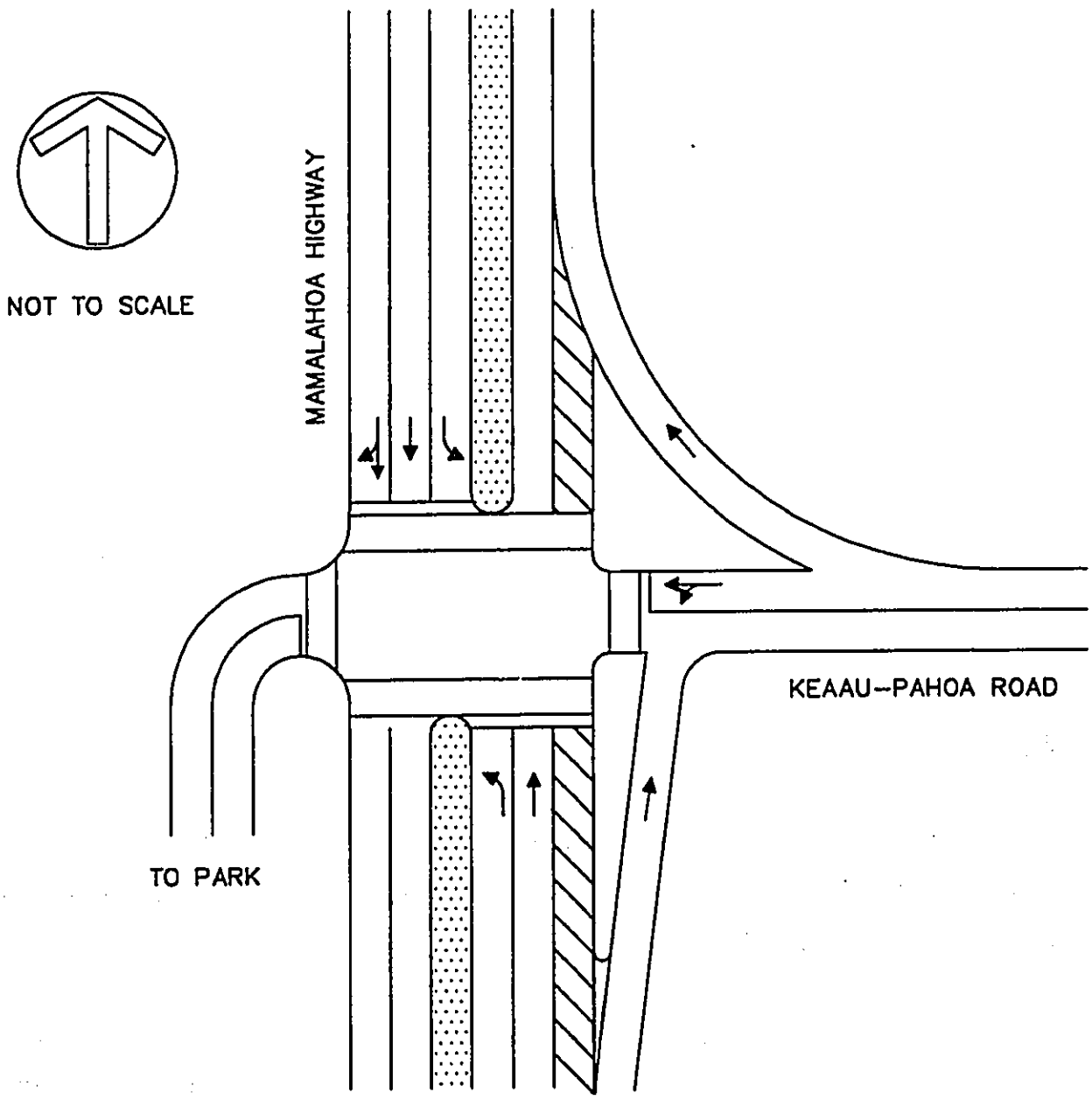

Figure 5

EXISTING LANE CONFIGURATION

3. NO-BUILD ALTERNATIVE

The objective of a traffic impact analysis is to determine the impacts of a proposed project. In this chapter the impact of not activating the proposed Bypass Road (the No-Build Alternative) is determined.

Traffic projections provided by Hawaii Department of Transportation (HDOT) were adjusted to estimate 1993, 2003, and 2013 traffic volumes without the proposed bypass.

It should be noted that the traffic projections did not include the eastbound approach to the intersection. Therefore, traffic volumes for this approach to the intersection were adjusted using the annual traffic counts conducted by HDOT.

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The objective of a traffic impact analysis is to determine the impacts of a proposed project. In this chapter the impact of not activating the proposed Bypass Road (the No-Build Alternative) is determined.

Traffic projections provided by Hawaii Department of Transportation (HDOT) were adjusted to estimate 1993, 2003, and 2013 traffic volumes without the proposed bypass.

It should be noted that the traffic projections did not include the eastbound approach to the intersection. Therefore, traffic volumes for this approach to the intersection were adjusted using the annual traffic counts conducted by HDOT.

DESCRIPTION OF NO-BUILD ALTERNATIVE

The no-build alternative is the scenario in which the Bypass Road is not constructed. For this situation, all traffic that would be assigned to the Bypass Road is forecast to use the existing roadway network. All traffic would use the existing intersection of Mamalahoa Road at Pahoa Road.

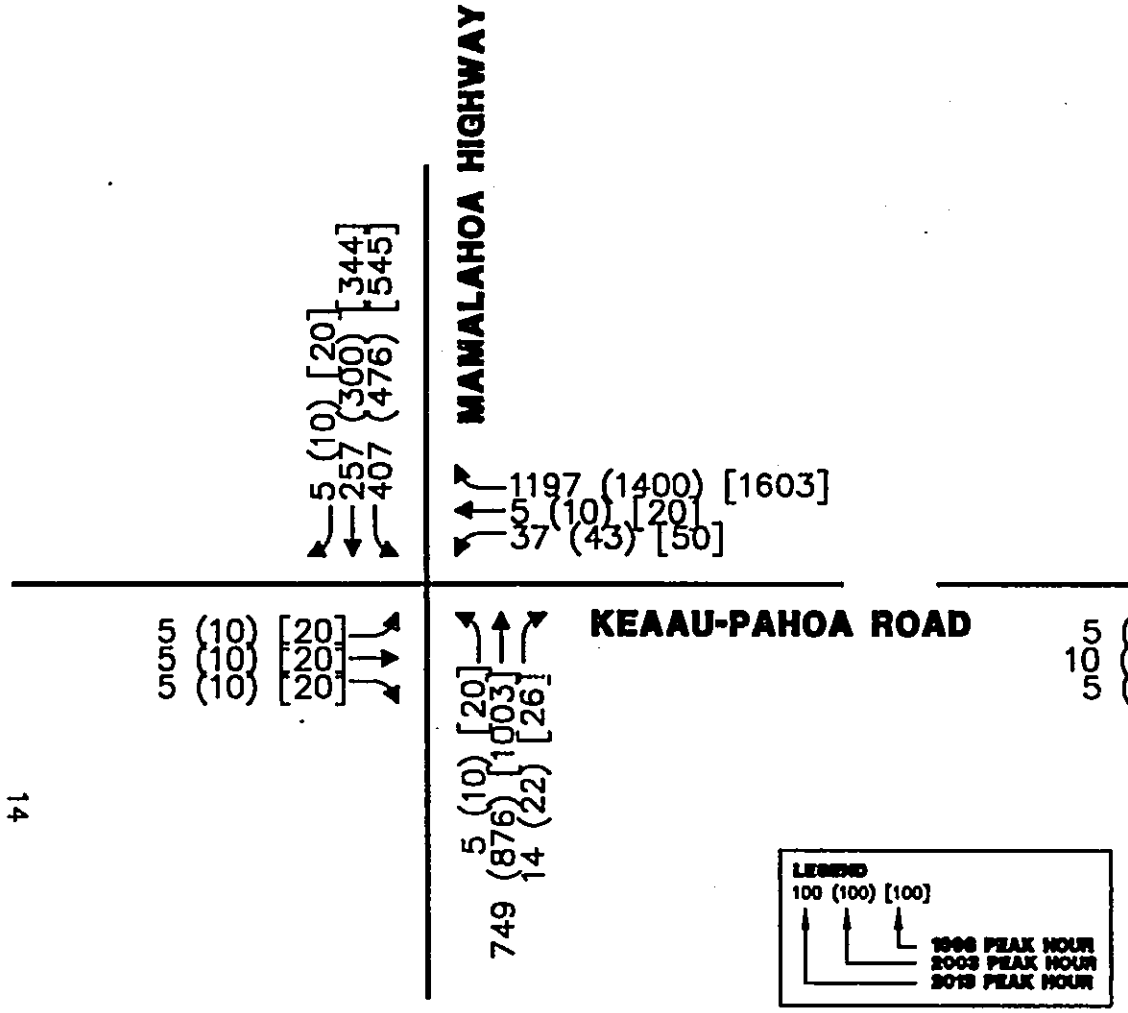
TRAFFIC VOLUMES AND LEVEL-OF-SERVICE ANALYSIS

The resulting traffic volumes for design years 1993, 2003, and 2013 are shown in Figure 6. The resulting levels-of-service for the design years are shown in Table 3.

MITIGATION MEASURES FOR NO-BUILD ALTERNATIVE

As shown in the level-of-service analysis, the intersection of Mamalahoa Highway will have to be improved to accommodate the projected traffic volumes if the Bypass Road is not built. Without the Bypass Road, the level-of-service for 1993 projected conditions is 'E' during both the morning and afternoon peak hours. To accommodate the anticipated 1993 conditions, an additional southbound to eastbound left-turn lane and an additional northbound through-lane should be added. The resulting level-of-service is 'A' during both the morning and afternoon peak hours.

To accommodate 2003 projected conditions, the westbound to northbound right-turn lane should be widened from one to two lanes. This will require widening along the northbound direction of Mamalahoa Highway to accommodate the lane drops. The widening will accommodate 2003 peak hour traffic at level-of-service 'B' (both morning and afternoon) and 2013 traffic at level-of-service 'C.' Thus the two improvements described above will accommodate the projected traffic volumes through 2013 at level-of-service 'C.'



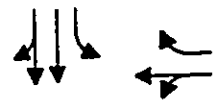
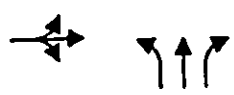
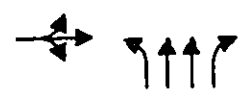
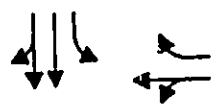
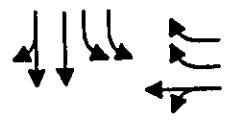
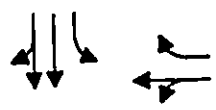
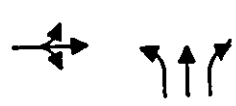
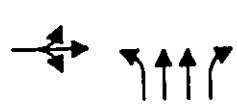
AM PEAK HOUR

PM PEAK HOUR

Figure 6

TRAFFIC VOLUMES NO-BUILD ALTERNATIVE

Table 3
LEVEL OF SERVICE ANALYSIS FOR NO BUILD ALTERNATIVE
MAMALAHOA HIGHWAY AT KEAAU-PAHOA ROAD

Year	Period	Peak Hour Volume	Existing Conditions		Mitigated Conditions	
			Lane Configuration	V/C [LoS]	Configuration	V/C [LoS]
1993	AM Peak Hour	5 257 407 / 1197 5 37 / 5 749 14		0.903 [E]		0.577 [A]
	PM Peak Hour	5 656 1053 / 460 5 20 / 105 5 / 5 323 33		0.919 [E]		0.514 [A]
2003	AM Peak Hour	10 300 476 / 1400 10 43 / 10 100 / 10 876 22		1.076 [F]		.684 [B]
	PM Peak Hour	10 767 1230 / 537 20 5 / 10 100 / 10 378 38		1.125 [F]		0.626 [B]
2013	AM Peak Hour	20 344 545 / 1603 20 50 / 20 200 / 20 1003 26		1.231 [F]		0.783 [C]
	PM Peak Hour	15 878 1409 / 616 15 26 / 20 200 / 20 437 44		1.290 [F]		.719 [C]

4. PREFERRED ALTERNATIVE

At the initiation of the study, there were several alternatives. After review of the alternatives by the reviewing agencies, the preferred alternative shown in Figure 7 was selected. The next step is to determine the geometric requirements.

TRAFFIC PROJECTIONS

Traffic projections for 2003 and 2013 were provided by HDOT-Planning. Average Daily Traffic (ADT), A.M. peak hour, and P.M. peak hour traffic volumes were provided. These volumes are summarized in Figures 8 and 9 for 2003 and 2013, respectively.

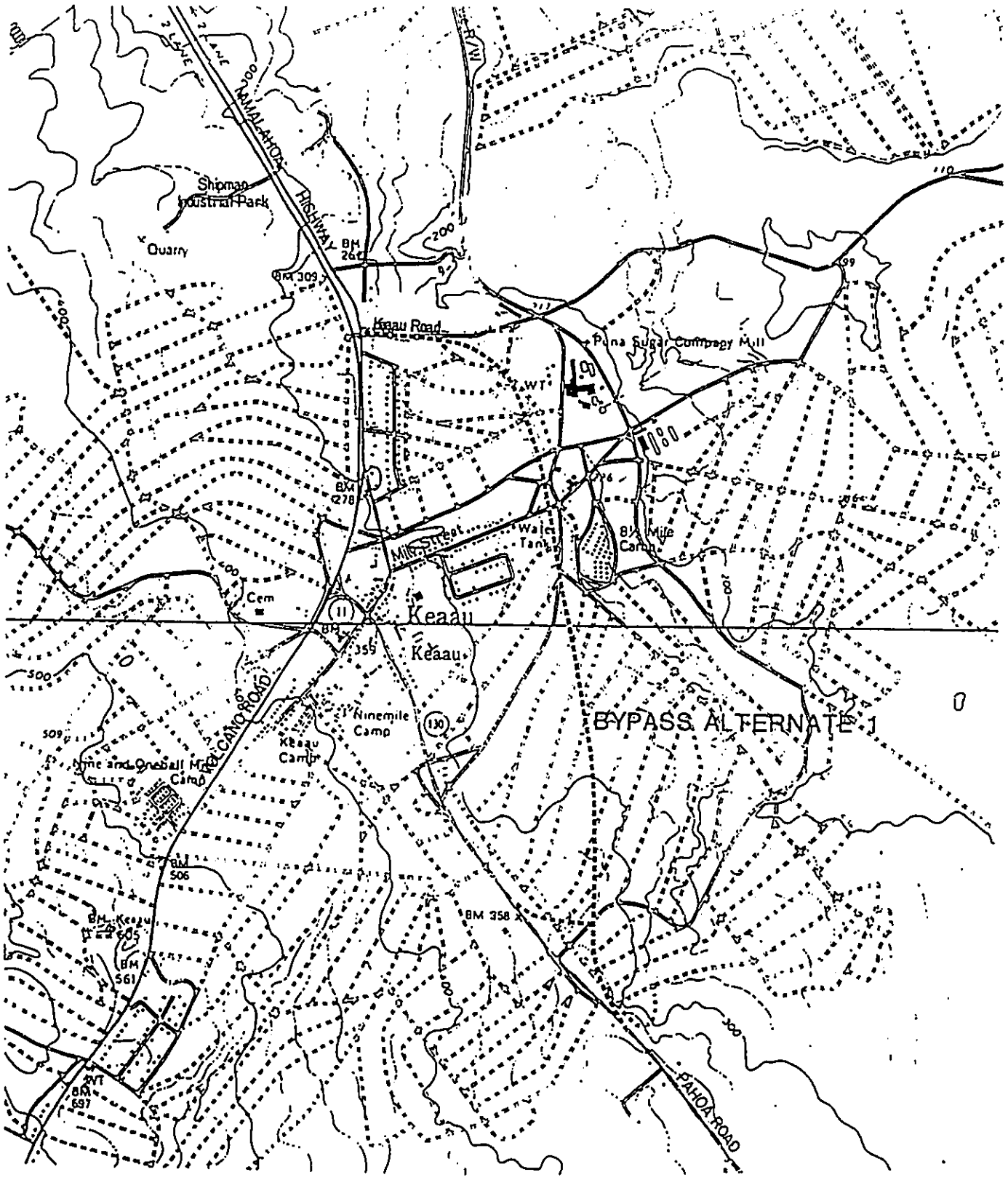


Figure 7

PREFERRED ALTERNATIVE ALIGNMENT

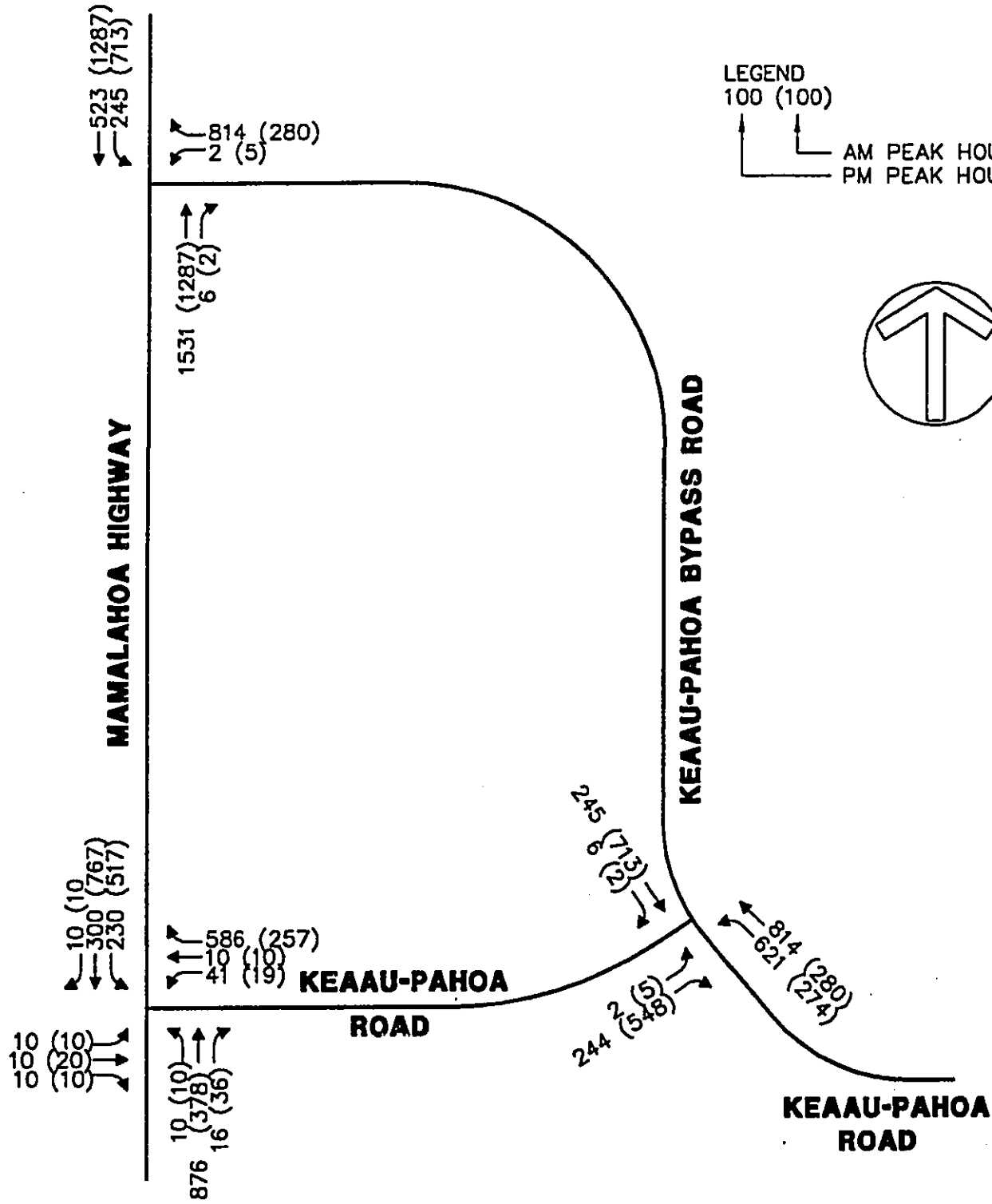


Figure 8

2003 TRAFFIC PROJECTIONS

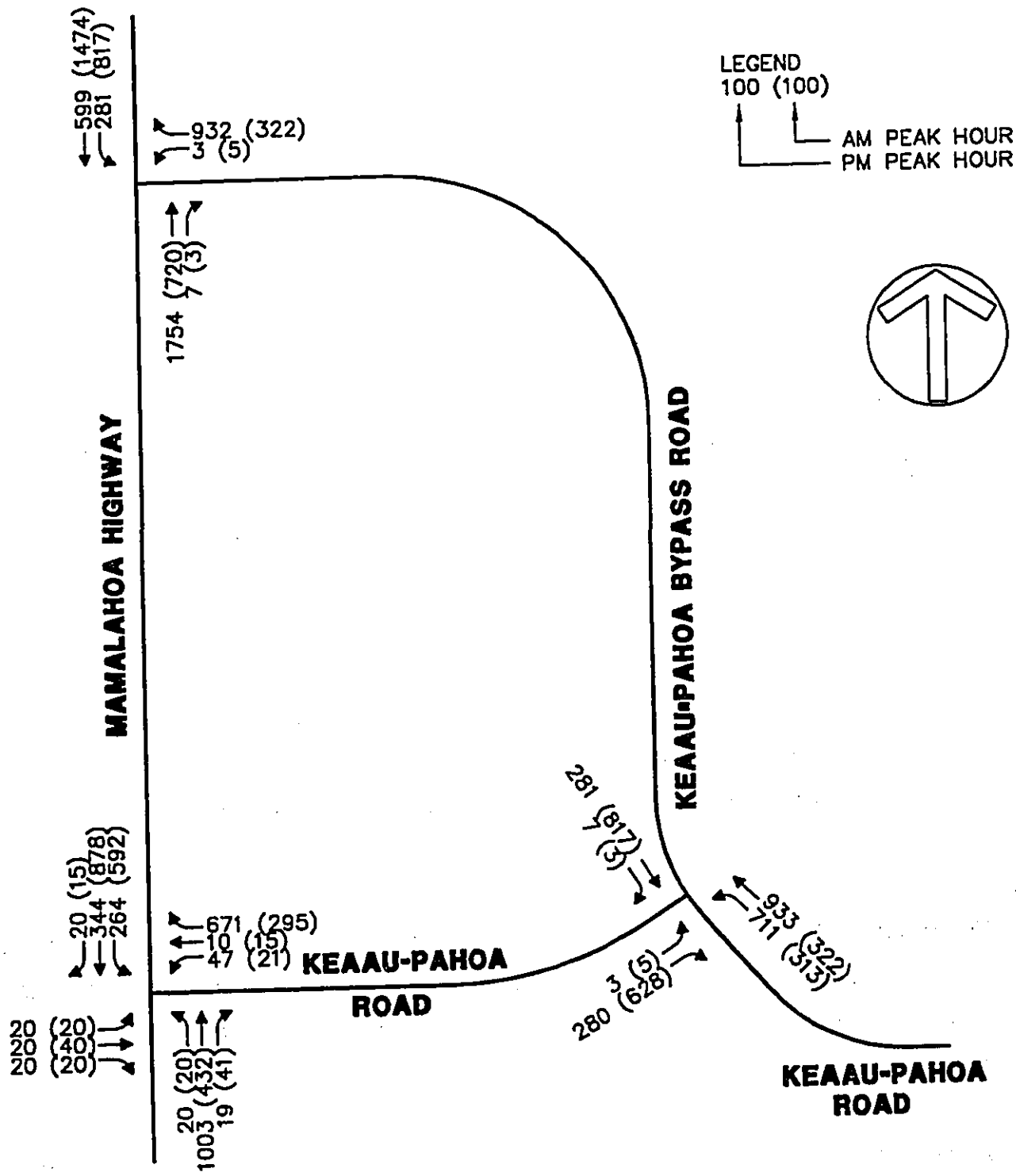


Figure 9

2013 TRAFFIC PROJECTIONS

NUMBER OF LANES

One of the objectives of the study is to determine the number of lanes required for the roadway and the intersection configurations. For purposes of the analyses presented in this report. the level-of-service for a two-lane, two-way roadway was compared to a four-lane, undivided highway. The intersection configurations will be discussed in the following chapter.

The methodology outlined in the 1985 Highway Capacity Manual (HCM) was used to calculate the level-of-service for a two-lane and a four-lane undivided highway, using 2013 design basic traffic volumes. In utilizing the HCM methodology, assumptions must be made relative to several geometric and design factors. The assumptions used are summarized as follows:

(1) Design speed is 60 mph.

(2) Lane widths are 12 feet, with a minimum lateral clearance of 6 feet.

(3) Terrain is rolling.

(4) For the two-lane roadway condition, 50 percent of the roadway would be "no passing."

The results of the LOS analysis are presented as Appendix B. For the two-lane roadway, the LOS would be "D," for 2013 design traffic. This indicates that congestion and delays can be expected during peak hours. The HDOT Design Manual states that the desired design LOS should be "C."

A four-lane undivided highway would operate at LOS "A," which is above the HDOT criteria.

It is recommended that the proposed Bypass Road be designed as a four-lane divided highway because a two-lane roadway would not provide sufficient capacity to accommodate 2013 design volumes at an acceptable LOS. Since the LOS is "A," the

excess capacity would be available to accommodate traffic growth beyond 2013 or any local development that is currently not anticipated.

The recommended typical section is shown as Figure 10.

INTERSECTION CONFIGURATION

The next step is to determine the lane configuration at the intersections of Mamalahoa Highway at Bypass Road and Pahoa Road and Bypass Road. The first task is to determine if traffic signals are warranted at the study intersections. This was done using the criteria contained in the Manual of Uniform Traffic Control Devices, which is the standard reference used in Hawaii. A worksheet using estimated Average Daily Traffic has been developed that would determine if the minimum vehicular or interruption of traffic flow warrants are satisfied.

The worksheets are presented as Appendix C. The results of the traffic signal warrant analysis are that traffic signals are warranted at both the study intersections using estimated 2003 traffic projections. Therefore, the signals should be designed and installed during the initial construction phase.

INTERSECTION LANE CONFIGURATIONS

The required lane configurations are based on the assumption that traffic signals are to be installed based on the results of the traffic signal warrant analysis discussed in the previous section and that the design level-of-service would be 'C' since the intersections are located in relatively rural areas.

Various lane configurations were analyzed to determine the most effective configuration. This analysis is summarized in Figure 11.

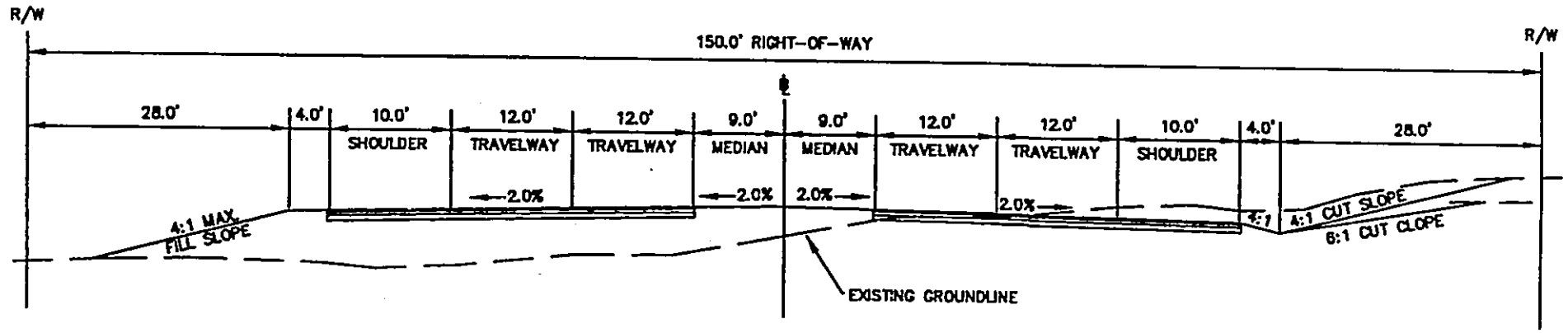
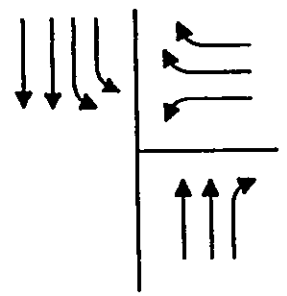
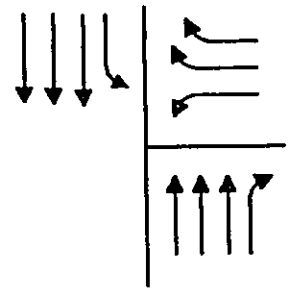
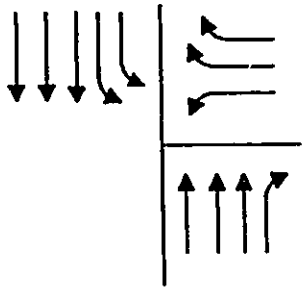
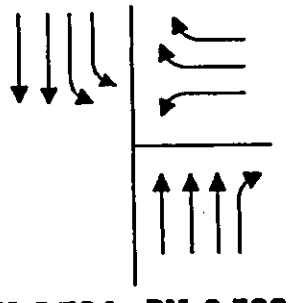
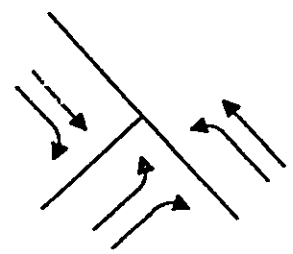
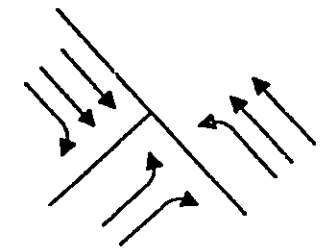
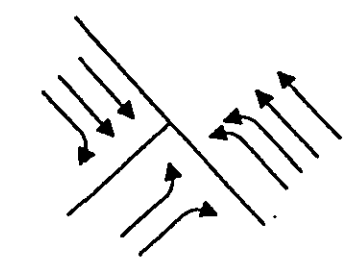


Figure 10

RECOMMENDED TYPICAL SECTION

MAMALAHOA HIGHWAY AT BYPASS ROAD	 **AM 0.959 PM 0.609**	 **AM 0.857 PM 0.802**	 **AM 0.764 PM 0.529**	 **AM 0.764 PM 0.588**
BYPASS ROAD AT KEAAU-PAHOA ROAD	 **AM 0.829 PM 1.131**	 **AM 0.736 PM 0.858**	 **AM 0.499 PM 0.753**	

LEGEND

AM 0.829 PM 1.131

- PM PEAK HOUR VOLUME/CAPACITY RATIO
- AM PEAK HOUR VOLUME/CAPACITY RATIO

NOTE: ABOVE ANALYSIS IS BASED ON 2013 TRAFFIC PROJECTIONS, SEE FIGURE 7.

Figure 11

INTERSECTION CONFIGURATION ANALYSIS

The final recommended lane configurations are shown as Figures 12 and 13 for the Mamalahoa Highway/Bypass Road and Bypass Road/Keaau-Pahoa Road intersections, respectively.

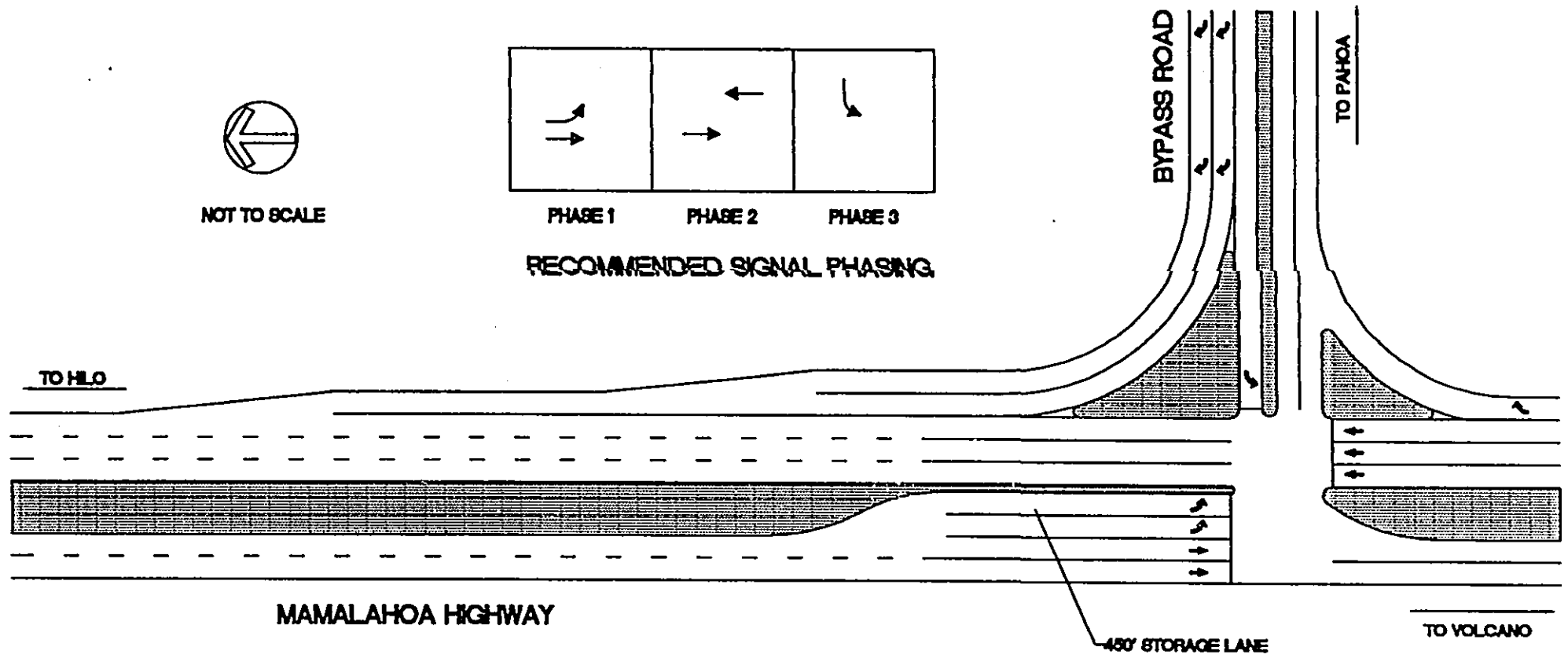


Figure 12

RECOMMENDED PLAN
MAMALAHOA HOGHWAY AT BYPASS ROAD

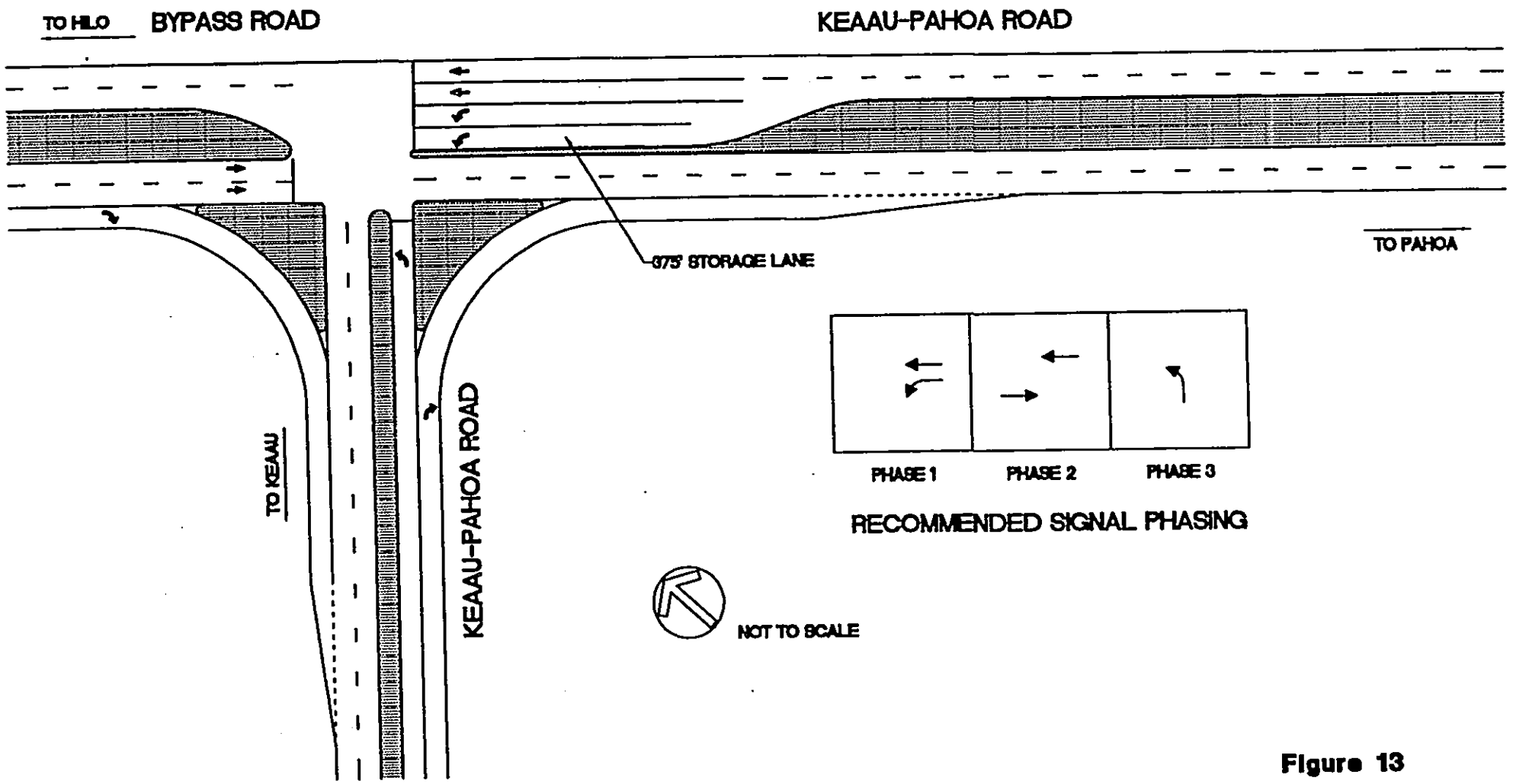


Figure 13

RECOMMENDED PLAN
BYPASS ROAD AT KEAAU-PAHOA ROAD

5. CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations of the traffic study are as follows:

1. The objectives of the traffic study were to determine the required lane configurations to accommodate 2013 traffic projections at level-of-service 'C' or better and to determine the traffic related impacts of the proposed Bypass Road.

2. A level-of-service analysis of a two-lane versus a four-lane roadway was conducted and it was determined that the Bypass Road should be a four-lane divided highway.

3. Since only one alternative was selected for analysis for this study, the project analyzed the impacts of a no-build scenario in which all traffic would utilize the intersection of Mamalahoa Highway at Keaau-Pahoa Road. The analysis determined that if the Bypass was not built the intersection would have to be

determined that if the Bypass was not built the intersection would have to be modified to accommodate 2013 traffic projections at level-of-service 'C.' The improvements consist of the following:

(1) an additional southbound left-turn lane,

(2) an additional northbound through-lane, and

(3) an additional lane on the westbound to northbound right-turn ramp.

4. The lane configurations for the intersections of Mamalahoa Highway at Bypass Road and Bypass Road at Keaau-Pahoa Road were determined. Schematics of the proposed lane configurations and the recommended traffic signal timings are presented in the previous chapter.

5. With completion of the Bypass Road, the Level-of-Service at the intersection of Mamalahoa Highway at Bypass Road will be 'D' and 'C' during the morning and afternoon peak periods, respectively, for 2013 conditions. This assumes that no additional improvements at this intersection is implemented.

APPENDIX A
HDOT TRAFFIC PROJECTIONS

TRAFFIC ASSIGNMENT PROJECT TA 93-14
KEAAU BYPASS ROAD
PROJECT NO. 130B-01-92
JULY 1993

PURPOSE

Data from this traffic assignment project, as requested by HWY-PA, will be used for planning studies.

REQUIREMENTS

1. Intersection turning movements for:
   a. 1993, 2003, and 2013 ADT
   b. 1993, 2003, and 2013 A.M. Peak Hour Traffic
   c. 1993, 2003, and 2013 P.M. Peak Hour Traffic
2. K, D, and T for A.M. and P.M. Peak Hours
3. T24

BASIC CONDITIONS AND ASSUMPTIONS

1. The traffic was based on the 2010 ADT from the Island of Hawaii Long Range Highway Plan, Final Report, May 1991, prepared by Parsons Brinckerhoff Quade and Douglas, Inc.
2. Growth and reduction factors were developed by using the 2010 ADT and 1992 ground counts in the project area.
3. The ADT turning movements were based on judgement to match the final report volumes.
4. The peak hour leg volumes were based on historical K and D factors and the 1993 ADT developed for this project.
5. The peak hour turning movements were primarily based on the turning movement percentages of the lowest volume ADT turns.
6. The K and D factors were based on traffic developed for this project.
7. The truck factors were based on the historical record at:
   a. Station 2LL, Mamalahoa Highway at Keaau-Pahoa Road
   b. Station 2E, Mamalahoa Highway at Old Mamalahoa Highway
   c. Station C2H, Keaau-Pahoa Road, 1.60 mile northwest of Waipahoehoe Bridge

7/13/93
cm

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION
HIGHWAYS DIVISION

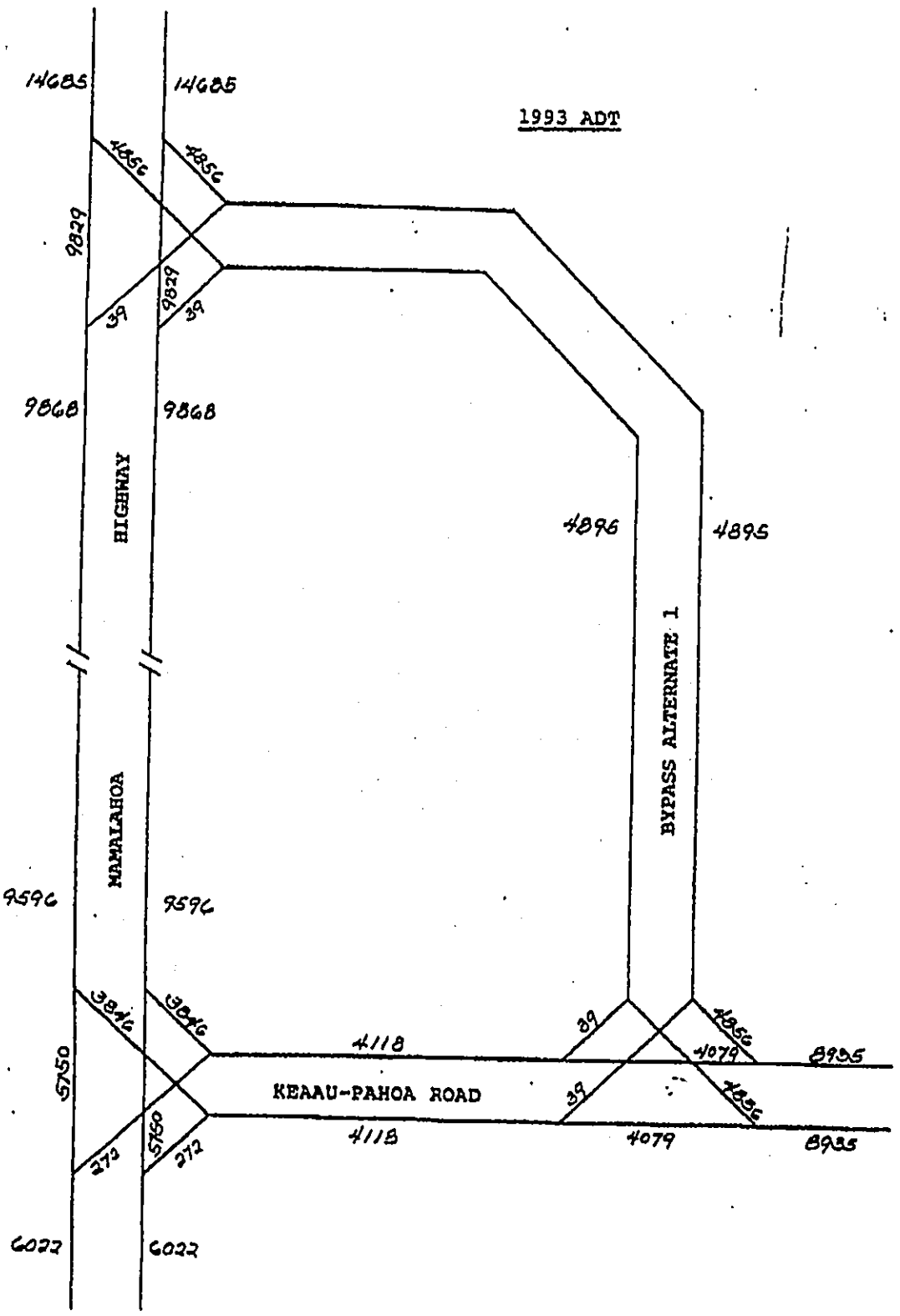
PREPARED BY THE

PLANNING BRANCH

IN COOPERATION WITH THE

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

REF. NO. TA 93-14
JULY 1993



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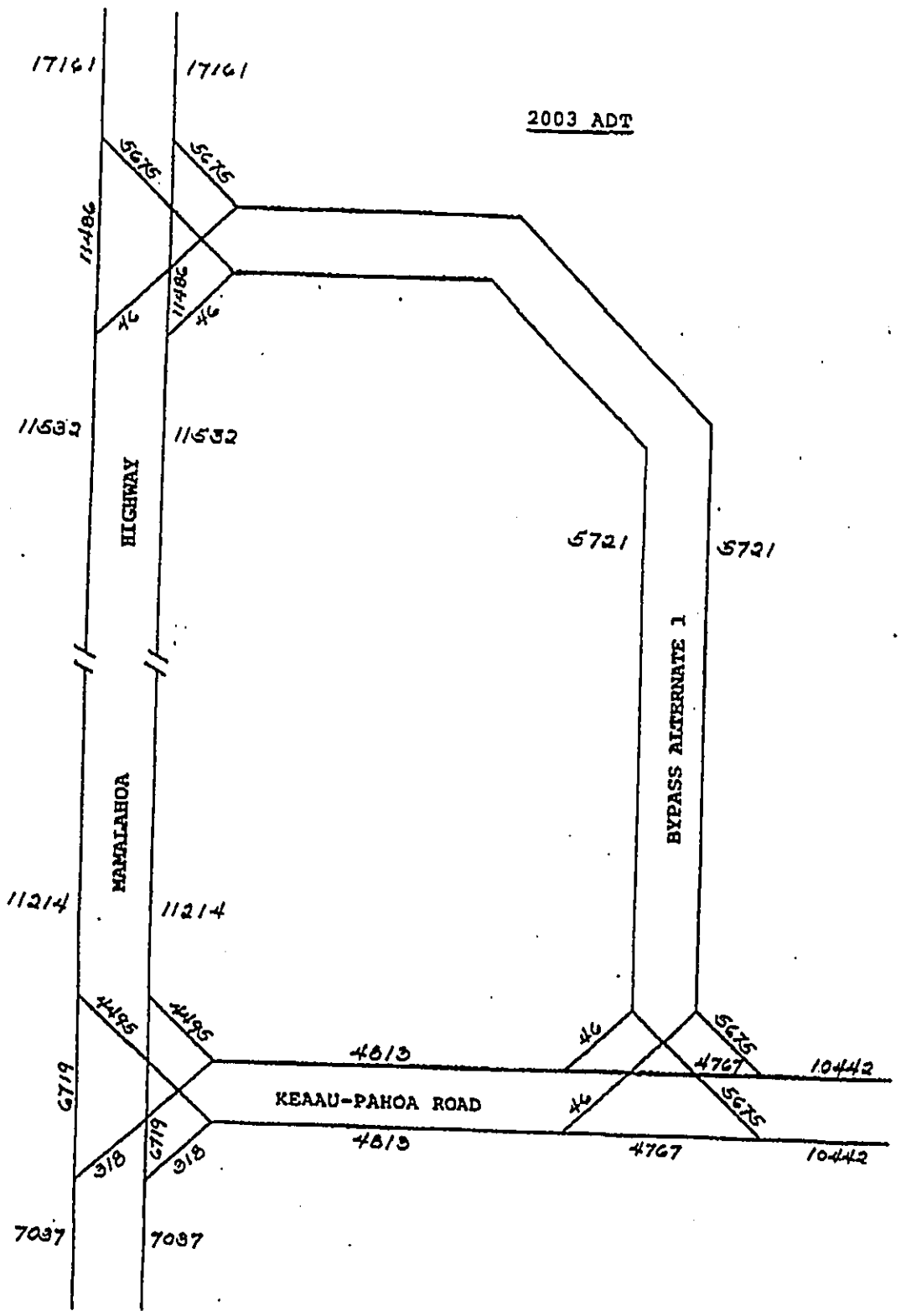

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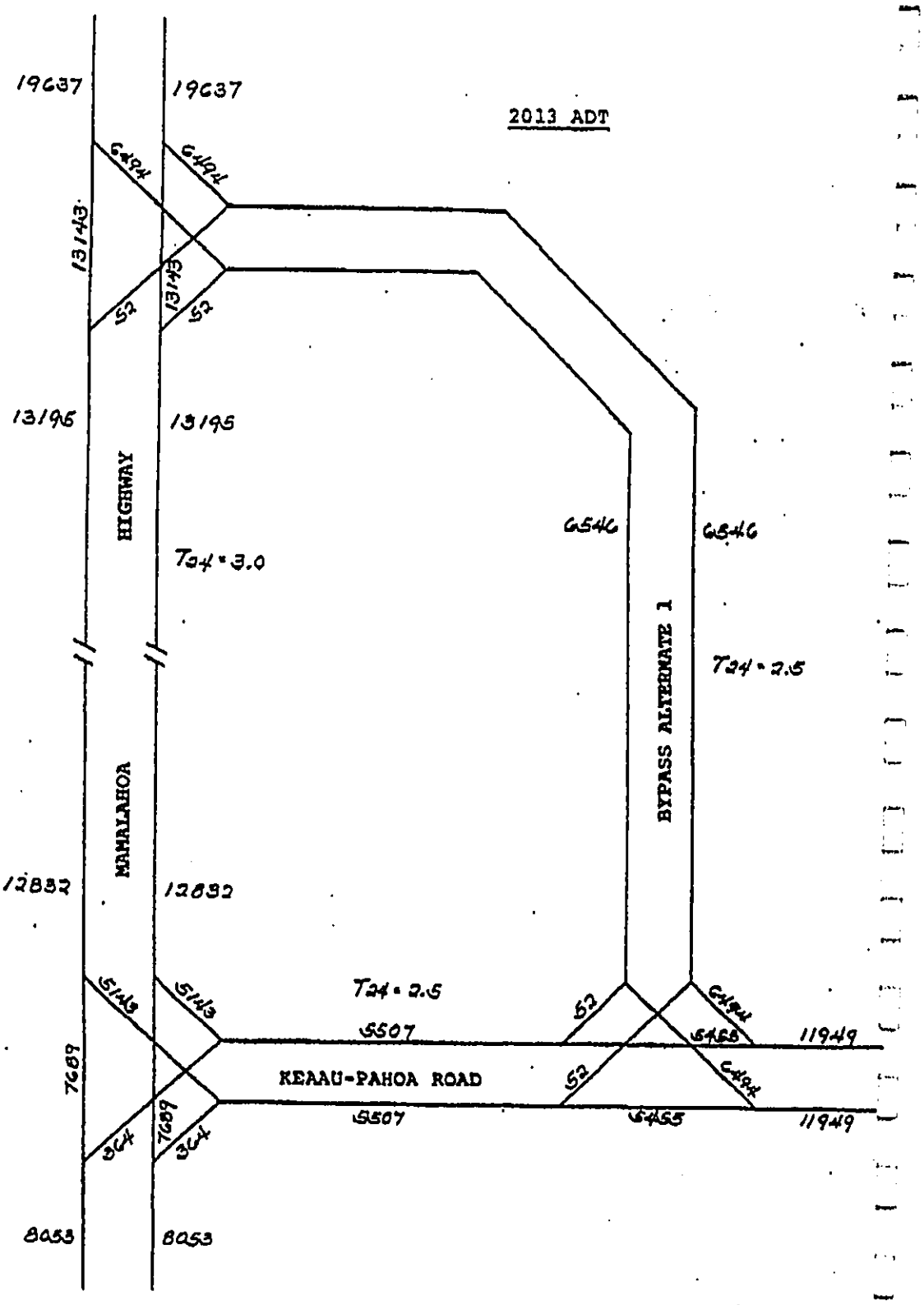

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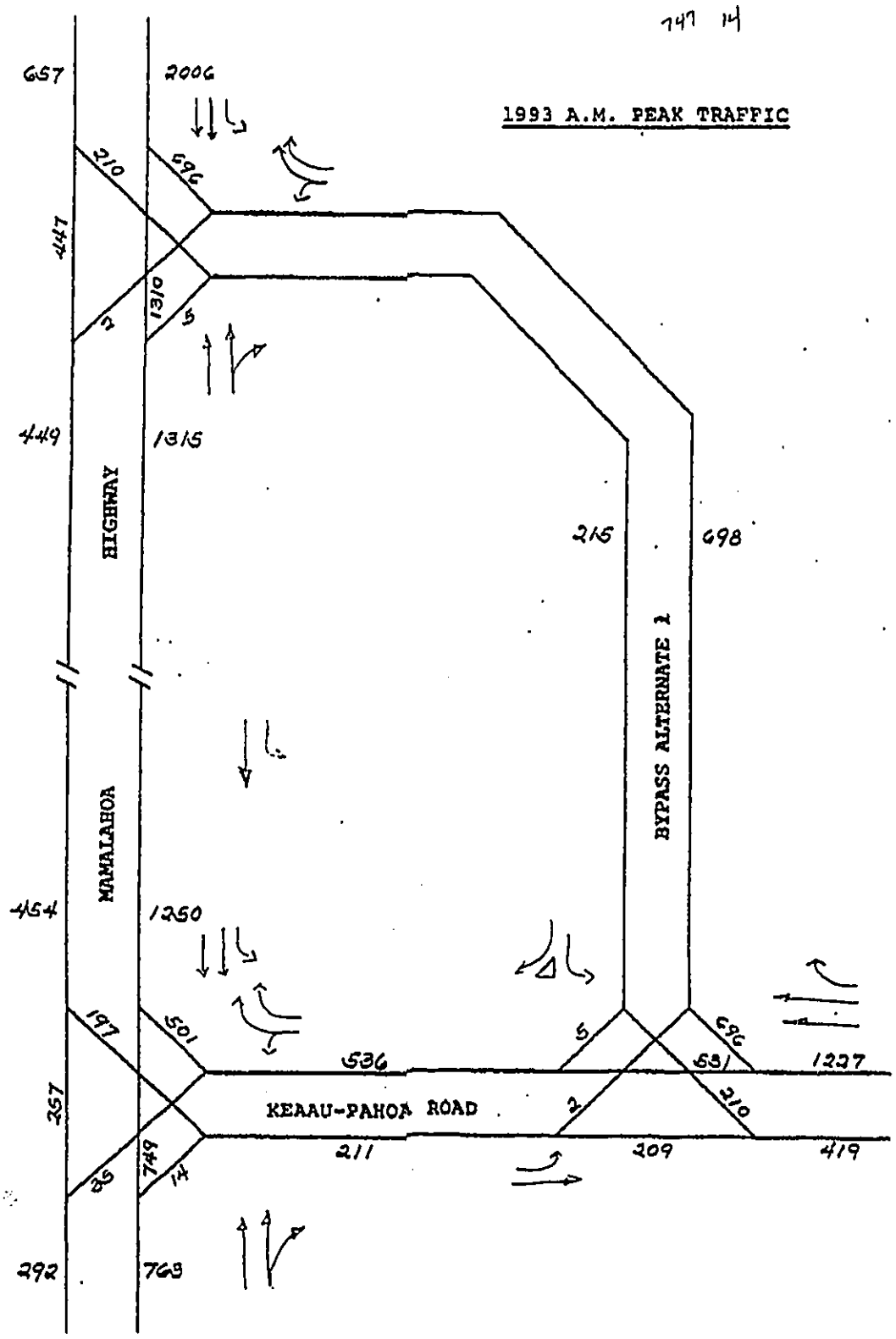
FEDERAL HIGHWAY ADMINISTRATION
REF. NO. TA 93-14
JULY 1993

257 207 1197 37 747 14

1993 A.M. PEAK TRAFFIC



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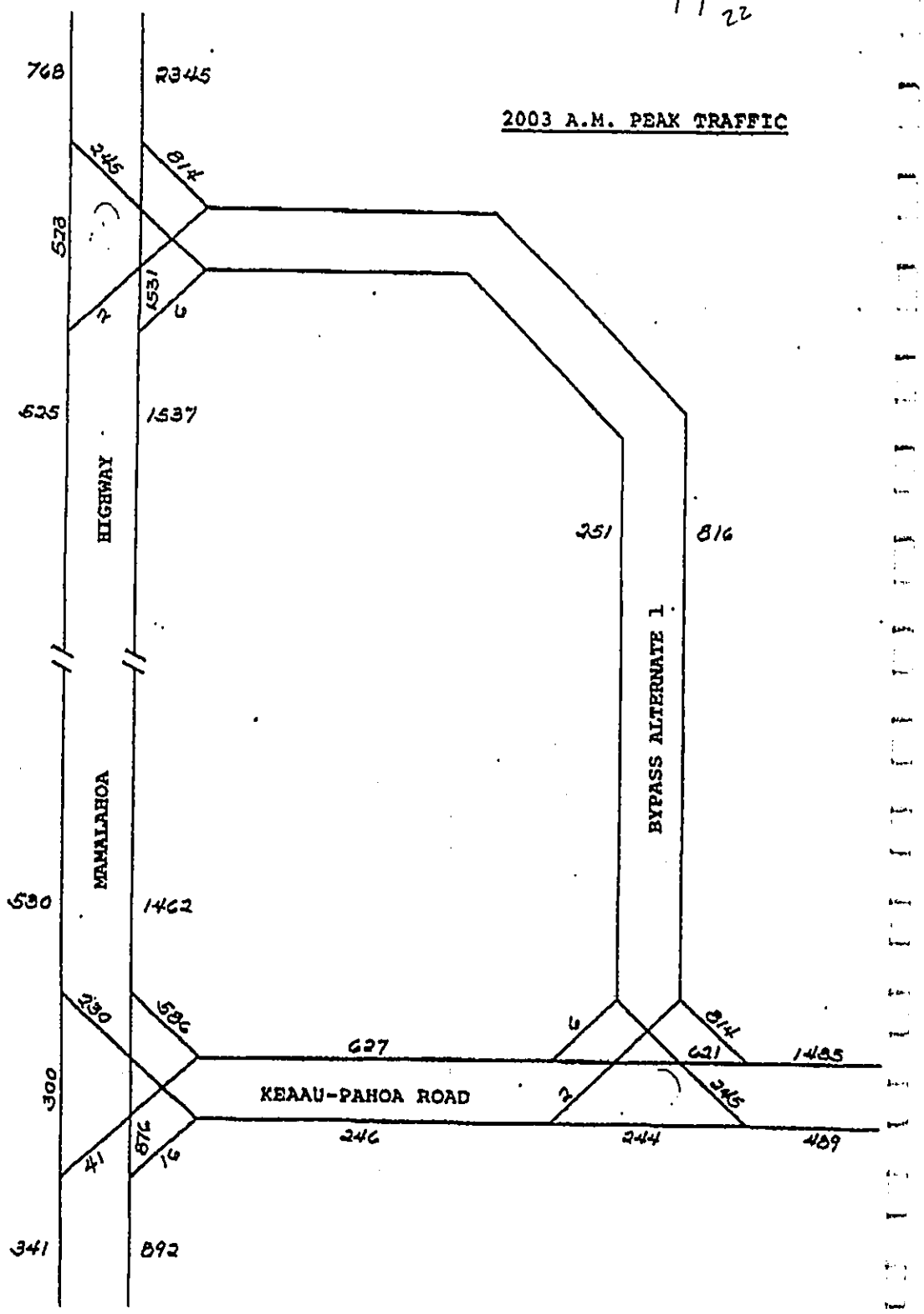
FEDERAL HIGHWAY ADMINISTRATION
REF. NO. TA 93-14
JULY 1993

3-0 ↓ 475 ← 1400 ↓ 03 4e
174 ↑ ↱ 22

2003 A.M. PEAK TRAFFIC



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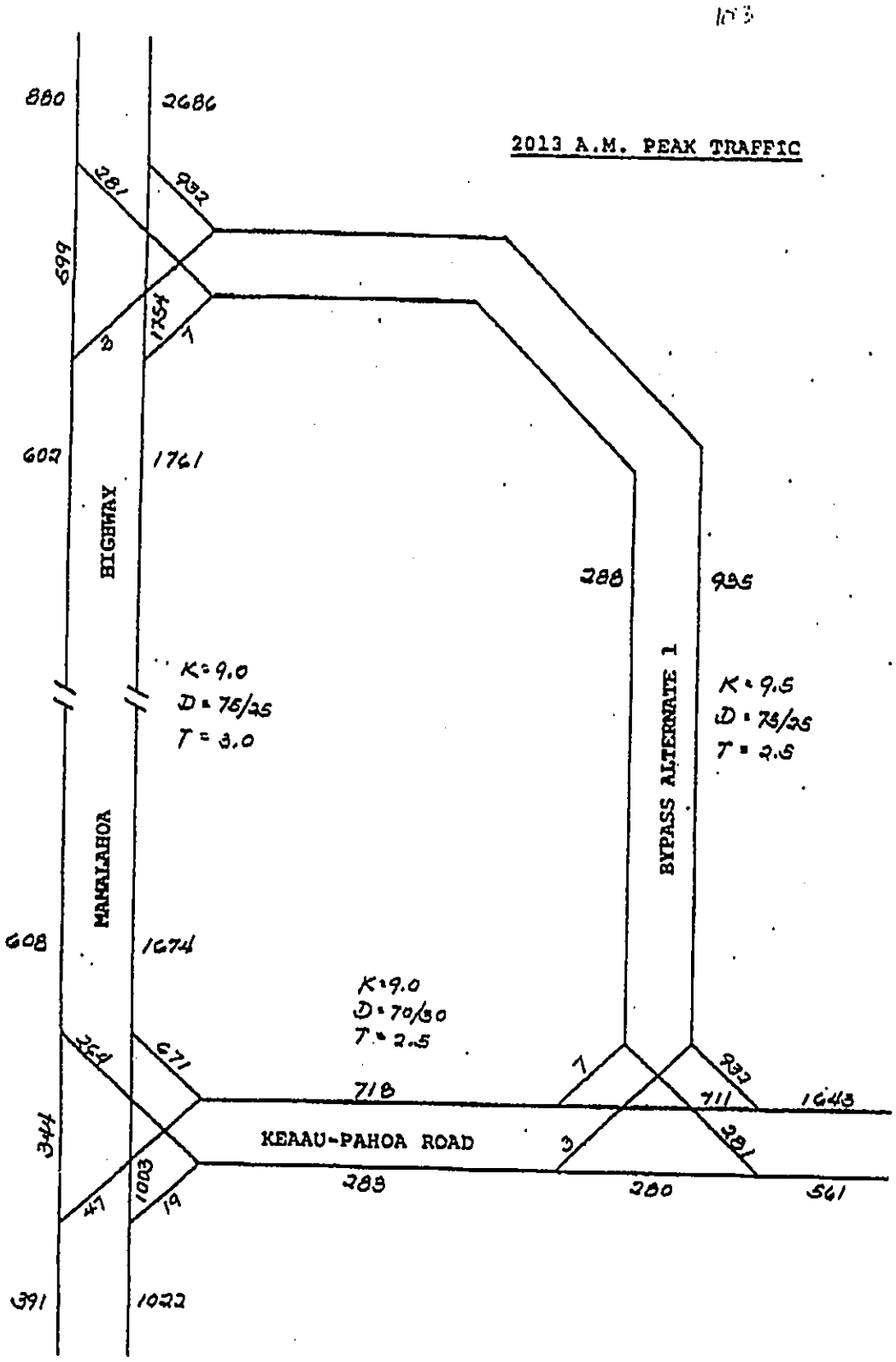
2013 A.M. PEAK TRAFFIC



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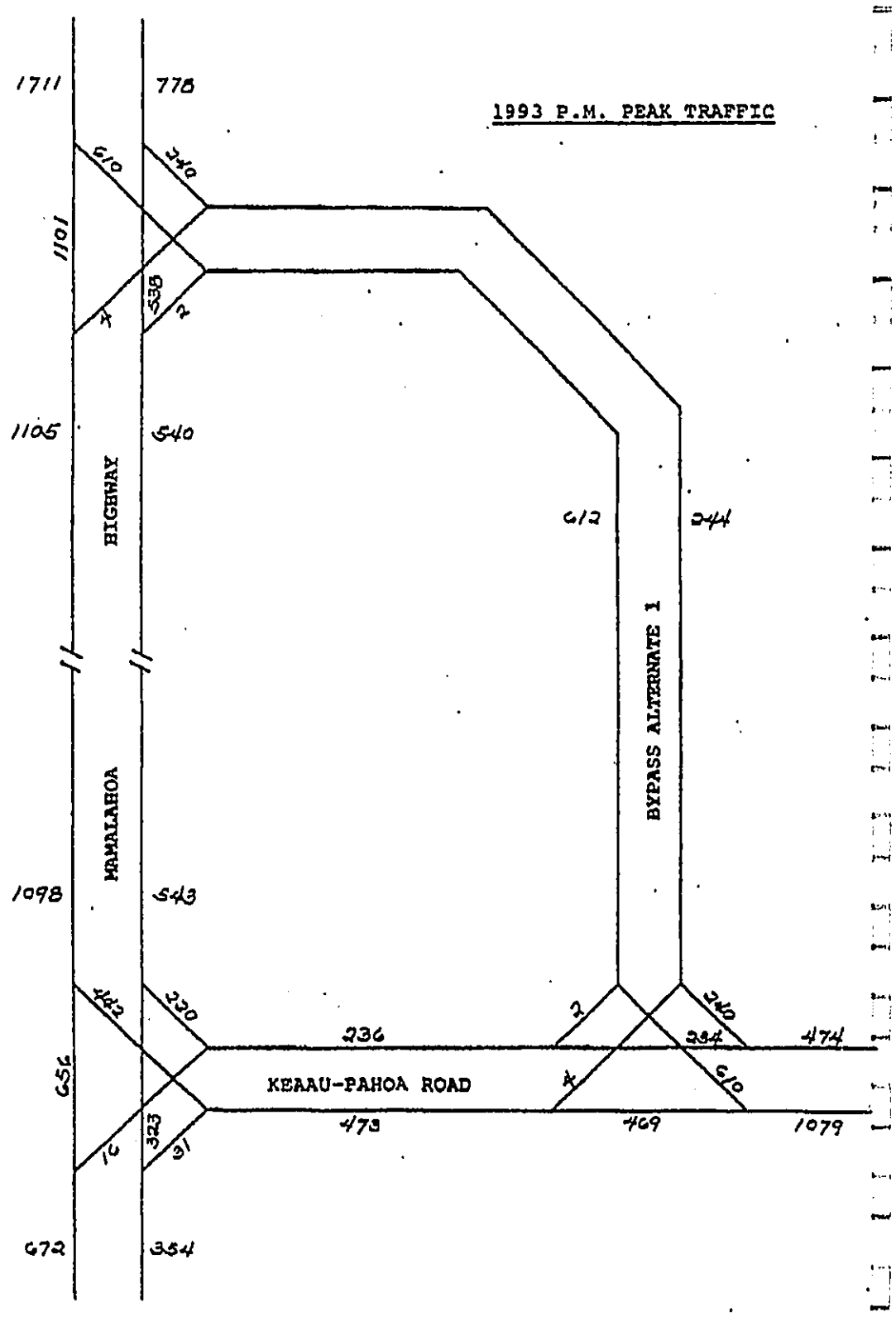
FEDERAL HIGHWAY ADMINISTRATION
REF. NO. TA 93-14
JULY 1993

10 52
6 52
460
20
323
33

1993 P.M. PEAK TRAFFIC



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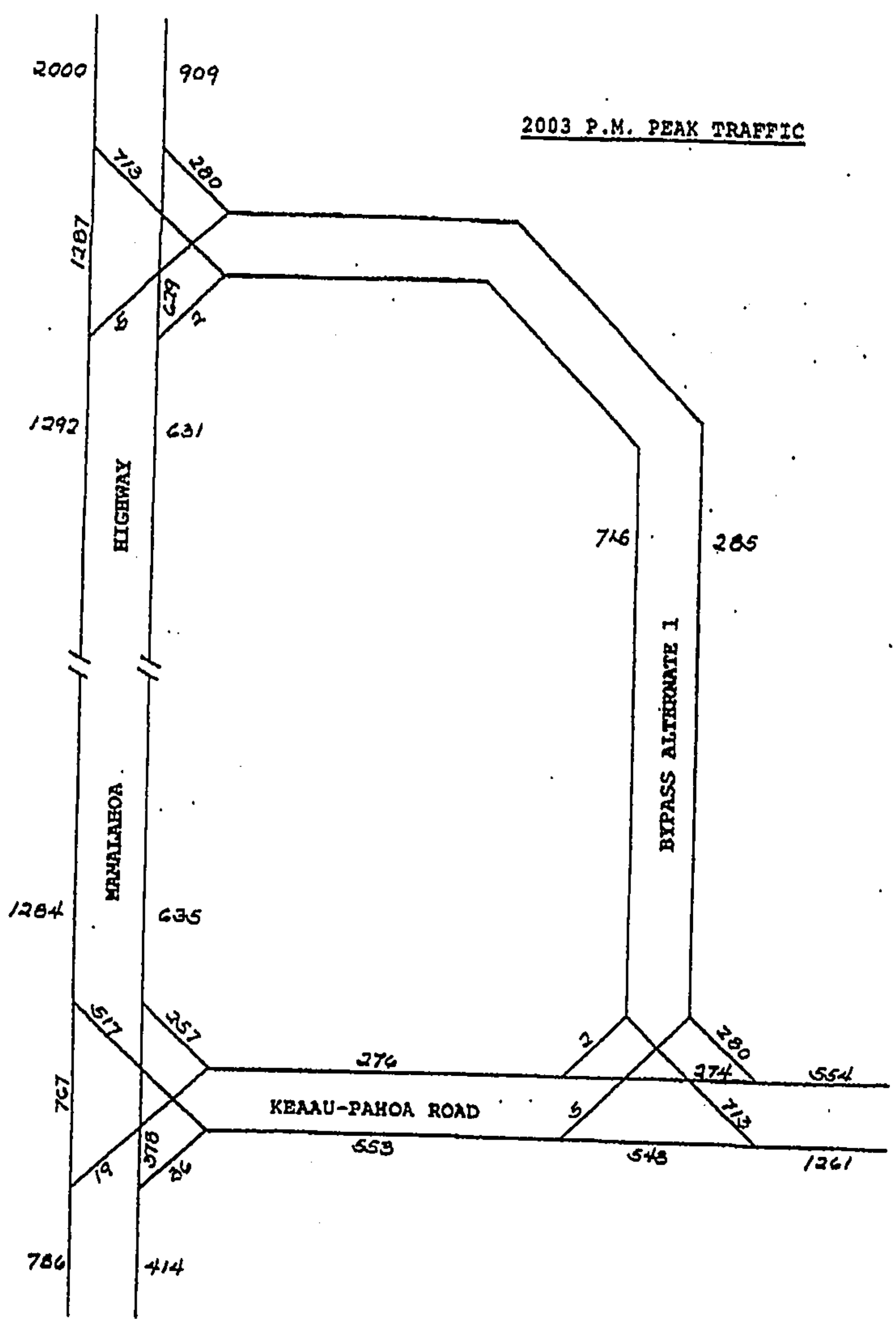

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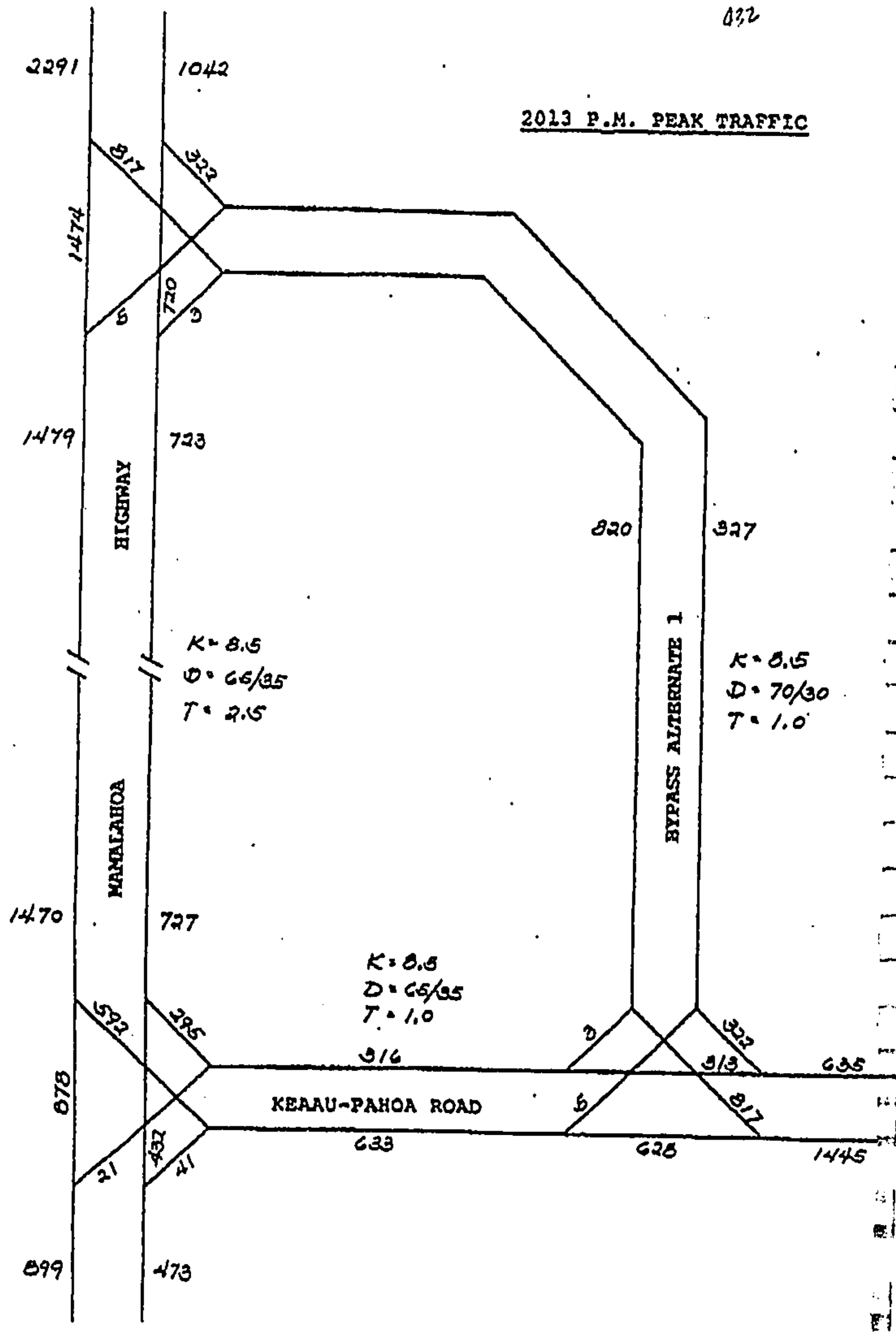
REF. NO. TA 93-14
JULY 1993

2013 P.M. PEAK TRAFFIC



APPENDIX B
LEVEL-OF-SERVICE ANALYSIS FOR TWO-LANE VERSUS FOUR-LANE ROADWAY

1985 HCM:TWO-LANE HIGHWAYS

****

FACILITY LOCATION.... BYPASS ROAD
ANALYST..... PJR
TIME OF ANALYSIS..... PM PEAK HOUR
DATE OF ANALYSIS..... 09-14-1993
OTHER INFORMATION....

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS.....	1
PERCENTAGE OF BUSES.....	0
PERCENTAGE OF RECREATIONAL VEHICLES.....	0
DESIGN SPEED (MPH).....	60
PEAK HOUR FACTOR.....	1
DIRECTIONAL DISTRIBUTION (UP/DOWN).....	70 / 30
LANE WIDTH (FT).....	12
USABLE SHOULDER WIDTH (AVG. WIDTH IN FT.)...	6
PERCENT NO PASSING ZONES.....	50

B) CORRECTION FACTORS

ROLLING TERRAIN

LOS	E T	E B	E R	f w	f d	f HV
A	4	3	3.2	1	.89	.97
B	5	3.4	3.9	1	.89	.96
C	5	3.4	3.9	1	.89	.96
D	5	2.9	3.3	1	.89	.96
E	5	2.9	3.3	1	.89	.96

C) LEVEL OF SERVICE RESULTS

INPUT VOLUME(vph): 1147
ACTUAL FLOW RATE: 1147

LOS	SERVICE FLOW RATE	V/C
A	169	.07
B	455	.19
C	839	.35
D	1246	.52
E	2204	.92

LOS FOR GIVEN CONDITIONS: D

1985 HCM:MULTILANE HIGHWAYS
****

FACILITY SECTION..... BYPASS ROAD
ANALYST..... PJR
TIME OF ANALYSIS..... PM PEAK HOUR
DATE OF ANALYSIS..... 09-14-1993
OTHER INFORMATION....

A) ADJUSTMENT FACTORS

PERCENTAGE OF TRUCKS..... 1 (TYPICAL - 200 #/HP)
PERCENTAGE OF BUSES..... 0
PERCENTAGE OF RECREATIONAL VEHICLES.. 0
DESIGN SPEED (MPH)..... 70
PEAK HOUR FACTOR..... 1
DRIVER POPULATION FACTOR..... 1 (WEEKDAY/COMMUTER)
LANE WIDTH (FT)..... 12
OBSTRUCTIONS..... NO
DISTANCE (FT) FROM ROADWAY EDGE..... 6
TYPE OF MULTILANE HIGHWAY..... RURAL, UNDIVIDED

B) CORRECTION FACTORS

TERRAIN TYPE	E T	E B	E R	f HV	f w	f p	f E
ROLLING	4.0	3.0	3.0	0.97	1.00	1.00	0.95

C) OPERATIONAL ANALYSIS RESULTS
****

NO. OF LANES..... 2
INPUT VOLUME..... 1147
V/C RATIO..... .31
LEVEL OF SERVICE.....A
MAX. SERVICE FLOW RATE (pcphpl).. 622
SPEED (mph)..... 56
DENSITY (pcpmpl)..... 10

APPENDIX C
TRAFFIC SIGNAL WARRANT ANALYSIS

Figure 9-1D

TRAFFIC SIGNAL WARRANTS

(Based on Estimated Average Daily Traffic - See Note 2)

URBAN ..... RURAL ✓

	Minimum Requirements EADT			
1. Minimum Vehicular Satisfied ✓ Not Satisfied ____	Vehicles per day on major street (total of both approaches)		Vehicles per day on higher-volume minor-street approach (one direction only)	
Number of lanes for moving traffic on each approach Major Street / Minor Street	Urban	Rural	Urban	Rural
1 / 1	8,000	5,600	2,400	1,680
2 or more / 1	9,600	6,720	2,400	1,680
2 or more / 2 or more	9,600	6,720	3,200	2,240
1 / 2 or more	8,000	5,600	3,200	2,240
2. Interruption of Continuous Traffic Satisfied ✓ Not Satisfied ____	Vehicles per day on major street (total of both approaches)		Vehicles per day on higher-volume minor-street approach (one direction only)	
Number of lanes for moving traffic on each approach Major Street / Minor Street	Urban	Rural	Urban	Rural
1 / 1	12,000	8,400	1,200	850
2 or more / 1	14,400	10,080	1,200	850
2 or more / 2 or more	14,400	10,080	1,600	1,120
1 / 2 or more	12,000	8,400	1,600	1,120
3. Combination Satisfied ✓ Not Satisfied ____ No one warrant satisfied but following warrants fulfilled 80% or more ..... 1 / 2	2 Warrants		2 Warrants	

NOTE:

1. Heavier left turn movement from the major street may be included with minor street volume if a separate signal phase is to be provided for the left-turn movement.
2. To be used only for NEW INTERSECTIONS or other locations where actual traffic volumes cannot be counted.

Manalahoa @ Bypass

34,322

11,442

23,064

2003 Volume

TS-10D

Figure 9-1 D

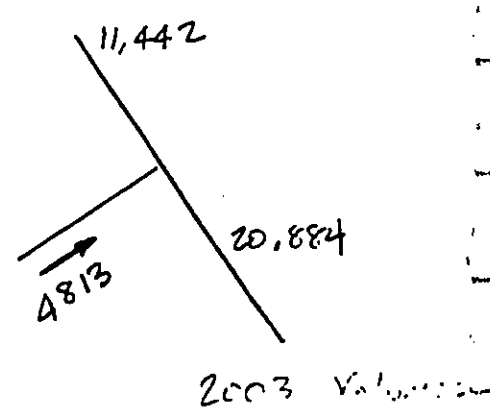
TRAFFIC SIGNAL WARRANTS

(Based on Estimated Average Daily Traffic - See Note 2)

URBAN ..... RURAL ✓	Minimum Requirements EADT	
1. Minimum Vehicular Satisfied ✓ Not Satisfied _____	Vehicles per day on major street (total of both approaches)	Vehicles per day on higher-volume minor-street approach (one direction only)
Number of lanes for moving traffic on each approach Major Street / Minor Street	Urban / Rural	Urban / Rural
1 ..... 1	8,000 / 5,600	2,400 / 1,680
2 or more 1	9,600 / 6,720	2,400 / 1,680
2 or more ..... 2 or more	9,600 / 6,720	3,200 / 2,240
1 ..... 2 or more	8,000 / 5,600	3,200 / 2,240
2. Interruption of Continuous Traffic Satisfied ✓ Not Satisfied _____	Vehicles per day on major street (total of both approaches)	Vehicles per day on higher-volume minor-street approach (one direction only)
Number of lanes for moving traffic on each approach Major Street / Minor Street	Urban / Rural	Urban / Rural
1 ..... 1	12,000 / 8,400	1,200 / 850
2 or more 1	14,400 / 10,080	1,200 / 850
2 or more ..... 2 or more	14,400 / 10,080	1,600 / 1,120
1 ..... 2 or more	12,000 / 8,400	1,600 / 1,120
3. Combination Satisfied ✓ Not Satisfied _____ No one warrant satisfied but following warrants fulfilled 80% or more ..... 1 / 2	2 Warrants	2 Warrants

NOTE:

1. Heavier left turn movement from the major street may be included with minor street volume if a separate signal phase is to be provided for the left-turn movement.
2. To be used only for NEW INTERSECTIONS or other locations where actual traffic volumes cannot be counted.



APPENDIX D

D.L. ADAMS ASSOCIATES, LTD.
dba
DARBY
& ASSOCIATES
ACOUSTICAL CONSULTANTS

#93-10

ENVIRONMENTAL NOISE ASSESSMENT
KEAAU PAHOA ROAD
(KEAAU BYPASS ROAD)
KEAAU TOWN SECTION
PUNA DISTRICT, ISLAND OF HAWAII

Project No. 130B-01-92

March 18, 1994

Prepared for
GK & ASSOCIATES
Kailua, Hawaii

PALI PALMS PLAZA • 970 NO. KALAHEO AVENUE • SUITE A-311
KAILUA. HAWAII 96734 • (808) 254-3318 • FAX (808) 254-5295

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1. SUMMARY

1.1 The average ambient noise levels at noise sensitive areas along the proposed Keaau Bypass Road corridor during non-peak hour traffic times range from 41 to 45 dBA, typical of rural/residential areas.

1.2 Existing (1993) peak hour traffic noise levels due to traffic on Mamalahoa Highway and Keaau-Pahoa Road at the noise sensitive locations along the proposed Bypass Road corridor were calculated to be in the range of 50 to 54 dBA depending on their distance from these roadways and the shielding provided by foilage and intervening terrain and/or man-made structures.

1.3 The reduction of traffic volume through Keaau town, afforded by the Keaau Bypass Road, will result in a reduction in traffic-generated noise levels for Keaau Elementary and Intermediate School and several existing residences. Traffic noise levels will be reduced approximately 3.6 and 2.0 dB along Keaau-Pahoa Road and Mamalahoa Highway, respectively, in the years 2003 and 2013.

1.4 All noise sensitive locations (residences) along the proposed Bypass Road corridor (Alternate 1 or Alternate 2) will be significantly impacted by peak hour traffic on the Bypass Road.

1.5 Noise due to construction of the proposed Bypass Road, though relatively short-term, will significantly impact the noise sensitive locations along the proposed Bypass Road corridor.

1.6 A greater number of noise sensitive locations (residences) will be significantly impacted by traffic and construction noise by Bypass Alternate 2 than by Bypass Alternate 1.

1.7 Possible traffic noise mitigation for the Keaau Bypass Road consists of: reduced vehicular speed, appropriate use of retaining ("Jersey") barriers, construction of noise barriers, alteration of horizontal and vertical roadway alignments, acquisition of real property, design of roadway surface, and air-conditioning of impacted dwellings.

1.8 Mitigation of construction noise can be achieved through adoption of a construction noise permitting process, similar to that in effect on Oahu, or the stipulation of noise control requirements in the project's Contract Documents. If blasting is required during the construction, the use of proper blast design techniques can control blast noise within acceptable limits.

2. PROJECT DESCRIPTION

Keaau-Pahoa Road is generally a straight, two-lane roadway with a posted speed limit of 55 mph providing access to the lower Puna region linking the towns of Kalapana, Pahoa and Keaau with Hilo. At its northerly end, the Keaau-Pahoa Road is a narrower two-lane road with reduced speeds of 25 mph and 35 mph passing through Keaau to its juncture with the Hawaii Belt Road (Mamalahoa Highway) at a signal-controlled intersection. Between Keaau and Hilo, the Mamalahoa Highway is a 4-lane divided expressway with a posted speed limit of 55 mph. A project vicinity map is shown in Figure 1.

A new 4-lane roadway is proposed as an alternate route which would bypass Keaau town and, thus, alleviate traffic congestion through the town. The Keaau Bypass Road will primarily serve through-traffic between Puna and Hilo. Restricted access and fewer intersections will provide better traffic flow with greater roadway capacities.

The Bypass Road will intersect Keaau-Pahoa Road approximately 1.5 miles south-east of Keaau town. As shown in Figure 2, the Bypass Road is proposed to be routed east of Keaau town and to join Mamalahoa Highway north of Keaau town at either Keaau Road (Alternate 1) or at the Shipman Industrial Park road (Alternate 2).

3. APPLICABLE REGULATIONS AND CRITERIA

A comparison of federal criteria and state regulations referenced herein is presented in Table 1.

3.1 Federal Highway Administration (FHWA) - Reference 1 provides, "...procedures for noise studies and noise abatement measures to help protect the public health and welfare, to supply noise abatement criteria, and to establish requirements for information to be given to local officials for use in the planning and design of highways..."

Traffic Noise Impacts are defined as, "...impacts which occur when the predicted traffic noise levels approach or exceed the noise abatement criteria, or when the predicted traffic noise levels substantially exceed the existing noise levels."

The noise metric used is Leq(h), the equivalent steady-state sound level for the worst (noisiest) hour for the design year that contains the same acoustic energy as the time-varying sound level during the same one-hour time period. Traffic noise predictions are to be made using the FHWA Traffic Noise Prediction Model [Reference 2].

Reference 1 also states:

"(a) The highway agency shall determine and analyze expected traffic noise impacts and alternative noise abatement measures to mitigate these impacts, giving weight to the benefits and cost of abatement, and to the overall social, economic and environmental effects.

(b) The traffic noise analysis shall include the following for each alternative under detailed study:

(1) Identification of existing activities, developed lands, and undeveloped lands for which development is planned, designed and programed, which may be affected by noise from the highway;

(2) Prediction of traffic noise levels;

(3) Determination of existing noise levels;

(4) Determination of traffic noise impacts; and

(5) Examination and evaluation of alternative noise abatement measures for reducing or eliminating the noise impacts."

With respect to noise abatement, Reference 1 states:

"(a) In determining and abating traffic noise impacts, primary consideration is to be given to exterior areas. Abatement will usually be necessary only where frequent human use occurs and a lowered noise level would be of benefit.

(b) In those situations where there are no exterior activities to be affected by the traffic noise, or where the exterior activities are far from or physically shielded from the roadway in a manner that prevents an impact on exterior activities, the interior criterion shall be used as the basis of determining noise impacts.

(c) If a noise impact is identified, the abatement measures listed (below) must be considered.

(d) When noise abatement measures are being considered, every reasonable effort shall be made to obtain substantial noise reductions.

(e) Before adoption of a final environmental impact statement or finding of no significant impact, the highway agency shall identify:

(1) Noise abatement measures which are reasonable and feasible and which are likely to be incorporated in the project, and

(2) Noise impacts for which no apparent solution is available.

(f) The views of the impacted residents will be a major consideration in reaching a decision on the reasonableness of abatement measures to be provided.

(g) The plans and specifications will not be approved by FHWA unless those noise abatement measures which are reasonable and feasible are incorporated into the plans and specifications to reduce or eliminate the noise impact on existing activities, developed lands for which development is planned, designed, and programed."

3.2 State Department of Health (DOH) - The Hawaii DOH regulations [Reference 3], while in effect only on Oahu and not adopted by the County of Hawaii, require that, "No highway or freeway which can be expected to create at designed capacity operation, a noise level of fifty dBA or more inside any classroom, library, multi-purpose room, hospital, or rest home already in existence and used for its primary design purpose, shall be constructed without first providing for noise control measures which can be expected to limit the noise to no more than fifty dBA."

Assuming that 50 dBA refers to DOH's "allowable limit" concept, which is the noise level not to be exceeded more than 10% of the time, this equates to an hourly Leq(h) of 47 dBA which is more stringent than the FHWA interior criterion of 52 dBA. DOH regulations require mitigative measures which will reduce the interior noise levels caused by traffic to less than Leq(h) of 47 dBA for noise impacted classrooms, libraries, multi-purpose rooms, hospitals and rest homes already in existence. These measures might include air-conditioners for naturally ventilated buildings, erection of noise barriers between the roads and these noise sensitive structures, etc.

3.3 State Department of Education (DOE) - In Reference 4, DOE requires that "feasible noise control measures shall be installed in classrooms (excluding shop classrooms) whenever 50 percent of the intruding noise level measurements inside the classroom, with windows and doors open and the room empty, exceeds 55 dBA." As revised in 1991, this policy states that, "Air conditioning shall be provided to (school) facilities exposed to exterior noise levels greater than L10 = 65 dBA."

3.4 Department of Housing and Urban Development (HUD) - In Reference 5, HUD provides minimum national standards to protect citizens against excessive noise in and about their place of residence. The sound pressure levels in the standards are expressed in terms of day night average sound levels (Ldn). See Appendix A, Acoustical Terminology. The standards state that when certain auto/truck and time of day relationships are satisfied, then Ldn is approximately equal to Leq(h). These relationships are applicable for the Bypass Road and, therefore, Ldn is used interchangeably with Leq(h) in this report.

Residential and other noise sensitive developments can normally be constructed in areas subject to levels up to and including an Ldn of 65, with no special noise control measures required.

Sites exposed to Ldn's in the range of 65 to 75 dB are considered normally unacceptable for residential development without building approval and are subject to additional noise control measures. For Ldn's between 65 and 70 dB, it is required that 5 dB of additional noise attenuation be achieved over that provided by normal construction in the area. For Ldn's between 70 and 75 dB, an additional 10 dB of noise attenuation is required.

Furthermore, HUD also has a design goal of Ldn 45 or less for interior noise levels. However, in Hawaii, where the climate allows for natural ventilation, this may not be possible in many situations unless air-conditioning or mechanical ventilation is installed.

3.5 U.S. Environmental Protection Agency - The U.S. Environmental Protection Agency (EPA) has identified a range of yearly day-night average sound levels sufficient to protect public health and welfare from the effects of environmental noise [Reference 6]. The EPA has established a goal to reduce exterior environmental noise to an Ldn of 65 dBA or less and a future goal to further reduce exterior environmental noise to an Ldn of 55 dBA or less. The EPA has also established a long-range goal to reduce interior noise to an Ldn of 45 dBA or less. Additionally, the EPA states that to protect against hearing damage, one's 24-hour equivalent sound level exposure, Leq, at the ear should not exceed 70 dBA. The EPA emphasizes that these goals are not intended as regulations as it has no authority to regulate noise levels, but rather as levels below which the general population will not be at risk from any of the identified effects of noise.

4. EXISTING ACOUSTICAL ENVIRONMENT

4.1 Ambient Noise Measurements - Short term, average ambient noise measurements were taken on November 16, 1993 to assess the existing acoustical environment at selected noise sensitive locations along the proposed Bypass Road alignment. Average noise level measurements were taken over 5-minute sampling periods using a Larson-Davis Laboratories Model 800B Sound Level Meter.

Noise level measurements were obtained at the five locations described below and identified in Figure 3.

A. Shipman Industrial Park road extension east of Mamalahoa Highway,
B. Road adjacent 8-1/2 mile camp,
C. Milo Street at water tank,
D. Corner Uhiuhi Street (dog leg), and
E. Corner Uhiuhi Street and Ohe Street.

The measured average ambient noise levels at locations A and C were 41 dBA and 45 dBA at locations B, D and E. These levels are typical of quiet rural/residential areas as illustrated in Figure 4. The dominant identifiable noise sources were wind in the foliage, farm animals, birds, and occasional local traffic noise. At location B, noise from activities at the old Puna Sugar Company Mill also contributed to the measured ambient noise level. Traffic noise level measurements and traffic counts were taken at two locations along Keaau-Pahoa Road and at one location on Mamalahoa Highway. These locations are shown in Figure 5. These measurements provided: (1) an assessment of traffic noise levels in the areas of existing residential homes, and (2) data for calibrating the model used to predict traffic noise.

5. TRAFFIC NOISE LEVEL CALCULATIONS

The Federal Highway Administration (FHWA) traffic noise prediction model [Reference 2] was used to predict traffic-generated noise levels for the Keaau Bypass Road Alternatives. Field acquired data were used to calibrate the model and traffic flow data provided by the traffic consultant for the "No-build" Alternate [Reference 7] and by the Planning Branch of the Highway Division, State of Hawaii Department of Transportation (HDOT) for Bypass Alternates 1 and 2 [Reference 8] were used to calculate peak-hour traffic-generated noise for the existing (1993) case and for the three alternates for the years 2003 and 2013.

5.1 Existing Peak Hour Traffic Noise - Existing peak hour traffic noise levels, Leq(h), for Keaau-Pahoa Road and Mamalahoa Highway between the two extremities of the proposed Keaau Bypass Road and at a distance of 100 feet from the roadway centerline were calculated to be 66.8 and

71.7 dBA, respectively. These calculations were based on an average vehicle speed of 40 mph on the included portion of Keaau-Pahoa Road and on vehicle speeds of 55 mph, the posted speed limit, on Mamalahoa Highway.

5.2 Future Year Peak Hour Traffic Noise - Peak hour traffic-generated noise levels at a distance of 100 feet from the centerline of Keaau-Pahoa Road and Mamalahoa Highway for the years 2003 and 2013 were calculated. The calculated levels, as well as comparisons between the "build" alternates, i.e., Alternates 1 and 2, and the "No-build" Alternate are given in Table 2.

6. POTENTIAL TRAFFIC NOISE IMPACTS ON NOISE SENSITIVE AREAS

Noise sensitive land uses, as defined by the applicable standards and criteria, e.g., FHWA as presented in Table 1, were used to identify the noise sensitive locations in the study area. The existing noise sensitive locations are exclusively single-family residences along the Keaau-Pahoa Road and the Mamalahoa Highway corridors, as well as along the proposed Keaau Bypass Road alignments (Alternates 1 and 2).

6.1 Along Keaau-Pahoa Road - When approaching Keaau town from the southeast, the posted speed limit varies from 55 mph to 45 mph approximately one mile from the Mamalahoa Highway intersection, to 35 mph approximately 2000 feet from the intersection, and to 25 mph approximately 1100 feet from the intersection. The proposed Keaau Bypass Road intersects Keaau-Pahoa Road approximately 1.3 miles southeast of the Mamalahoa Highway intersection.

Keaau Elementary and Intermediate School, as well as several single-family homes are located along this portion of Keaau-Pahoa Road, i.e., within 0.5 to 0.75 miles of the Keaau-Pahoa Road intersection with Mamalahoa Highway. Many of these homes are situated quite close to the roadway. An average vehicle speed of 40 mph was used to calculate the existing and future peak hour traffic-generated noise levels at a distance of 100 feet from the roadway centerline for this portion of the road.

Table 2 indicates that the Keaau Bypass Road will reduce the noise impact (-3.6 dB) on the noise sensitive areas near Keaau town. Although not evident from the calculated noise levels, implementation of the Keaau Bypass Road will allow higher average vehicle speeds on Keaau-Pahoa Road because of a reduction in the peak hour traffic congestion. The effect of this will be higher noise levels; however, detailed traffic flow data would be required to quantitatively determine this increase. For example, a change in the average vehicle speed from, say, 25 mph to 40 mph with all other parameters the same results in a 4.1 dB increase in noise level. Conversely, if it were

assumed that the mix of medium and heavy trucks to automobiles were to decrease on this portion of Keaau-Pahoa Road, because trucks would use the Bypass Road instead, the noise levels along Keaau-Pahoa Road would decrease. For example, a decrease in medium and heavy trucks on Keaau-Pahoa Road from 3.6 and 2.5%, respectively, to 1.0 and 0%, respectively with all other parameters the same would result in a 3.5 dB decrease in peak hour traffic noise level.

For the portion of Keaau-Pahoa Road southeast of its intersection with the proposed Keaau Bypass Road, where the posted speed limit is 55 mph, the calculated peak hour traffic noise level at a distance of 100 feet from the roadway centerline is 69.8 dBA for the existing case (1993), 70.5 dBA for the year 2003, and 71.1 dBA for the year 2013. The future year noise levels are applicable for both of the "build" and the "No-build" alternates. However, it should be noted that traffic congestion through Keaau town, currently and for the No-build Alternate, during morning and afternoon peak hours prevents, or will prevent, vehicles from attaining the posted speed. Thus, the actual traffic-generated noise levels during peak hour are, or will be, less than calculated.

6.2 Along Mamalahoa Highway - As shown in Table 2, for the portion of Mamalahoa Highway from the intersection with Keaau-Pahoa Road north to the intersection with the proposed Bypass Road--either Alternate 1 or 2--the Bypass Road will result in a slight decrease (1.3 dB) in peak hour traffic noise level in the year 2003 compared to the current (1993) level. By the year 2013, the decrease will be only 0.6 dB for the "build" alternates. Without the Bypass Road, i.e., the "No-build" Alternate, the peak hour traffic noise levels will increase slightly--0.7 and 1.3 dB for the years 2003 and 2013, respectively. The differences between the "build" alternates (Alternates 1 and 2) and the No-build Alternate are -2.0 and -1.9 dB for the years 2003 and 2013, respectively. These changes are not considered significant.

It should be noted that, like Keaau-Pahoa Road, the same argument concerning increased noise levels resulting from increased average vehicle speed due to a reduction of traffic congestion during peak hours will apply to the "build" alternates. Likewise, the routing of truck traffic onto the Keaau Bypass Road will result in a decrease in traffic noise along this portion of Mamalahoa Highway. However, as before, these changes in noise level are not quantifiable without detailed predictions of the traffic flow parameters for the various conditions.

6.3 Along Keaau Bypass Road - The existing (1993) peak hour traffic noise levels for the noise sensitive locations of Figure 3 have been calculated and are presented in Table 3. The residences in the eastern portions of Keaau town and 8-1/2 Mile Camp will primarily be

impacted. This rural area currently has low traffic volume on the local roads and streets near noise sensitive areas and, thus, enjoys relatively low ambient noise levels, i.e., 41 to 45 dBA, during non-peak hour traffic times. With respect to the specific noise sensitive areas where field noise measurements were taken, a comparison of calculated existing (1993) peak hour noise levels to those calculated for the years 2003 and 2013 with the Keaau Bypass Road Alternates 1 and 2 is also presented in Table 3. As seen from this table, the increases in noise level from the existing peak hour noise levels range from a low of 1.6 dB at Location A in the year 2003, if Alternate 1 is built, to a high of 18.9 dB at Location C for the year 2013 for either Alternate 1 or 2.

7. RELATIVE NOISE IMPACTS OF THE THREE ALTERNATES

The relative noise impacts on the noise sensitive locations for the three alternates, i.e., Bypass Alternate 1, Bypass Alternate 2, and the No-build Alternate are presented below, as well as construction noise impact.

7.1 Bypass Alternate 1 - Except for the northern portion of the proposed Bypass Road, the noise impacts of Alternates 1 and 2 are identical. See Figure 2. As seen in Table 2, both alternates should produce a negative noise impact along the included portions of Mamalahoa Highway and Keaau-Pahoa Road. Intersecting Mamalahoa Road on the north at the current Keaau Road intersection, Bypass Alternate 1 is shorter than Bypass Alternate 2 and, therefore, impacts fewer noise sensitive locations.

7.2 Bypass Alternate 2 - Bypass Alternate 2 intersects Mamalahoa Road at the existing Shipman Industrial Park road intersection. In addition to the noise sensitive locations impacted by Alternate 1, Alternate 2 will significantly impact at least two additional residential dwellings in the area of Location A on Figure 3, i.e., an increase of approximately 16 dB over Alternate 1 for the year 2003.

7.3 No-build Alternate - Without the Bypass Road, noise levels in the area of Keaau town due to traffic on Mamalahoa Highway and Keaau-Pahoa Road will continue to increase in future years as the volume of traffic increases. Though not considered significant, the traffic noise levels along these two roadways will increase approximately 0.7 and 1.3 dB by the years 2003 and 2013, respectively.

7.4 Construction Noise Impact - The construction of either of the build alternates, i.e., Bypass Alternate 1 or Bypass Alternate 2, will involve excavation, grading and possibly blasting. The various construction phases could generate significant noise, which would impact the nearby noise sensitive residential areas. The actual noise

levels produced are dependent on the construction methods employed during each phase of the construction process. Typical noise level ranges produced by various types of construction equipment are shown in Figure 6. Earth moving equipment, e.g., diesel engine powered bulldozers, trucks, backhoes, front-end loaders, graders, etc., will probably be the noisiest equipment used during construction. Blasting, if required, could also produce noise impacts.

8. NOISE MITIGATION

Because the noise sensitive locations along either Keaau Bypass Road corridor, Alternate 1 or Alternate 2, will be significantly impacted by traffic noise and by construction noise, the measures presented below should be considered to mitigate these noise impacts.

8.1 Restrict Vehicular Speed - The noise level produced by traffic is a function of the speed of the vehicles--the greater the speed, the higher the noise level. This is due primarily to tire noise, i.e., the noise produced by the tire contact with the roadway pavement. For example, a reduction from 55 mph to 45 mph in the posted speed limit on the Keaau Bypass Road and enforcement of the posted speed would result in approximately a 3 dB decrease in the traffic-generated noise level at all significantly impacted locations.

8.2 Retaining Barriers - Solid concrete vehicle retaining barriers, commonly referred to as "Jersey Barriers," can provide sound shielding of automobile tire and exhaust noise, if the line-of-sight to the tires and the exhausts is blocked. For example, this shielding can provide a reduction in automobile traffic noise level of 5 to 10 dB at a point of observation located about 5 feet above the ground when the roadway is elevated at about 10 feet. The amount of attenuation varies with the receiver distance from the sound barrier. The closer the listener is to, or below, the barrier; the greater the attenuation will be. This means that dwellings with open fenestrations higher than 12 to 13 feet will gain little or no benefit from a solid vehicle retaining barrier. Also, these low barriers are not effective in attenuating exhaust noise from trucks and buses with elevated exhausts. Specific impacted noise sensitive locations which can benefit from the use of "Jersey Barriers" can be determined during the Bypass Road design phase after relative elevations of roadway and dwellings have been established.

8.3 Construction of Noise Barriers - Noise barriers consisting of earthen berms, fences, or walls may be erected along the edges of the Bypass Road to attenuate traffic noise to impacted dwellings along the roadway. Reductions of 10 to 12 dBA are possible for single-story dwellings at about the same elevation as the roadway; however, barriers would be ineffective for the residences at higher elevations

and, in general, for the second floors of two-story dwellings when the line-of-sight to the roadway is not blocked. Special noise barrier constructions having sound absorbing surfaces facing the roadway are typically more effective in attenuating traffic noise. Barriers such as these reduce noise reflected to the opposite side of the roadway. The optimum barrier heights and locations should be determined during the design phase of the Bypass Road after the exact alignment of the roadway is determined and detailed dimensions, topography, and setbacks of the residences are developed.

8.4 Alteration of Horizontal and Vertical Alignments - In some cases, the mitigation of traffic noise for impacted areas is possible through the careful selection of the exact roadway alignment. For example, alteration of the roadway horizontal alignment can take advantage of intervening topography of the terrain between the roadway and noise sensitive areas, such as placing the roadway on the opposite side of a puu or knoll from a dwelling to provide noise shielding. Likewise, in some cases, depression or elevation of the roadway surface can block line-of-sight from noise sensitive areas to one or more lanes of the roadway, thus, providing noise attenuation.

8.5 Acquisition of Real Property - The acquisition of real property or interests therein (usually undeveloped or unimproved property) to serve as a buffer zone and preempt development on lands which would be adversely impacted by traffic noise is another possible method of noise mitigation for the Bypass Road.

8.6 Road Surface Considerations - With respect to lower noise levels, the surface of the Bypass Road should be as smooth as possible to reduce tire noise. Grooved pavement surfaces should be avoided. Asphalt surfaced roads are generally quieter than concrete, since the expansion joints of concrete roadways exacerbate tire noise.

8.7 Air-conditioning of Dwellings - Most of the dwellings along the Bypass Road corridor are naturally ventilated. For those which would be significantly impacted by the traffic noise and cannot benefit from noise shielding or barriers, it may be necessary to install air-conditioning equipment so that windows and doors with line-of-sight to the roadway can be closed. In some cases, jalousies, loose-fitting sliding doors and windows may have to be replaced by tight-fitting, gasketed windows and doors to achieve adequate noise reduction. Measures such as these can provide up to 20 dB of noise attenuation in most instances.

8.8 Construction Noise Mitigation - Although it will be temporary, construction noise will impact the noise sensitive locations along the Bypass Road corridor and mitigation of this impact should be provided. The Hawaii DOH regulations [Reference 3], while in effect

only on Oahu and not adopted by the County of Hawaii, provide for mitigation or control of construction noise. In cases where construction noise exceeds or is expected to exceed, the DOH's "allowable" limits, a permit must be obtained from the DOH to allow the operation of vehicles, construction equipment, power tools, etc., which emit noise levels in excess of the "allowable" limits. Required permit conditions for construction activities are:

> "No permit shall allow construction activities creating excessive noise...before 7:00 am and after 6:00 pm of the same day."
>
> "No permit shall allow construction activities which emit noise in excess of ninety-five dBA...except between 9:00 am and 5:30 pm of the same day."
>
> "No permit shall allow construction activities which exceed the allowable noise levels on Sundays and on... [certain] holidays. Activities exceeding ninety-five dBA shall [also] be prohibited on Saturdays."

Phases of the construction which produce high noise levels (e.g., blasting and pile driving) may be limited to certain days or times of day so as to minimize the impact on residents of the neighboring areas and on their activities. Furthermore, the DOH regulations state that construction equipment and on-site vehicles or devices requiring exhaust of gas or air must be equipped with mufflers.

Adoption of a similar construction noise control permitting process or the establishment of specific noise control requirements in the roadway project's Contract Documents, could effectively mitigate the noise impact on the noise sensitive areas.

The noise impact of blasting, if required, can be mitigated by using numerous small charges detonated with short time delays rather than a single large charge. In addition, blast mats can be employed to assist in directing the explosive energy into the rock and, thus, attenuate the airborne blast noise. With appropriate blast design techniques, the noise from blasting can usually be controlled within acceptable limits.

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2. *FHWA Highway Traffic Noise Prediction Model*, Federal Highway Administration Report No. FHWA-RD-77-108; U.S. Department of Transportation, December 1978.

3. *Community Noise Control for Oahu*, Department of Health, State of Hawaii, Title II, Administrative Rules, Chapter 43, November 6, 1981.

4. *Acoustical and Environmental Control Policy*, Policy 6700, State of Hawaii, Department of Education, June 1981, Revised August 1991.

5. *Department of Housing and Urban Development Environmental Criteria and Standards*, Title 24 CFR Part 51, Federal Register, Vol. 44, No. 135, July 12, 1979; Amended 49 FR 880, January 6, 1984.

6. *Toward a National Strategy for Noise Control*, U.S. Environmental Protection Agency, April 1977.

7. *Traffic Volumes No-Build Alternative (Draft)*, Barton-Aschman Associates, Inc., November 9, 1993.

8. *Traffic Assignment Project TA 93-14 Keaau Bypass Road*, State of Hawaii, Department of Transportation, Highways Division, Project No. 130B-01-92, July 1993.

TABLE 1
COMPARISON OF FEDERAL HIGHWAY ADMINISTRATION
AND STATE OF HAWAII HIGHWAY NOISE
LEVEL STANDARDS/CRITERIA/REGULATIONS
(REFERENCES 1 AND 3)

Agency	Land Use Description	Leq (h)[a]
Federal Highway Administration (FHWA)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preser–vation of those qualities is essential if the area is to continue to serve its intended purpose. (Exterior)	57
	Picnic areas, recreation areas, playgrounds, active sponrts areas, parks, residences, motels, hotels, schools,chruches, libraries, and hospitals. (Exterior)	67
	Developed lands, properties, or activities not included in the above two categories. (Exterior)	72
	Undeveloped lands. (Exterior)	(b)
	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums. (Interior)	52
Hawaii DOH (Oahu)	Existing school classroom, library, multipupose room, hospital or rest home. (Interior)	(c) 47

NOTES:
(a) Hourly Equivalent Sound Level in dBA.

(b) Not stated.

(c) Approximated Leq, based on a stated maximum level of 50 dBA.

TABLE 2
CALCULATED PEAK HOUR TRAFFIC–GENERATED NOISE LEVELS [Leq(h) in dBA]
100 FEET FROM ROADWAY CENTERLINE

Roadway/Condition	1993 Existing	2003		2013	
		With Bypass	W/O Bypass	With Bypass	W/O Bypass
Keaau–Pahoa Road (a)	66.8	63.9	67.5	64.5	68.1
Change from Existing	--	−2.9	+0.7	−2.3	+1.3
Difference Btwn Build (Alt 1 or 2) & No–build	--	−3.6		−3.6	
Mamalahoa Highway (b)	71.7	70.4	72.4	71.1	73.0
Change from Existing	--	−1.3	+0.7	−0.6	+1.3
Difference Btwn Build (Alt 1 or 2) & No–build	--	−2.0		−1.9	

NOTES:

(a) For that portion of Keaau–Pahoa Road from the intersection with proposed Keaau Bypass Road (Alternates 1 and 2) to intersection with Mamalahoa Highway. Based on an average vehicle speed: 40 mph; vehicle mix: 93.9% automobile, 3.6% medium trucks, 2.5 % heavy trucks; and 0% grade.

(b) For that portion of Mamalahoa Highway from Keaau town north to intersection with Keaau Road (Alternate 1) or to intersection with Shipman Industrial Park Road (Alternate 2). Based on vehicle speed: 55 mph; vechicle mix: 93.4% automobiles, 3.6% medium trucks, 3.0% heavy trucks; and 0% grade.

TABLE 3
PEAK HOUR TRAFFIC–GENERATED NOISE LEVELS
AT NOISE SENSITIVE LOCATIONS

Noise Sensitive Location (a)	Approximate Distance to Bypass Road Centerline	Leq(h) in dBA		
		(b) 1993 (EXISTING)	(c) 2003 With Bypass	(c) 2013 With Bypass
A (if Alt. 1)	5,300'	54.2	55.8(d)	56.4(d)
A (if Alt. 2)	100'	54.2	70.1	70.7
B	350'	50.2	61.6	62.2
C	200'	49.9	68.2	68.8
D	210'	50.6	68.0	68.6
E	1,300'	51.8	60.1	60.7

NOTES:
(a) Noise Sensitive Locations as shown in Figure 3.

(b) Calculated using 1993 peak hour traffic flow parameters for Mamalahoa Highway [Reference 7] plus measured average ambient sound level.

(c) Except as noted otherwise, calculations for Keaau Bypass Road are based on a vehicle speed of 55 mph, a vehicle mix of 93.9% automobiles, 3.6% medium trucks and 2.5% heavy trucks, and a 2.5% grade.

(d) Calculation based on peak hour traffic flow parameters for Mamalahoa Highway [Reference 8].

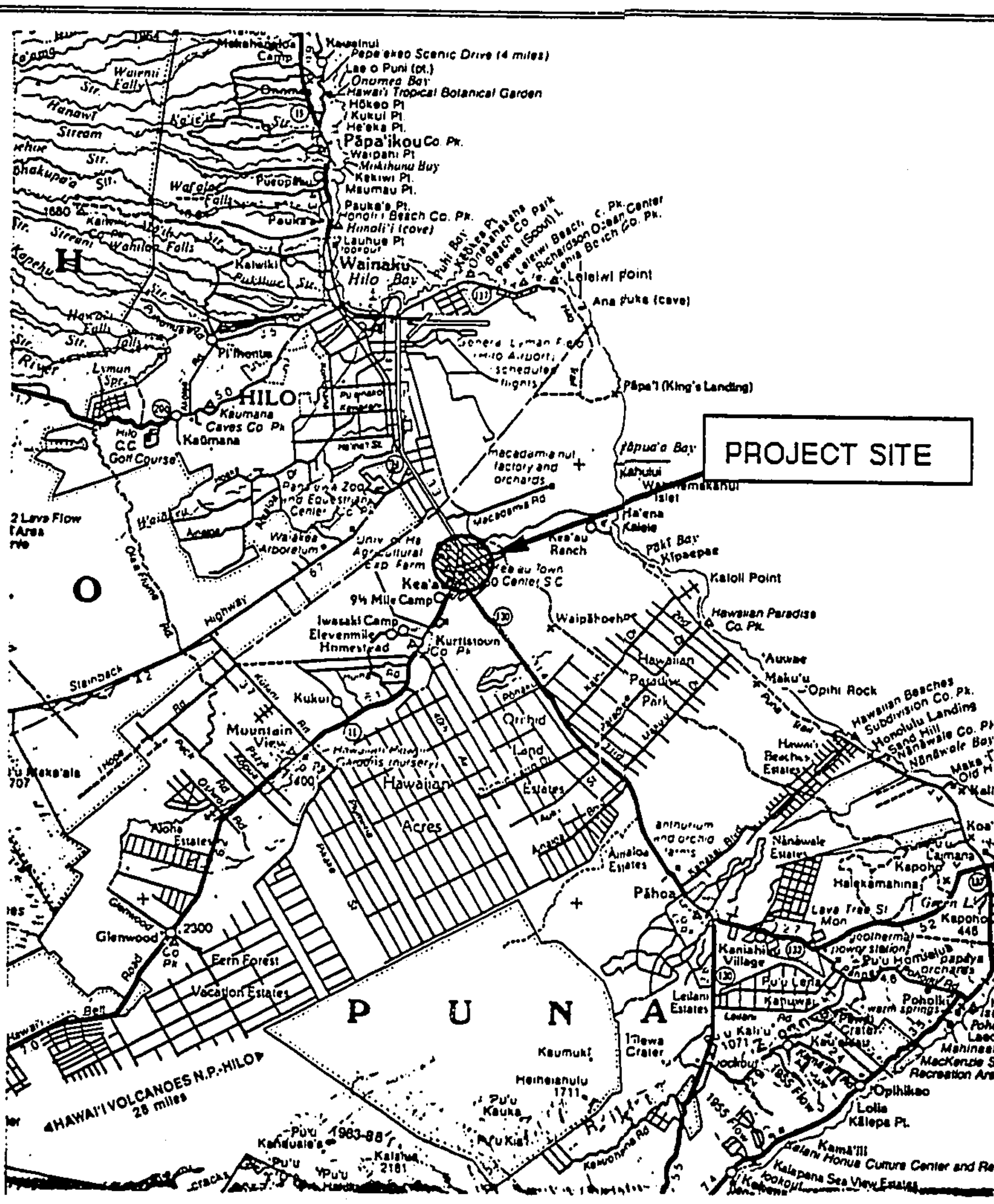

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FIGURE 1 PROJECT VICINITY MAP

Approx. Scale: 1" = 3.75 miles

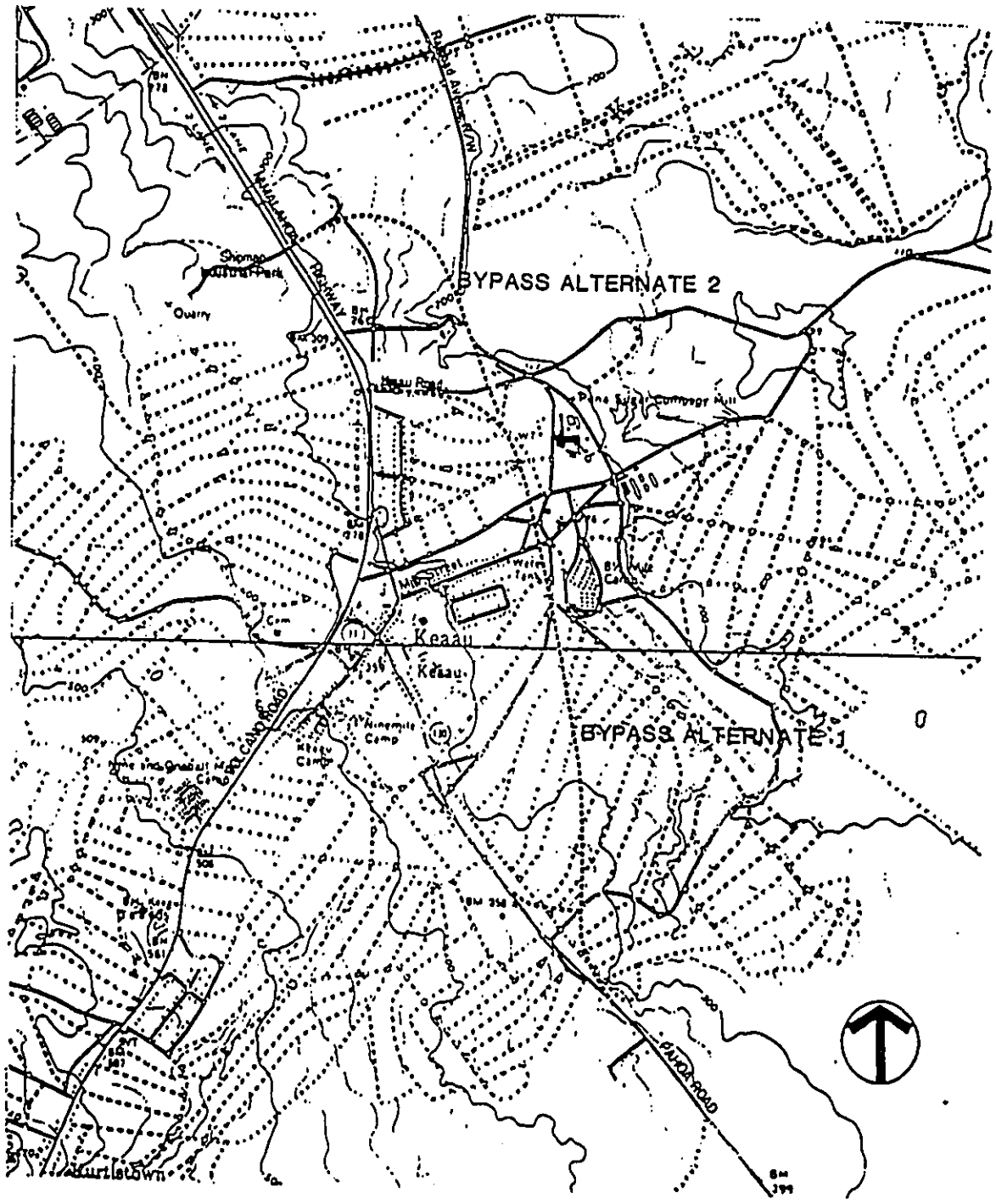

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FIGURE 2 PROPOSED KEAAU BYPASS ROAD ALIGNMENT WITH ALTERNATES 1 AND 2

Approx. Scale: 1" = 2,500'

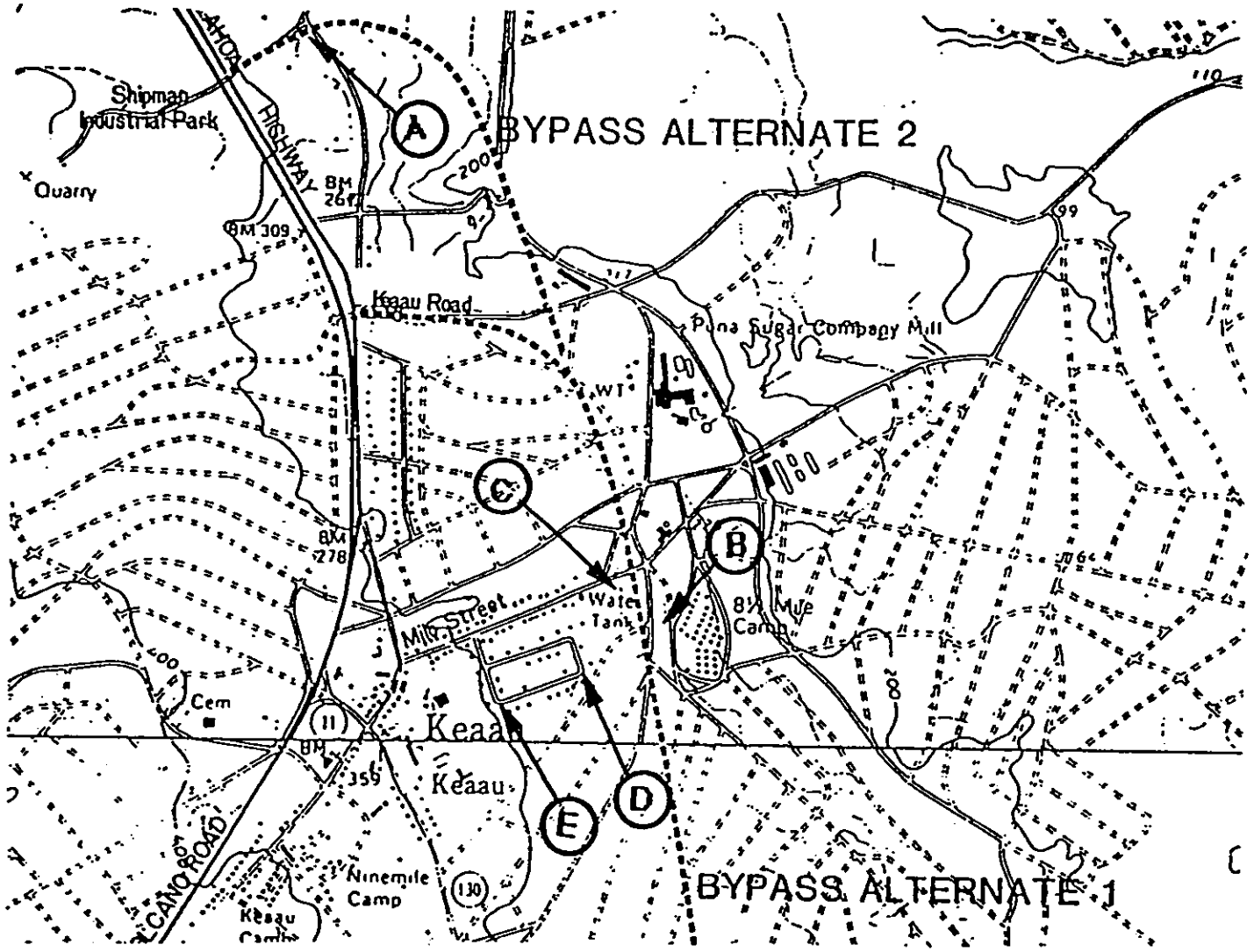

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FIGURE 3 AMBIENT NOISE LEVEL MEASUREMENT LOCATIONS AT NOISE SENSITIVE AREAS

Approx. Scale: 1" = 1530'

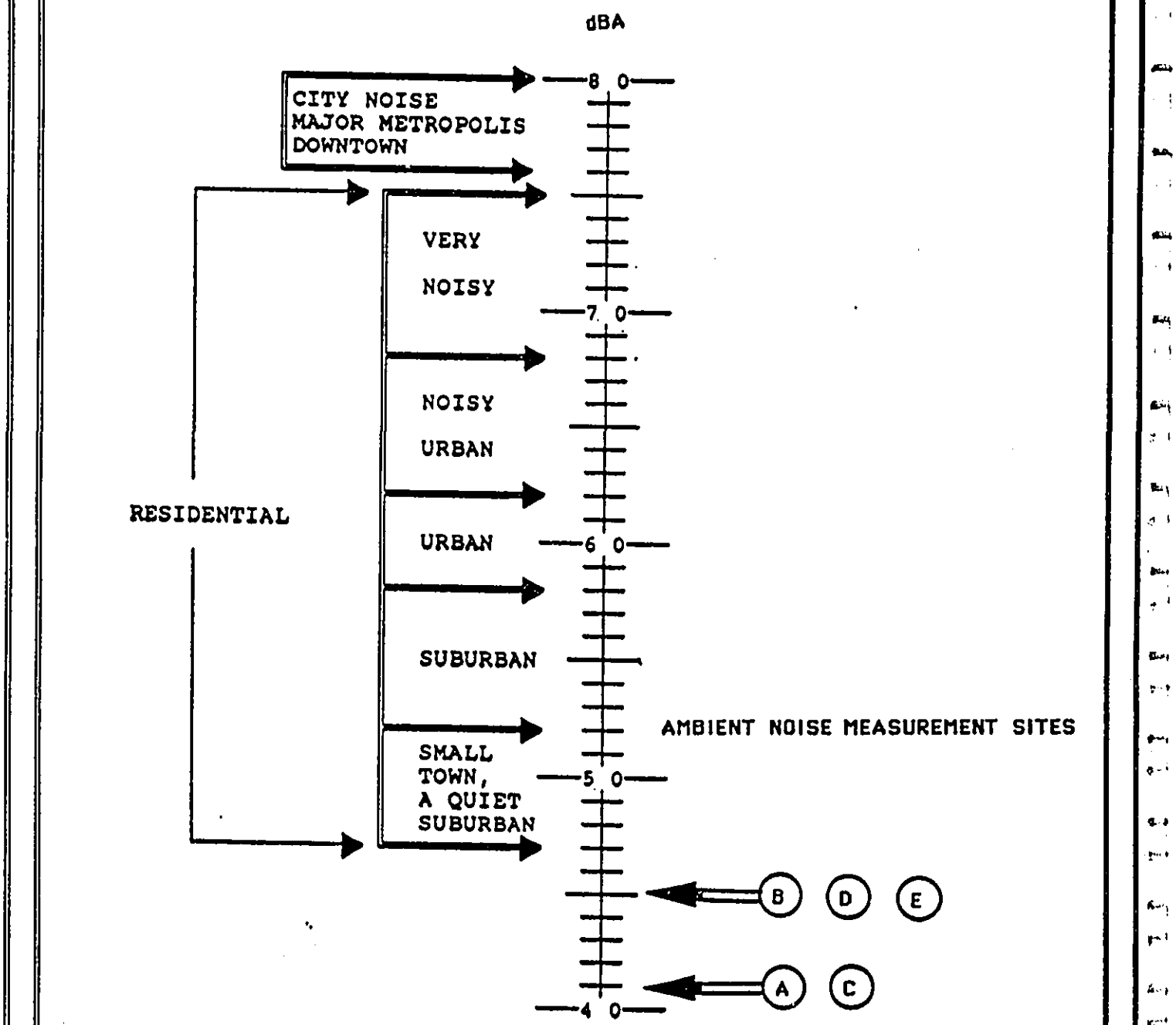

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FIGURE 4 COMPARISON OF MEASURED AVERAGE AMBIENT NOISE LEVELS AT NOISE SENSITIVE LOCATIONS TO TYPICAL ENVIRONMENTAL NOISE LEVELS (SEE FIGURE 3 FOR LOCATIONS)

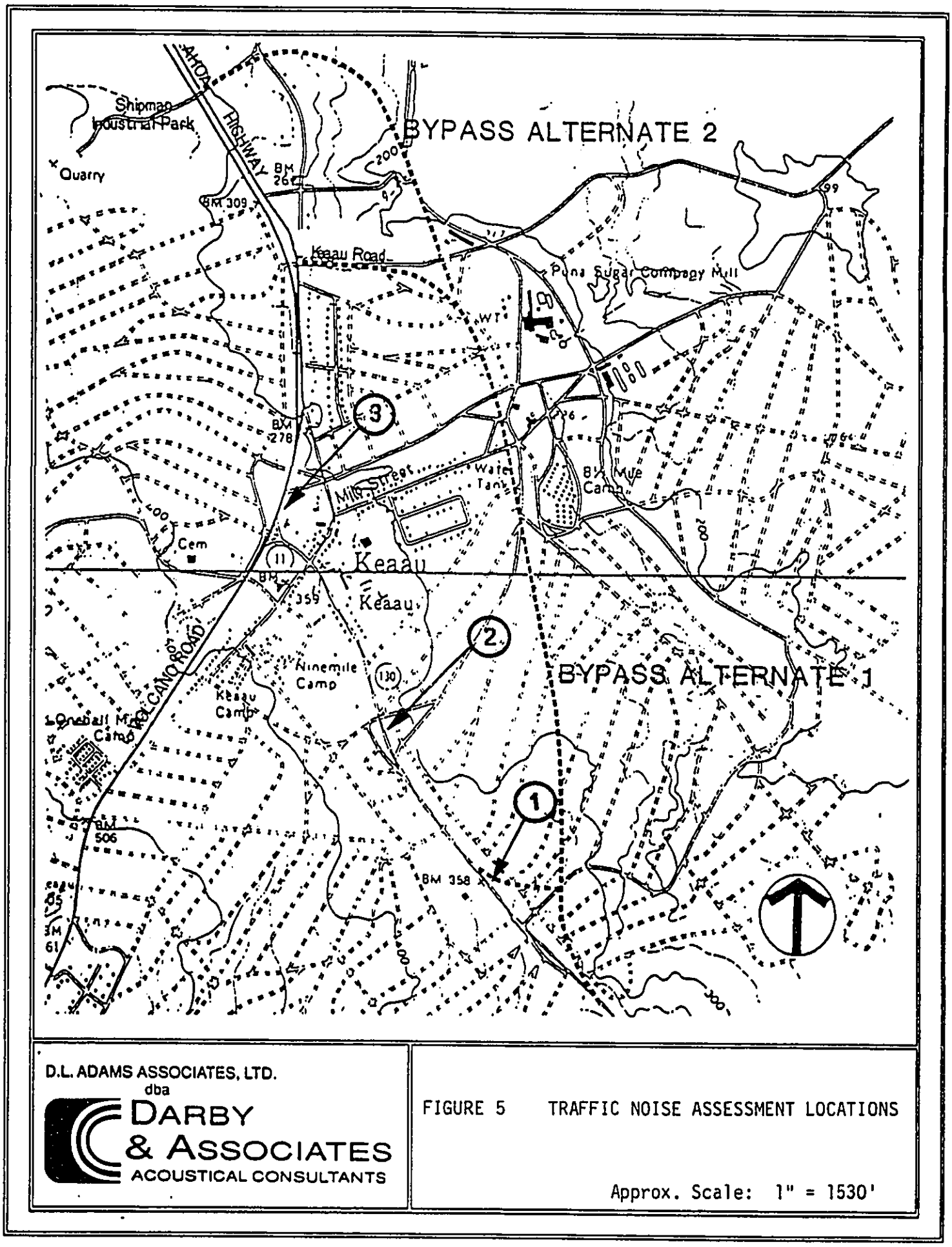

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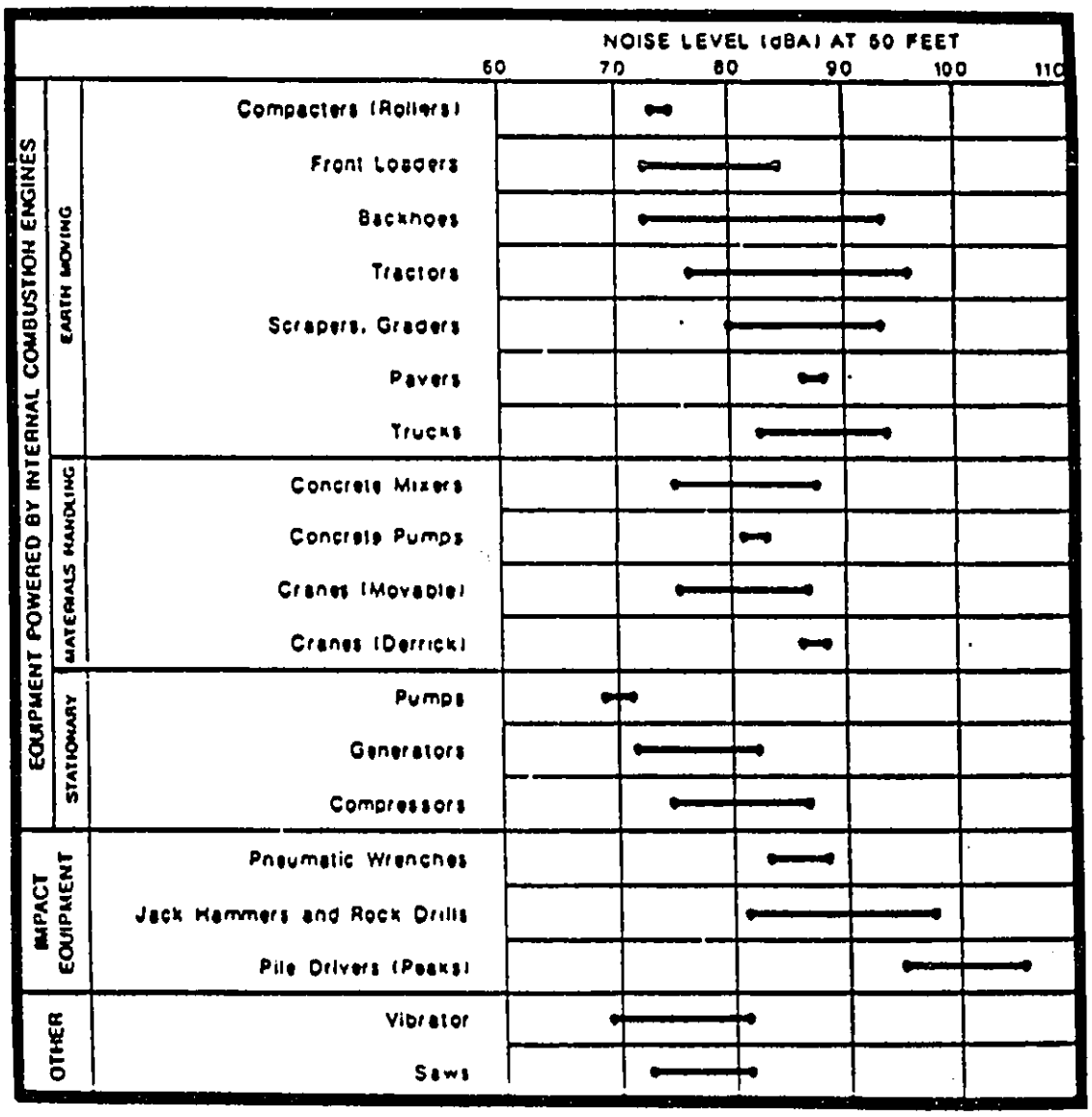
FIGURE 5 TRAFFIC NOISE ASSESSMENT LOCATIONS

Approx. Scale: 1" = 1530'



Note: Based on Limited Available Data Samples

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FIGURE 6 TYPICAL SOUND PRESSURE LEVELS FROM CONSTRUCTION EQUIPMENT

SOURCE: U.S. ENVIRONMENTAL PROTECTION AGENCY 1972

APPENDIX A

ACOUSTICAL TERMINOLOGY

Sound (Noise) Level

Sound or noise consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. It is measured in terms of decibels (dB) using precision instruments known as sound level meters.

Sound Level or Sound Pressure Level is defined as:

$$SPL = 20 \log (P/Pref) \text{ dB}$$

where P is the sound pressure fluctuation (above or below atmospheric pressure) and Pref is 20 micropascals, which is approximately the lowest sound pressure that can be detected by the human ear. For example, if P is 20 micropascals, then SPL = 0 dB, or if P is 200 micropascals, then SPL = 20 dB. The relation between sound pressure in micropascals and sound pressure level in decibels (dB) is shown in Figure A-1.

The sound level that results from a combination of noise sources is not the sum of the individual sound levels, but rather the logarithmic sum. For example, two sound levels of 50 dB produce a combined level of 53 dB, not 100 dB; two sound levels of 40 and 50 dB produce a combined level of 50.4 dB.

Human sensitivity to changes in sound level is highly individualized. Sensitivity to sound depends on frequency content, time of occurrence, duration, and psychological factors such as emotion and expectations. However, in general, a change of 1 or 2 dB in the level of a sound is difficult for most people to detect, a 3 to 5 dB change corresponds to a small but noticeable change in loudness, and a 10 dB change corresponds to an approximate doubling or halving in loudness.

A-Weighted Sound Level

The human ear is more sensitive to sound with frequencies above 1000 Hertz (Hz), than with frequencies below 125 Hz. Due to this type of frequency response, a weighting system, A-weight, was developed to approximate the frequency response of the human ear. A-weighted sound level (dBA) de-emphasizes the low frequency portion of the spectrum of a signal. The A-weighted (dBA) level of a sound is a good measure of the loudness of that sound, and so different sounds having the same A-weighted level sound about equally as loud. Typical values of the A-weighted sound level of various noise sources are listed in Figure A-1.

Appendix A
Acoustical Terminology
(Continued)

Statistical Sound (Noise) Levels

The sound levels of long-term noise producing activities, such as traffic movement, aircraft operations, etc., can vary considerably with time. In order to obtain a single number rating of such a noise source, several statistical noise levels have been developed and instrumentation are available to measure them. Common statistical sound levels include Equivalent Continuous Noise Level, Leq, and Percentile Exceedence Level, Lx.

The Equivalent Continuous Noise Level, Leq, represents a constant level with the same amount of total acoustic energy as that contained in the actual time-varying sound being measured over a specific time period. Leq is commonly used to describe community noise, traffic noise, and hearing damage potential.

A Percentile Exceedence Level, Lx, represents the sound level which is exceeded for x% of the measured time period. For example, L10 = 60 dBA describes that over the measured time period, the measured noise exceeded 60 dBA for 10% of the time. Common Percentile Exceedence Levels include L1, L10, L50, and L90, which are widely used to assess community and environmental noise. Figure A-2 illustrates the relationship between selected statistical noise levels.

Day Night Average Sound Level

The Day Night Average Sound Level, Ldn, is essentially the Equivalent Continuous Noise Level measured over a 24-hour period. However, in calculating the Ldn, 10 dBA is added to the noise levels recorded between 10 pm and 7 am to account for people's higher sensitivity to noise at night. The Ldn is a commonly used noise descriptor in assessing land use compatibility, and is used by federal and local agencies and standards organizations. Qualitative descriptions, as well as local examples of Ldn, are shown in Figure A-3.

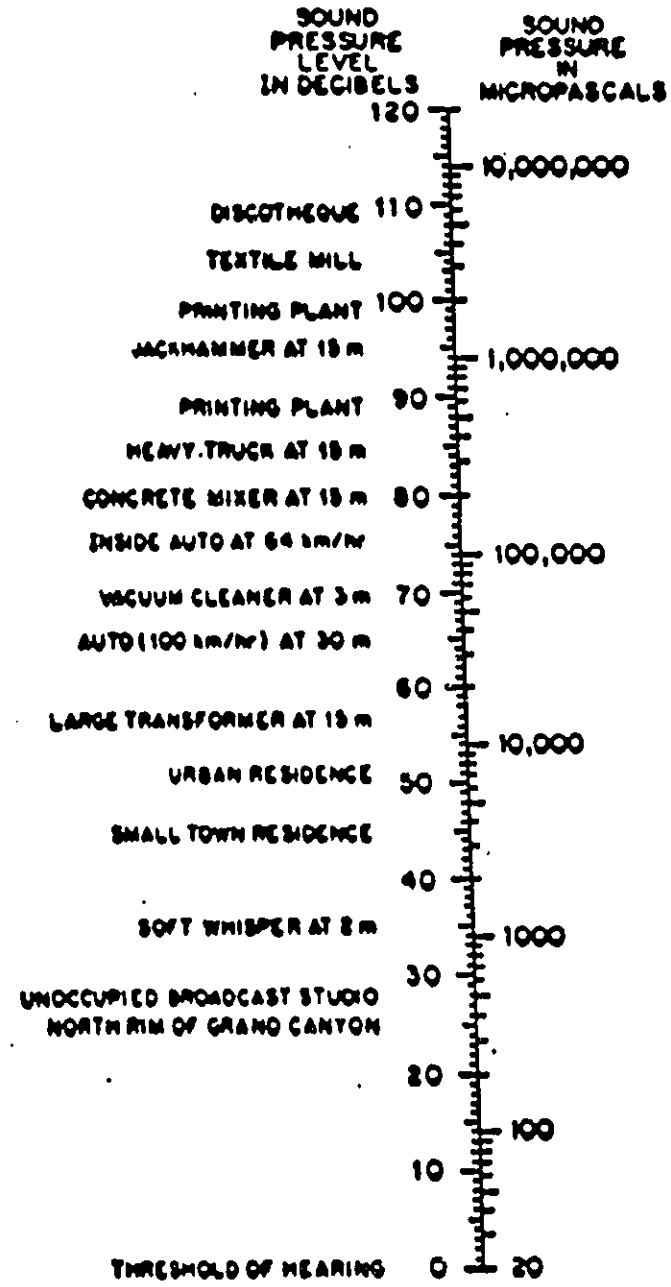

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FIGURE A-1 THE RELATION BETWEEN SOUND PRESSURE, P, AND SOUND PRESSURE LEVEL, SPL. ALSO SHOWN ARE TYPICAL VALUES OF A-WEIGHTED SOUND LEVELS OF VARIOUS NOISE SOURCES.

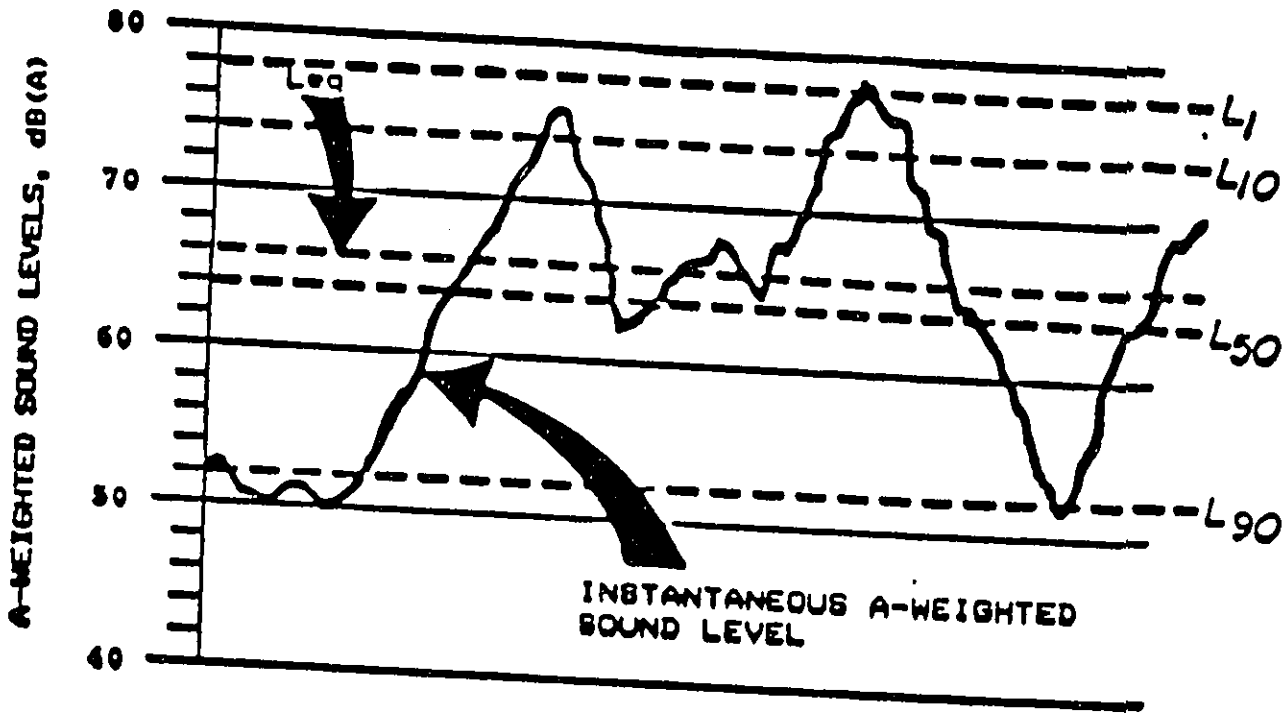

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FIGURE A-2 COMPARISON OF AN INSTANTANEOUS SOUND LEVEL AND THE CORRESPONDING STATISTICAL SOUND LEVELS

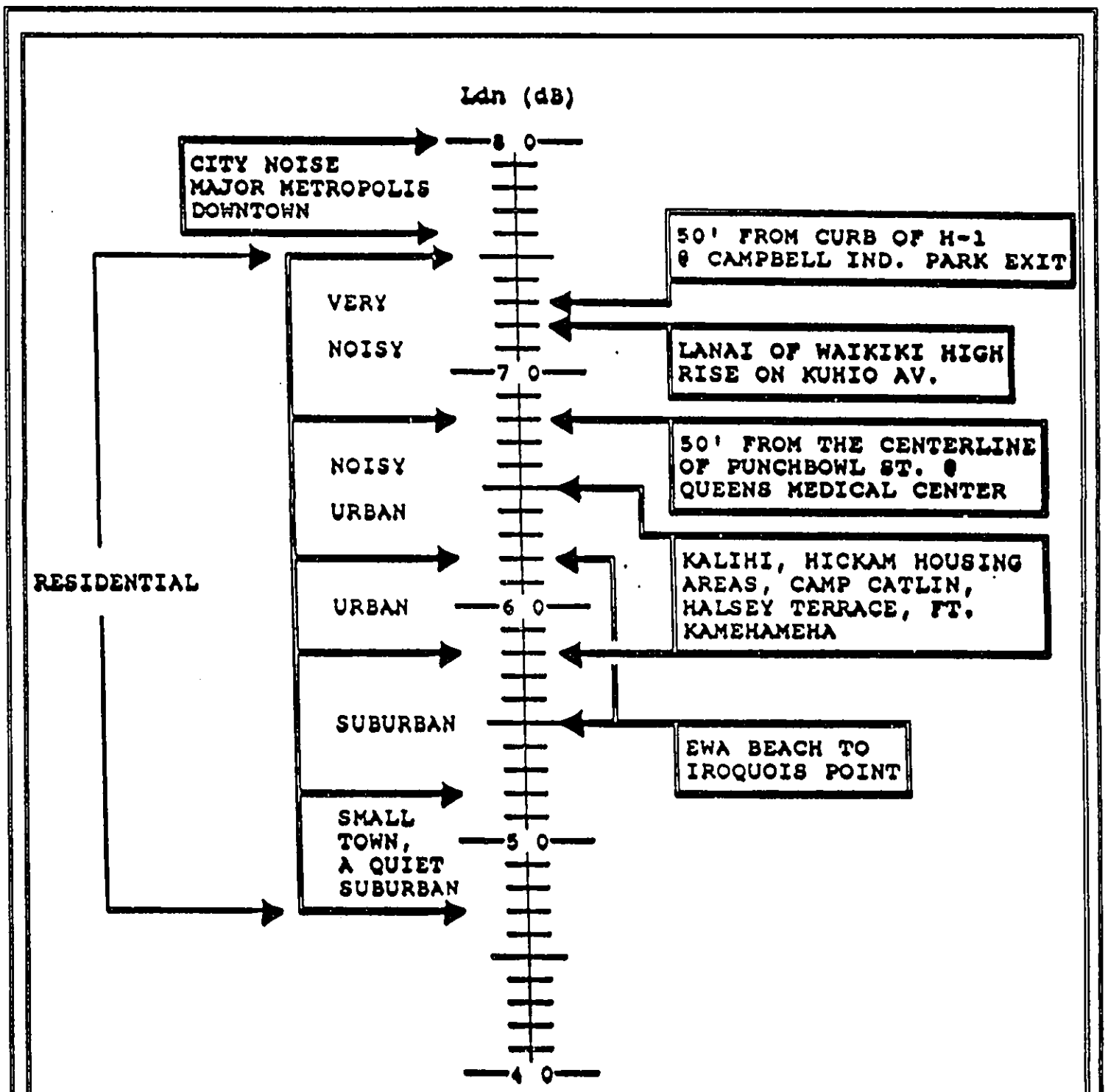

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FIGURE A-3 QUALITATIVE DESCRIPTION OF THE DAY-NIGHT SOUND LEVELS (Ldn) AND EXAMPLE Ldn's AT SELECTED LOCATIONS ON OAHU

APPENDIX E

Air Quality Impact Analysis
Keaau Pahoa Road
Keaau Town Section
Project No. 130B-01-92

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March 1994

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SECTION 1

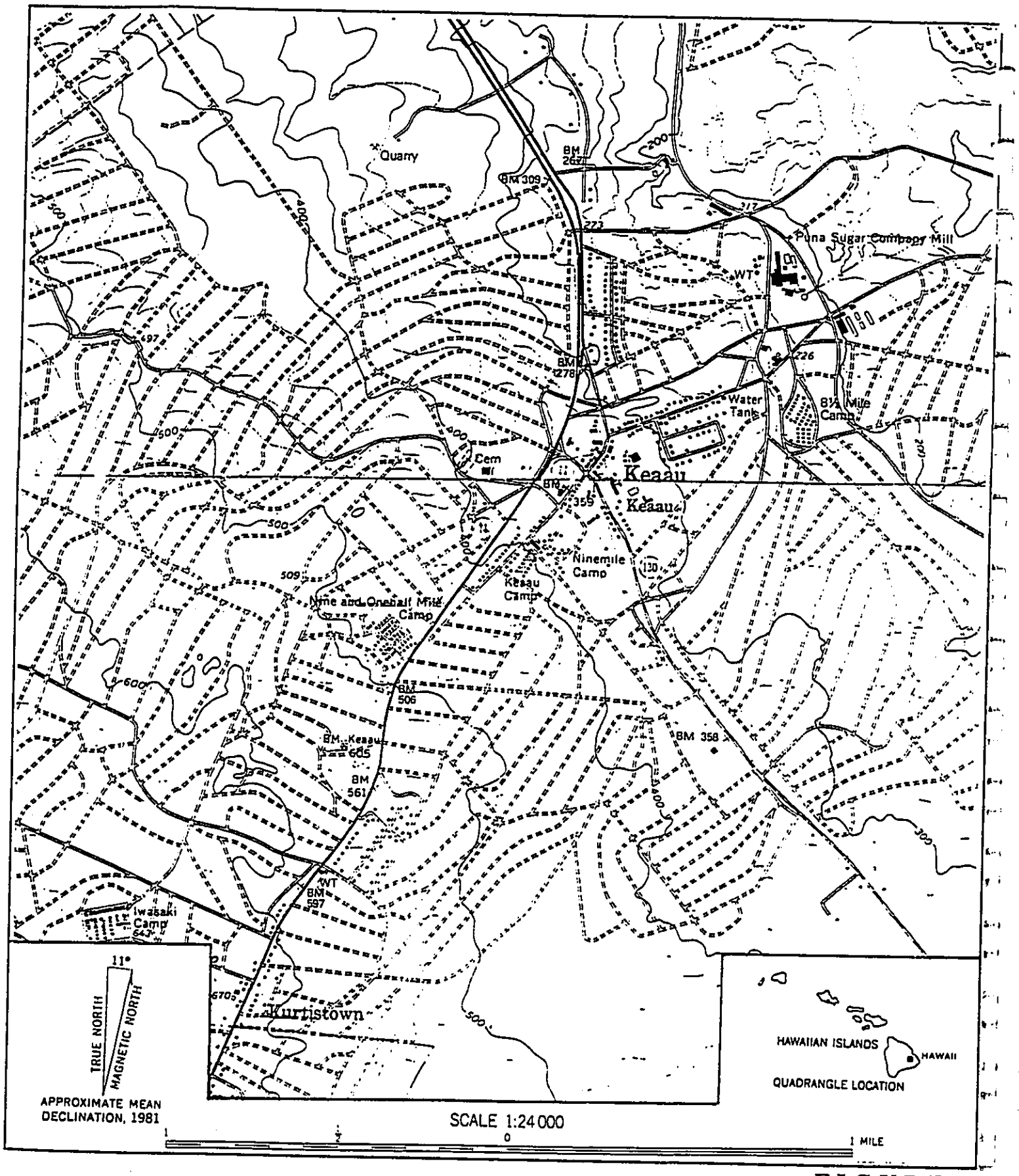
INTRODUCTION

The State of Hawaii Department of Transportation (DOT), is proposing to construct a bypass road routing Keaau-Pahoa Road around the town of Keaau, located on the eastern side of the Island of Hawaii (see Figure 1-1). The proposed project offers an alternate route to bypass Keaau town in order to alleviate traffic congestion through the town. The bypass road will primarily serve through traffic between Puna and Hilo. Restricted access and fewer intersections will provide better traffic flow with greater roadway capacities.

The purpose of this report is to assess the impact of the proposed development on air quality both on a local and regional basis. Potential air quality impacts that exceed Federal or State air quality standards would constitute a significant effect. Potential air quality impacts that do not exceed Federal or State air quality standards would be insignificant.

The overall project is an "indirect source" of air pollution as defined in the Federal Clean Air Act because its primary association with air pollution is due to motor vehicle traffic generated by residences, offices, and stores, etc. Thus, the focus of this analysis is on the project's potential to reduce or enhance the impact of the surrounding air quality as a result of the bypass road. Additionally, this report addresses the short-term impacts due to construction activities.

The following sections describe the environmental setting, the impacts of the proposed project, and potential mitigation measures.



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LOCATION MAP OF KEAAU

FIGURE

1-1

SECTION 2

ENVIRONMENTAL BACKGROUND

This section identifies the National and State air quality regulations and provides a summary of the existing air quality. The physical conditions (i.e., meteorology, climate, and topography) affecting air pollution dispersion at the Keaau-Pahoa Road proposed bypass site and surrounding area.

2.1 Regulatory Setting

The Federal *Clean Air Act* of 1970 (amended November 15, 1990) set forth National Ambient Air Quality Standards (AAQS) with States retaining the option to develop more stringent standards. These standards represent the maximum levels of pollution considered safe, with an adequate margin of safety, to protect the public health and welfare. The six pollutants for which National standards have been established (criteria pollutants) are sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), ozone (O_3), particulate matter less than 10 microns in diameter (PM_{10}), and lead (Pb). State standards were established for these same pollutants in Chapter 11-59 of the Hawaii Administrative Rules, *Ambient Air Quality Standards* (amended November 26, 1993). In the amendment of Chapter 11-59, the State standard for PM was removed and a new standard for PM_{10} was implemented to match the Federal PM_{10} standard. Both the State and Federal standards are summarized in Table 2-1.

2.2 Ambient Air Quality Levels

In evaluating the compliance of a new source with applicable standards, ambient background concentrations of the criteria pollutants are added to the maximum predicted concentrations resulting from implementation of the proposed project, and compared with existing National and State AAQS. Typically, the maximum background concentrations recorded within the previous three years are used to represent baseline conditions for the air quality analysis. Background concentrations in the project area have not been monitored regularly by the Department of Health (DOH) Clean Air Branch (CAB). To date, 24-hour averaging period data exist only for SO_2 and PM in the Hilo area for 1985. No other pollutants were monitored by DOH, and the Hilo monitoring station has not

Table 2-1

SUMMARY OF STATE AND FEDERAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Hawaii State	Federal Primary Standard[a]	Federal Secondary Standard[b]
Carbon Monoxide (mg/m^3)			
1 hour	10	40	40
8 hour	5	10	10
Nitrogen Dioxide ($\mu g/m^3$)			
1 hour	--	--	--
24 hour	--	--	--
Annual (Arithmetic)	70	100	100
Particulate Matter-10[c] ($\mu g/m^3$)			
24 hour	150	150	150
Annual (Arithmetic)	50	50	50
Ozone ($\mu g/m^3$)			
1 hour	100	235	235
Sulfur Dioxide ($\mu g/m^3$)			
3 hour	1300	--	1300
24 hour	365	365	--
Annual (Arithmetic)	80	80	--
Lead ($\mu g/m^3$)			
3 months (Arithmetic)	1.5	1.5	1.5
Hydrogen Sulfide ($\mu g/m^3$)	35	--	--

a Designed to prevent adverse effects on public health.

b Designed to prevent adverse effects on public welfare including effects on comfort, visibility, vegetation, animals, aesthetics values, and soiling and deterioration of materials.

c Particulate Matter which is 10 microns or less in diameter.

operated since October 1985. Hawaiian Electric Light Company (HELCO), however, operated an air quality monitoring station approximately 5.5 miles north of the proposed project site between February 1989 and May 1990. The HELCO Waiakea monitoring station data for SO_2, NO_2, PM_{10}, and CO were used in this study to represent baseline ambient air quality. Table 2-2 lists the maximum measured ambient background concentrations for the criteria pollutants available for the Hilo area at this time. While there are no background data available for O_3 or Pb, it is assumed that the air quality relative to these pollutants is good. There are no significant stationary sources of these pollutants in the vicinity. The State of Hawaii is presently considered in attainment for all criteria pollutants (i.e., not violating the State or Federal air quality standards).

It should be noted, however, that the worst air pollution episodes experienced in Hawaii County occur when unfavorable meteorological conditions enhance the pollutant concentration levels from the volcano that has erupted continuously over the past 11 years. While volcanic emissions are somewhat variable and have not been fully characterized, it is well known that visibility is frequently affected by the presence of fine particulates resulting directly from volcanic activity, as well as, secondarily from forest fires caused by lava flows. In addition, there are substantial increases in the ambient concentrations of SO_2 and other toxic air contaminants as a result of these eruptions.

2.3 Meteorology and Climate

The Island of Hawaii is located within the North Pacific trade wind band. The trade winds are controlled by a semipermanent high pressure system that is located north-northeast of the Hawaiian Islands. Wind circulation generated by this high pressure system is clockwise and outward from the center. The prevailing trade winds arrive from the northeast to east direction. The trade winds are more persistent in the summer than in the winter, averaging 90 and 50 percent, respectively, and stronger in the afternoon than at night (University of Hawaii 1983). At night, the wind direction becomes variable and blows down from the mountains, a phenomenon that can be attributed to the presence of the islands two largest mountains, Mauna Kea and Mauna Loa (refer to figure 2-1 for frequency of wind speed and direction for Hilo between 1984-1988).

The South Hilo District receives between 130 inches of rain near the coastline to as much as 300 inches of rain in the uppermost elevations. The Keaau-Pahoa Bypass Road project

Table 2-2

MAXIMUM MEASURED AMBIENT BACKGROUND CONCENTRATIONS IN HILO AREA[1]

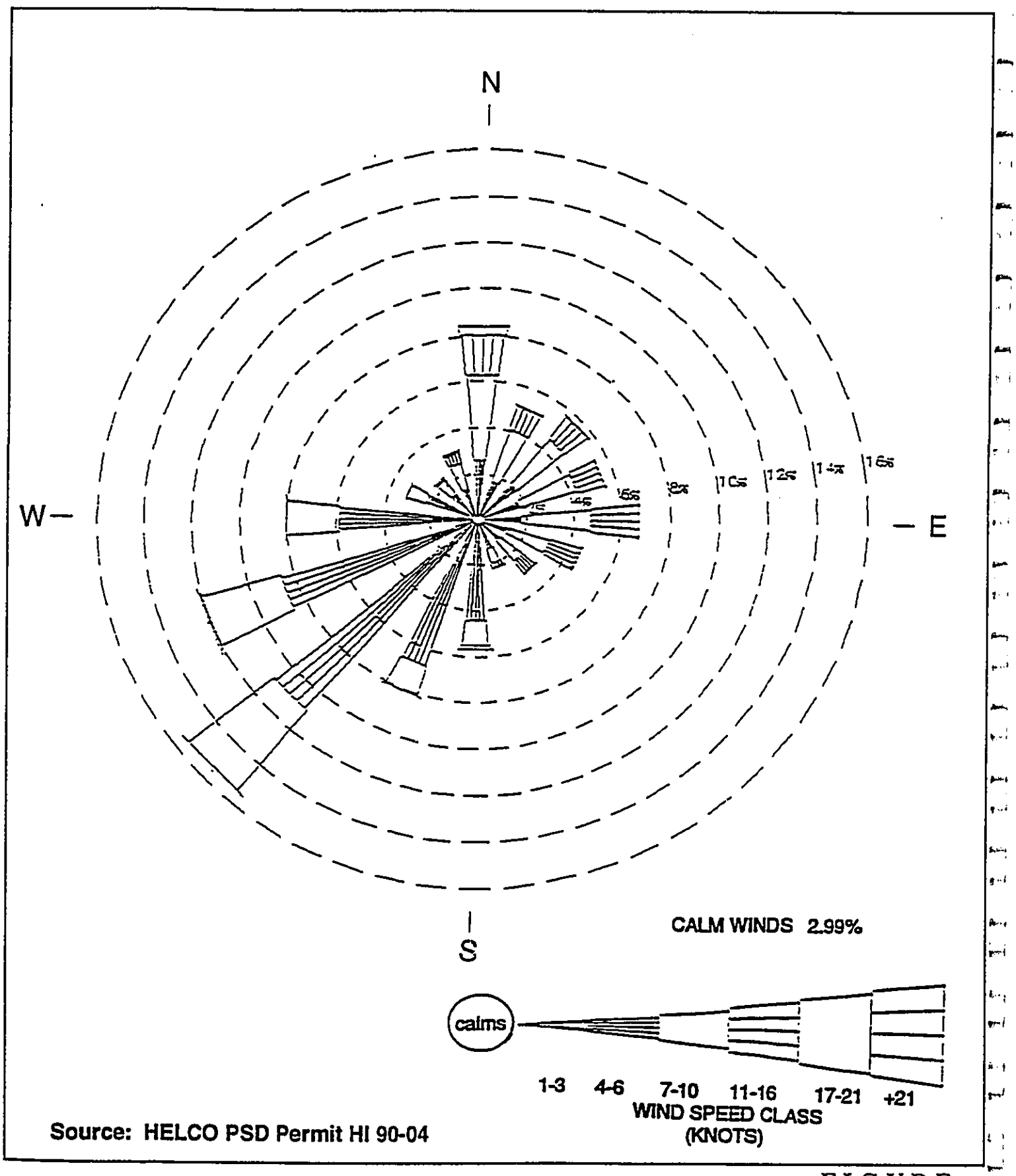
Pollutant	Averaging Period	Concentrations ($\mu g/m^3$)
SO_2	3-hour	678.0
	24-hour	207.4
	Annual	11.3
NO_2	Annual	5.6
CO	1-hour	2290.0
	8-hour	2290.0[2]

1. SOURCE: HELCO ATC Permit Application HI 90-04
2. Concentration is the maximum 24-hour value for the monitoring period

area receives approximately 150 inches of rain per year. The annual average temperature is 73.6°F, with an average daily maximum of 81.2°F and a daily minimum of 71.2°F (University of Hawaii 1983).

2.4 TOPOGRAPHY

The Keaau-Pahoa Bypass Road area will cover approximately 2 miles and is located in the eastern quadrant of the Island of Hawaii just south of the town of Hilo. The Pacific Ocean lies approximately 5.0 miles east of the proposed bypass road site. The town of Keaau and the Panaewa and Waiakea Forest Reserves are to the west of the proposed bypass road site. Contours of constant elevation parallel the coastline and run through the proposed site so that the eastern end is approximately 200 feet above sea level (ASL), and the western end is approximately 300 feet ASL. There are no significant terrain features (e.g., cliffs, bluffs, hills) in the project area (USGS 1981).



Source: HELCO PSD Permit HI 90-04

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WINDROSE: HILO AIRPORT 1984-1988

FIGURE

2-1

SECTION 3

ENVIRONMENTAL IMPACTS

This section describes the environmental impacts of the proposed project. Impacts have been broken down into three groups: short-term, long-term, and indirect. Each of these groups is discussed below.

3.1 SHORT-TERM POLLUTANT IMPACTS

Short-term pollutant impacts of the proposed Keaau-Pahoa Bypass Road are considered to be those associated with construction activities. Emission sources primarily include tailpipe emissions from heavy-duty construction equipment and workers' vehicles and fugitive dust generated during demolition and construction activities, particularly site clearing and land grading.

The size of the project indicates that a large number of various types of equipment (i.e., scrapers, dozers, water trucks) will be utilized. The operation of the heavy-duty construction equipment will cause the emission of SO_2, oxides of nitrogen (NO_x), hydrocarbons (HC), CO, and PM. Typically, diesel-powered equipment will emit more NO_x, SO_2, and PM than will gasoline-powered equipment. The latter, however, will emit more HC and CO. In addition, exhaust emissions from workers' vehicles will add to the total pollutants emitted. While localized increases of these pollutants are expected to occur, they are not considered significant.

Fugitive dust generated (i.e., PM) from clearing vegetation and other heavy-duty construction operations is estimated at 1.2 tons per acre per month of activity (USEPA 1985). According to the State DOT, approximately 88 acres will be disturbed over the lifetime of the project. The construction will be accomplished in one phase with the largest land disturbance occurring during the vegetation clearing. The potential for significant fugitive dust generation during this phase will exist. However, these air quality impacts will be localized and temporary.

3.2 LONG-TERM POLLUTANT IMPACTS

Long-term pollutant impacts of the proposed Keaau-Pahoa Bypass Road are considered to be those associated with everyday use of the bypass road. The most significant long term emission sources are motor vehicles, with the most significant tailpipe emission being CO.

High short-term concentrations of CO, known as "hot spots", can occur at locations where traffic is congested, such as at intersections and along the highways. For this project, the intersection of Mamalahoa Highway and Keaau-Pahoa Road was modeled because this location has the greatest traffic volume (in terms of vehicles per peak hour) of all of the intersections in the area (Barton-Aschman Associates, Inc. 1993). Peak traffic volume occurs in the evening of 2013 at a Level of Service (LOS) rating "F" if the Keaau Pahoa-Bypass Road is not constructed. Consequently, traffic at this intersection was modeled using the existing 1993 traffic data, the projected 2003 and 2013 traffic volumes assuming the project is not built, and the 2003 and 2013 traffic volumes assuming the project is built. The modeling results provide the worst-case scenario of CO concentration levels to be produced with or without the project at this intersection. The CO concentrations produced by the project's two new intersections along the bypass road as well as any other intersection in the area will be less than those at the Mamalahoa Highway Keaau-Pahoa Bypass Road intersection due to their lower LOS ratings.

The CAL3QHC air quality model developed by the U.S. Environmental Protection Agency (USEPA) was used to analyze the potential air quality impacts at specific receptors surrounding the intersection. CAL3QHC is presently listed in Supplement B to the USEPA *Guideline on Air Quality Models (Revised)*. This document lists the preferred air quality models (USEPA 1987, USEPA 1990a).

Vehicle emissions were generated for 1993, 2003, and 2013 using MOBILE 5.0 emission factors, assuming the national average vehicle mix. Studies indicate that the average miles traveled per gallon per vehicle in Hawaii is higher than the national average. This higher average is due to a higher number of fuel efficient vehicles (most likely rental cars) in operation. Using these emission rates is conservative. Different emission factors were used for the various estimated speeds approaching the intersections (i.e., 55 miles per hour (mph) along Mamalahoa Highway and 35 mph along Keaau-Pahoa Road). The idle emission factors generated by the MOBILE 5.0 model were adjusted for site-specific

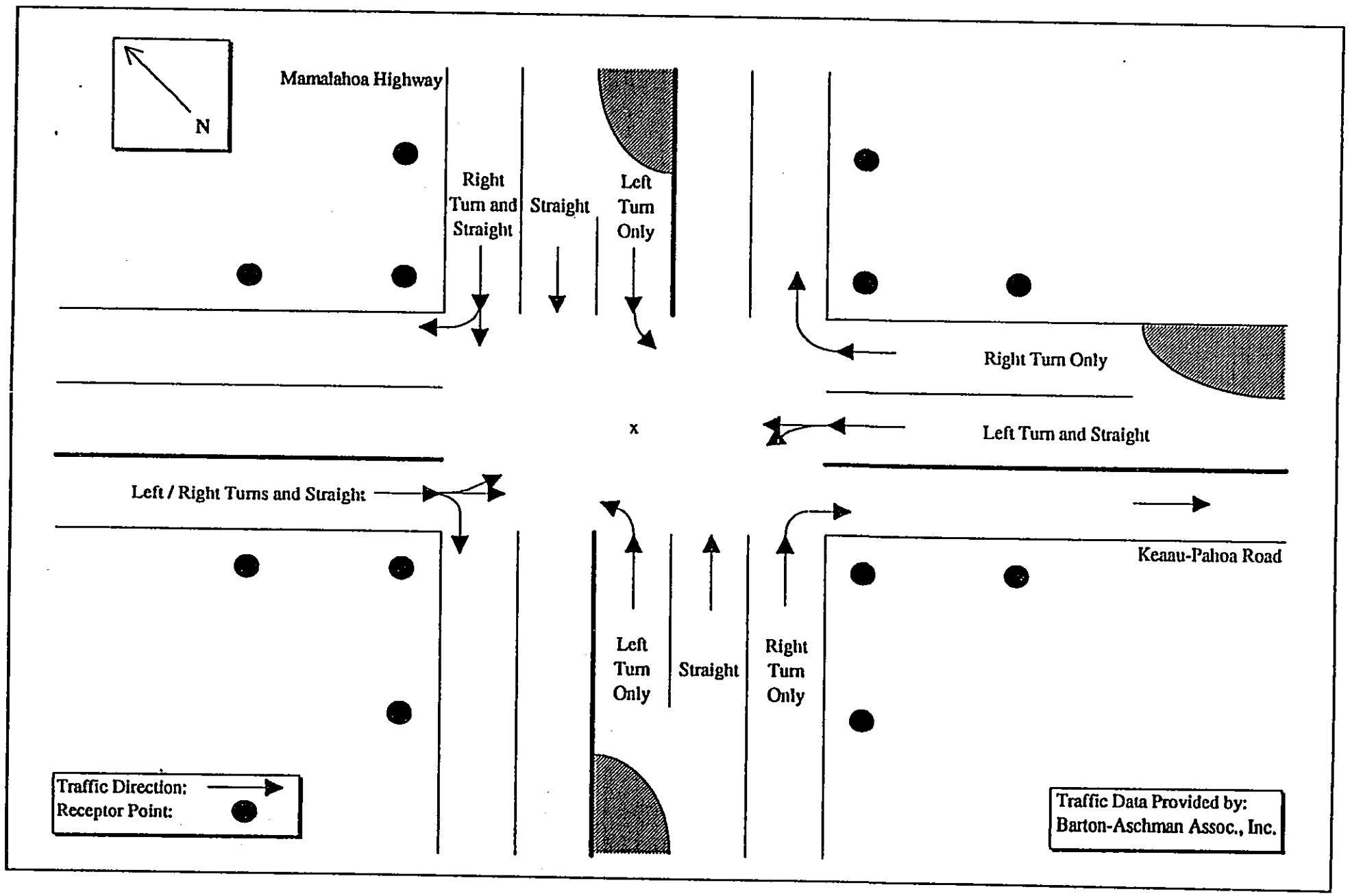
conditions. The MOBILE 5.0 emission rates were used as input into CAL3QHC. The CAL3QHC model is designed to calculate CO concentrations at a signalized intersection.

The maximum 1-hour average concentration of CO was estimated based on the worst-case meteorological conditions of a wind speed of 1.0 meters per second (mps) and a stability class of D. This stability class was considered appropriate for the study involved.

Receptors (i.e., locations where the ambient CO concentrations are calculated) were placed at 30-ft intervals along Mamalahoa Highway at a distance of approximately 10 feet from the edge of the roadways. Figure 3-1 shows the locations of the receptors and the various roadway links used in the CAL3QHC model.

A CO concentration of 2 ppm is considered average for background levels found in ambient air quality and is confirmed by the data collected by HELCO at Waiakea. As mentioned earlier, high concentrations of CO, known as "hot spots," can occur at locations where traffic is congested, such as at intersections and along the highways. For this scenario, we have both an intersection and an adjoining highway. Therefore, the modeling results will show typical CO concentration levels that are found at these locations. Although CO concentrations are higher at this intersection than elsewhere, CO concentrations are below Federal and State AAQS. Based on USEPA guidelines, a persistence factor of 0.7 was used to estimate the 8-hour average CO concentration from the predicted 1-hour values.

The modeling results indicate that the project is not expected to cause exceedances of the Federal or State CO standards. Table 3-1 summarizes the maximum model-predicted 1-hour and 8-hour CO concentrations for the existing conditions, the future without the project, and the future with the project alternatives. The results shown in the table give the maximum predicted concentrations for the wind direction that caused the highest overall predicted concentration. The highest 1-hr CO concentration of 7.1 ppm was predicted for the existing am conditions (i.e., present day without project). The highest concentration predicted for the future was 6.1 ppm in the year 2013 for the am scenario without the project. With the project, CO concentrations are much lower. This is due to the fact that traffic will be less congested at the Mamalahoa Highway and Keaau-Pahoa Road intersection as a result of the bypass road project and improvements in fuel efficiency as mandated under the Clean Air Act Amendments.



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SCHEMATIC DIAGRAM OF CAL3QHC MODELING ANALYSIS AT THE MAMALAHOA HIGHWAY AND KEAAU-PAHOA ROAD INTERSECTION

FIGURE

3-1

Table 3-1
MAXIMUM PREDICTED CO CONCENTRATIONS
(ppm)

			Maximum Predicted 1-hr CO concentrations			
Year	Time	Ambient Background	Without Project	With Project	SAAQS	NAAQS
1993	am	2.0	7.1	-----	9	35
	pm	2.0	5.8	-----	9	35
2003	am	2.0	5.6	3.9	9	35
	pm	2.0	3.8	4.0	9	35
2013	am	2.0	6.1	3.4	9	35
	pm	2.0	4.2	3.5	9	35

			Maximum Predicted 8-hr CO concentrations			
Year	Time	Ambient Background	Without Project	With Project	SAAQS	NAAQS
1993	am	2.0	5.0	-----	4	9
	pm	2.0	4.1	-----	4	9
2003	am	2.0	3.9	2.7	4	9
	pm	2.0	2.7	2.8	4	9
2013	am	2.0	4.3	2.4	4	9
	pm	2.0	2.9	2.5	4	9

Note: 1-hr CO NAAQS of 40 mg/m3 is equivalent to 35 ppm.
8-hr CO NAAQS of 10 mg/m3 is equivalent to 9 ppm.
1-hr CO SAAQS of 10 mg/m3 is equivalent to 9 ppm.
8-hr CO SAAQS of 5 mg/m3 is equivalent to 4 ppm.

According to Barton-Aschman Associates, Inc. (1993), the intersection of Mamalahoa Highway and Keaau-Pahoa Road has the worst LOS factor of all of the intersections in the area with or without the project. The higher the LOS rating, the more congested the intersection is and the more CO is generated. Because the two new intersections created by the project along the bypass road have a LOS rating lower than the modeled intersection, CO concentrations are expected to be lower. Therefore, CO concentrations created by the project at the two new intersections will be below the Federal and State AAQS and will have no significant impact.

3.3 Indirect Pollutant Impacts

The project will have additional air quality impacts beyond those associated with construction and traffic. For example, street lights have no direct emissions of air pollutants. However, these lighting fixtures will increase energy demand from power generating facilities. This increased demand though minimal will also contribute to the regional air pollution background, yet total air pollution generated will have little impact in the area and will remain well below the State's ambient air quality standard. Therefore, impacts beyond those associated with construction and traffic are considered to be insignificant.

This and other development projects on the Island of Hawaii will dictate that HELCO be able to provide additional electricity. Though HELCO is presently investigating increasing electrical output on Hawaii, currently the majority of the island's electricity is generated by burning fuel oil which emits SO_2, NO_x, PM, and HC. The impact from these emissions will be external to the proposed project site, but because additional electrical demands will be generated by the project, a portion of these emissions are attributable to it. This increase in electrical demand as a result of the project will have little impact in the area and pollutant concentrations are expected to remain well below the State's ambient air quality standard. Therefore, impacts associated with electrical demand are considered to be insignificant.

Other potential indirect sources of air pollution include pesticide use. Impacts associated with indirect pollution sources are not expected to significantly impact the regional air quality, and are therefore, considered insignificant as well.

SECTION 4

MITIGATION MEASURES

This section describes the mitigation measures that can be employed to minimize or reduce the potentially adverse environmental impacts from the proposed development. The mitigation measures vary according to impact type. The following subsections discuss mitigation measures for short-term, long-term, and indirect pollutant impacts.

4.1 Short-Term Measures

Fugitive dust and heavy equipment use are the primary short-term emission sources. Fugitive dust emissions can be mitigated by ensuring that appropriate brush clearing and construction operations are practiced. These include: minimizing the number of concurrent brush clearing and construction activities, and watering to minimize fugitive dust emissions. Onsite personnel should determine the locations and application times for watering based on construction activities and local meteorological conditions.

Although exhaust emissions from construction equipment are not expected to be significant, the following measures can be taken to reduce potential impacts. These include utilizing electrical equipment and/or fuel burning equipment with air pollution control technologies applied (i.e., source catalytic converter, and fuel injection timing retard).

4.2 Long-Term Measures

As a result of the Keaau-Pahoa Bypass Road, the traffic volume is not expected to significantly raise CO concentrations in the surrounding areas. However, there are measures designed to reduce motor vehicle trip generation that can be incorporated into the overall project strategy. Implementation of the following measures are suggested: encourage public transportation and/or ride sharing by providing public access to alternate forms of transportation and install bike lanes.

4.3 INDIRECT MEASURES

Indirect pollutant impacts are not considered to be significant. Due to the negligible impact of these sources, no additional reduction measures are unwarranted.

SECTION 5

CONCLUSION

The air quality impact analysis for the Keaau-Pahoa Bypass Road project reveals potential short-term significant impacts. The potential for significant fugitive dust generation during the construction phase will exist. However, there are mitigation measures that can be taken to reduce the air quality impact, which will be localized and temporary. The modeling results indicate that the long-term air quality impact of the project is not significant (i.e., not expected to cause exceedances of the Federal or State AAQS). Impacts associated with indirect pollution sources are not expected to significantly impact the regional air quality, and are therefore, considered insignificant as well.

SECTION 6

REFERENCES

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APPENDIX F

BOTANICAL SURVEY
KEA'AU PAHOA ROAD
KEA'AU TOWN SECTION
PROJECT NO. 130B-01-92
PUNA DISTRICT, ISLAND OF HAWAI'I

by

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Prepared for: GK & ASSOCIATES

January 1994

BOTANICAL SURVEY
KEA'AU PAHOA ROAD
KEA'AU SECTION
PROJECT NO. 130B-01-92
PUNA DISTRICT, ISLAND OF HAWAI'I

INTRODUCTION

Since 1970, the population within the district of Puna has grown rapidly with a large number of people commuting daily to work in Hilo. Much of the commuter traffic funnels through Kea'au town with reduced speeds of 25 mph and 35 mph along a two-lane road. The State Department of Transportation proposes to design and construct a bypass road around the town of Kea'au to alleviate traffic congestion through the town.

The bypass road will primarily serve through traffic between Puna and Hilo. It is anticipated that restricted access and fewer intersections will provide better traffic flow with greater roadway capacities. Widening the existing roadway through town is constrained by the existing development adjacent to the roadway. A makai route is proposed to meet Mamalahoa Highway at either Kea'au Road or Shipman Industrial Park.

Field studies to assess the botanical resources found on the proposed bypass road corridor were conducted on 03 December 1993. The primary objectives of the survey were to: 1) describe the major vegetation types found within the corridor; 2) inventory the flora; 3) search for threatened and endangered species as well as rare and vulnerable plants; and 4) identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

SURVEY METHODS

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. Topographic maps and a recent aerial photograph were examined to determine access, vegetation cover patterns, boundaries, reference points, and terrain characteristics.

The less disturbed vegetation types such as the mixed forest north of Kea'au Road were more intensively surveyed as they are more likely to harbor native plant communities, and, perhaps, rare plants. The actively cultivated macadamia nut orchards were not surveyed in detail as sensitive native plant communities are not likely to occur in such situations.

A walk-through survey method was used. A corridor 300 ft. wide was surveyed along the proposed bypass road. Notes were made on plant associations and distribution, substrate types, topography, exposure, drainage, degree of disturbance, etc. Plant identifications were made in the field; plants which could not be positively identified were collected for later determination in the herbarium, and for comparison with the most recent taxonomic literature.

DESCRIPTION OF THE VEGETATION

There have been a few botanical studies on nearby lands, or which have included portions of the proposed bypass road corridor. The sugar cane fields adjacent to the Puna Sugar Mill and a portion of the mixed forest along the Railroad Avenue Road have been described by Char (1990) for the Puna Sugar Mill Generating Station expansion; the study involved a survey of the vegetation found within a square kilometer centered on the Puna station.

Studies of adjacent lands include the botanical assessment survey for the Shipman Industrial Park (Char 1984) and a biotic assessment of the Puna geothermal area (Char and Lamoureux 1985).

Most of the proposed bypass road corridor will cross over former sugar cane fields now overgrown with weedy trees and other species. A mixed forest composed primarily of introduced tree species is found along Bypass Alternate 2, near the Railroad Avenue Road. The Bypass Alternate 2 corridor also crosses over a macadamia nut orchard. These three vegetation types are described in more detail below. A list of all the vascular plants inventoried on the corridor during the field studies is found at the end of the report.

Old Field Vegetation

The proposed bypass road corridor, from where it leaves the Kea'au-Pahoa Road to where it joins Mamalahoa Highway at the Kea'au Road intersection, will cross over old field vegetation; this vegetation type dominated by introduced or alien species is found on the majority of the bypass road corridor. It is found on former Puna Sugar Company lands and is composed of weedy tree species, various grasses, and weedy herbs and shrubs. Remnant patches of sugar cane (Saccharum officinarum) can still be found in these fields.

Melochia (Melochia umbellata) a small tree, 6 to 20 ft. tall, with fuzzy, heart-shaped leaves and clusters of pale pink flowers, is the most abundant of the weedy trees invading the former cane fields. Other weedy tree species occasionally observed are gunpowder tree (Trema orientalis), bingabing (Macaranga mappa), and guarumo (Cecropia obtusifolia). The tree cover is variable, ranging from open, very scattered cover (less than 30%), to open-canopied situations (more than 30%, but less than 60% cover).

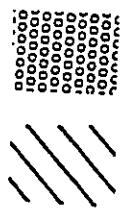
Filling in the matrix between the trees is a dense, matted, low cover (2 to 6 ft. high) composed of a varied assortment of grasses, shrubs, and herbs. Among the more commonly observed grasses are California grass (Brachiaria mutica), Hilo grass (Paspalum conjugatum), broomsedge (Andropogon virginicus), and molassesgrass (Melinis minutiflora). Clumps of sugar cane can be found scattered throughout these old fields, but the plants are denser nearer the roadsides. Among the herbs and shrubs, the more commonly observed species include sensitive plant or puahilahila (Mimosa pudica), honohono (Commelina diffusa), several Desmodium species, comb hyptis (Hyptis pectinata), Spermacoce mauritiana, and pluchea (Pluchea symphytifolia).

Rows of taller (30 to 40 ft.), much older gunpowder and melochia trees can sometimes be found bordering overgrown canehaul roads. These rows of trees may have served as windbreak plantings at one time.

Mixed Forest

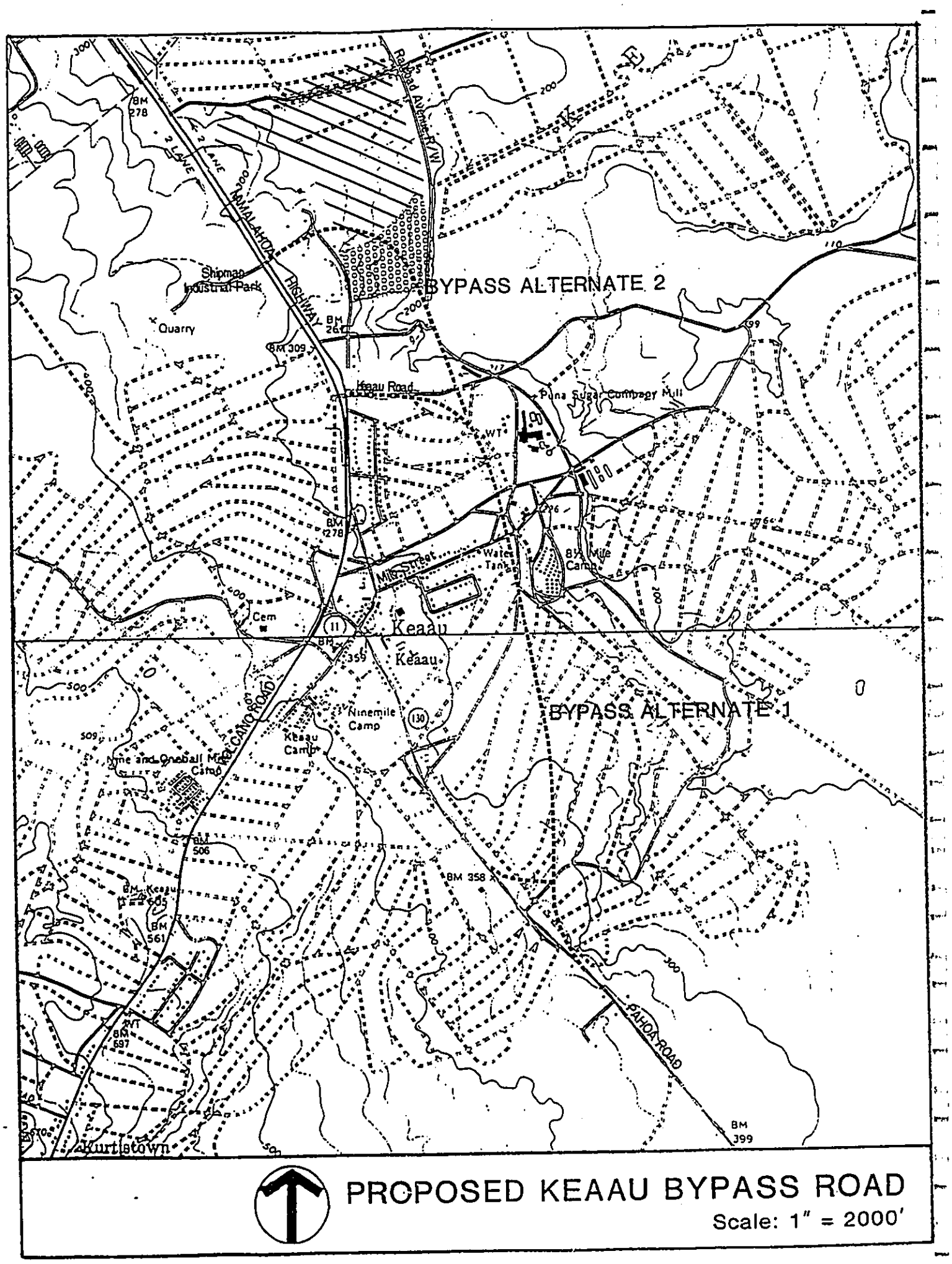
This vegetation type occupies only a small area north of Kea'au Road along the Bypass Alternate 2 corridor (Figure 1). It is composed almost exclusively of introduced species, that is, plants that were brought to the islands by humans after Western contact (Cook's discovery of the Hawaiian Islands in 1778). In fact, during the late 1920's, portions of Hilo and Puna were reforested by aerial seeding (Wagner et al. 1990). The forest within the bypass road corridor consists primarily of large, old specimens of gunpowder tree, 50 to 70 ft. tall. Scattered throughout the forest are other tree species which include guarumo, melochia, avocado (Persea americana), mango (Mangifera indica), 'ulu or breadfruit (Artocarpus altilis), kukui (Aleurites moluccana), king or Alexandra palm (Archontophoenix alexandrae), hala (Pandanus tectorius), and Chinese banyan (Ficus microcarpa).

FIGURE 1. Approximate location of Mixed Forest and Macadamia Nut Orchard along Bypass Alternate 2, Kea'au, Puna, island of Hawai'i



Mixed Forest

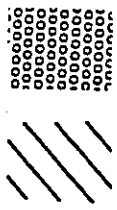
Macadamia Nut Orchard


BYPASS ALTERNATE 2
BYPASS ALTERNATE 1
Railroad Avenue R/W
2 LANE
NAALAHOA HIGHWAY
Shipman Industrial Park
Quarry
BM 278
BM 267
BM 309
Keaau Road
Pana Sugar Company Mill
WT
BM 1278
Mill Street
Water Tank
8½ Mile Camp
Cem
Keaau
BM 359
Ninemile Camp
Keaau Camp
Nine and Oneball Mile Camp
VOLCANO ROAD
BM 506
BM 605
BM 561
BM 597
BM 358
PAHOA ROAD
BM 399
Hurtstown
PROPOSED KEAAU BYPASS ROAD
Scale: 1" = 2000'

CORRECTION

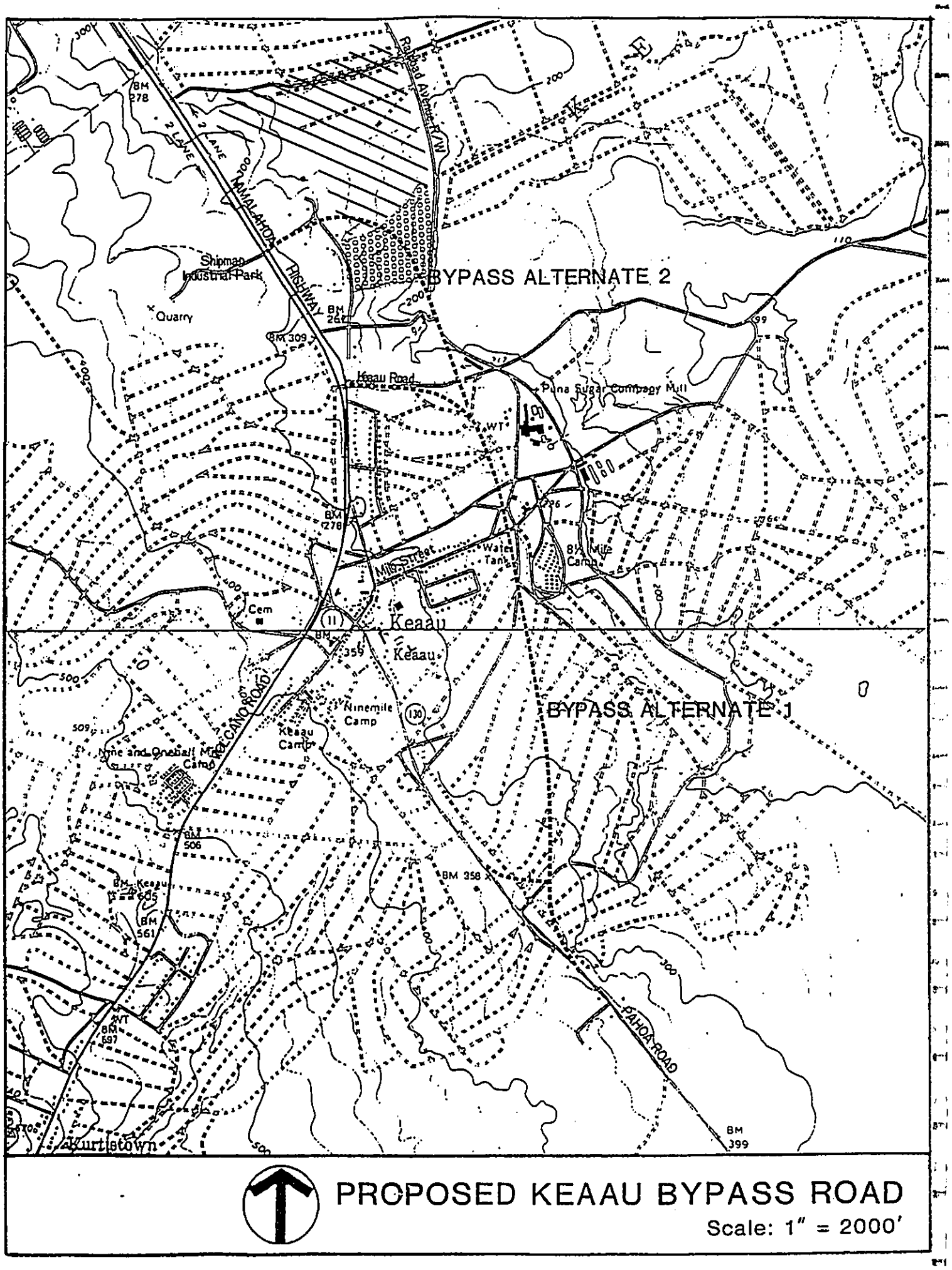
THE PRECEDING DOCUMENT(S) HAS BEEN REPHOTOGRAPHED TO ASSURE LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

FIGURE 1. Approximate location of Mixed Forest and Macadamia Nut Orchard along Bypass Alternate 2, Kea'au, Puna, island of Hawai'i



Mixed Forest

Macadamia Nut Orchard


BYPASS ALTERNATE 2
BYPASS ALTERNATE 1
Railroad Avenue R/W
2 LANE
2 LANE
MAMALAHOA HIGHWAY
Shipman Industrial Park
Quarry
BM 278
BM 309
BM 260
Keaau Road
Puna Sugar Company Mill
WT
Mill Street
Water Tank
8½ Mile Camp
Cem
Keaau
BM 359
Keaau
Ninemile Camp
Keaau Camp
Nine and One-half Mile Camp
BM 506
BM Keaau 505
BM 561
BM 597
BM 358
PAHOA ROAD
BM 399
Kurtistown
PROPOSED KEAAU BYPASS ROAD
Scale: 1" = 2000'

The 'ulu and kukui are originally of early Polynesian introduction. The hala is an indigenous species, that is, it is native to the Hawaiian Islands and also elsewhere. Also found in this forest are a few trees of 'ohi'a or 'ohi'a lehua (Metrosideros polymorpha), an endemic species, that is, it is native only to the islands.

The trees form a closed-canopy forest, that is, the crowns of the trees interlock and canopy cover is greater than 60%. The understory, however, is very open. Litter (branches and leaves) and moss-covered rocks and outcroppings are common. Saplings from the trees above are numerous. Where the canopy cover is somewhat more open and light is able to reach the ground below, there are scattered patches of plants such as basketgrass (Oplismenus compositus), cestrum (Cestrum aurantiacum), woodfern (Christella parasitica), palmgrass (Setaria palmifolia), and yellow ginger (Hedychium flavescens).

Along the edges of the forest, where there is more light, several climbing species are found; these are a Philodendron species, syngonium (Syngonium podophyllum), taro vine (Epipremnum pinnatum), wood rose (Merremia tuberosa), and fragrant thunbergia (Thunbergia fragrans).

Macadamia Nut Orchard

This vegetation type is located along a portion of the Bypass Alternate 2 corridor (Figure 1). It consists of rows of macadamia nut trees (Macadamia integrifolia cultivars). Paperbark trees (Melaleuca quinquenervia) form a windbreak along the edges of the field. Papaya (Carica papaya) was cultivated here at one time.

The actively cultivated fields support a few weedy species, usually on rocky outcroppings and along the edges of fields. These include maile pilau (Paederia foetida), several weedy

spurge species (Chamaesyce, Euphorbia), green kyllinga (Kyllinga brevifolia), guava (Psidium guajava), and saplings of weedy tree species such as melochia, guarumo, and bingabing.

DISCUSSION AND RECOMMENDATIONS

The proposed Kea'au Bypass Road corridor will primarily cross over former sugar cane fields now overgrown with weedy, introduced plants and remnant patches of sugar cane. Along portions of the Bypass Alternate 2 corridor, mixed forest and actively cultivated macadamia nut fields are found. Again, these two vegetation types are dominated by introduced plants. Of a total of 107 plant species inventoried on the bypass road corridor, 91 (85%) are introduced or alien species; 8 (7.5%) are originally of Polynesian introduction; and 8 (7.5%) are native. Of the natives, 7 are indigenous, that is, they are native to the Hawaiian Islands and elsewhere; these are the ferns -- 'ekaha (Asplenium nidus), uluhe (Dicranopteris linearis), Gonocormus minutus, pakahakaha (Pleopeltis thunbergiana), oheohe (Vittaria elongata), and two flowering plants -- Pycreus polystachyos and hala (Pandanus tectorius). Only 1 species, the 'ohi'a or 'ohi'a-lehua (Metrosideros polymorpha), is endemic, i.e. native only to the Hawaiian Islands.

None of the plants found on the corridor are listed threatened and endangered species (U.S. Fish and Wildlife Service 1989, 1990); nor are any proposed or candidate for such status (U.S. Fish and Wildlife Service 1992, 1992). Other botanical studies on adjacent areas (Char 1984, 1990; Char and Lamoureux 1985) have recorded similar findings.

Given the findings above, the proposed bypass road is not expected to have a significant negative impact on the botanical resources. There are no botanical reasons to impose any restrictions, conditions, or impediments to the project. No recommendations are proposed at this time.

PLANT SPECIES LIST -- Kea'au-Pahoa Bypass Road

A checklist of all those terrestrial, vascular plant species inventoried along the proposed bypass road corridor is presented below. The species are arranged alphabetically by family within each of three groups: Ferns, Monocots, and Dicots. The taxonomy and nomenclature of the Ferns are in accordance with Lamoureux (1988); the flowering plants, Monocots and Dicots, for the most part, follow Wagner et al. (1990).

For each species, the following information is provided:

1. Scientific name with author citation.
2. Common English and/or Hawaiian name(s), when known.
3. Biogeographic status. The following symbols are used:
   E = endemic = native only to the Hawaiian Islands.
   I = indigenous = native to the Hawaiian islands, and also elsewhere throughout the Pacific
   P = Polynesian = plants originally of Polynesian introduction prior to Western contact (1778); not native
   X = introduced or alien = all those plants introduced by humans to the islands, intentionally or accidentally, after Western contact; not native.
4. Presence (+) or absence (-) of a particular species within each of three vegetation types recognized on the project site (see text for discussion):
   old = Old Field Vegetation
   mxf = Mixed Forest
   mac = Macadamia Nut Orchard

Scientific name	Common name	Status	Vegetation type old	mxf	mac
FERNS					
ASPLENIACEAE (Bird's-nest Fern Family)					
Asplenium nidus L.	'ekaha, bird's-nest fern	I	–	+	–
GLEICHENIACEAE (Vine Fern Family)					
Dicranopteris linearis (Burm.) Underw.	uluhe	I	+	–	–
HEMIONITIDACEAE (Gold Fern Family)					
Pityrogramma calomelanos (L.) Link	silver fern	X	+	–	–
HYMENOPHYLLACEAE (Filmy Fern Family)					
Gonocormus minutus (Blume) v.d. Bosch		I	–	+	–
NEPHROLEPIDACEAE (Sword Fern Family)					
Nephrolepis biserrata (Sw.) Schott cv. "Furcans"	fishtail fern	X	+	–	–
Nephrolepis multiflora (Roxb.) Jarrett ex Morton	hairy sword fern	X	+	+	+
POLYPODIACEAE (Common Fern Family)					
Phlebodium aureum (L.) J. Sm.	laua'e haole	X	–	–	+
Phymatosorus scolopendria (Burm.) Pic.-Ser.	laua'e, lauwa'e	X	–	+	–
Pleopeltis thunbergiana Kaulf.	pakahakaha, 'ekaha-'akolea	I	–	+	–
THELYPTERIDACEAE (Downy Woodfern Family)					
Christella dentata (Forsk.) Brownsey & Jermy	downy woodfern	X	+	–	–
Christella parasitica (L.) Levl.	woodfern, oakfern	X	+	+	+
VITTARIACEAE (Ribbon Fern Family)					
Vittaria elongata Sw.	oheohe	I	–	+	–

Scientific name	Common name	Status	Vegetation type old	mxf	mac
FLOWERING PLANTS					
MONOCOTS					
AGAVACEAE (Agave Family)					
Cordyline fruticosa (L.) A. Chev.	ti, ki	P	–	+	+
ARACEAE (Aroid Family)					
Caladium sp.	caladium	X	+	–	–
Philodendron sp.		X	–	+	–
Syngonium podophyllum Schott	syngonium	X	–	+	–
ARECACEAE (Palm Family)					
Archontophoenix alexandrae (F.v. Muell.) H.A. Wendl. & Drude	king palm, Alexandra palm	X	+	+	–
COMMELINACEAE (Spiderwort Family)					
Commelina diffusa N.L. Burm.	honohono	X	+	–	+
CYPERACEAE (Sedge Family)					
Kyllinga brevifolia Rottb.	green kyllinga, kili'o'opu	X	+	–	+
Pycreus polystachyos (Rottb.) P. Beauv.		I	+	–	+
DIOSCOREACEAE (Yam Family)					
Dioscorea pentaphylla L.	pi'ia	P	–	+	–
MUSACEAE (Banana Family)					
Musa paradisiaca L.	maia, banana	P	+	–	–
ORCHIDACEAE (Orchid Family)					
Arundina graminifolia (D. Don) Hochr.	bamboo orchid	X	+	–	+
Spathoglottis plicata Blume	Philippine ground orchid	X	+	–	–
PANDANACEAE (Hala Family)					
Pandanus tectorius S. Parkinson ex Z.	hala, pandanus	I?	–	+	–

Scientific name	Common name	Status	Vegetation type old	mxf	mac
POACEAE (Grass Family)					
Andropogon virginicus L.	broomsedge	X	+	–	+
Bambusa vulgaris Schrad. ex Wendl.	feathery bamboo	X	–	+	–
Brachiaria mutica (Forssk.) Stapf	California grass	X	+	–	+
Coix lachryma-jobi L.	Job's-tears	X	+	–	–
Digitaria adscendens (Kunth.) Henr.	crabgrass	X	+	–	+
Digitaria ciliaris (Retz.) Koeler	hairy crabgrass	X	+	–	+
Digitaria radicosa (Presl) Miq.		X	+	–	+
Eleusine indica (L.) Gaertn.	wiregrass, goosegrass	X	+	–	–
Eragrostis pectinacea (Michx.) Nees		X	+	–	–
Melinis minutiflora P. Beauv.	molassesgrass	X	+	–	+
Oplismenus compositus (L.) P. Beauv.		X	–	+	–
Panicum maximum Jacq.	Guinea grass	X	+	–	–
Paspalum conjugatum Bergius	Hilo grass, mauu Hilo	X	+	+	+
Pennisetum purpureum Schumach.	Napier grass, elephant grass	X	+	–	–
Saccharum officinarum L.	ko, sugar cane	P	+	–	–
Sacciolepis indica (L.) Chase	Glenwood grass	X	+	–	+
Setaria palmifolia (J. Konig) Stapf	palmgrass	X	+	+	–
Sporobolus indicus (L.) R. Br.	Indian dropseed, rattail grass	X	+	–	+
ZINGIBERACEAE (Ginger Family)					
Hedychium flavescens N. Carey ex Roscoe	yellow ginger, 'awapuhi melemele	X	–	+	–
Zingiber zerumbet (L.) Sm.	'awapuhi kuahiwi, shampoo ginger	P	–	+	–
DICOTS					
ACANTHACEAE (Acanthus Family)					
Thunbergia fragrans Roxb.	fragrant thunbergia	X	+	+	+
ANACARDIACEAE (Mango Family)					
Mangifera indica L.	mango, manako	X	–	+	–

Scientific name	Common name	Status	Vegetation type old	mxf	mac
APIACEAE (Parsley Family)					
Centella asiatica (L.) Urb.	Asiatic pennywort, pohe kula	X	+	–	–
ASTERACEAE (Sunflower Family)					
Ageratum houstonianum Mill.	maile hohono	X	+	–	+
Bidens pilosa L.	Spanish needle, beggar's tick, ki, ki nehe	X	+	–	–
Crassocephalum crepidioides (Benth.) S. Moore	crassocephalum	X	+	–	+
Emilia fosbergii Nicolson	pualele	X	+	–	+
Erechtites valerianifolia (Wolf) DC.	fireweed	X	–	–	+
Pluchea symphytifolia (Mill.) Gillis	pluchea, sourbush	X	+	–	–
Wedelia trilobata (L.) Hitchc.	wedelia	X	+	–	–
BALSAMINACEAE (Touch-me-not Family)					
Impatiens wallerana J.D. Hook.	impatiens	X	–	+	–
BEGONIACEAE (Begonia Family)					
Begonia hirtella Link	white-flowered begonia	X	–	+	–
BIGNONIACEAE (Bignonia Family)					
Spathodea campanulata P. Beauv.	African tulip tree	X	+	–	–
CARICACEAE (Papaya Family)					
Carica papaya L.	papaya, mikana	X	+	–	–
CARYOPHYLLACEAE (Pink Family)					
Drymaria cordata (L.) Willd. ex Roem. & Schult.	pipili	X	+	–	+
CECROPIACEAE (Cecropia Family)					
Cecropia obtusifolia Bertol.	guarumo	X	+	+	+
CONVOLVULACEAE (Morning-glory Family)					
Ipomoea alba L.	moonflower, koali pehu	X	+	–	–

Scientific name	Common name	Status	Vegetation type		
			old	mxf	mac
Ipomoea triloba L.	little bell, pink bindweed	X	+	–	–
Merremia tuberosa (L.) Rendle	wood rose, pilikai	X	–	+	–
CUCURBITACEAE (Squash Family)					
Momordica charantia L.	wild bittermelon	X	+	–	–
EUPHORBIACEAE (Spurge Family)					
Aleurites moluccana (L.) Willd.	kukui, tutui	P	–	+	+
Chamaesyce hirta (L.) Millsp.	hairy spurge	X	+	–	+
Chamaesyce hyssopifolia (L.) Small		X	+	–	+
Chamaesyce prostrata (Aiton) Small	prostrate spurge	X	+	–	+
Euphorbia heterophylla L.	kaliko	X	–	–	+
Macaranga mappa (L.) Mull. Arg.	bingabing	X	+	+	+
Phyllanthus debilis Klein ex Willd.	niruri	X	+	–	+
Ricinus communis L.	castor bean, koli	X	+	–	–
FABACEAE (Pea Family)					
Centrosema sp.		X	+	–	–
Chamaecrista nictitans (L.) Moench	partridge pea, lauki	X	+	–	–
Crotalaria lanceolata E. Mey.		X	+	–	–
Crotalaria micans Link		X	+	–	+
Desmodium cajanifolium (Kunth) DC.		X	+	–	–
Desmodium incanum DC.	Spanish clover, ka'imi	X	+	–	+
Desmodium intortum (Mill.) Urb.		X	+	–	–
Desmodium sp.		X	+	–	–
Indigofera suffruticosa Mill.	indigo, 'iniko	X	+	–	–
Macroptilium lathyroides (L.) Urb.	wild bush bean, cow pea	X	+	–	–
Mimosa pudica var. unijuga (Duchass. & Walp.) Griseb.	sensitive plant, sleeping grass, puahilahila	X	+	–	+
LAMIACEAE (Mint Family)					
Hyptis pectinata (L.) Poit.	comb hyptis	X	+	–	–
LAURACEAE (Laurel Family)					
Persea americana Mill.	avocado, alligator pear	X	–	+	–

Scientific name	Common name	Status	Vegetation type old	mxf	mac
LYTHRACEAE (Loosestrife Family)					
Cuphea carthagenensis (Jacq.) Macbr.	tarweed, Colombian cuphea	X	+	–	–
MALVACEAE (Mallow Family)					
Sida rhombifolia L.		X	+	–	–
MORACEAE (Mulberry Family)					
Artocarpus altilis (Parkins. ex Z.) Fosb.	'ulu, breadfruit	P	–	+	–
Ficus microcarpa L.f.	Chinese banyan	X	–	+	–
MYRTACEAE (Myrtle Family)					
Melaleuca quinquenervia (Cav.) S.T. Blake	paperbark	X	–	–	+
Metrosideros polymorpha Gaud.	'ohi'a, 'ohi'a lehua	E	–	+	+
Psidium cattleianum Sabine	strawberry guava, waiawi 'ula'ula	X	+	+	–
Psidium guajava L.	guava, kuawa	X	+	+	+
ONAGRACEAE (Evening Primrose Family)					
Ludwigia octovalvis (Jacq.) Raven	kamole, primrose willow	P?	+	–	–
POLYGALACEAE (Milkwort Family)					
Polygala paniculata L.	bubble-gum plant	X	+	–	–
PROTEACEAE (Protea Family)					
Macadamia integrifolia Maiden & Betche	macadamia nut	X	–	–	+
RUBIACEAE (Coffee Family)					
Coffea arabica L.	coffee	X	–	+	–
Hedyotis corymbosa (L.) Lam.		X	+	–	+
Paederia scandens (Lour.) Merr.	maile pilau	X	+	+	+
Spermacoce assurgens Ruiz & Pav.	buttonweed	X	–	–	+
Spermacoce mauritiana Gideon		X	+	–	+
RUTACEAE (Rue Family)					
Citrus sinensis (L.) Osbeck	orange, 'alani	X	–	–	+

Scientific name	Common name	Status	Vegetation type old	mxf	mac
SCROPHULARIACEAE (Figwort Family)					
Lindernia crustacea (L.) F.v. Muell.	false pimpernel	X	+	-	-
SOLANACEAE (Tomato Family)					
Cestrum aurantiacum Lindl.	orange cestrum, makahala	X	-	+	-
STERCULIACEAE (Cacao Family)					
Melochia umbellata (Houtt.) Stapf	melochia	X	+	+	+
ULMACEAE (Elm Family)					
Trema orientalis (L.) Blume	gunpowder tree, charcoal tree	X	+	+	+

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APPENDIX G

BIRD AND MAMMAL SURVEY FOR KEAAU PAHOA ROAD, KEAAU TOWN SECTION, PROJECT No. 130B-01-92

July 7, 1994

Leonard A. Freed

INTRODUCTION

This report presents the results of a field survey for birds and mammals along the proposed Keaau-Pahoa By-Pass Road, Island of Hawaii. The survey, conducted on 4-5 December 1993, was designed to identify biologically significant habitats for birds and mammals, to cover such habitats thoroughly, and to sample the remaining habitats.

At the time of the survey, the following species of birds and mammals were listed by the U.S. Fish and Wildlife Service (USFWS 1983a) and by the State of Hawaii (DLNR 1986) as endangered or threatened, and were known or suspected to exist on the island of Hawaii (Tomich 1986, Pratt et al. 1987):

BIRDS

Akiapolaau	(Hemignathus munroi)
Hawaii Creeper	(Oreomystis mana)
Hawaii Akepa	(Loxops coccineus coccineus)
Palila	(Loxioides bailleui)
Ou	(Psittirostra psittacea)
Hawaiian Crow	(Corvus hawaiiensis)
Hawaiian Hawk	(Buteo solitarius)
Hawaiian Duck	(Anas wyvilliana)
American Coot	(Fulica americana alai)
Nene	(Nesochen sandvicensis)
Black-necked Stilt	(Himantopus mexicanus knudseni)
Dark-rumped Petrel	(Pterodroma phaeopygia sandwichensis)
Newell's Shearwater	(Puffinus newelli) (threatened only)
Band-rumped Storm-Petrel	(Oceanodroma castro crytoleucura) (endangered by State of Hawaii only)

MAMMAL

Hawaiian Hoary Bat (Lasiurus cinereus semotus)

This report identifies existing conditions of birds and mammals on the site as evidenced by the results of the survey, and supplemented by the literature and interviews with biologists from state, federal, and private agencies in Hawaii. Potential impacts of the project are discussed.

METHODS

Birds were detected by sight and sound by two observers with 10 x 40 binoculars at 10 stations along the proposed road (Figure 1). Each station was monitored for 10 minutes between 1240-1530 on 4 December and 5 were again monitored between 0950-1150 on 5 December.

Weather was overcast with variable winds. Habitat was noted at each station and surrounding area.

The survey for bats was conducted by two observers between 1710-2000 on 4 December. A Mini-II bat detector tuned at 30,000 hertz was used to receive ultrasonic signals from any bats that might have been in the vicinity but not observable in the dark. Others have used this method successfully elsewhere in Hawaii (C. Stone, National Park Service, personal communication). The monitoring varied between 5 and 40 minutes at 7 of the 10 stations. Most time was spent at a station near a pair of white lights that attracted moths and beeties on which the bat feeds. Occasional heavy showers occurred throughout the evening.

Biologists were consulted from the U.S. Fish and Wildlife Service, State of Hawaii Division of Forestry and Wildlife, and Bishop Museum.

SUMMARY OF SIGNIFICANT FINDINGS

No endangered or threatened birds and no endangered bats were detected during the survey. Moreover, the habitat along the proposed by-pass road consists almost exclusively of exotic vegetation.

DETAILED FINDINGS AND DISCUSSION

There were no native habitats discovered in the project area. There were also no wetlands or other specialized habitats that might be used by native animals. The project area appears to be an agricultural area with exotic herbaceous weeds and vines, and introduced trees such as Cecropia, banyan, tropical ash, and Macademia nut.

The only native bird seen during the survey was the Pacific Golden-Plover (Pluvialis fulva). Numerous individuals were seen at 5 of the 10 stations.

The following species of introduced birds were seen or heard:

Zebra Dove	(Geopelia striata)
Spotted Dove	(Streptopelia chinensis)
Japanese White-Eye	(Zosterops japonicus)
House Finch	(Carpodacus mexicanus)
Common Myna	(Acridotheres tristis)
Northern Cardinal	(Cardinalis cardinalis)
Nutmeg Mannikin	(Lonchura punctulata)

The introduced Mongoose (Herpestes auropunctatus) was the only mammal seen.

ENDANGERED AND THREATENED SPECIES PROBABLE OR POSSIBLE

Hawaiian Hawk. These birds are widely distributed on the Island of Hawaii, use habitats with exotic vegetation, and have been detected in the vicinity of Keaau (Scott et al. 1986). Their use of the site would probably be more for feeding than for nesting given the presence of forest outside of the project area (USFWS 1984).

Hawaiian Hoary Bat. As with the hawk, these bats are widely distributed on the island of Hawaii, use habitats with exotic vegetation, and have been detected in the vicinity of Keaau (Kepler and Scott 1990). The rarity with which bats were detected during the evening during the Hawaii forest bird survey, 0.02 bats per person-day (Kepler and Scott 1990), can account for the absence of sightings during the 1-evening sampling period. Since tree cover was not extensive on the project site, bats would be expected to feed rather than roost on the site (Tomich 1986, Jacobs 1991).

Dark-rumped Petrel and Newell's Shearwater. Munro (1944) documented that these subspecies formerly nested on slopes at elevations as low as 1500 feet (petrel) and 500 feet (shearwater) on all islands. Breeding populations at low elevations on the island of Hawaii have been reduced with the introduction of rats, mongooses, feral cats, and feral dogs (Berger 1981, USFWS 1983b). However, there is evidence that both species have or may be developing breeding populations on Mauna Loa and Kilauea (Conant 1980; Banko 1980a,1980b; Berger 1981). Most recently (1993), two colonies of Newell's Shearwater were discoverd in pit craters in lower Puna at 600' and 1000' elevations. Dead shearwaters have found in and outside of Hilo in 1991 and 1993 (Larry Katahira, HVNP, and Michelle Reynolds, USFWS, personal communication). Dead petrels were found in Volcano and at Kilauea Military Camp (ibid.). While pit craters were not found in the project area, the proximity of the area to known shearwater colonies in lower Puna may result in parents at least occasionally flying over the project site to attend their nests. In addition, the location of the area below suspected petrel and shearwater colonies on the northeast slope of Mauna Loa, may result in parents flying repeatedly over the project site to attend their nests, and fledglings may fly over the site enroute to the ocean (Harrison 1990).

Band-rumped Storm-Petrel. This subspecies is listed as endangered by the State of Hawaii and is proposed as a candidate species for listing by the USFWS (1991). Evidence from nocturnal calling over land and sightings near the coast indicate probable high elevation breeding populations on the southwest rift and possibly upper western slope of Mauna Loa (Harrison et al. 1990, Banko et al. 1991). Calls thought to be those of band-rumped storm-petrels have been heard in the Kapapala Forest Reserve and Mauna Loa Forest Reserve (Paul Banko, pers. comm.). As with the other seabirds, it is possible that parents and fledglings may fly over the site enroute to the ocean (Harrison 1990).

OTHER PROBABLE OR POSSIBLE NATIVE SPECIES

Pueo. This owl is widely distributed on the Island of Hawaii but is declining (Scott et al. 1986). Its use of grasslands and shrublands makes it possible in the project area which has those types of habitats with exotic plant species.

ENDANGERED SPECIES NOT LIKELY

The apparent absence of other endangered or threatened birds on the study site is consistent with previous studies in the area and knowledge of habitat requirements. The waterbirds (Hawaiian Duck, Black-necked Stilt, American Coot) would not be expected in the area since there were no wetlands. The Nene and all the passerine birds (Akiapolaau, Hawaii Creeper, Hawaii Akepa, Palila, Ou, Hawaiian Crow) have specialized habitat requirements that do not include fields with exotic vegetation and trees such as exist in the project area, and do not exist even in native forest at the elevation of Keaau (Scott et al. 1986).

POTENTIAL IMPACTS AND MITIGATION

The new road should little impact on the Hawaiian Hawk, Hawaiian Hoary Bat, and Pueo. These species have all been detected elsewhere near roads, so aside from possible disturbance during construction, the road and traffic would not be expected to make this area more unsuitable than it is now. The footprint of the right of way represents minor removal of vegetation. The only possible negative impact would be chance collision with vehicles on the new road. The lighting for the new road may attract insects and actually enhance the area for bats.

In contrast, lights are known to attract and disorient seabirds in Hawaii (Reed et al. 1985). Disoriented seabirds could collide with nearby objects such as utility poles, trees, or buildings. Mitigating actions to reduce the probability of collision include the use of shields on lights that reduce upward radiation. Experimental work on Kauai has shown that light shielding decreases attraction of fledgling Newell's Shearwaters to buildings and that the birds are attracted to light sources and not the areas they illuminate (Reed et al. 1985). Shielding of lights in the project area may thus reduce the element of attraction in the probability of collision.

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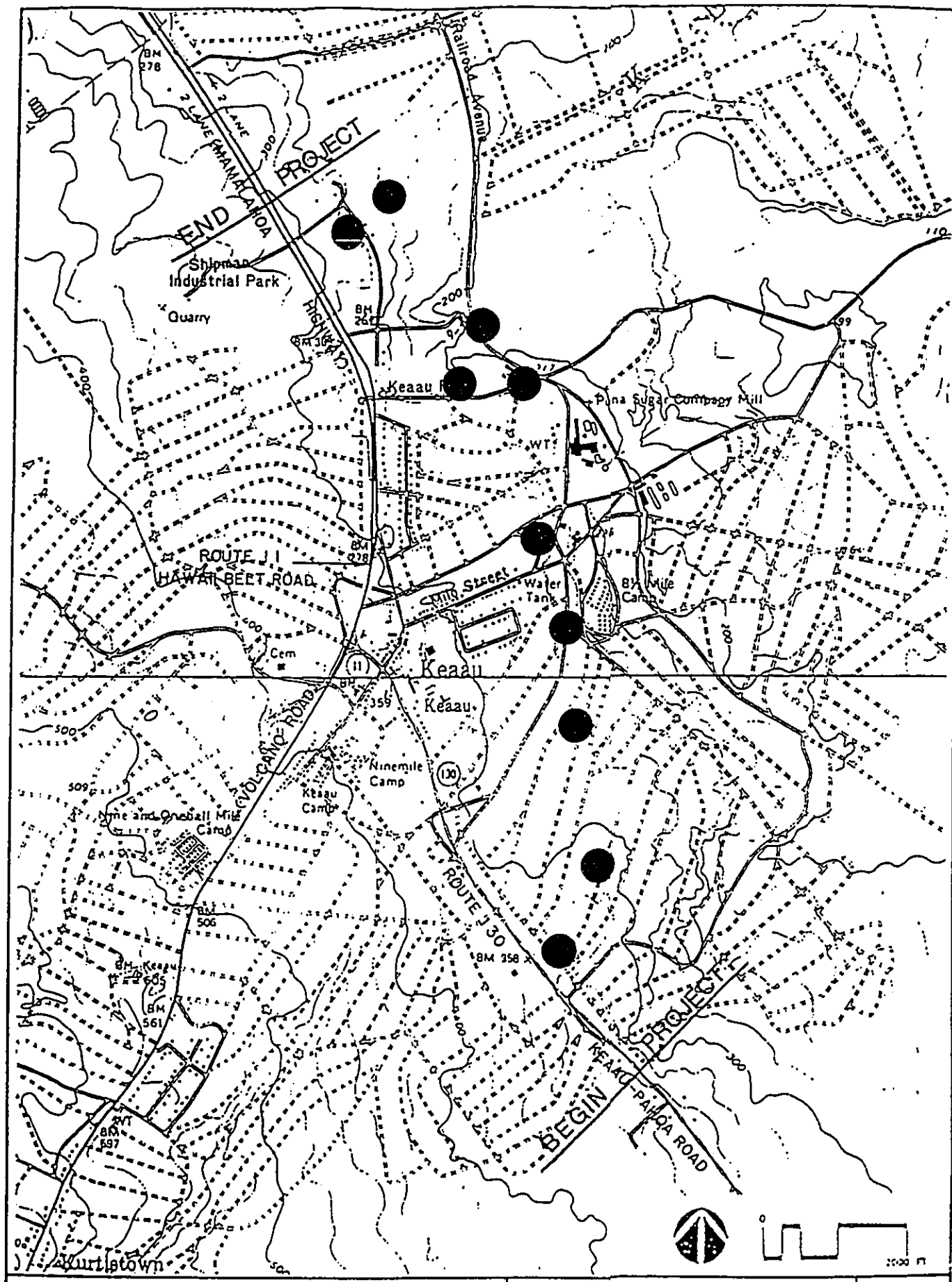

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STATIONS AT WHICH BIRDS AND MAMMALS WERE SURVEYED

FIGURE **1**