Final Report

PUNA REGIONAL CIRCULATION PLAN

For:

County of Hawai'i
Planning Department
101 Pauahi Street, Ste. 3
Hilo, HI 96720

Prepared By:

Townscape, Inc.
900 Fort Street Mall
Ste. 1160
Honolulu, HI 96813

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County of Hawai'i, Department of Public Works
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Federal Highways Administration (FHWA)
Hawai'i County Council
Hawai'i County Police Department
Kamehameha Schools
Kea'au Community Center
Puna Traffic Safety Council
Queen Liliu'okalani Children's Center
State of Hawai'i, Department of Transportation
Various Subdivision Community Associations
W.H. Shipman, Ltd.

PUNA REGIONAL CIRCULATION PLAN
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APPENDICES

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1. EXECUTIVE SUMMARY

The *Puna Regional Circulation Plan* (PRCP) addresses future automobile, bicycle, pedestrian, and transit corridors of the Puna District. The Plan was initiated to evaluate existing regional transportation systems and propose future transportation corridors in Puna till year 2030. The planning consultant developed the PRCP in close coordination with County officials, County staff, a PRCP Community Advisory Group (CAG), and other interested citizens. This transportation plan was a community-based process that encouraged participation. The Plan projected future population and developed land use scenarios in order to identify transportation demands and improvement projects.

1.1. Why a Regional Circulation Plan?

The PRCP was needed to develop a balanced, equitable, well-connected, safe system that integrates not only vehicular travel, but also transit, biking, walking, and other transportation demand measures.

The PRCP was needed to address five key problems that affect transportation and quality of life:

1. **Redundancy and emergency bypass routes do not exist.** The absence of route redundancy in Puna is especially problematic because of lava and tsunami hazard zones that could require evacuation. Limited route and mode choices further congest traffic.
2. **The District has the highest five-year total motor vehicle fatality rate of all Hawai'i County districts.** Risk factors include narrow or non-existent shoulders, limited sight distance, delays in discovery and extended EMS response times, and frequent/severe crashes on gravel roads or off-road.
3. **The District is a rapidly growing area.** Puna has over 55,000 subdivided lots with the potential to accommodate regional growth without rezoning. The region is not equipped with the infrastructure and public services needed to accommodate population growth.
4. **Equal access to transportation is not provided**. The Puna District is a low-income area where many residents cannot afford the cost of owning a vehicle. Improvements in transit, pedestrian, and bicycle facilities are needed to address the youth, elderly, disabled, and low-income populations.
5. **Existing land use patterns distance residents from jobs, services, and schools.** This distance preserves an auto-dependent pattern, denies equity for low-income residents, and increases traffic congestion.

The traditional circulation element of planning addresses movement of people and goods within the region. This regional circulation plan moves beyond traditional traffic circulation elements and includes multiple methods of travel. Transportation values and guidelines, developed by the community, are addressed by comprehensive travel modes, demand management tools, and strong linkages to land-use policies. The Plan was developed to address several time horizons including: 1) short-range, 1 to 5 years; 2) mid-range, 5 to 10; 3) long-range 10 to 20, and 4) very long range, 20 years and beyond.

"Transportation planning has moved from supply-side focus—siting facilities to meet projected demands—toward an integrated system and demand management perspective."

The purpose of the Puna Regional Circulation Plan is to:

- Set the overall transportation direction and define the transportation future to plan towards;
- Provide a decision-making structure, incorporating a participatory public involvement process, to plan and prioritize improvements to the transportation system;
- Build on existing knowledge, resources, and information to conduct technical analysis including evaluation of current and future conditions, forecasts, and trends;
- Balance multiple and competing stakeholder objectives and funding expectations;
- Identify and provide a long-range funding program;
- Provide a framework to prioritize expenditures based on community values and guidelines;
- Focus short-range investments on long term goals; and
- Provide accountability to citizens on future direction and actions to get there.

There are five main objectives of the Regional Circulation Plan:

1. Improve **traffic safety**.

   Strategies: Intersection improvements and safe routes to school,

2. Provide for **commuting efficiency and peak-hour travel** demands.

   Strategies: Widening of existing roads, alternate routes, transportation demand management, transit system expansion, bus rapid transit, park and ride lots, and bicycle path access to schools.

3. Provide transportation improvements for **off-peak travel**.

   Strategies: Rural Para-transit, bike/pedestrian facilities, context-sensitive highway design.

4. Develop a **connectivity network** for vehicles, bicycles, pedestrians, and transit based on origins and destinations.

   Strategies: Connectivity projects, emergency bypass, bike and pedestrian facilities, safe routes to school, park and ride lots.

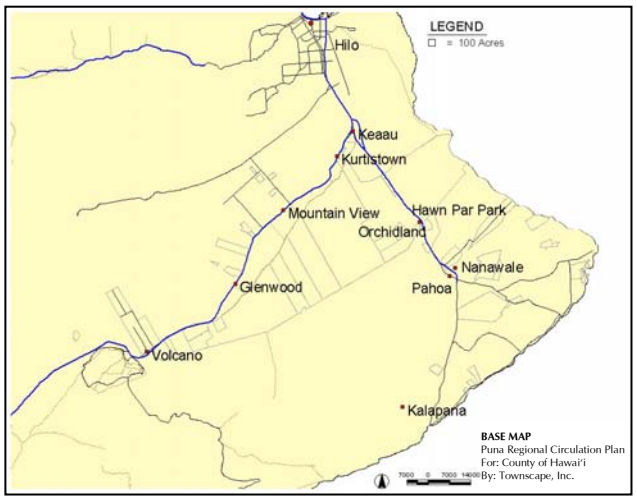
5. Plan for **transit-ready, pedestrian-oriented, mixed-use development** projects.

   Strategies: Bike and pedestrian facilities, transit system expansion, corridor preservation, village land use development.

1.2. Project Area

The project area covers the Puna District which is located in the southeast portion of Hawai'i Island. The District encompasses 499.5 square miles or 319,680 acres. The study area includes communities near Pāhoa, Kea'au, Kurtistown, Glenwood, Mountain View, and Volcano. In 2000, the entire district of Puna had a population of 31,335. Development in the project area includes residential, commercial centers, industrial parks, family-owned farms with dwellings, and commercial farms.

FIGURE 1.1: PROJECT AREA



Primary routes within the Puna District are the Volcano Road (Highway 11), which provides access to Hilo and serves the upper Puna region; the Puna Road (Highway 130), serving lower Puna from Kea'au to Kalapana-Kaimū; the Kapoho Road (Highway 132), from Pāhoa to Kapoho; and the Puna Coast Road (Highway 137), linking Kapoho and Kalapana-Kaimū. The existing roadway system is often congested and unsafe, lacks redundancy and connectivity, and promotes single-occupant vehicles (SOV).

Highway 130, Kea'au-Pahoa Highway

The Hele-On Bus is administered by the County of Hawai'i Mass Transit Agency (MTA). The Hele-On Bus serves lower Puna with a Pāhoa-Hilo route that includes five round trips a day. The Hele-On also has a Volcano-Hilo route operating once a day. The MTA currently utilizes an average of four buses in Pāhoa-Hilo and Ka'u-Hilo (through Volcano) routes.

Ridership of the system could be significantly improved with convenient routes and schedules, marked stops or transit centers, and marketing programs.

Bicycle and pedestrian facilities are limited in the Puna District. There is an existing signed bikeway along the Kea'au Bypass. A popular unimproved bike route is the "Puna Triangle." This Plan supports previously identified projects and reiterates the need for implementation to provide mobility choice, interconnectivity, and recreation opportunities. The Plan recommends many bikeways in the Puna District.

Multi-purpose paths serve a variety of user groups.
Source: Dan Burden, www.pedbikeimages.org

The PRCP was initiated by the County of Hawai'i, Planning Department and the Puna Community. Many County departments participated in the planning process participants included the Mayor and his staff, County Council members, the Planning Department, Mass Transit Agency, and the Department of Public Works (DPW).

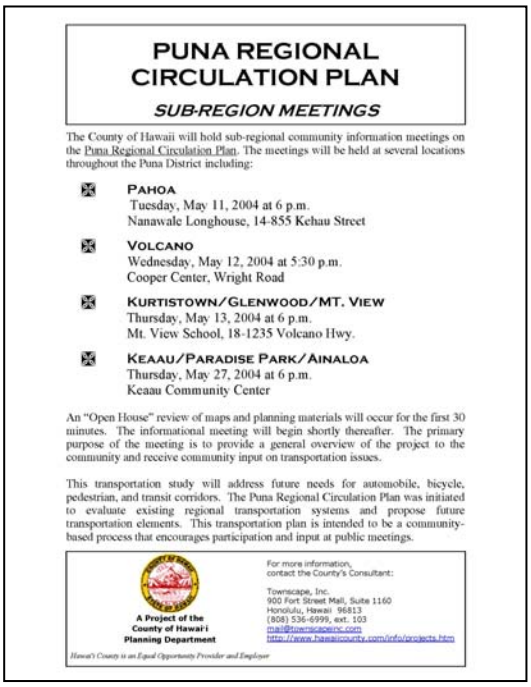
Noni trees, kava starts, pineapples, palms, and rainbow bark trees at startup Kokopelli Farm in Hawaiian Paradise Park.

The involvement of these participants provided various sources of knowledge to the planning team. The Planning Department (PD) provided information on existing conditions, land use plans, and residential development. They also assisted with community meetings and interviews. The Mass Transit Agency provided information on Hele-On bus routes and ridership. The DPW provided data on existing roads and infrastructure. The consultant team consisted of Townscape, Inc., community and environmental planning and Julian Ng, Incorporated, transportation engineering.

1.3. Frequently Asked Questions

This section summarizes commonly asked questions about the Puna Regional Circulation Plan. The answers to questions provide explanations on the plan methodology, planning process, implementation, and reasoning.

- *How was information gathered from the community?* ANS: Our participation strategy included several methods of community consultation which aimed to reach community members with varying levels of interest, experience, and commitment. These elements include: 1) establishment of a Community Advisory Group (CAG) with regular semi-monthly meetings; 2) interviews with community leaders and outreach to residents; 3) subregional community meetings held in Pāhoa, Volcano, Mountain View, and Kea'au; and 4) a final general public meeting for the region to review the Draft Report and Regional Circulation Master Plan.



PUNA REGIONAL CIRCULATION PLAN

SUB-REGION MEETINGS

The County of Hawaii will hold sub-regional community information meetings on the Puna Regional Circulation Plan. The meetings will be held at several locations throughout the Puna District including:

PAHOA
Tuesday, May 11, 2004 at 6 p.m.
Nanawale Longhouse, 14-855 Kehau Street

VOLCANO
Wednesday, May 12, 2004 at 5:30 p.m.
Cooper Center, Wright Road

KURTISTOWN/GLENWOOD/MT. VIEW
Thursday, May 13, 2004 at 6 p.m.
Mt. View School, 18-1235 Volcano Hwy.

KEAAU/PARADISE PARK/AINALOA
Thursday, May 27, 2004 at 6 p.m.
Keaau Community Center

An "Open House" review of maps and planning materials will occur for the first 30 minutes. The informational meeting will begin shortly thereafter. The primary purpose of the meeting is to provide a general overview of the project to the community and receive community input on transportation issues.

This transportation study will address future needs for automobile, bicycle, pedestrian, and transit corridors. The Puna Regional Circulation Plan was initiated to evaluate existing regional transportation systems and propose future transportation elements. This transportation plan is intended to be a community-based process that encourages participation and input at public meetings.

A Project of the County of Hawai'i Planning Department

For more information, contact the County's Consultant:

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http://www.hawaiicounty.com/info/projects.htm

Hawai'i County is an Equal Opportunity Provider and Employer

Subregional Meeting Announcement

- *I never heard about this planning process, how were meetings publicized?* ANS: Whenever possible, meetings and plan updates were publicized through radio, newspapers (Puna News, Hawai'i Island Journal, and Hawai'i Tribune Herald), Community Association Newsletters, County of Hawai'i website and weekly email newsletters, email Correspondence, Postal "snail" mail, and Posted flyers (Verna's Drive In, Community Centers, Mailbox bulletin boards, etc.).

- *How did this planning process coordinate with the State Department of Transportation (DOT)?* ANS: The PRCP was funded by the Federal Highway Administration (FHWA) through the State Department of Transportation (DOT). The planning process included regular consultation and briefings with DOT's Statewide Transportation Planning (STP) Office and Highways Division. There was also coordination and communication regarding existing DOT improvement projects in Puna.

- *What is the "Hawai'i Long Range Transportation Plan (HLRTP)"?* ANS: The *Hawai'i Long Range Transportation Plan* (1998) guides the development of multimodal transportation systems throughout Hawai'i County according to a prioritization of transportation spending. This plan has a 20-year planning horizon and is Federally and State mandated. The HLRTP includes roadway, bicycle, pedestrian, and transit project improvements. Efforts to revise this plan are underway. The State is currently working with consultants to develop a new transportation model before beginning the update.

- *What is the STIP, and how do projects get placed on it?* ANS: The Hawai'i Statewide Transportation Improvement Program (STIP) provides a multi-year listing of the State and County projects and identifies those projects slated for Federal funding. It is a multi-modal transportation improvement program that is developed utilizing existing transportation plans and policies, and current highway, transit, and transportation programming processes. The STIP delineates the funding categories and the Federal and local share required for each project. STIP projects must be consistent with the *Hawai'i County General Plan* and the *Hawai'i Long Range Transportation Plan*.

- *How will the PRCP be implemented?* ANS: This document includes an Action Plan that outlines next steps. The Plan may also be adopted by the County Council as a resolution or ordinance. The PRCP may also be helpful in the formulation of the Puna Community Development Plan that could begin as early as 2005-2006.

- *What is a trip? Is it every segment of travel after leaving an origin?* ANS: A trip is any travel between destinations, i.e., from home, to store, to work totals 2 trips. A "home-based trip" is travel exiting or entering the place of residence.

- *What kind of transportation data is available?* ANS: Traffic counts were used from the State of Hawai'i Department of Transportation Highway Planning Branch, Traffic Summary – Island of Hawai'i. Twenty-four hour traffic counts are taken from multiple highway points in the region. These counts are conducted every two years. Sources of both bicycle and transit ridership data could also be helpful in future planning.

Classic Puna: Papaya trees and lava rock.

1.4. Community-Based Planning

This community-based planning process involved much more outreach than the standard "public informational meeting." The planning team consulted with community leaders, groups, landowners, and public agencies. This approach was integral to the development of a plan that addressed the needs of Puna.

1.4.1. Community Guidelines

Community guidelines were summarized relating to transportation issues that distinguish the Puna District from other areas. The guidelines below provide a basis on which to evaluate this Plan. The goal is to develop and implement a transportation plan that improves transportation choice and mobility in this region.

PUNA REGIONAL CIRCULATION PLAN
COMMUNITY GUIDELINES

1. **Provide choices in modes of transportation.**
2. **Promote travel by transit, walking, and biking as viable alternatives to automobiles.**
3. **Increase the availability of high-quality affordable public transportation.**
4. **Develop an equitable system of transportation for elderly, children, and low-income.**
5. **Protect adequate rights-of-way for future transit development.**
6. **Develop village centers throughout Puna that provide mixed land uses and services within neighborhoods.**
7. **Utilize context-sensitive highway design with landscaping and multi-modal amenities.**
8. **Accept a level of traffic congestion in order to shift modal choice (provided that choices are available).**
9. **Create redundancy, resiliency, and connectivity within road networks.**
10. **Ensure connectivity between pedestrian, bike, transit, and road facilities.**
11. **Improve transportation safety and emergency circulation.**
12. **Ensure that transportation solutions work effectively with the natural and built environment.**

1.5. Community Perspectives

Community participants attended CAG meetings, interviews, and subregion meetings. Major comments expressed include:

- Puna needs more short-term transportation projects and "easy wins."
- Emergency bypasses are needed along Highway 130 and 11.
- Many are in favor of mixed land use with more services for Puna's growing population.
- However, others are very opposed to any development in agricultural subdivision areas.
- More expansion of bus systems, pedestrian infrastructure, and bikeways is needed and supported.
- A Puna Makai Alternate Route is needed especially as the population increases.
- However, many residents are opposed to an alternate route through Hawaiian Paradise Park.
- Connectivity should be determined by each private subdivision.

Copies of the Draft Plan were available by request. The Draft Plan was also made available for public review at the County of Hawai'i Planning Department and at the Kea'au, Mountain View, Pāhoa, and Hilo Public Libraries. An electronic copy was also placed on the County of Hawai'i website for those with internet access. Comments received were summarized and can be found at the end of each section under "Community Perspectives." A complete file of all draft report comments can be reviewed at the County Planning Department upon request.

1.6. Growth Projections

Growth projections were used as a basis for transportation demand analysis. The Plan calculated population projections using past trends and an analysis of indicators. Growth indicators were used to measure existing conditions, inventory opportunities and constraints, identify issues, and determine future growth. Growth is occurring rapidly in the Puna District with the addition of over 1,000 persons each year (1980 to 2000). In year 2000, the U.S Census reported a population of 31,335. The Puna District population is projected to reach 80,162 by year 2030.

TABLE 1.1: POPULATION 1960-2000

Population		1960	1970	1980	1990	2000
Puna District		5,030	5,154	11,751	20,781	31,335
210.01	Lower Kea'au	n/a	n/a	7,055	6,844	11,776
210.02	Kea'au-Volcano				7,235	10,962
211.00	Pāhoa-Kalapana			4,696	6,702	8,597

Source: U.S. Census.

The County's *General Plan* (2005) developed three "series" of growth projections for year 2020. The PRCP indicator-based population projection (63,886) was only slightly higher than that of the County's *General Plan,* Series C (63,491). Puna has over 55,000 subdivided lots with the potential to accommodate regional growth without rezoning.

TABLE 1.2: AVERAGE POPULATION GROWTH

Census Tract	Block Group	1990-2000 Growth Pns./Year	Average Indicator Rate	Projected Growth Pns./Year	Projected 2004 Population	Projected 2030 Population
210.01	1	352	1.7	598	9,572	24,338
210.01	2	13	1.7	22	1,063	1,609
210.01	3	136	1.6	218	4,493	10,253
210.02	1	6	1.6	10	1,254	1,497
210.02	2	200	1.4	280	5,935	13,440
210.02	3	130	1.5	195	4,147	9,217
210.02	4	38	1.3	49	1,762	3,060
211	1	101	1.6	162	4,528	8,427
211	2	32	1.2	38	1,941	2,927
211	3	1	1.4	1	474	511
211	4	76	1.1	84	2,794	4,883
TOTAL PUNA DISTRICT					37,963	80,162

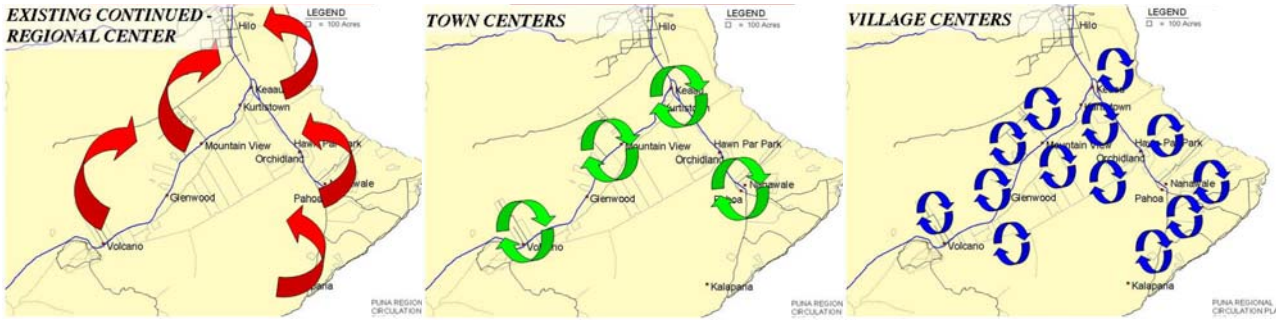
1.7. Land Use Scenarios

The PRCP identified existing land uses and projected potential land use demands based on population projections. The planning process illustrated three scenarios of land use that could potentially develop in Puna's future. The objective was to evaluate transportation needs and devise projects in the context of different land uses. Each land use scenario of the PRCP differs primarily in the distribution of commercial and industrial development. Based on population projections, land use demands were assigned to village centers, town centers, and/or the regional center in Hilo.

TABLE 1.3: LAND USE SCENARIOS

Scenario	Distribution of Demand		
	Village	Town	Hilo
A – Existing Continued	5%	20%	75%
B - Town Centers	5%	55%	40%
C - Village Centers	50%	25%	25%

FIGURE 1.2: LAND USE CONCEPTS



1.8. Alternative Circulation Concepts

A total of six alternatives were considered in the Puna Regional Circulation Plan. Two variations of land use were applied to the alternatives: "past trends continued" and "village centers"

A: "Limited Road Construction", road widening would be limited to committed projects; i.e., widening of Highway 130 between Kea'au and Pahoa. The community requested an alternative that assumed no new road construction or widening projects. If all available funds were used for alternate modes of travel, what might this look like?

B: "Limited Multi-modal", represents more of a traditional approach to transportation planning. Generally, highway improvements were used to satisfy future travel demands.

C: "Existing Routes", first identified the maximum amount of trips that bikeways and transit could provide. In order to address remaining travel demands, this alternative proposes widening of existing routes. No new alternate routes are identified.

D: "New Alternate Routes" is similar to Alternative C. A two-lane Puna Makai Alternate Route (PMAR) is proposed instead of widening of Highway #130 from Hilo to Ainaloa.

E: "Realistic Change", also approaches demands using multi-modal projects first. However, this alternative considers that changes in land use patterns, human behavior and mode choice could take much longer than 25 years. If these conditions take time to occur how do we plan for year 2030? This alternative sets the proportion of trips in the bicycle/pedestrian at 1 percent and transit at 10 percent.

TABLE 1.4: DESCRIPTION OF ALTERNATIVES

ALTERNATIVE	DESCRIPTION
A	"LIMITED ROAD CONSTRUCTION" Multi-modal Emphasis
B	"LIMITED MULTI-MODAL" Vehicle Emphasis
C	"EXISTING ROUTES" Multi-modal & Vehicle Balanced
D	"NEW ALTERNATE ROUTES" Multi-modal & Vehicle Balanced
E	"REASONABLE CHANGE" Multi-modal & Vehicle Balanced
PRCP PLAN	**"PREFERRED PLAN"**

TABLE 1.5: COMPARISON OF ALTERNATIVE ELEMENTS

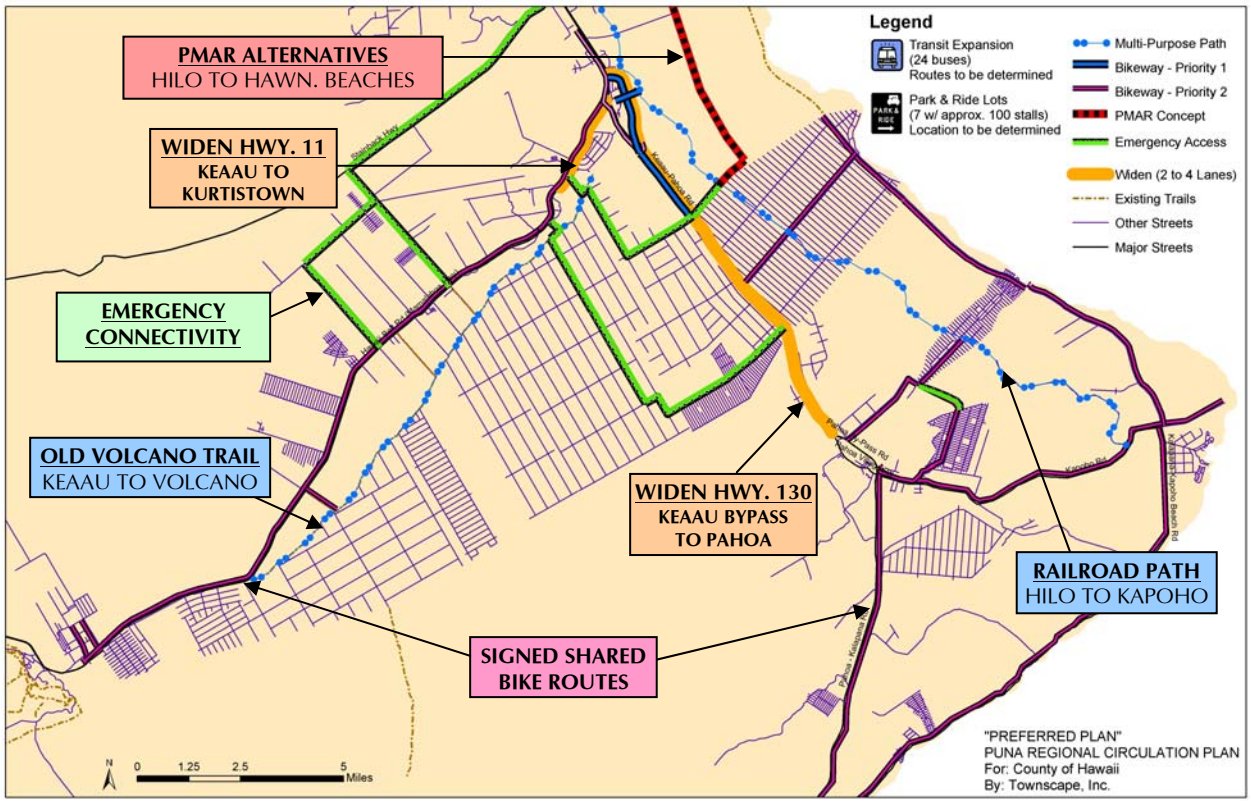
Plan Alternative	Land Use	Transit Ridership Buses Req.	Bus Only Lane[1]	Bike Ridership	Railroad Pathway	PMAR 2 Lanes	Connectivity Projects	Widen Hwy.130	Widen Hwy. 11 Kea'au-Huina	Widen Hwy. 11 Hilo-Kea'au	Cost Estimate (million)
A	Village	7-36% / 46	✓ 130	2-11%	✓		✓	✓			$166
B	Past Trends	0-9% / 21		1%		✓ [2]		✓ [3]	✓	✓	$173
C	Past Trends	15% / 38	✓ 130	2%	✓		✓	✓ [3]	✓	✓	$187
D	Past Trends	15% / 38	✓ PMAR	2%		✓ [2]	✓		✓	✓	$222
E	Past Trends	10% / 21	✓ PMAR	1%	✓	✓	✓	✓	✓	✓	$249
PLAN	**Village**	**12.5% / 24**	✓ **PMAR**	**2%**	✓	✓	✓	✓	✓		**$233**

1.9. Regional Circulation Plan

The *Puna Regional Circulation Plan* proposes projects that provide multi-modal choices, connectivity, equity, capacity, and safety. The PRCP assumes that implementation of *Bike Plan Hawai'i* projects would serve 2 percent of the peak-hour travel demand. Transit serves as much as 12 percent of the peak-hour travel demand. Needed roadway improvements include a two-lane Puna Makai Alternate Route (PMAR) from Hilo to Puna Makai, widening of Highway 130 between Kea'au and Pahoa, and widening of Highway 11 between Kea'au and Kurtistown. The plan also identifies connectivity for vehicles, bicycles, and/or pedestrians between isolated subdivisions. The interconnections help provide equity to various users and improve safety.

[1] *Bus Only Lanes accommodated on Hwy. 130 or PMAR project.*
[2] *Project includes multi-purpose path.*
[3] *Widening only till Ainaloa Blvd.*

FIGURE 1.3: PUNA REGIONAL CIRCULATION PLAN



The Puna Regional Circulation Plan proposes:

1. **Bus Transit Expansion** - addressing schedules, headways, and fleet providing more equity in transportation service for elderly, children, low-income. Overall, the Plan recommends significant expansion of the Hele-On busing system, routes, service, and programming. The Plan proposes expanded bus service, a bus-only lane, a rural para-transit system, seven park and ride facilities, development of a Transit Master Plan, and implementation of a Transportation Demand Management program. (For more detail on transit projects, see Section 7.0.)

2. **Bike and Pedestrian Facilities** - that are interconnected and integrated with other transportation modes (car, bus, etc.). The Plan proposes implementation of 24 Bike Plan Hawai'i projects. Development of any new road facilities should provide adequate rights-of-way for bike facilities. The Plan identifies two key projects, the Railroad Avenue Multi-Purpose Pathway and the Old Volcano Trail. A Safe Routes to School (SR2S) program should also be implemented. (For more details on bike paths and multipurpose paths, see Section 9.0.)

3. **Connectivity -** Meetings and coordination with area landowners, community associations, and road maintenance corporations will be needed to develop connectivity where it is appropriate. More importantly, does the immediate community (neighboring subdivisions) want or need the convenience or safety of a connection? The PRCP identifies possible connections for vehicular, bicycle, transit, and/or pedestrian access within a one-mile grid. Of these alternatives, several were identified for implementation of emergency access routes. Proposed emergency access routes for upper Puna and Puna makai include:

1. PEAR
2. PEAR II
3. Railroad ROW Access
4. Kehau to Punawai
5. N. Peck Rd. to Ihope Rd.
6. N. Kulani Rd. to Stainback Hwy.

(For more information on connectivity and emergency access routes, see Section 10.)

4. **An alternate route to Highway 130** - providing redundancy, emergency access, multi-modal choices, and capacity. The project could include infrastructure for bicyclists, pedestrians, and transit. The Plan identifies several alternative alignments from Hilo to Hawaiian Paradise Park, Hawaiian Beaches, and/or Nānāwale. This plan proposes implementation of an alternate route from Hilo to Shower Drive as soon as possible. (For more information on the Puna Makai Alternate Route (PMAR) alternatives, see Section 8.)

5. **Widening** – of Highway 130 from two to four lanes from Kea'au to Pahoa. Widen Highway 11 from two to four lanes from Kea'au to Huina Street in Kurtistown. Shifts in mode choices and village center development will take time, so road expansion continues to be needed.

1.10. Funding

Implementation of the Puna Regional Circulation Plan will require significant funding. The cost for these services should provide an overall economic and social benefit to the community. The cost of improvements is particularly controversial in lava hazard zones where volcanic destruction is a significant threat.

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) was enacted August 10, 2005, as Public Law 109-59. TEA-21 authorizes the Federal surface transportation programs for highways, highway safety, and transit for the 5-year period 2005-2009. The estimates provided here are based the assumption that funding for the State of Hawai'i will continue without major change. Based on historical funding, the State of Hawai'i receives approximately $150 million per year. The County of Hawai'i generally receives $24 million of State funds. Over the 25-year planning horizon, approximately $75 to $150 million may be

available for various multi-modal capacity improvements. Table 1.6 provides a quick reference guide to projects and required actions of the Puna Regional Circulation Plan. This section offers steps towards Plan implementation.

1.11. Action Plan

This action plan is a quick reference guide to projects and required actions of the Puna Regional Circulation Plan. Figure 1.4 illustrates the action plan projects.

A. Widen Highway 130 in affordable increments:
- i. Permanently convert the shoulder lane from Shower to a travel lane.
- ii. Widen to 4-lanes from Keaau to Pahoa.

B. Widen Highway 11 to 4 lanes in affordable increments:
- i. Keaau to Paahana
- ii. Paahana to Huina

C. Construct new makai alternate route:
- i. Alignment Alternatives Study
- ii. Planning (EIS)
- iii. Design and Construction

D. Transportation Demand/System Management:

Transportation Demand Management techniques strive to reduce the number of automobiles during peak periods.
- i. Ride-sharing Program
- ii. Rapid Accident Removal Program

E. Increase bus frequency and routes.
- i. Initiate a circuit routing system. The initial roll-out of this system will provide bus service at 1-hour intervals throughout the day.
- ii. Initiate fixed scheduled feeder routes in the more built-out subdivisions. The feeder route system will be part of the paratransit system.

F. Construct park/ride facilities.

To expedite, the preference is to use existing facilities (e.g., church, shopping center). Consultant hired to identify most strategic locations, site requirements, and estimated cost.

G. Supplement bus transit with paratransit.

The paratransit system would coordinate underutilized resources (e.g., school buses, social services vans, taxis) to service the feeder routes and to also provide on-demand, door-to-door service coordinated through the Internet and GPS.

H. Ensure safe routes to schools to encourage walking and biking by school children.

The nonprofit group called PATH has planned and implemented such programs at Kealakehe and other schools. The have access to DOH and other funding sources to leverage County funding.

I. Improve the Old Volcano Road Trail.

Besides its recreational function, this trail could serve as an off-highway pedestrian route to Mountain View Elementary School.

J. Acquire and improve Railroad ROW.

Although this ROW will be a pedestrian and bike path, the driving justifications to proceed immediately with this project is to provide an alternate pedestrian/bike route when the shoulder lane is converted and its interim value as an emergency bypass to Highway 130.

K. Investigate Beach Road Improvements.

At this point, the value of improving the Beach Road is to provide a recreational pedestrian/bicycle link to Kapoho. Since there are no multi-purpose reasons, and the regional transportation value is low, and it is located in the tsunami inundation and high lava hazard zones, the priority to allocate funds is low.

L. Improve intersections along Highway 130.

DOT has committed to do an in-house study to determine whether improvements are warranted at the intersections along Highway 130. (E.G.: Kaloli Drive, Paradise Drive, Orchidland Drive, Maku'u Drive)

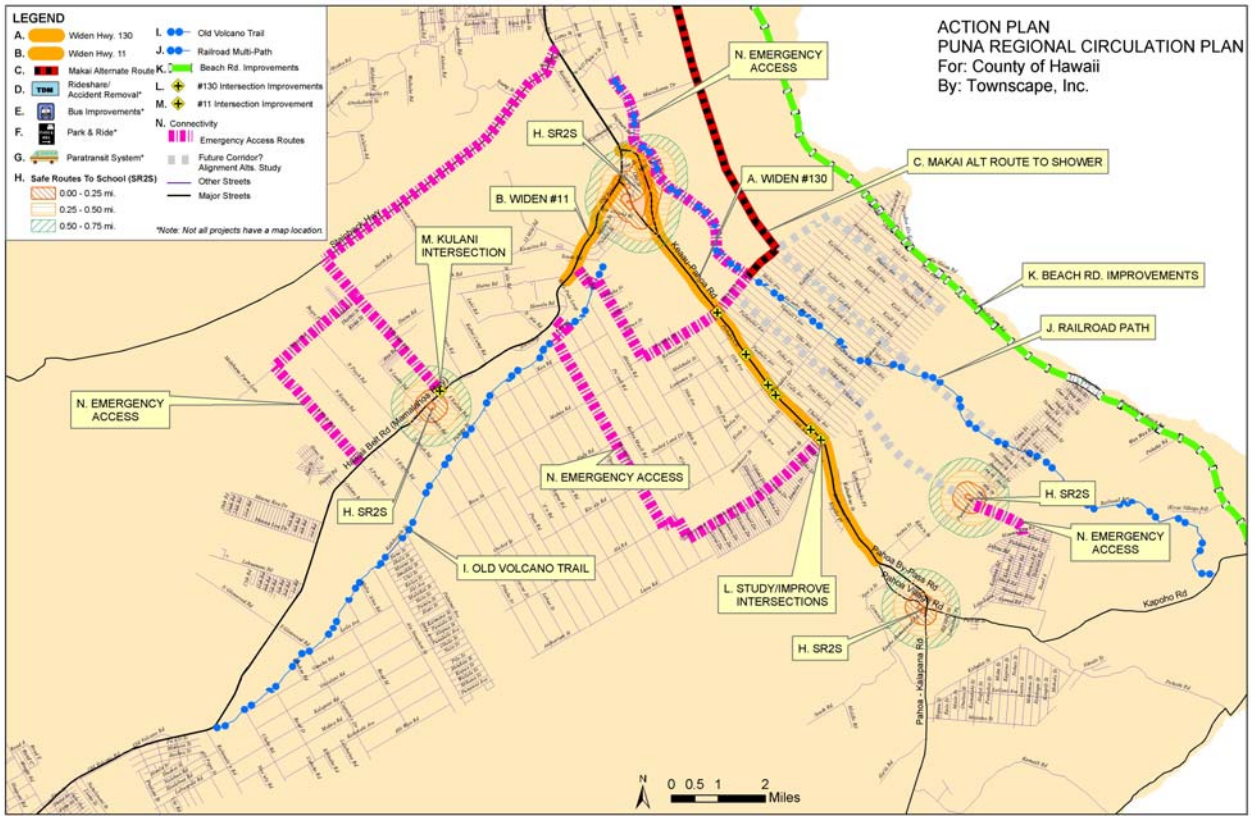
M. Improve intersections along Highway 11.

The intersection improvement at Huina has been completed. Construction funds have been committed to improve the Kūlani intersection.

N. Emergency Bypass/Connectivity Projects

The focus for this plan are those interconnections that have regional benefit in terms of providing alternate roads to major destinations, or providing emergency bypass or faster response times.

FIGURE 1.4 ACTION PLAN



2. COMMUNITY-BASED PLANNING

This section describes the community consultation process and summarizes public comments and issues expressed during planning. The Puna District represents a diverse community. Transportation is an important aspect of this rapidly growing community.

2.1. Community Consultation Plan

2.1.1. Purpose and Objective

The objective of community consultation was to gather information on values, issues, and experiences from those living in the region. The challenges of consultation were to encourage widespread participation, identify and record public ideas, and develop a plan with and for stakeholders that adequately represents the larger community.

Several issues were considered in developing the community consultation process:

- How do we identify stakeholders and conduct outreach?
- Will meetings be public or private?
- How large should meetings be?
- Who is invited to participate in meetings?
- When and where will meetings be held?
- How will the public be notified?
- Will there be other means and methods for community participation?

2.1.2. Participation Process

The PRCP participation process featured: 1) establishment of a Community Advisory Group (CAG) with regular semi-monthly meetings; 2) interviews with community leaders and outreach to residents; 3) subregional community meetings held in Pāhoa, Volcano, Mountain View, and Kea'au; and 4) a final general public meeting for the region to review the Draft Report and Regional Circulation Master Plan.

Our participation strategy included several methods of community consultation which aimed to reach community members with varying levels of interest, experience, and commitment. These elements included:

Community Advisory Group (CAG)

The "CAG" is a core group of stakeholders and community members that worked together to address transportation issues at a more detailed level. The CAG met regularly throughout the plan development process. The CAG was originally formed by the County to participate in the selection of a planning consultant.

Community Advisory Group Meeting, Kea'au Community Center.

CAG members were selected based on input and recommendations from interested citizens, community leaders, and the three County Council Members of the district. Invitations were sent to all Puna community associations listed in Table 2.1. The CAG membership expanded through out the planning process. To facilitate trust in this planning process, CAG meetings were open to the public. All CAG members and public attendees abided by an agreed-upon set of ground rules.

Personal Interviews

Personal and small-group interviews were conducted with community leaders, social services agencies, long-time residents, large landowners, key government agencies, and/or other interested citizens. These meetings provided one-on-one opportunities to get to know the community better, receive input, and build relationships.

Subregional Groups

Recognizing that subregions within the vast district of Puna may have different issues, community meetings were conducted in sub areas of the Puna district. These meetings addressed transportation issues and ideas within each specific subregion. Meetings were scheduled and held at each community's convenience. Subregional meetings encouraged participation, information sharing, and receipt of new ideas.

Subregions included:

- Kea'au (i.e., Kea'au/Paradise Park/Orchidland/Ainaloa)
- Mountain View (i.e., Kurtistown/Hawn. Acres/ Mountain View/Fern Acres/Glenwood)
- Pāhoa (i.e., Pāhoa/Hawaiian Beaches/Nānāwale/Leilani Estates/Kapoho/Kalapana)
- Volcano (i.e., Volcano Village/'Ōhi'a Estates/Mauna Loa Estates/Royal Hawaiian Estates)

Presentations were also available, upon the request of community associations, churches, schools, social services, non-profit organizations, and others. This created additional opportunities for diverse community participation and review.

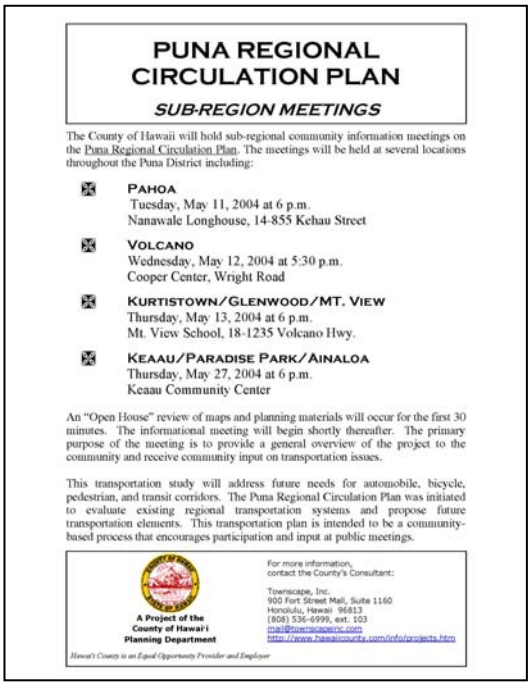
The PRCP process included two rounds of subregion public informational meetings that discussed the Plan. The draft Plan and report were presented and discussed in the second round of meetings.

Copies of the Draft Plan were available by request. The Draft Plan was also made available for public review at the County of Hawai'i Planning Department and at the Kea'au, Mountain View, Pāhoa, and Hilo Public Libraries. An electronic copy was also placed on the County of Hawai'i website for those with internet access. Comments received were summarized and can be found at the end of each section under "Community Perspectives."

2.1.3. Meeting Publicity

Public meetings were publicized through various methods in an effort to reach the broad and diverse community of Puna. Whenever possible, meetings and plan updates were publicized in the following ways:

- Radio
- Newspapers – Puna News, Hawai'i Island Journal, and Hawai'i Tribune Herald
- Community Association Newsletters
- County of Hawai'i – Website and weekly email newsletter
- Email Correspondence to ongoing mailing list
- Postal "snail" mail
- Posted flyers – Verna's Drive In, Community Centers, Mailbox bulletin boards, etc.



PUNA REGIONAL CIRCULATION PLAN

SUB-REGION MEETINGS

The County of Hawaii will hold sub-regional community information meetings on the Puna Regional Circulation Plan. The meetings will be held at several locations throughout the Puna District including:

PAHOA
Tuesday, May 11, 2004 at 6 p.m.
Nanawale Longhouse, 14-855 Kehau Street

VOLCANO
Wednesday, May 12, 2004 at 5:30 p.m.
Cooper Center, Wright Road

KURTISTOWN/GLENWOOD/MT. VIEW
Thursday, May 13, 2004 at 6 p.m.
Mt. View School, 18-1235 Volcano Hwy.

KEAAU/PARADISE PARK/AINALOA
Thursday, May 27, 2004 at 6 p.m.
Keaau Community Center

An "Open House" review of maps and planning materials will occur for the first 30 minutes. The informational meeting will begin shortly thereafter. The primary purpose of the meeting is to provide a general overview of the project to the community and receive community input on transportation issues.

This transportation study will address future needs for automobile, bicycle, pedestrian, and transit corridors. The Puna Regional Circulation Plan was initiated to evaluate exising regional transportation systems and propose future transportation elements. This transportation plan is intended to be a community-based process that encourages participation and input at public meetings.

A Project of the County of Hawai'i Planning Department

For more information, contact the County's Consultant:

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(808) 536-6999, ext. 103
mail@townscapeinc.com
http://www.hawaiicounty.com/info/projects.htm

Hawai'i County is an Equal Opportunity Provider and Employer

Subregional Meeting Announcement.

2.1.4. Identifying Stakeholders

The planning team conducted an assessment of transportation issues in the community. Stakeholder groups were identified based on this analysis. As the understanding of transportation issues deepened throughout the development of the plan, additional stakeholders were identified and added. During the course of this study, the consultant held meetings with various members of the community. Participants from community associations, social services agencies, government, and other areas provided key insights on transportation. A summary of contacted stakeholders is listed in Table 2.1.

TABLE 2.1: SUMMARY OF COMMUNITY CONSULTATION

Subdivision Community Associations:	**Government:**
• Ainaloa Community Assn. • Community Dev. Fern Forest • Eden Roc Estates • Fern Acres Community Assn. • Fern Forest • Glenwood Residents • Hawaiian Acres Community Assn. • Hawaiian Paradise Park Owners Assn. • Hawaiian Shores, Beaches, Parks Res. • Kaohe Homesteads Residents • Kapoho Beach Lots Residents • Kea'au Residents • Kurtistown Residents • Leilani Estates Community Assn. • Mainstreet Pāhoa Assn. • Mauna Loa Estates Road Maint. Inc. • Mountain View Residents • Nānāwale Community Assn. • Orchid Isle Estates Residents • Orchidland Community Assn. • Royal Hawaiian Est. Community Assn. • Vacation Land Farm Lots • Volcano Community Assn. (VCA) • Volcano Cymbidium Acres Residents • Volcano Golf Course Residents • Wa'a Wa'a Residents	• Federal Highways Administration (FHWA) • Hawai'i Volcanoes National Park • Dept. of Transportation (DOT), State of Hawai'i • Dept. of Hawaiian Home Lands (DHHL) • Dept. of Land and Natural Resources (DLNR) • Senator Russell Kokubun, State Senate • Representative Helene Hale, State House • Councilman Gary Safarik, HI County • Councilman Bob Jacobson, HI County • Councilman James Arakaki, HI County • HI County Department of Public Works (DPW) • HI County Mass Transit Agency (MTA) • HI County Civil Defense • HI County Police Dept. (HPD) **Other Community Organizations:** • Bicycle & Pedestrian Advisory Committee • Disabled Rights Hawai'i • Hawai'i Anthurium Industry Association • Hawai'i Speleological Survey • Queen Liliu'okalani Children's Center (QLCC) • Malama O Puna • Neighborhood Place of Puna • Puna Traffic Safety Council **Large Landowners:** • Kamehameha Schools (KS) • W.H. Shipman, Ltd.

2.2. Title VI - Environmental Justice

Title VI of the Civil Rights Act of 1964 addresses environmental justice in minority populations and low-income populations. Title VI states that "No person in the United States shall, on the grounds of race, color, or national origin, be excluded from participation in, be denied the benefits of, or be subjected to discrimination under any program or activity receiving Federal financial assistance." Title VI prohibits intentional discrimination as well as disparate impact discrimination.

In 1994, President Clinton signed the Environmental Justice Order (Executive Order 12898). This Order strengthens Title VI by providing that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations." Together, these statutes prohibit discrimination on the basis of race, color, national origin, disability, and age in programs or activities that receive Federal financial assistance.

There are three fundamental Environmental Justice principles:

1. To avoid, minimize, or mitigate disproportionately high and adverse human health or environmental effects, including social and economic effects, on minority populations and low-income populations.
2. To ensure the full and fair participation by all potentially affected communities in the transportation decision-making process.
3. To prevent the denial of, reduction in, or significant delay in the receipt of benefits by minority populations and low-income populations.

Equity in transportation should be provided to all.

The U.S. Department of Transportation planning regulations (23 C.F.R. 450) require states to "seek out and consider the needs of those traditionally underserved by existing transportation systems, including, but not limited to, low-income and minority households." As required by the National Environmental Policy Act (NEPA) and 23 U.S.C. 109(h), impacts on all communities including low-income communities must be routinely identified and addressed.

2.2.1. Environmental Justice and Transportation Planning

Environmental justice is more than a set of legal and regulatory obligations. Properly implemented, environmental justice principles and procedures improve all levels of transportation decision making. According to Federal Highways Administration (FHWA), this approach will:

- *Make better transportation decisions that meet the needs of all people.*
- *Design transportation facilities that fit more harmoniously into communities.*
- *Enhance the public-involvement process, strengthen community-based partnerships, and provide minority and low-income populations with opportunities to learn about and improve the quality and usefulness of transportation in their lives.*
- *Improve data collection, monitoring, and analysis tools that assess the needs of, and analyze the potential impacts on minority and low-income populations.*
- *Partner with other public and private programs to leverage transportation-agency resources to achieve a common vision for communities.*
- *Avoid disproportionately high and adverse impacts on minority and low-income populations.*
- *Minimize and/or mitigate unavoidable impacts by identifying concerns early in the planning phase and providing offsetting initiatives and enhancement measures to benefit affected communities and neighborhoods.*

2.2.2. A Discrimination Complaint

In 2000, a Sustainability Committee, comprised of citizens of Puna and Ka'u, filed a discrimination complaint against the State of Hawai'i Department of Transportation (DOT) and the County of Hawai'i (Appendix A). They requested investigation and correction of discriminatory planning in the *Hawai'i Long Range Transportation Plan* (HLRTP). FHWA concluded that evidence supported the allegations of the discrimination complaint. The investigation found that the State had discriminated by failing to recognize actual land uses, economic development, and multi-modal needs of low-income communities.

Plans that propose highway capacity improvements can serve high- or even middle-income populations that can afford to drive to work. However, highway improvements fail to provide equal treatment to low-income people, many of whom cannot afford a car. In a dispersed area like Puna, equal treatment and access can be provided by the development of transportation choices and neighborhood-level jobs, services, recreation, and education. Many feel that the high cost of a suburban auto-based lifestyle is prohibitive for low-income Puna residents. This factor is directly related to isolation, public health decline, accident rates, and land use development, and has been linked to poor transportation planning and Federal funding for the region. The *Puna Regional Circulation Plan* has considered these effects and has worked to develop land use scenarios and multi-modal projects that provide choices and access for all communities.

2.3. Community Survey

Approximately 70 community members participated in a survey. The purpose of the survey was to collect information on resident values, transportation problems, and needs. The survey document is located in Appendix B. Responses indicated that 21 percent of respondents live in Puna for its climate and environment. Another 20 percent selected Puna's rural lifestyle as the main reason they chose to live in the district. Puna's open space and affordability were also important incentives for respondents.

FIGURE 2.1: WHY DO YOU LIVE IN PUNA?

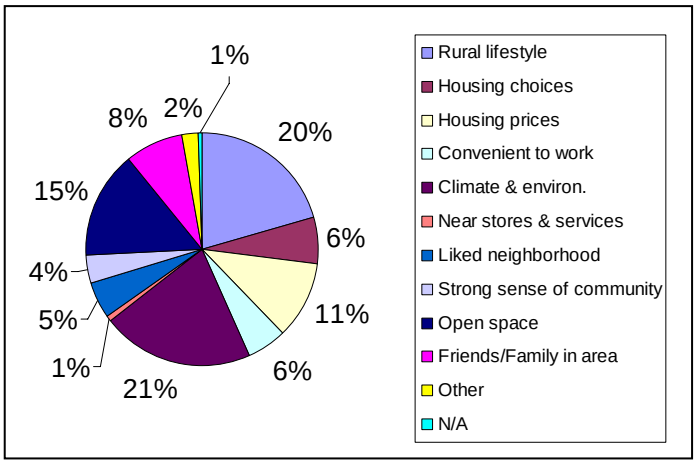
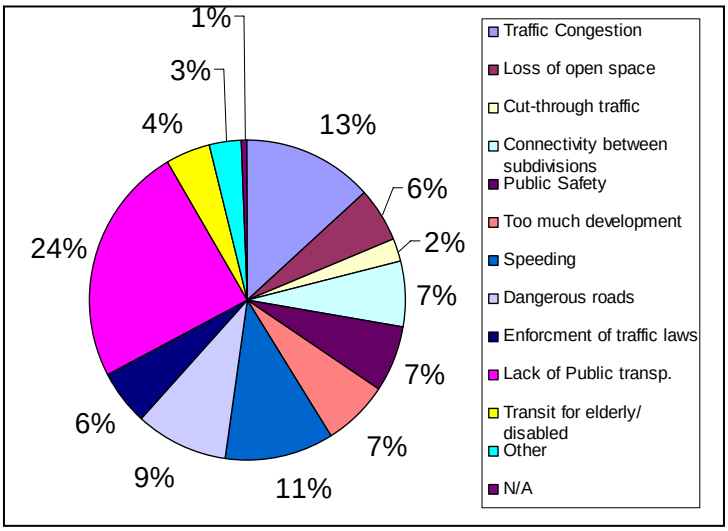


FIGURE 2.2: IMPORTANT TRANSPORTATION ISSUES



The Puna District is a rapidly growing community with many residents new to the area. However, there are also many residents that have lived in the district for over ten years. Respondents were also asked to note importance of transportation issues. Twenty-four percent of participants selected the absence of public transportation, followed by traffic congestion with thirteen percent. Respondents were asked to select the most needed transportation projects. At least fifteen percent of those surveyed selected the need for increased Hele-On bus service.

Other responses included:

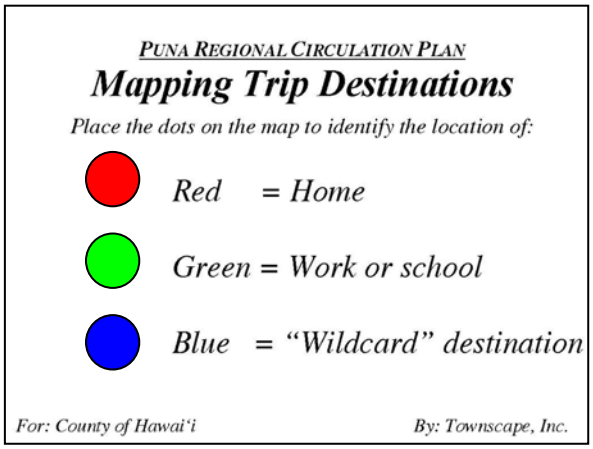
- 15 percent - Increased "Hele-On" Bus service
- 14 percent - Bikeways and bike lanes
- 12 percent - Pedestrian paths and trails
- 11 percent - Car pool/Van pool programs
- 10 percent - Construction of new roads

2.4. Community Mapping Exercise

Community mapping provides an inclusive and graphic framework for people to affirm and pool their experiences and knowledge about their home place. As a participatory tool, mapping relies on the active engagement of the community.

Subregional meetings were held in four areas of the Puna District: Nānāwale, Volcano, Mountain View, and Kea'au. Community mapping was conducted at meetings in order to get participants engaged in the process. Participants were each provided with three sticker "dots." Community members were asked to place the dots on the map to help identify trip attractors, origins, and destinations.

The red dot represented home locations. The green dot represented locations of employment or schooling. Finally, the blue dot was provided as a "wild card" for participants to identify a frequent destination that could include family visits, shopping, doctor /dentist visits, errands, social visits, recreation, and other entertainment venues. Figures 2.3 through 2.6 depict the community mapping and travel patterns of each subregion. The maps provided supplemental transportation data on travel patterns. While the exercise illustrated that some residents do stay within the region for local services, work, and school, it also validated large numbers of residents who travel regularly to Hilo.



An example of sticker handouts.

FIGURE 2.3: NĀNĀWALE

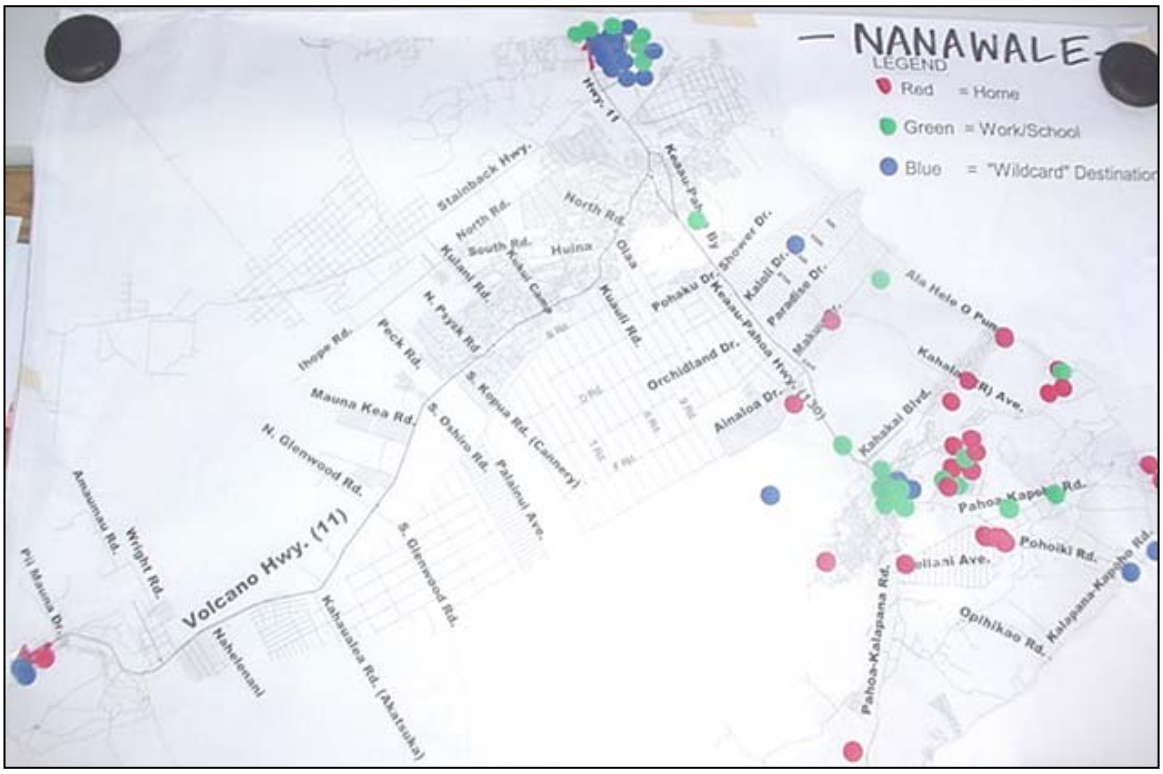


FIGURE 2.4: VOLCANO

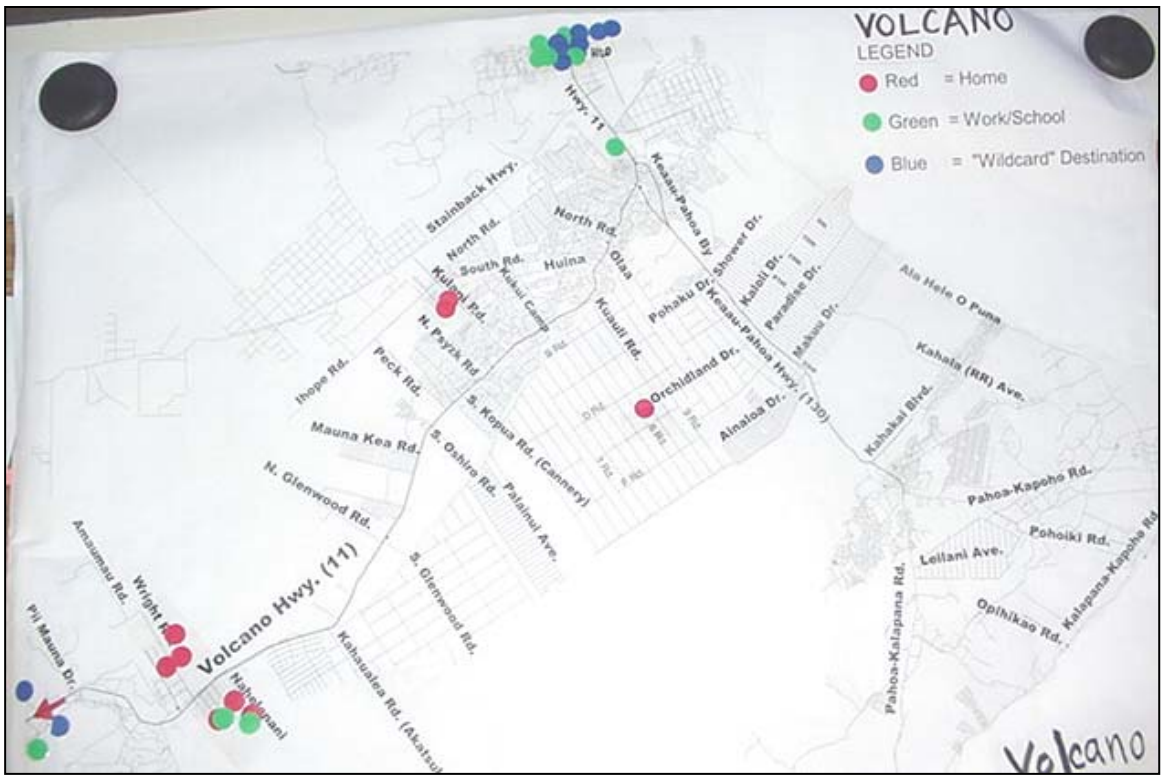


FIGURE 2.5: MOUNTAIN VIEW

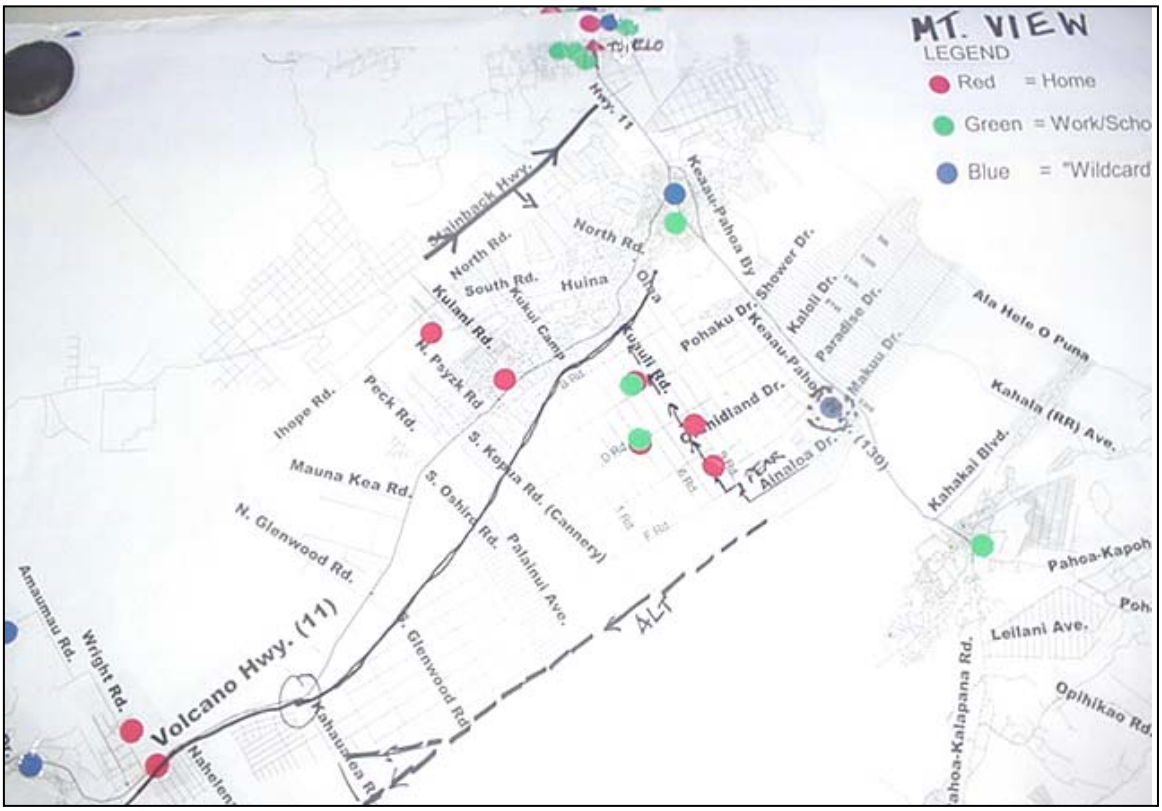
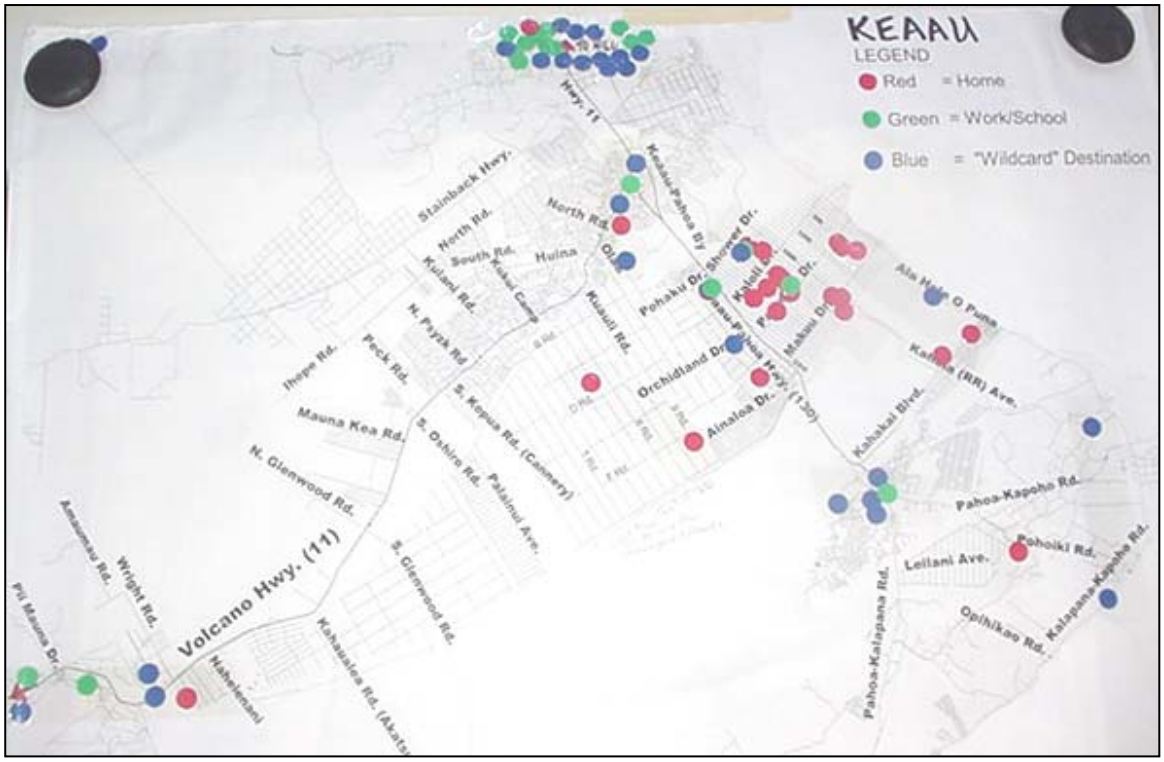


FIGURE 2.6: KEA'AU



2.5. Values and Guidelines

Values are what guide our decisions. The articulation of values and guidelines serve the greatest good when there are difficult decisions and choices to make. The guidelines help to steer the planning process and serve as evaluative tools of the plan.

"Values are standards, behaviors or practices widely understood, aspired to, and encouraged as desirable and mutually beneficial."

"From the Ground Up"
American Planning Association, 1999.

This list of guidelines was developed by listening to Puna residents and the Community Advisory Group (CAG) through interviews, public meetings, mapping, and surveys.

1. **Provide choices in modes of transportation.**
2. **Promote travel by transit, walking, and biking as viable alternatives to automobiles.**
3. **Increase the availability of high quality affordable public transportation.**
4. **Develop an equitable system of transportation for elderly, children, and low-income.**
5. **Protect adequate rights-of-way for future transit development.**
6. **Develop village centers throughout Puna that provide mixed land uses and services within neighborhoods.**
7. **Utilize context-sensitive highway design with landscaping and multi-modal amenities.**
8. **Accept a level of traffic congestion in order to shift modal choice (provided that choices are available).**
9. **Create redundancy, resiliency, and connectivity within road networks.**
10. **Ensure connectivity among pedestrian, bike, transit, and road facilities.**
11. **Improve transportation safety and emergency circulation.**
12. **Assure that transportation solutions work effectively with the natural and built environment.**

2.5.1. Discussion of Community Values

Community values relating to transportation issues were summarized in meetings. These community values distinguish the Puna District from other areas. The guidelines provide a basis on which to evaluate this plan. The goal is to develop and implement a transportation plan that improves transportation choice and mobility in this region.

The community expressed the desire for an innovative plan that would question conventional assumptions of transportation planning. As a result, much of the methodology and analysis focused on new ways of planning transportation improvements. Improving traffic congestion is only a small part of an overall program to improve transportation choices and mobility in this region. The community recognizes that it will have to accept a degree of congestion in order to force modal shifts and lifestyle changes. However, congestion can only be endured if viable transportation choices are available.

Community members meet to discuss the PRCP.

Transportation infrastructure for walking and biking will help provide modal choices for the diverse Puna community. Development of an integrated network of bike lanes and pedestrian pathways could begin with a multi-purpose path along Railroad Avenue. The community was also interested in implementing safe routes to school.

A majority of residents also focused on transit issues. The community attained consensus regarding the need for expansion and improvement of the Hele-on bus system. One meeting participant noted the shortfall of the existing system: "In Puna, you need a car to catch the bus!" Residents agreed that transit service seeks to provide equity and flexibility in choices rather than congestion relief. An expanded, reliable, and affordable bus system would provide equity by serving the entire community including children, elderly, low-income, and non-drivers.

The community also expressed concern for the protection of future transportation rights-of-way. Preserving corridors for future transportation demands will provide increased transportation efficiency for the Puna region. Corridor preservation encompasses right-of-way preservation, advance acquisition, and access management techniques. Corridor management prevents

development within a planned transportation right-of-way and allows for its acquisition in advance of construction need. This helps to ensure that transportation facilities will be adequate to serve existing circulation and planned growth.

Residents recognize that the dynamics of the Puna region are quickly changing as development occurs. However, the diversity of residents is apparent in discussing land use and development issues. Many noted that the Puna District lacks adequate land uses for self sufficiency from Hilo. As a result, they advocated for changes in land uses and zoning to allow development of commercial activities in Puna. Such a change could create jobs and services within Puna neighborhoods. This development would affect transportation patterns and, as many believe, reduce the need for trips to Hilo. One participant noted: "*changes to land uses will alleviate congestion!*"

On the other hand, other residents discussed a rural-like, agriculturally based vision for Puna. These residents moved to Puna for its seclusion. Many feel that development of commercial areas would encroach on their way of life and fear the "rush to build."

Community Comments

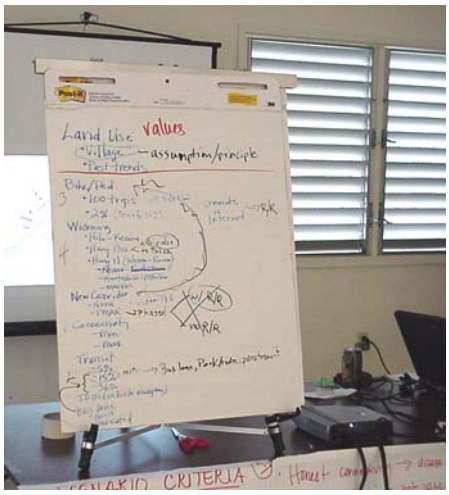
- *"You need a car to catch the bus!"*
- *"Changing land uses will alleviate congestion."*
- *"Keep Puna, Puna!"*
- *"I like my rural roads."*
- *"I'm afraid of the RUSH to build."*

The challenge in planning transportation improvements is in preserving the desired landscapes and lifestyles. Many community participants stated: "Keep Puna rural" or "I like my rural roads." Puna has many areas with special cultural and historical importance. The natural resources, cultural sites, and natural landscapes need protection.

As traffic congestion increases and peak-travel hours lengthen, commuters must get up and leave their homes earlier and earlier. Increased traffic and travel times affect quality of life. Conversely, construction of more roads drastically changes the landscape of the region. These issues clearly present the transportation needs of Puna, which cannot be addressed by construction alone.

The Community Advisory Group agreed that increasing connectivity for emergencies was a high priority action that could be focused on in the short-term. Construction and widening of new roads, without other actions (e.g., improved mass transit, increased connectivity), merely induce more traffic. Without action to increase connectivity, no amount of roadway improvement is enough to relieve the congestion.

Connectivity could provide alternate routes to major trip attractors without having to solely rely on Highways 11 and 130. One resident discussed such an example. He and his family reside in Nānāwale Estates. His daughter's best friend lives in neighboring Hawaiian Beaches. Although parts of the subdivisions are within a mile apart, children cannot play with each other without being driven on the highway. A simple interconnection between the subdivisions could allow pedestrian, bike, and even vehicular access, thus removing the need to use the highway. Connections would provide alternate routes during natural disasters, traffic accidents, water main breaks, or other emergency road blockages.



Flip charts used to record community comments.

Residents also requested that needed roadway improvements consider community character. Transportation enhancements including landscaped buffers, bikeways, paths, and lighting should be a part of comprehensive transportation projects. The various amenities help service diverse residents and also fulfill the goal of providing multi-modal choices in transportation. The community also recognized the importance of connecting various transportation modes so a bike rider may catch the bus or an automobile driver can park and catch a bus.

3. PROFILE OF THE PUNA REGION

This section presents an overview of the planning region including its community character, physical characteristics, natural hazards, and archaeological resources. Several elements of the region were selected as growth indicators and are discussed in more detail in Section 4, Growth Projections and Indicators. These elements include lava hazards, flooding, and infrastructure.

3.1. Rural or Suburban? Puna is Something Else!

The Puna District is a unique place. Many describe it as a "rural" community for its agricultural activities, open space, and the absence of "urban" infrastructure. However the district is also considered "suburban" due to widespread residential development, the absence of local jobs and services, and commute patterns to Hilo. The Puna District can neither be characterized akin to rural areas of middle America nor classic suburb neighborhoods complete with sidewalks. Puna is something else!

Rural means a land use, transportation, and economic pattern characterized by locally balanced land uses and largely self-sufficient small towns, surrounded by agricultural lands. In more self-sufficient rural communities, local jobs and services, along with homes and farms, mean that there is almost no commuting to distant employment centers. This is somewhat different from what Puna is. As a result, some have characterized Puna as "large-lot suburban" or "semi-rural." People who travel to Hilo only once every week and make their entire living within Puna are truly rural. Yet, most Puna residents commute daily, if not more, with two or more commuters per household.

Nevertheless, most of the lots in Puna are at least one-acre with generous open space and vegetation that buffer homes. It is understandable that some residents oppose small local employment and service centers in an effort to protect the existing quality of life, whether it is called rural, semi-rural, or large-lot suburban.

A resident's backyard in Orchidland Estates illustrates open space and livestock not commonly found in suburbs.

Noni trees at Paradise Farms in Hawaiian Paradise Park.

Residents with this perspective feel very strongly about protecting their community and way of life. They enjoy Puna's natural landscape, open space, rough infrastructure, distance from business activity, and quiet environment. Farms, livestock, and other rural activities, not allowed in classic suburbs, are found throughout Puna. Many people move there precisely because of these qualities. Moreover, any kind of development, even at the village level, can seem like a very slippery slope towards urban living. Many residents have fought hard to maintain the "agricultural" land use allocation as opposed to "rural."

However interestingly, past surveys conducted by community associations found that the divide between those in favor of Puna as "wild" versus "more development" was evenly split 50/50. The absence of urban development can be desirable for those who know they can easily travel to the regional center of Hilo for work, goods, and services. The area's sense of place is "preserved" by distancing homes and farms from jobs and services. The difficulty is that this distance preserves an auto-dependent pattern, denies equity for low-income residents, and increases traffic congestion and environmental impacts.

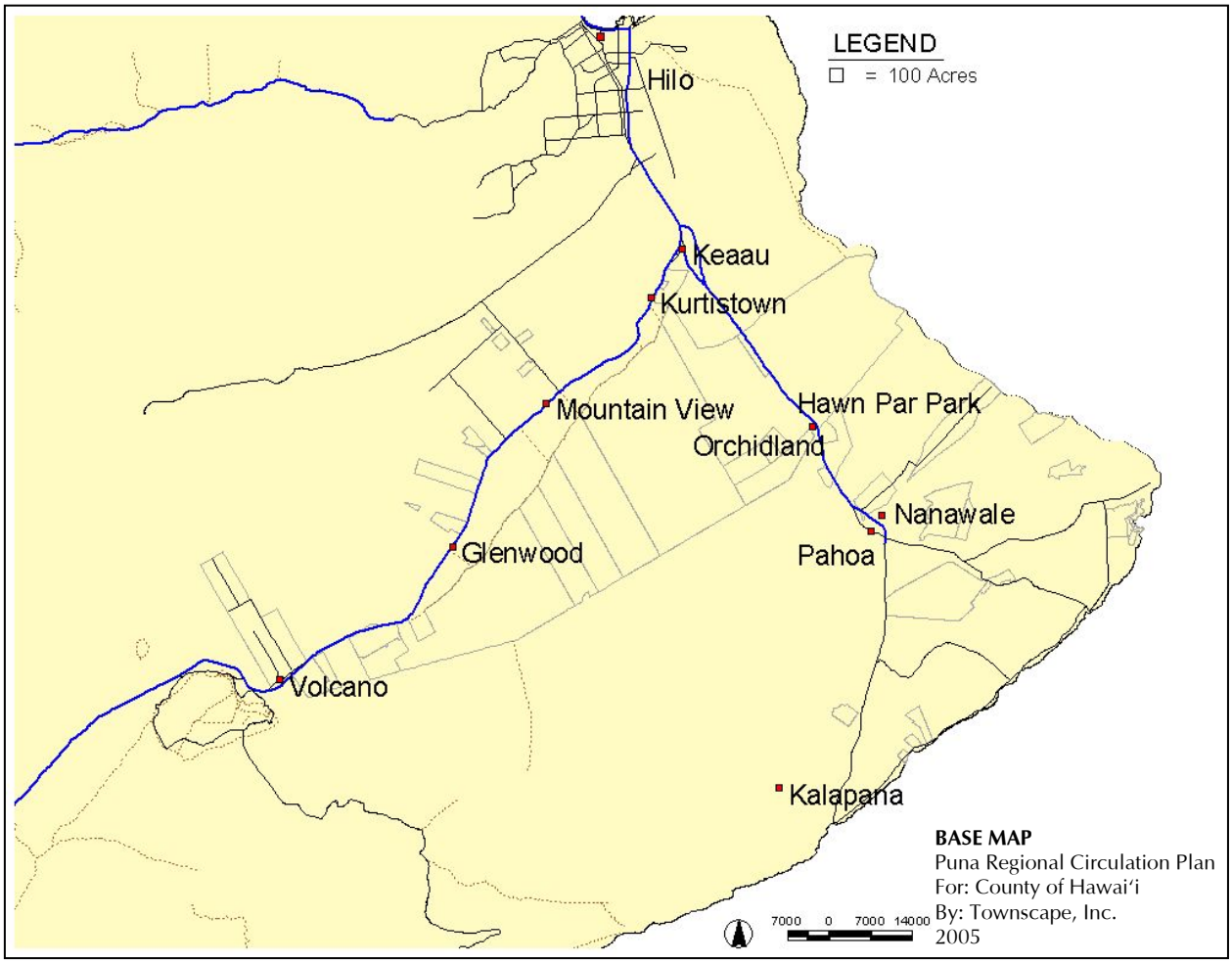
There are also residents of Puna who have a desire for village development that provides access to more local jobs, goods, and services. Implementation of village centers could create sustainable patterns that remove the need for regular commutes. A truly rural, locally balanced, land use pattern can lower transportation costs and provide economic and lifestyle improvements and choices for all types of residents. This group includes minorities such as the elderly, disabled, and youth. The "rural" approach of multiple smaller "villages" with low-density areas in between offers multiple economic, ecological, social and cultural benefits.

So what does this all mean for planning Puna's transportation systems for the next 25 years? If development of village centers does not occur, the increasing population will continue to commute to Hilo for jobs, goods, and services. Therefore, major increases in infrastructure will be needed, including highways. Transit, bikeways, and paths may provide some relief and equity for low-income residents.

On the other hand, if residents allow limited and planned mixed use development, better outcomes can occur. This development can take time, and roads and transit will continue to be needed. However, village centers can eventually shorten trips, decrease commutes, and facilitate the use and necessity of more bike and pathways. The community will have to decide if they can tolerate the long commutes, major highway development, and social inequity needed to preserve their distance from mixed uses. The option is to accept some neighborhood level development in exchange for decreased highway development, equal access, and overall environmental benefits.

Residential development in the Hawaiian Shores subdivision.

FIGURE 3.1: PROJECT AREA



3.2. Physical Description

3.2.1. Location

The Puna District encompasses 499.5 square miles or 319,680 acres. It is bound to the north by the Hilo District and to the west by the Ka'u District. Primary access to the district is from an east-west roadway (Volcano Road) that runs parallel to the northern boundary of the District. A main branch road at Kea'au runs south to access the southern and eastern portions of the District.

3.2.2. Terrain and Climate

The majority of the terrain in Puna is characterized by broad and gentle slopes with no defined waterways. The Puna landscape is formed of porous volcanic rock and soils from Mauna Loa and Kīlauea eruptions. An extensive network of subterranean lava tubes runs throughout much of the District and are accessible through collapsed openings.

The climate is tropical with temperatures averaging 67 degrees Fahrenheit in Mountain View at the 1,530-foot elevation and daily temperatures range between 10 and 20 degrees. August and September are the warmest months; January, February, and March are the coolest. Rainfall averages 100 inches per year; June is usually the driest month; and December is the wettest. However, monthly and annual rainfalls are very unpredictable and rainfall in East Hawai'i can vary by a factor of three from year-to-year (60 to 180 inches a year). Rainfall averages are higher at upper elevations and range from 50 inches a year along the southwestern coast to 300 inches in the northern extent of the district.

3.2.3. Soils

According to the U.S. Department of Agriculture *Soil Conservation Service Soils Report* (1973), there are over 20 soil types found in the area. The three major soil associations are:

Kekake-Ke'ei-Kīloa – Described as very shallow, gently sloping to steep, well-drained organic soils over 'A'ā or pāhoehoe lava; on uplands.

Akaka-Honokaa-Kaiwiki – Deep gently sloping to steep, moderately well drained and well drained soils that have a moderately fine textured subsoil, high in organic matter, very porous and continuously wet; on uplands.

Lava Flows - Gently sloping to steep, excessively drained, nearly barren lava flows; on uplands.

There are no major development constraints caused by area soils.

3.2.4. Geology

The region was formed as part of the shield volcano mountain-building process of Mauna Loa and Kīlauea. Kīlauea is currently active and lava has covered numerous acres of developed lands within the Puna District in the last thirty years. Recent eruptions have generally been limited to the National Park lands. The lava tubes and cave systems of the Puna area are an integral and common element of extrusive volcanic landscapes in shield volcanoes such as Kīlauea and Mauna Loa. Although exact numbers cannot be determined, it is certain that thousands of lava tubes lie within the pāhoehoe lava flows. According to the Hawai'i Speleology Survey (HSS), most of these caves are too small to be an important concern in land planning.

Important sites include several named lava tube caves, including Kazumura, Keala, and Lower U`ilani Caves. Kazamura Cave is internationally recognized as the world's largest lava tube cave. The Puna area is broadly considered to be the world's leading area for scientific study of lava tubes large enough to be caves.

According to representatives of the HSS, distribution of specific data regarding caves requires approval of their board. The HSS can review requests for information on a project-by-project basis. Lava tube caves are valuable resources based on their geology, recreation quality, biology, and Hawaiian cultural significance. Transportation improvement projects have the potential to disturb lava tube caves, moreover, the caves are also a potential hazard to the projects. As noted, the HSS should be consulted in future planning and engineering to assure that negative impacts to important caves and transportation projects are avoided.

3.2.5. Topography

The region gently slopes in a radial pattern from the high western mountains of Kīlauea and Mauna Loa. The slope is predominately gentle but includes small hillocks, swales, and broken land resultant from the volcanic geology and subsequent weathering. The area slopes from an elevation of 5,000 feet to sea level along the coastal boundary. No major development constraints are caused by topography.

3.2.6. Flora and Fauna

Dominant vegetation types in the region range from rain forest to desert scrub and coastal strand. Under the Endangered Species Act, the U.S. Fish and Wildlife Service is charged with designating critical habitats for threatened and endangered species whenever it is determined to be prudent and determinable. There are over 100,000 acres of land within the region which are designated as critical habitat areas.

Researchers have grouped the flora of the Puna region into nine ecosystem categories depending on rainfall, stage of succession from bare lava, elevation, and penetration of exotics into the native ecosystem. Area ecosystems include:

- Lava
- ʻŌhiʻa woodland
- ʻŌhiʻa forest
- Dry forest
- Dry scrub community
- Dry grassland
- Mixed lowland forest
- Scrub
- Agricultural lands

Some forests in the upper elevations are maintained as extensive ecosystems. However, lower elevation lands used as agricultural and residential areas have allowed the spread of exotics and "domestics" such as mango, coconut, bamboo, rose apple, eucalyptus, Christmasberry, kukui, and milo. Other species that have proliferated include myrica faya, ginger, tibouchina, strawberry guava, banana poka, palm grass, and yellow Himalayan raspberry. Rare, threatened, and endangered plant species reported in the Puna area include:

- Alphitonia ponderosa var kauila
- Adenopherous periens, (Fern, pendant kihi)
- Bidens skottsbergii var. conglutinate
- Clermontia hawaiiensis
- Clermontia peleana (ʻOha wai)
- Cyanea tritiomantha
- Cyrtandra ramosissima, Hedyotis hedyosmifolia var. magnifolia
- Labordia baillonii
- Nathocestrum longifolium var. rufipilosum
- Peperomia lilifolia va. Obtusata (ʻalaʻala-wai-nui)
- Phyllostegia brevidens var. heterodoxa
- Sterogyne macrantha
- Stenogyne scrophularioides
- Tetraplasnadra kavaiensis var. dipyrena
- Xylosma hawaiiensis var. hillebrandii
- Zanthoxylum dipetelaum var. gemenicarppum
- Zanthoxylum glandulosum

Endangered animals that may be found in the Puna region include the following:

- Buteo solitarius (I'o), Hawaiian Hawk,
- Hemignathus wilsoni ('Akiapolaau)
- Lasiurus cinereus semotus ('Ope'ape'a), Hawaiian Hoary Bat.

Early identification of endangered species sites is helpful in planning projects. Specific improvement projects should address this to avoid costly changes to engineering plans.

3.2.7. Natural Hazards

The Overall Hazard Assessment (OHA) identified in the *Atlas of Natural Hazards in the Hawaiian Coastal Zone* (2002) is ranked moderate-to-high to very high for the Puna region. The overall rating considers the weighted individual assessments of the following variables: tsunami, stream flooding, high waves, storms, erosion, sea level, and volcanic/seismic activity with consideration of the coastal slope. There are development constraints in coastal areas and lava hazard zones 1 and 2. For more information, see Section 4.

3.2.8. Groundwater

Parts of the following aquifers are in the Puna District: Northeast Mauna Loa Sector, Southeast Mauna Loa Sector, and the Kīlauea Sector. The estimated combined total yield within the District is 1 billion gallons per day. Puna's abundant rainfall and the absence of sediment load create high-quality groundwater. There are six hydrologic units identified in the region: Kea'au, 'Ōla'a, Pāhoa, Kalapana, Hilina, and Keiwa. According to the Department of Land and Natural Resources (DLNR) Commission on Water Resource Management, the aquifers have a combined sustainable groundwater yield of 1,154 million gallons per day (MGD). There are approximately 23 existing wells located in the area including the Hawaiian Shores, Keonepoko, Kapoho, and Pāhoa wells. There are no direct development constraints caused by Puna groundwater conditions.

3.2.9. Conservation Reserves

There are four forest reserves in the Puna District including Nānāwale, 'Ōla'a, Keauohana, and Malama-kī. These reserves total over 13,000 acres. There are two natural area reserves in the region. Pu'u Maka'ala contains 12,106 acres of montane wet 'ohi'a and koa forests. Kahauale'a Natural Area Reserve represents volcanic activity with fresh lava fields as a blank slate where plants and animals re-colonize cooled lava flows. The Reserve's 16,726 acres include wet 'ōhi'a (Metrosideros polymorpha) forests. The natural area reserves include both endemic and endangered species.

Hawai'i Volcanoes National Park was established in 1916. The Park encompasses 333,000 acres and ranges from sea level to the summit of the volcano, Mauna Loa, at 13,677 feet. Over half of the Park is designated wilderness and provides recreational opportunities. Conservation areas protect watersheds, endangered species, and open space. Transportation projects planned near or through forest reserves should carefully consider negative impacts.

3.3. Socioeconomic Characteristics

3.3.1. Demographics

The Puna region is rural. According to the U.S. Census, the Puna population was 31,335 in year 2000. The project area grew by nearly 20,000 people from 1980 to 2000. This equates to growth of 1,000 people a year. There are over 13,000 households in Puna with an average household size of 2.79.

TABLE 3.1: PUNA DISTRICT POPULATION 1960 TO 2000

	1960	1970	1980	1990	2000
Puna Dist.	5,030	5,154	11,751	20,781	31,335

Source: County of Hawai'i General Plan 2005.

The ethnic composition of the District is similar to the County. About one-third of the District population is of Caucasian ancestry, slightly more than the County-wide percentage. Residents with Asian ancestry represent one-fifth of the District, also slightly lower than the County. The number of Native Hawaiian and other Pacific Islanders is proportionately the same in Puna as in the County. These categories, however, inadequately address the ethnic makeup as perceived by Hawai'i residents, who distinguish among Native Hawaiians, Samoans, Japanese, Chinese, Koreans, and Filipinos. In addition, many births since 1970 have involved parents of different or mixed ethnic backgrounds.

3.3.2. Employment and Income

The median household income of Puna residents is $30,821, about $10,000 below County-wide levels. The per capita income for the District is $14,000, compared to a County-wide income of $19,000 (U.S. Census, 2000).

Generally, the unemployment rate in Puna is greater than the County rate. The 2000 Census reported a 12.2 percent rate for the Puna District compared to 8 percent for the County. The mean travel time to work exceeds the County average by about seven minutes and about five percent more Puna residents participate in carpooling than the County residents in general. Data illustrates a correlation between low to median household income residents and need for alternative modes of travel. This community can be assisted by efficient, affordable, and convenient busing systems.

TABLE 3.2: LABOR FORCE/TRAVEL CHARACTERISTICS, COUNTY AND DISTRICT - 2000*

Census Tract	% (percent)			Mean Travel time to work (minutes)
	Unemployed	Car-pools	Public Transportation	
210.01	11.4	25.8	0.9	30.4
210.02	8.6	22.1	0.5	31.1
211	16.7	24.6	0.4	31.5
Puna District	12.2	24.1	0.6	31.0

*Workers 16 years and over. *Source: U.S. Census 2000 Summary File 3.*

3.3.3. Economic Base

The region's main economic base is agriculture. Crops include vegetables, fruits, macadamia nuts, ornamental flowers, and foliage. Flowers, primarily orchids and anthuriums, are grown throughout Puna. Tourism is a growth industry in the region as tourists visit Hawai'i Volcanoes National Park and seek accommodations at bed and breakfast establishments. The region has several parks, natural area reserves, and other places of interest. A significant portion of Puna residents work in home-based businesses and cottage industries. Many of these jobs are possible due to telecommuting. Transportation choices and amenities could improve business and the economic diversity of Puna. Access by regular bus service and pathways such as the Railroad Path and the Old Volcano Trail, would provide increased options for tourists to travel throughout Puna.

3.4. Historic and Cultural Resources

Puna meaning "spring" has many historic sites, including ancient trails, burial caves, habitation sites, fishponds, and heiau. The Puna District has rich cultural landscapes including the Mahina Akaaka Heiau, Nuikūkahi Heiau, Kohelele o Pele, and Kūki'i Heiau. The Waha'ula Heiau was a significant archeological temple site located within the Puna area of Hawai'i Volcanoes National Park. Sites such as this heiau were destroyed by recent lava flows.

3.4.1. Archaeological Sites

The majority of the archaeological sites located along the coast indicate a settlement pattern associated with ocean resources. Numerous agricultural features indicate extensive cultivation of taro, sweet potato, and other traditional crops. The easternmost region of Puna is the sacred site known as Kumukahi. This locality receives the first light of dawn and was a place of healing and power. The ancient landscape of Puna was covered with forest, brush, and vegetation prior to being transformed into ranchland and sugar cane fields. In between historic lava flows, Puna vegetation began with lichens, ferns, and shrubs. William Ellis[4] described Puna in 1850 with thick verdant soils, grass, trees, and taro. Historically, the region supported wet and dry taro planting, banana, sugar cane, sweet potato, coconut groves, and breadfruit trees.

[4] Handy, E.S. Craighill, and Elizabeth Green Handy, with Mary Kawena Pukui. *Native Planters in Old Hawai'i: Their Life, Lore, and Environment.* Bishop Museum Press, 1991.

3.4.2. Historic Sites

Numerous historic sites are also located within the District. Table 3.3 lists these sites.

TABLE 3.3: SITES LISTED ON STATE AND NATIONAL REGISTER OF HISTORIC PLACES

Site	Tax Map Key	Ahupua'a or Region	Hawai'i Register	National Register
Johnson Summer Home/Hale 'Ōhia Cottages	1-1-05:19,42	Kea'au	x	
Hale 'Ōhia Tract Historic District	1-1-05: 24-26; 29-33	Volcano	x	
Star of the Sea Catholic Church, Kalapana Painted Church	1-2-06:81	Kaimū	x	x
Ala Loa	1-2-09:3	Kehena	x	
Keauohana Ahupua'a Archaeological District	1-2-09:3	Kehena	x	
''Opihikao Evangelical Church Residence	1-3-04:18	'Opihikao	x	
King's Highway	1-3-07:26	Malama Kī	x	
MacKenzie Petroglyphs	1-3-07:26 1-3-08:1	Malama Kī	x	
Mountain View Theater	1-8-02:1	'Ōla'a	x	

3.4.3. Ahupua'a

An ahupua'a is a land division usually extending from the uplands to the sea. Ahupua'a within in the Puna District include:

Kea'au	Lae'apuki	Makua
Waikahekahe nui	Pānau iki	'Opihikao
Waikahekahe iki	Pānau nui	Ula
Keonepoko	Kealakomo	Kapaahu
Waiakahiula	Kahue	Kupahua
Wa'a Wa'a	'Āpua	Kalapana
Keahialaka	Pūlama	Kaimū
Kapoho	Poapoa	Kikala
Kahauale'a	Alaa	Kēōkea
Kamoamoa	Hālona	Kaueleau

Thorough investigation and early identification of archaeology is very important in planning new transportation infrastructure. A project's feasibility and route can be impacted by the existence of such sites.

4. GROWTH PROJECTIONS & INDICATORS

This section presents Puna population trends and describes the use of indicators for projecting growth to year 2030. An indicator can be a positive or negative attribute of the area that affects future residential settlement, economic development, and resulting travel patterns. This section also compares PRCP growth projections to those of Hawai'i County, as presented in the *General Plan*, and the State of Hawai'i Department of Business, Economic Development, and Tourism (DBEDT).

4.1. Past Trends

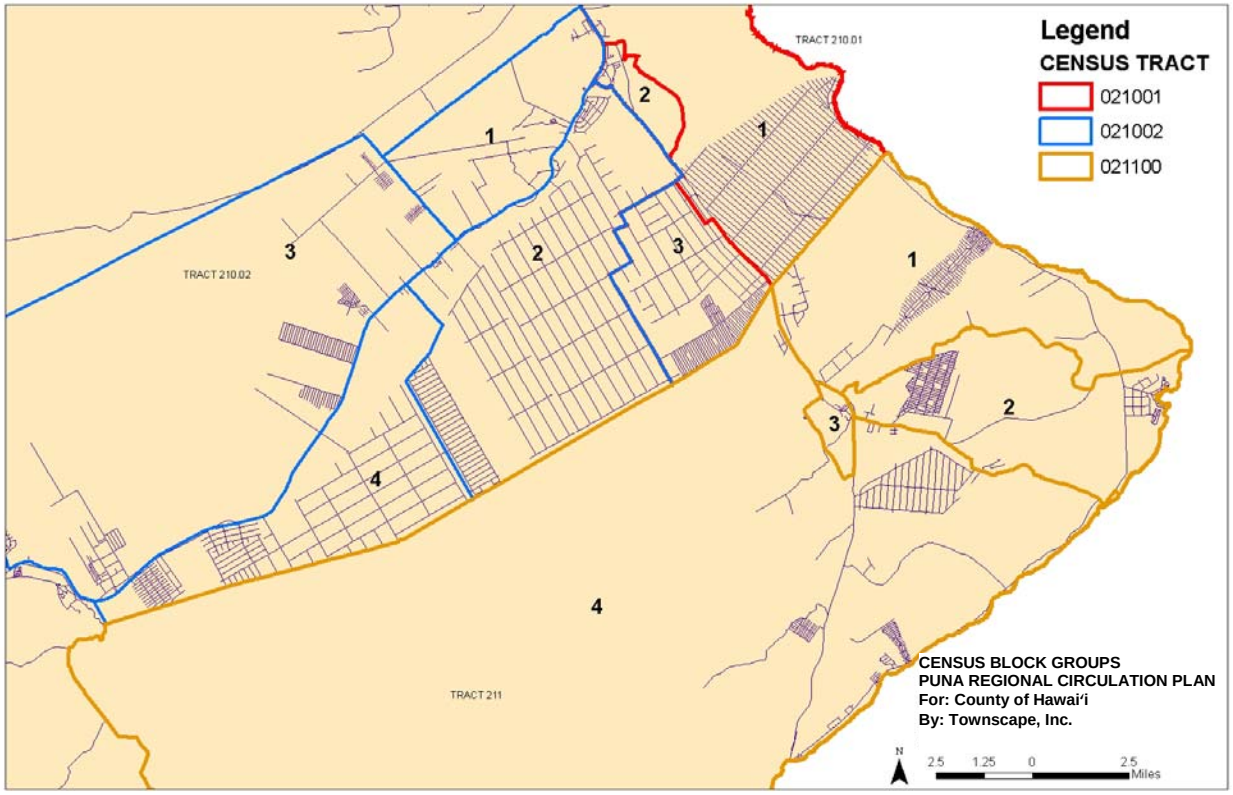
Population projections were developed for year 2030 as a basis for calculating transportation demands. The Federal Highways Administration (FWHA) requires planning horizons of at least 20 years. In 2000, the Puna District population was 31,335. Population growth trends for the Puna District from 1960 to 2000 are presented in Table 4.1.

TABLE 4.1: POPULATION 1960-2000

Population		1960	1970	1980	1990	2000
Puna District		5,030	5,154	11,751	20,781	31,335
210.01	Lower Kea'au	n/a	n/a	7,055	6,844	11,776
210.02	Kea'au-Volcano				7,235	10,962
211.00	Pāhoa-Kalapana			4,696	6,702	8,597

Source: U.S. Census.

FIGURE 4.1: MAP OF CENSUS BLOCK GROUPS



4.2. Increasing Growth Trends (2000 to present)

Originally, U.S. Census population trends (1990 to 2000) were used as the foundation for PRCP growth projections. A projected 2020 population of 53,035 was based on the per person growth from 1990 to 2000. This figure was extremely low when considering the *General Plan* numbers, community input, and actual fieldwork.

Census undercounting is an obvious problem in population counts of remote and inaccessible areas of Puna. According to a 2001 U.S. Census Study,[5] the State of Hawai'i has an estimated census undercount rate of 2.16 percent. The Puna District undercount is likely higher than that of the State.

It is also clear that yearly growth trends from 2000 to 2004 surpass those before year 2000. Since 2000, growth has increased immensely due largely in part to low interest rates. Housing market values have increased and this affected development trends. Residents seek affordable housing that is readily available in Puna. Fieldwork visits to the region observed hundreds of lots in various stages of clearing and construction, thus confirming development trends.

[5] U.S. Census Bureau and Dr. Eugene Ericksen, "Estimates of State and County Undercount Rates," May 1, 2001.

4.3. Using Growth Indicators

Growth indicators were used to measure existing conditions, inventory opportunities and constraints, identify issues, and determine future growth. Population projections of the PRCP consider past growth trends along with seven other growth indicators. These indicators vary for each area of Puna and affect growth trends. Growth indicators include:

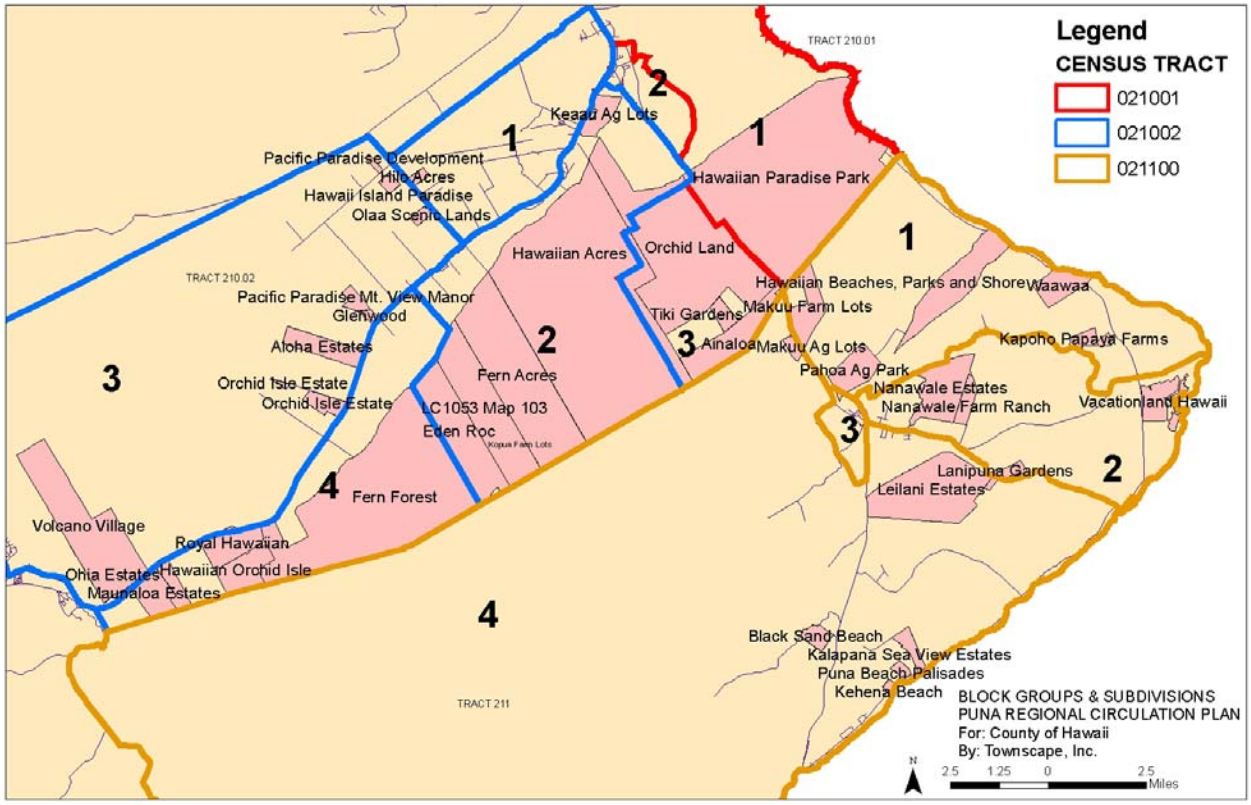
- Existing development
- Water service
- Road condition
- Lava hazard
- Flooding
- Past growth trends
- Proximity to regional center

Some subdivisions of Puna are growing faster than others due to various opportunities and constraints. For example, land with high-quality roads or County water is generally more desirable for development than others. Each of the eleven Census block groups that exist for Puna were analyzed and scored based on these indicators. The scores determine the rate of future growth, 2.0 for population growth double that of 1990-2000, 1.5 for growth 150 percent of 1990 to 2000, 1.0 for growth equal to that of 1990 to 2000, and 0.5 for a 50 percent decrease in population from 1990 to 2000.

TABLE 4.2: SUBDIVISIONS BY CENSUS BLOCK GROUP

Census Tract	Block Group	Subdivisions (Area)
210.01	1	Hawaiian Paradise Park
210.01	2	Kea'au Town
210.01	3	Orchidland (part), Ainaloa, Tiki Gardens
210.02	1	Hilo Acres, Kurtistown
210.02	2	Hawaiian Acres, Fern Acres, Kōpua Farm Lots, Eden Roc, Orchidland (part), Kea'au Ag Lots
210.02	3	Glenwood, Volcano Village, Volcano Cymbidium Acres, Aloha Estates, Orchid Isle Est., Pacific Paradise Manor, Pacific Paradise Gardens
210.02	4	Fern Forest, Hawn. Orchidland Estates, 'Ōhi'a Est., Royal Hawn., Mauna Loa Estates
211	1	Maku'u Farm Lots, Hawn. Beaches/ Shores/ Parks, Wa'a Wa'a, Pahoa Ag Park, Kapoho Papaya Farms
211	2	Nānāwale Estates, Kapoho Beachlots, Vacationland
211	3	Pāhoa Town
211	4	Leilani Estates, Lanipuna Gardens, Kehena Beach, Kalapana Sea View Estates, Puna Beach Palisades

FIGURE 4.2: CENSUS BLOCK GROUPS AND SUBDIVISIONS



4.3.1. Existing Development

The absence of affordable housing and increasing home prices have accelerated residential growth in Puna. Many residents enjoy a rural spacious environment, and few have neighbors directly adjacent to their homes. If all 55,000 lots in Puna were developed with homes, a much different environment and quality of life would exist.

Puna's potentially buildable lots represent nearly half of available lots in the whole County. There are over 20 subdivisions with lot sizes ranging from 10,000 square feet to 5 acres. According to the County of Hawai'i Real Property Tax Office, there are a total of 12,297 dwelling units in Puna (Feb 2004). The majority of homes are single-family dwellings.

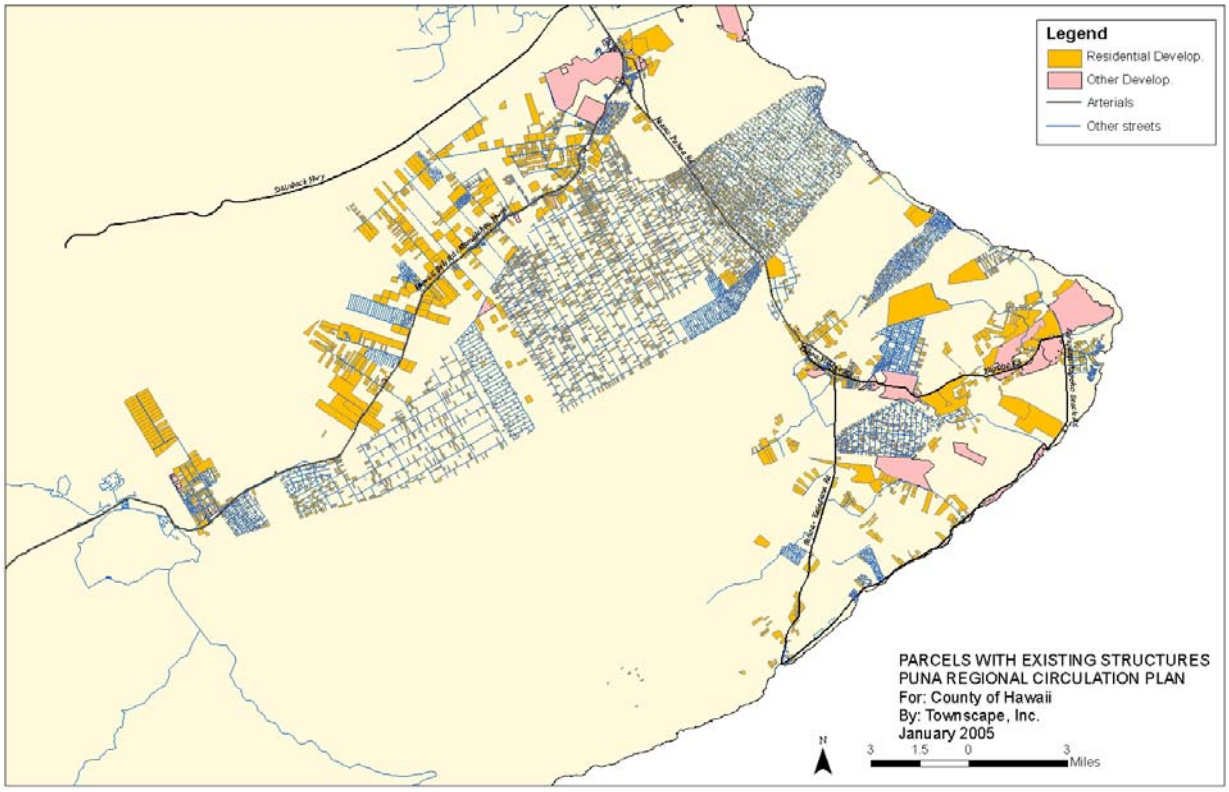
The rate of single-family residential construction in Puna increased significantly in the 1970's and has maintained a rapid pace in the last two decades. The 2000 Census recorded 13,068 households in the Puna District and, according to a 1997 study, approximately 98 percent of all housing units are single-family dwellings. This is the highest percentage of all districts on the island (County of Hawai'i, *General Plan*, 2005). The 2000 Census determined that about 71 percent of the occupied housing units were owner-occupied compared to the County rate of about 65 percent.

TABLE 4.3: GROWTH INDICATOR – EXISTING DEVELOPMENT

CENSUS AREA		DEVELOPMENT			
Census Tract	*Block Group*	*No. of Parcels*	*With Bldg.*	*Percent Dev*	*Score*
210.01	1	8893	2561	28.8	2.0
210.01	2	406	308	75.9	1.5
210.01	3	6833	1373	20.1	2.0
210.02	1	1087	495	45.5	2.0
210.02	2	8890	1829	20.6	1.5
210.02	3	6708	1332	19.9	1.5
210.02	4	6418	827	12.9	1.0
211	1	4697	1438	30.6	2.0
211	2	5296	836	15.8	1.5
211	3	316	158	50.0	1.5
211	4	8302	1187	14.3	1.0

Source: Hawai'i County, GIS Parcel & Real Property Data. No. of parcels with building value $100+.

FIGURE 4.3: DEVELOPED PARCELS



4.3.2. Water Service

There are four major water systems in the District: ʻŌlaʻa-Mountain View, Pāhoa, Kapoho, and Kalapana. The total average consumption of these systems is 1.2 million gallons per day (mgd).

The ʻŌlaʻa-Mountain View water system consists of eleven service areas and extends along the Volcano Road from the former Puna Sugar Company mill to the ʻŌlaʻa Reservation Lots and along the Keaʻau-Pāhoa Road to the vicinity of Kaloli Drive. Water for this system is supplied by three deep wells. The Pāhoa water system, located in the geographic center of the lower Puna region, extends from Keonepoko Homesteads down along portions of the Kapoho and Pohoiki Roads to Kapoho.

Most residents use individual water catchment systems.

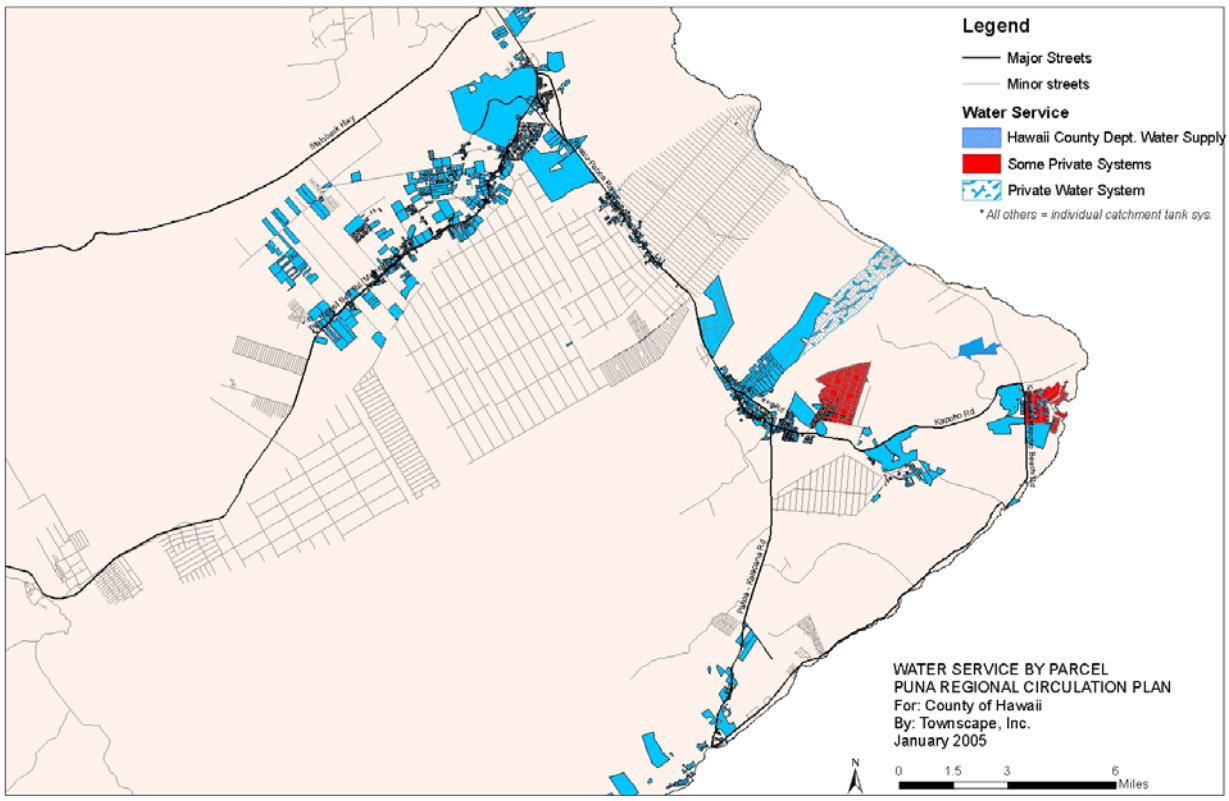
The Kapoho water system presently services farm lots in the vicinity. The Kalapana Water System extends from the Keauohana Forest Reserve along Highway 13 to the Kaimū Beach intersection. The Hawaiian Beaches subdivision located in Waiakahiula is served by a privately owned water system constructed by the developer. The system may not meet the minimum requirements for incorporation into the County system. The remaining areas still depend on individual residential roof catchment systems.

TABLE 4.4: GROWTH INDICATOR – WATER SERVICE

CENSUS AREA		WATER				
Census Tract	*Block Group*	*Parcels w/County*	*Parcels w/Private*	*Percent w/ County*	*Percent w/ Private*	*Score*
210.01	1	171	0	1.9	0.0	1.0
210.01	2	239	0	58.9	0.0	2.0
210.01	3	41	0	0.6	0.0	1.0
210.02	1	415	0	38.2	0.0	2.0
210.02	2	500	0	5.6	0.0	1.0
210.02	3	361	0	5.4	0.0	1.5
210.02	4	25	0	0.4	0.0	1.0
211	1	65	4090	1.4	87.1	2.0
211	2	342	4612	6.5	87.1	2.0
211	3	200	0	63.3	0.0	2.0
211	4	251	0	3.0	0.0	1.0

Source: Hawai'i County GIS Water Service Layer. Parcels with DWS water, not catchment. Hawai'i County, Puna Community Development Plan, 1994. Parcels with Private Water System, Subdivision Information.

FIGURE 4.4: WATER SERVICE



4.3.3. Road Condition

An extensive grid network of roads was constructed to form Puna subdivisions in the 1950's and 60's. The private roads are below present highway standards and are deficient in layout and construction. Road sections have inadequate drainage systems, sharp curves, and grades without adequate sight distance. There is also a historic network of private plantation roads throughout the District. These road deficiencies cause problems with safety and maintenance.

Gravel road In Fern Forest Subdivision.

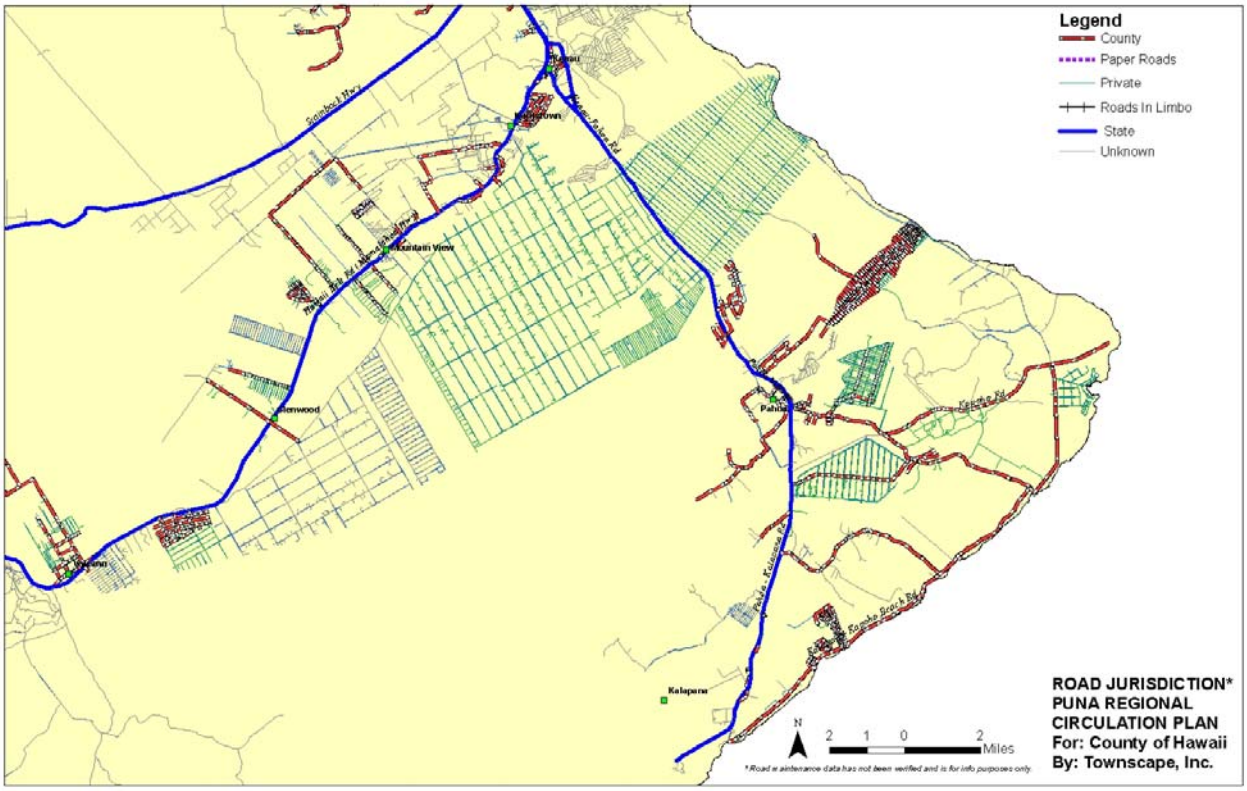
Subdivision associations collect annual road maintenance fees currently ranging from $60 to $150 per year. The maintenance fees are mandatory for some associations and voluntary for others. The majority of subdivisions have transferred ownership of roads to lot owner associations or road maintenance corporations. Each association manages private subdivision roads independently with varying levels of maintenance, improvements, and fees. As a result, there is a wide range of infrastructure conditions that affect housing and subdivision characteristics.

TABLE 4.5: GROWTH INDICATOR – ROAD CONDITION

CENSUS AREA		ROADS
Census Tract	*Block Group*	*Score*
210.01	1	1.5
210.01	2	2.0
210.01	3	1.5
210.02	1	1.5
210.02	2	1.0
210.02	3	1.5
210.02	4	1.5
211	1	1.5
211	2	1.0
211	3	2.0
211	4	1.0

Source: Average road condition based on fieldwork, community interviews, and jurisdiction.

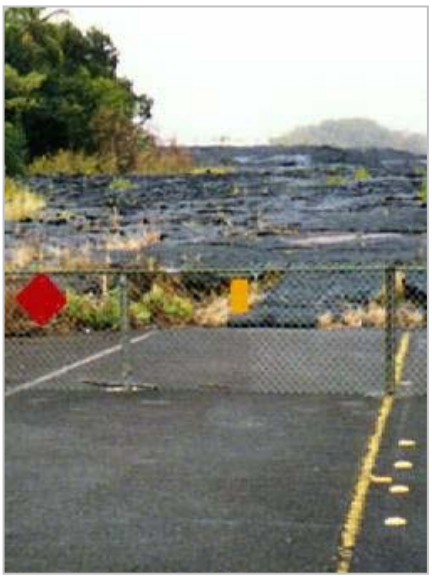
FIGURE 4.5: GROWTH INDICATOR – ROAD CONDITION



4.3.4. Lava Hazard

The U.S. Geological Survey (USGS) has completed an extensive mapping program to determine the history and severity of the volcanic hazards on the Island of Hawai'i. The Lava Flow Hazard Zone Map divides the island into nine Zones based on occurrence probability of flows. Lava flow hazard Zones 1, 2, 3, and 5 are located within the Puna region.

Lava flow risk areas are defined according to geology, seismic and volcanic activity history, and recent scientific predictions. Lava hazard Zone 1 includes the summits and rift zones of Kīlauea and Mauna Loa where vents have been repeatedly active in historic time. More than 25 percent of this area was covered by lava since 1800. Zone 2 includes areas adjacent to and down slope from Zone 1. Lava has covered 15 to 25 percent of Zone 2 since 1800, and 25 to 75 percent was covered with lava in the last 750 years. Zone 3 areas are gradually less hazardous than Zone 2 because of the greater distance from recently active vents or because topography makes it less likely that flows will cover these areas-1 to 5 percent covered since 1800; 15 to 75 percent covered in the last 750 years.



Lava flows covering roadways.

Property loss and economic devastation are the most frequent consequences. Based on the probability of lava flows in these Zones, there is concern for developing infrastructure in the region. The ranked zones also hamper residents' ability to acquire or maintain homeowners insurance. Insurance companies are hesitant to grant or renew homeowners insurance in Zones with high risks.

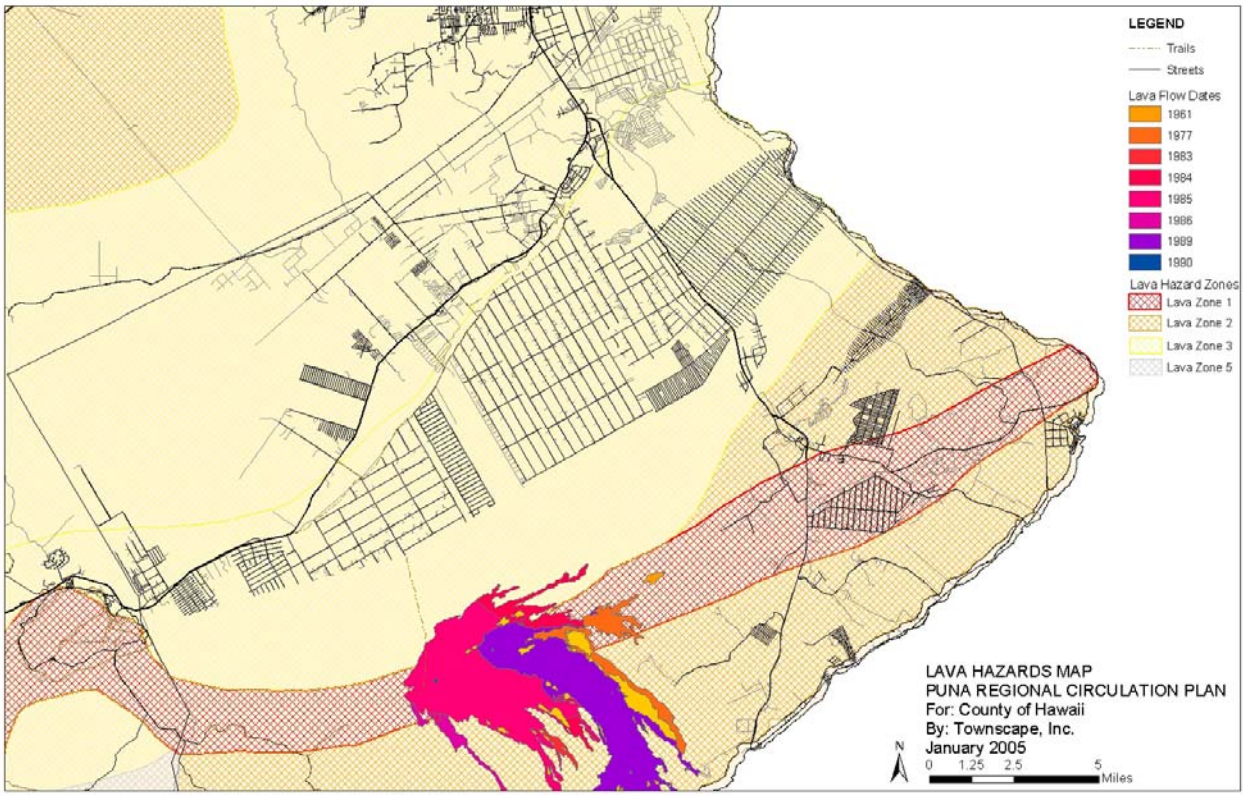
The volcanic activity of Kīlauea's east rift zone constitutes the greatest hazard for the Puna region. The USGS lava flow hazard map indicates the highest hazard ranking along the east rift zone. Lava flows have covered or made inaccessible the residential areas of Royal Gardens, Kalapana Gardens, Kapa'ahu, Kalapana, and Kaimū. Figure 4.6 indicates lava inundation risk zones for Puna.

TABLE 4.6: GROWTH INDICATOR – LAVA HAZARD ZONES

CENSUS AREA		*LAVA HAZARD ZONES*						
Census Tract	*Block Group*	*Lava Zones*	*Parcels in Zone 1*	*Percent in Zone 1*	*Score*	*Parcels in Zone 2*	*Percent in Zone 2*	*Score*
210.01	1	3	0	0.0	1.5	0.0	0.0	1.5
210.01	2	3	0	0.0	1.5	0.0	0.0	1.5
210.01	3	3	0	0.0	1.5	0.0	0.0	1.5
210.02	1	3	0	0.0	1.5	0.0	0.0	1.5
210.02	2	3	0	0.0	1.5	0.0	0.0	1.5
210.02	3	3	0	0.0	1.5	0.0	0.0	1.5
210.02	4	3	0	0.0	1.5	0.0	0.0	1.5
211	1	1, 2	111	2.4	1.5	4428	94.3	0.5
211	2	1, 2	851	16.1	1.0	4421	83.5	0.5
211	3	1, 2	3	0.9	1.5	315	99.7	0.5
211	4	1, 2, 3	2545	30.7	0.5	5015	60.4	1.0

Source: U.S. Geological Survey (USGS), Lava Flow Hazard Zone Map. Parcels within 50 feet of Lava Zone 1 or 2.

FIGURE 4.6: GROWTH INDICATOR - LAVA HAZARD



4.3.5. Flooding

The District is subject to heavy rainfall and has experienced severe flooding. Historically, flooding along the Volcano Highway and the Kea'au-Pāhoa Highway have been the most prominent problems of the District. The Flood Insurance Rate Map (FIRM) has identified the inland area as Zone X – outside of the 500-year floodplain. Low-lying areas along the coast have been designated as Zone AE – where base elevations have been determined, and Zone VE – where base elevations have been determined and high velocity wave action may cause coastal flooding.

Overall, there is very limited information regarding flooding in the Puna District. The Puna Community Development Plan (PCDP) process placed articles in the newspaper after two major rains and requested reports of major flooding areas. Several water diversions exist in the area including a 1/2-mile wall from South Kūlani Bridge to 2 road in Hawaiian Acres (built in 1938-52 by 'Ōla'a Sugar). This wall diverts drainage flows from Mauna Loa slopes. The community reported water flows traveling down diagonally from Upper Glenwood, crossing Highway 11 in 14 places between Mountain View and Glenwood. Flows then continue diagonally, crossing roads like South Kōpua in several places until reaching Kīlauea pāhoehoe. Finally, it gets to South Kūlani Bridge, the diversion wall which moves flows from the 'Ōlaa drainage system to the Waipāhoehoe system.

Flooding occurs in coastal areas.

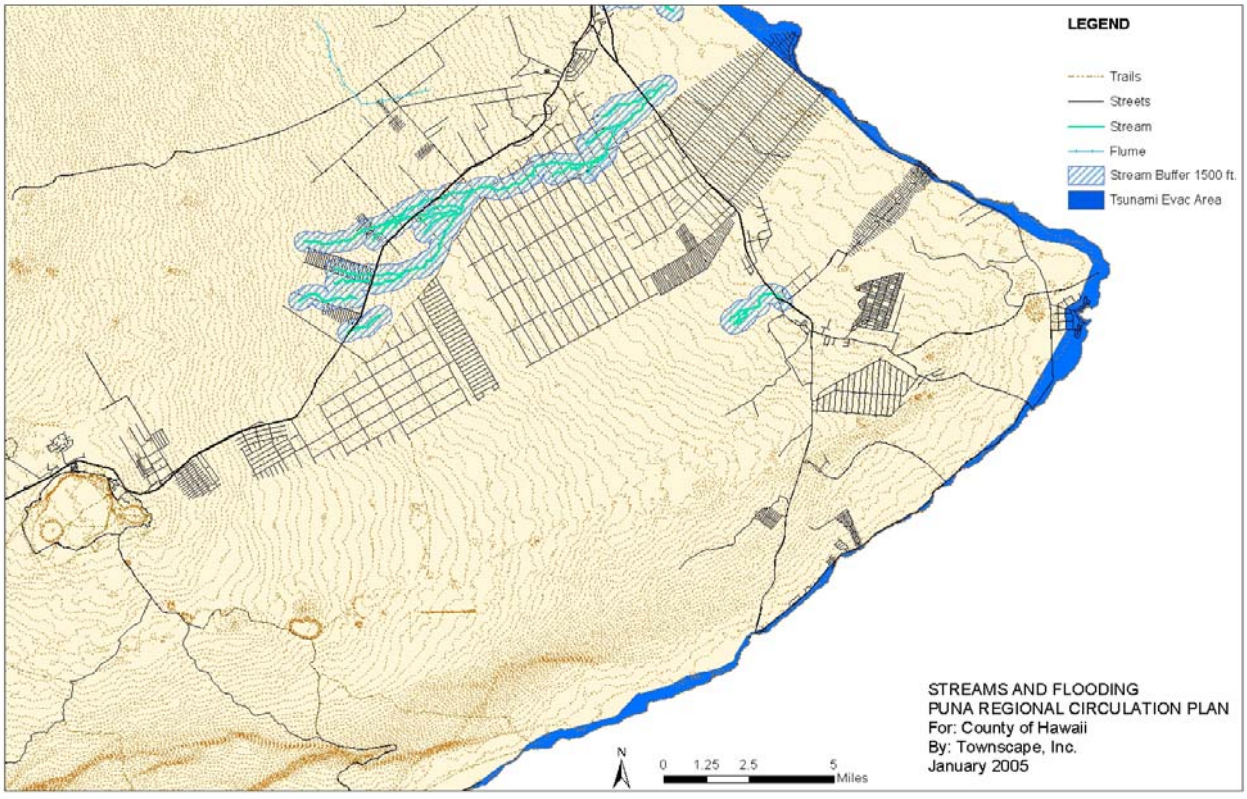
Currently, the lack of development and the extremely permeable soils have helped to minimize major flooding. However, as the amount of development increases within the District, flood problems are likely to increase. Highway improvements have helped alleviate some flooding on roadways. Along the Kea'au-Pāhoa Road, the State Department of Transportation (DOT) has installed culverts to facilitate the movement of water in certain sections.

TABLE 4.7: GROWTH INDICATOR FLOODING

CENSUS AREA		FLOODING		
Census Tract	*Block Group*	*Parcels in "Stream Area"**	*Percent in Designated "Zone"*	*Score*
210.01	1	19.0	0.2	1.5
210.01	2	6.0	1.5	1.5
210.01	3	37.0	0.5	1.5
210.02	1	10	0.9	1.5
210.02	2	952	10.7	1.5
210.02	3	2556	38.1	1.0
210.02	4	131	2.0	1.5
211	1	0	0.0	1.5
211	2	0	0.0	1.5
211	3	0	0.0	1.5
211	4	0	0.0	1.5

Source: USGS, Digital Line Graphs, 1983. Parcels within 1,500 feet of intermittent streams.

FIGURE 4.7: GROWTH INDICATOR - FLOODING



4.3.6. Past Demographic Trends

The population in the area has grown over the past 40 years. Beginning in the 1960's, the region began to see growth and has been increasing steadily since. Population counts provided by the United States Census show the population of the area has grown from 1970 to 2000.

TABLE 4.8: PUNA POPULATION

Tract	1980	1990	2000
210.01	n/a	6,844	11,776
210.02	n/a	7,235	10,962
211	n/a	6,702	8,597
Total	11,775	20,781	31,335

Source: U.S. Census, 2000.

The population growth trend in Puna over the last thirty years has resulted in the addition of approximately 10,000 people every decade. The growth was caused primarily by the availability of inexpensive residential parcels in Puna. The housing demand generated from employment opportunities in Hilo has also impacted growth. In the mid-1980's, housing costs increased in other regions of Hawai'i Island and statewide, resulting in subdivision infill. The closure of the Puna Sugar Company and significant road improvements also contributed to the evolution of Puna as a bedroom community for the urban center of Hilo.

The County of Hawai'i *General Plan* (2005) projects that Puna will generally maintain its rate of population increase for the next fifteen years. By 2020, Puna is expected to surpass South Hilo as the most populous district. The *General Plan* year 2020 population estimate ranges from 57,105 to 63,491.

TABLE 4.9: GROWTH INDICATOR – PAST GROWTH TRENDS

CENSUS AREA		POPULATION		
Census Tract	***Block Group***	***1990 to 2000 Growth***	***Percent Growth***	***Score***
210.01	1	352	96.1	2.0
210.01	2	13	15.8	1.0
210.01	3	136	59.9	2.0
210.02	1	6	5.4	1.0
210.02	2	200	70.9	2.0
210.02	3	130	63.0	2.0
210.02	4	38	31.8	1.5
211	1	101	35.4	1.5
211	2	32	21.6	1.0
211	3	-24	-33.5	1.0
211	4	76	44.5	1.5

Source: U.S. Census, 2000.

4.3.7. Proximity to Regional Center

The airport, harbor, State and County offices, and the University of Hawai'i are all located within the town of Hilo. The travel pattern, especially during peak-hour traffic, occurs between Puna and Hilo as residents commute for shopping, entertainment, medical care, school, and jobs. Changes in Puna land use and development could change this pattern. However, if past land use trends are extended, proximity to the regional center of Hilo will continue to be desirable. For this reason, Puna Census blocks were considered as indicators of future growth patterns. Generally, areas in closer proximity to Hilo have experienced more growth. Table 4.10 outlines and ranks block groups based on relative distances to Hilo.

TABLE 4.10: GROWTH INDICATOR - PROXIMITY TO REGIONAL CENTER

CENSUS AREA		PROXIMITY	
Census Tract	*Block Group*	*Miles to Regional Center*	*Score*
210.01	1	12-13	2.0
210.01	2	7-10	2.0
210.01	3	12-13	2.0
210.02	1	12-15	1.5
210.02	2	14-15	1.5
210.02	3	18-24	1.5
210.02	4	22-27	1.0
211	1	19-21	1.5
211	2	22-27	1.0
211	3	17-19	1.5
211	4	23-27	1.0

Source: USGS quad maps. Distances based on PRCP measurements.

4.4. Population Projection - Year 2030

Each growth indicator was considered in calculations. Indicators were selected based on development trends, opportunities and constraints, and available data sets. Development of more data on flooding and road condition would help to refine the population projections.

The indicators were not weighted and were considered on an equal basis. The eight indicator scores were averaged to calculate the growth rate for each Census block group. These numbers most accurately represent growth trends for each Census block group of Puna. Table 4.11 illustrates that the highest growth areas are located in Census block group 210.01-1 that includes the Hawaiian Paradise Park subdivision, and 210.02-2, that includes Hawaiian Acres. The projected 2030 population of Puna totals 80,162, which is over two times the current estimated population.

TABLE 4.11: AVERAGE POPULATION GROWTH

CENSUS AREA		PROJECTED GROWTH				
Census Tract	Block Group	1990-2000 Growth Pns./Year	Average Indicator Rate	Projected Growth Pns./Year	Projected 2004 Population	Projected 2030 Population
210.01	1	352	1.7	598	9,572	24,338
210.01	2	13	1.7	22	1,063	1,609
210.01	3	136	1.6	218	4,493	10,253
210.02	1	6	1.6	10	1,254	1,497
210.02	2	200	1.4	280	5,935	13,440
210.02	3	130	1.5	195	4,147	9,217
210.02	4	38	1.3	49	1,762	3,060
211	1	101	1.6	162	4,528	8,427
211	2	32	1.2	38	1,941	2,927
211	3	1	1.4	1	474	511
211	4	76	1.1	84	2,794	4,883
				TOTAL PUNA DISTRICT	37,845	80,162

TABLE 4.12: 2020 POPULATION PROJECTIONS COMPARISON

GENERAL PLAN			PRCP	
A	B	C	Census Trends	Growth Indicators
57,105	58,246	63,491	53,035	63,886

Several other growth projections were developed by the County of Hawai'i and State DBEDT. Table 4.12 lists various population projections for year 2020 including the three "series" of growth from the County's *General Plan*, PRCP growth calculated by Census trends 1990 to 2000, and PRCP growth calculated by indicators. Ultimately, the indicator-based population projection was slightly higher than that of the County's General Plan, Series C.

The State of Hawai'i, Department of Business Economic Development and Tourism (DBEDT) estimates the 2030 Hawai'i County population at 229,700 persons. Comparatively, the 2030 PRCP population projection for the Puna District represents 60.7 percent of this growth or 80,162 persons (Table 4.13).

The Puna District's growth from 1980 to 1990 was 32 percent of the growth for the entire Hawai'i Island. From 1990 to 2000, this percent increased to 37 percent. Considering these factors and the continuing growth trends, the PRCP projection is reasonable. Growth can expect to continue as other growth areas of Hawai'i Island, such as North Kona, reach capacities. Puna has over 55,000 subdivided lots with the potential to accommodate regional growth without rezoning. This means that growth can occur within existing County *General Plan* land use and zoning designations.

TABLE 4.13: HAWAI'I COUNTY AND PUNA GROWTH PROJECTION COMPARISON

Population	2000	Projected 2030	Net Growth 2000-2030	Percent of Growth 1980-1990	Percent of Growth 1990-2000	Percent of Growth 2000-2030
Hawai'i County	149,261*	229,700**	80,439**	100	100	100.0
Puna	31,335	*80,162***	48,827***	32	37	60.7

*Sources: *Table 1.5, County of Hawai'i, Research and Devlopment; **Table 1.24, State Data Book, Dept. of Business, Economic Development and Tourism (DBEDT); ***PRCP Growth Projections.*

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5. LAND USE SCENARIOS

Transportation and land use are interrelated. This means, in part, that land use affects the level of transportation service that is needed. Projected employment and population growth can translate to growth in traffic volumes in specific areas. The development of village centers, as opposed to suburban sprawl, can reduce automobile travel, decrease needs for highway construction, lower consumption of land for urban uses, preserve agricultural land and natural resources, and foster more livable and socially interactive neighborhoods. On the other hand, the location of transportation infrastructure can also impact land use development.

Transportation and land use elements need to be coordinated considering three relationships:

1) transportation as a service system to support activity patterns;
2) land use as a variable in transportation planning; and
3) transportation as a determinant of land use.

Given the relationship between transportation and land use, decisions about needed transportation facilities and programs should take into account the demands of the local population and the economy. Transportation planning should provide for a circulation system that reflects existing and proposed land use patterns – for example, to provide efficient access within a commercial core for pedestrians, bicyclists, transit, cars, and trucks while also encouraging quiet access in a residential neighborhood. Investments in the transportation system should also be consistent with growth and/or redevelopment areas targeted by the County *General Plan*.

This section identifies existing land uses and projected potential land use demands based on population projections. These calculations were conducted to year 2025. Significantly later in the planning process, the planning horizon was changed to year 2030.

5.1. Land Use: Existing and Projected

Puna lands are generally zoned as agricultural, residential, open (conservation), industrial, or commercial. Actual land uses include residential subdivisions, agricultural farms, an industrial park, and several small commercial service centers. Tables 5.1 and 5.2 identify Puna land use and zoning acreages.

TABLE 5.1: PUNA DISTRICT LAND USE ACREAGE: 2003

Agricultural	Conservation	Rural	Urban	Total
175,077	138,535	140	6,421	320,173

Source: County of Hawai'i Data Book, 2002, updated Nov. 2003.

TABLE 5.2: ZONING CLASSIFICATION, HAWAI'I COUNTY AND PUNA DISTRICT

Zoning Classification	Hawai'i County	Puna District
Total acres	2,577,805	320,173
Single-family residential	18,155	2,500
Multi-family residential	3,326	4
Resort	2,952	1
Commercial	2,015	80
Industrial	5,920	541
Agricultural	1,240,582	195,054
Open	345,165	5,080
Residential-agricultural	3,113	620
Unplanned (incl. Ag.)	-	-
No zone[6]	956,578	116,293

Source: County of Hawai'i Data Book, 2002.

5.1.1. Large Landowners

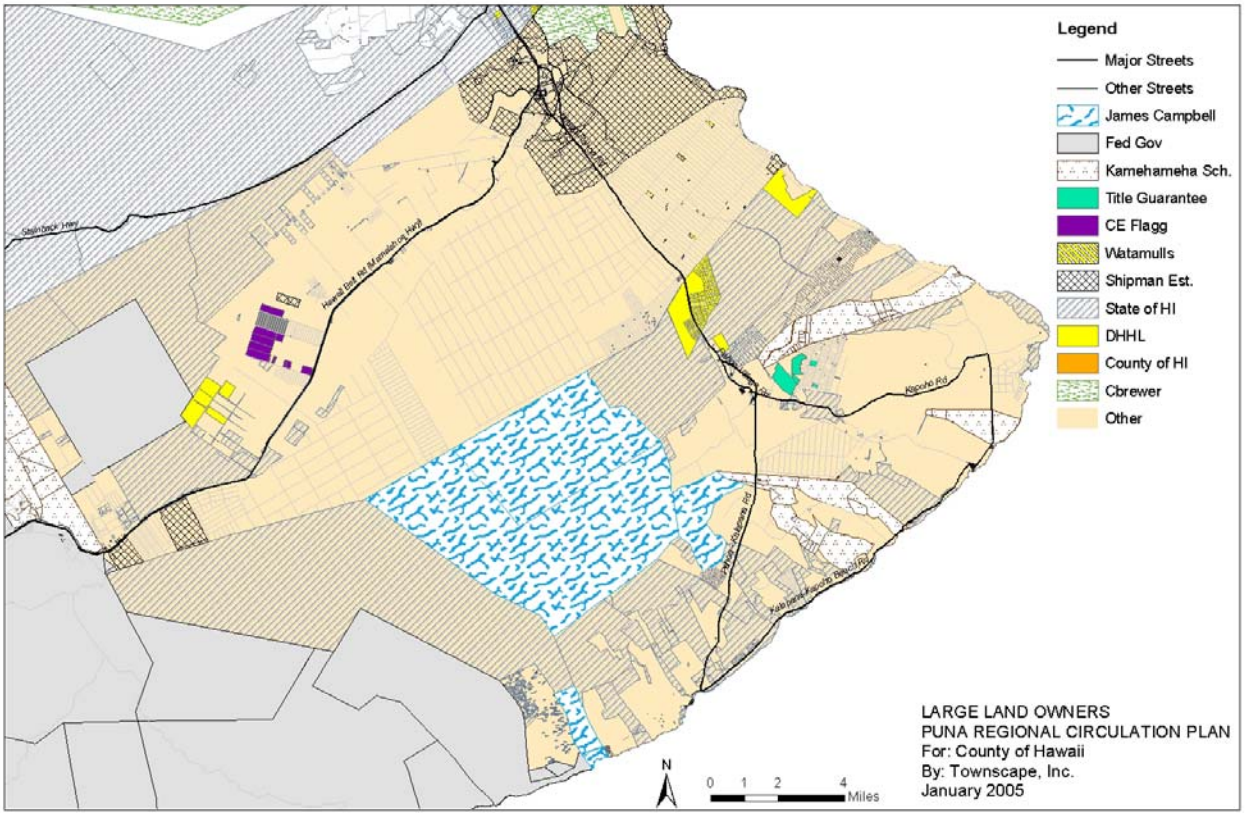
The State of Hawai'i owns the largest amount of land in the region, a total of over 200,000 acres. Other large landowners include the Federal government, James Campbell Estate, and W.H. Shipman, Limited. Table 5.3 lists Puna landowners that own over 3,000 acres in the region. The remaining acreage of the Puna District is subdivided into lots owned by private individuals.

TABLE 5.3: LARGE LANDOWNERS

Landowner	Parcel(s)	Acreage
State of Hawai'i	453	203,195
U.S. Government	12	36,353
James Campbell Estate	3	27,786
W.H. Shipman	42	11,784
Kamehameha Schools	70	8,768
County of Hawai'i	162	5,567
Kapoho Land & Dev.	51	4,327
Dept. Hawn. Home Lands	314	3,756
Henderson Timberlands	4	3,203

[6] *Forest Reserve, National Park, etc.*

FIGURE 5.1: LARGE LAND OWNERS



5.1.2. Agricultural

Of the 320,000 acres that constitute the Puna District, approximately 175,000 acres are designated agricultural under the State Land Use System. In addition, to implement the policies of the County General Plan, the County has zoned about 195,000 acres for agriculture (2002 County of Hawai'i Data Book updated November 2003). A significant portion of the agriculturally zoned land is improved with lots and houses. These developments question the true land use of subdivision areas. Are these lands truly agricultural or rural? Is active farming occurring on these lands?

Papaya fields in the Kapoho area.

The demand for a rural lifestyle is significant and has created development pressures on important agricultural lands. Agriculture remains an important component of the local economy, social character, and landscape of Puna. Agricultural lands serve as open space and buffers and offer local employment alternatives. Diversified agricultural enterprises have shown promise and employ significant numbers of residents.

5.1.3. Residential

Most of the Puna subdivisions were created prior to adoption of the County Zoning Code in 1967 and are zoned agricultural, and commonly, orchard lands. Of the 320,000 total acres that comprise the Puna District, 2,677 acres were zoned for single-family residential use. Those parcels are predominately located within substandard, nonconforming subdivisions. There are at least 47 subdivisions in the Puna District. Over 57,555 subdivided parcels now exist in the Puna District. According to Hawai'i County Real Property Assessments, approximately 11,690 lots are developed with 12,297 homes (February 2004).

Future residential units were calculated based on population projections and the average household size. Generally, the average household size ranges from 2.34 to 3.22 in the eleven Census block groups of Puna. Figures 5.3 and 5.4 were developed to illustrate the gross number of developed parcels based on existing and future populations. Based on these projections, between 26,000 and 28,000 homes could exist by 2030. These housing projections equate 40 percent of all available lots, based on existing land use and zoning regulations. Residential areas establish origins of transportation trips as people travel to school, work, and recreation areas.

TABLE 5.4: PUNA AVERAGE HOUSEHOLD SIZE

Tract 210.01			Tract 210.02				Tract 211				PUNA Average
BG 1	BG 2	BG 3	BG 1	BG 2	BG 3	BG 4	BG 1	BG 2	BG 3	BG 4	
2.9	3.22	3	2.97	2.72	2.66	2.34	3.06	2.75	2.82	2.38	2.80

Source: U.S. Census, 2000.

Nānāwale Estates subdivision in Puna Makai.

TABLE 5.5: PUNA SUBDIVISIONS

NAME	YEAR	NO. LOTS	LOT SIZE	ACRES
Ainaloa	1959	3,637	.2-.5 ac.	1,160
Aloha Estates	1961	1,846	.25-.3 ac.	593
Black Sand Beach	1962	918	7,750 sf	202
Eden Roc	1960	1,809	1 ac.	2,000
Fern Acres	1958	2,021	2 ac.	4,000
Fern Forest	1958	2,579	3 ac.	9,000
Glenwood	1962	152	.25-.3 ac.	53
Hawai'i Island Paradise	1960	449	.20 ac.	100
Hawaiian Acres	1958	3,944	1.8-6 ac.	12,141
Hawaiian Beaches, Parks and Shores	1961	3,522	.2-.5 ac.	1,416
Hawaiian Holidays Estates	1959	94	3.89 ac.	366
Hawaiian Orchid Isle	1958	205	3ac. + -	700
Hawaiian Paradise Park	1959	8,843	1 ac. +/-	9,469
Ho'onanea (?)	N/A	52	.20 ac.	12
Hilo Acres	N/A	48	N/A	N/A
Kalapana Sea View Estates	1971	693	<.25 ac.	166
Kaniahiku Village (?)	N/A	36	.5-3 ac.	28
Kaohe Homesteads (?)	N/A	96	3 ac.	1,325
Kapoho Beach Lots	1954	185	.25-1.2ac.	50
Kapoho Papaya Farms	N/A	40	3 + ac.	130
Kea'au Ag Lots	N/A	331	N/A	N/A
Kehena Beach	1964	199	.25-.3 ac.	52
Kōpua Farm Lots	N/A	115	N/A	N/A
Lanipuna Gardens	1973	118	1 ac.	130
Leilani Estates	1960	2,266	1 ac.	2,400
Maku'u Ag Lots	N/A	51	N/A	N/A
Maku'u Farm Lots	N/A	130	N/A	N/A
Mauna Lani Lots (?)	N/A	98	1 ac.	101
Maunaloa Estates	1960	893	20,000 sf	550
Nānāwale Estates	1960	4,289	.25-4ac.	1,134
Nānāwale Farm Ranch	N/A	86	N/A	N/A
'Ōhia Estates	1960	756	.25-.3 ac.	280
'Ōla'a Scenic Lands	N/A	442	N/A	N/A
Orchid Isle Estate	1961	845	.25-.3 ac.	292
Orchid Isle Estate 2	1961	83	N/A	N/A
Orchid Land	1958	2,491	.5,1-3 ac.	5,670
Pacific Paradise Development	1961	209	.20 ac.	49
Pacific Paradise Gardens	1973	423	.20 ac.	95
Pacific Paradise Mtn. View Manor	1971	606	.25-.3 ac.	145
Pāhoa Agriculture Park	N/A	63	N/A	N/A
Puna Beach Palisades	1973	72	20,000 sf	36
Royal Hawaiian	1959	1,640	.25-.5 ac.	630
Tangerine Acres	N/A	71	.5 acre	71
Tiki Gardens	1962	481	.2-.25 ac.	120
Vacationland Hawai'i	1963	489	.20-3.2ac.	557
Volcano Village	1968	1,064	N/A	N/A
Wa'a Wa'a	1958	177	.3-3.5 ac.	527

FIGURE 5.2: 2004 PARCELS WITH DWELLING UNITS

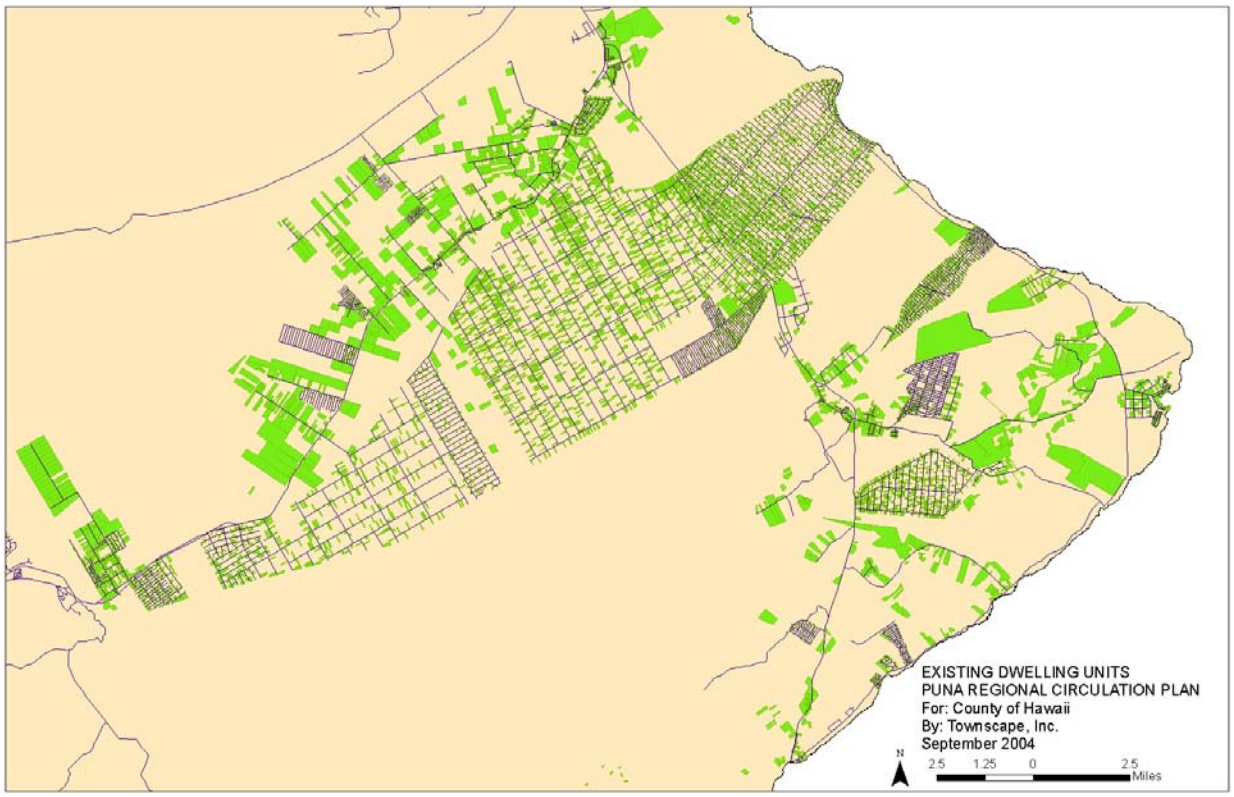
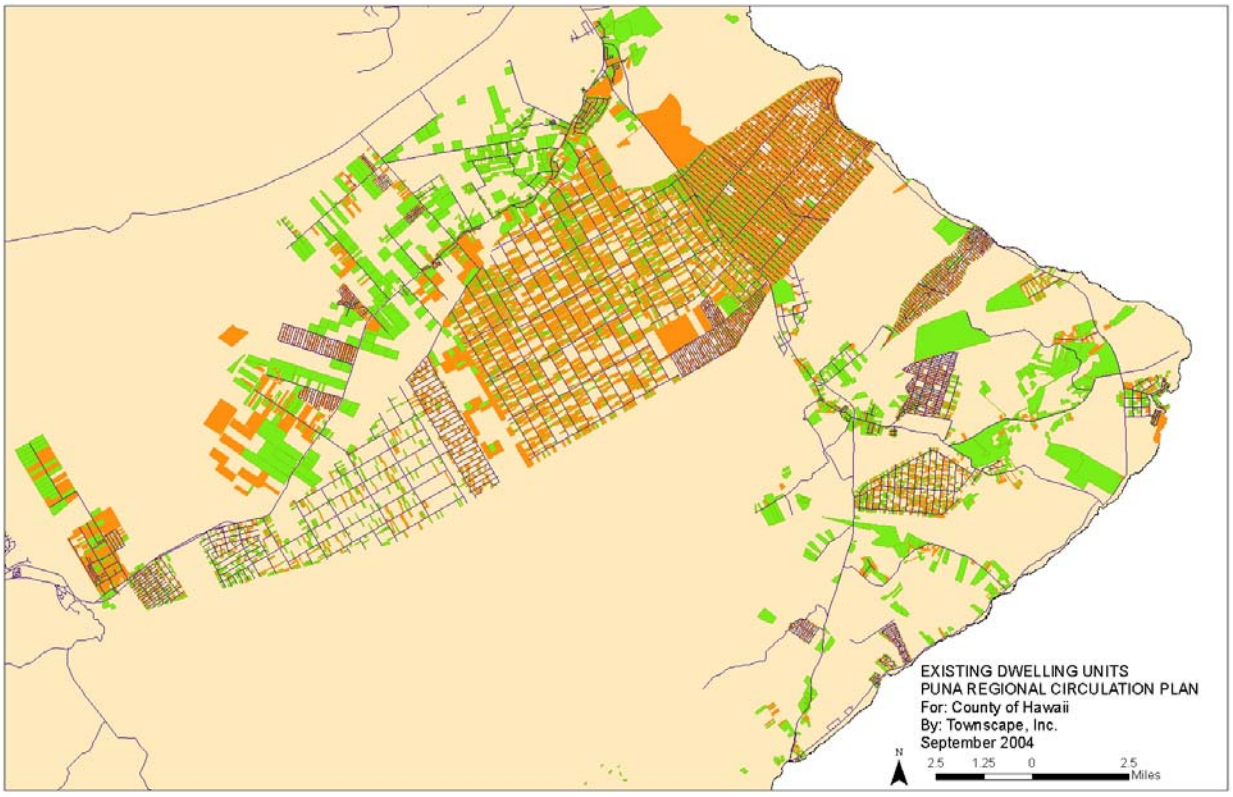


FIGURE 5.3: 2030 PARCELS WITH DWELLING UNITS



5.1.4. Commercial

Commercial centers for the District are located in Kea'au and Pāhoa. Small rural establishments are located in Kalapana, Orchidland Estates, Mountain View, Kurtistown, Glenwood, and Volcano. The commercial developments include shopping centers, grocery, retail, and public service establishments.

The plan estimates commercial acreage demand based on population. The calculation represents the total acreage that the projected population would require in local village centers, town centers, and/or regional areas such as Hilo. Both retail and office commercial demands were calculated using standards of building square feet per person. A building to land area ratio of 1 to 6 was used based on community input and rural values of the Puna District.

Kea'au Shopping Center.

Table 5.6 presents existing commercial acreage in each census tract of the Puna region, which totals 81.5 acres. The table also lists commercial acreage demands for the 2004 population (181 acres) and the projected 2025 projection (347 acres). The location of commercial centers ultimately helps determine the types and lengths of travel that occur in communities.

TABLE 5.6: TOTAL COMMERCIAL ACREAGE DEMAND

Year	Acres by Census Block Group			Total Acres
	210.01	210.02	211	
Existing	40	18.5	23	**81.5**
2004	72	62	46	**181**
2025	156	116	75	**347**

Standard: Retail - 30 s.f. of building per person; Office - 4.6 s.f. of building per person.

5.1.5. Industrial

W. H. Shipman, Limited rezoned about 32 acres in Kea'au from Agricultural to Industrial-Commercial Mixed Use designation. Project completion is anticipated in 2008 (County of Hawai'i *General Plan* 2005). Approximately 490 acres of industrial-zoned lands are in Puna. The 488-acre W.H. Shipman Industrial Park near the Puna-South Hilo District boundary is being developed as an industrial center for East Hawai'i. There are various agricultural industrial activities including the Mauna Loa Macadamia Nut Corporation's processing facility, flower packaging, and papaya processing and packaging within the District. Other industrial activities in the area include cinder and rock quarrying and certain cottage industries.

Shipman Industrial Park

Industrial acreage demands were calculated based on a standard of 300 square feet per person. Table 5.7 presents existing industrial acreage in each Census tract of the Puna region, which totals 165 acres. The table also lists demands for the 2004 population (261 acres) and the projected 2025 projection (501 acres). Industrial lands also can affect transportation trends as people travel for work and services.

TABLE 5.7: TOTAL INDUSTRIAL ACREAGE DEMAND*

Year	Census Block Groups			Total
	210.01	210.02	211	
Existing	27	138	0	**165**
2004	104	90	67	**261**
2025	225	167	108	**501**

**Standard: 300 s.f. land area per person.*

5.1.6. School Facilities

There are seven public schools and five public charter schools located in the Puna District. In the 2003 to 2004 school year, enrollment ranged from 38 at Kua o ka Lā Public Charter School (PCS) to over 1,000 students at Pāhoa Intermediate and High School. Schools are located in Kea'au, Pāhoa, Mountain View, and Volcano. There are three private schools in the region, the largest being Kamehameha Schools (KS). The school has generated significant traffic in the Kea'au area. Table 5.7 identifies Puna schools. The natural population growth and in-migration into the subdivisions in the area have increased demands on Puna education facilities. Overcrowding is experienced in some of the elementary schools.

State of Hawai'i Department of Education (DOE) multipliers were applied to population projections in order to calculate demands for future schools. The DOE has established multipliers that vary by elementary, middle, and high school.

According to these calculations, the Puna District will have a demand for a total of nine elementary schools, 3 middle schools, and 3 high schools. As a result, there could be a demand for many new schools; five elementary, two middle schools, and one high school. Figure 5.4 is a conceptual map of existing and future school facilities. Schools are a major catalyst of traffic congestion. The development and location of schools also have a major impact on transportation routes and trips.

Keonepoko Elementary School.

Bike and pedestrian trips to neighborhood schools could significantly ease congestion caused by school commute traffic to overly large schools. The goal and value of smaller, village-based schools are supported by many in the community and the Department of Education.

FIGURE 5.4: EXISTING AND PROJECTED SCHOOLS

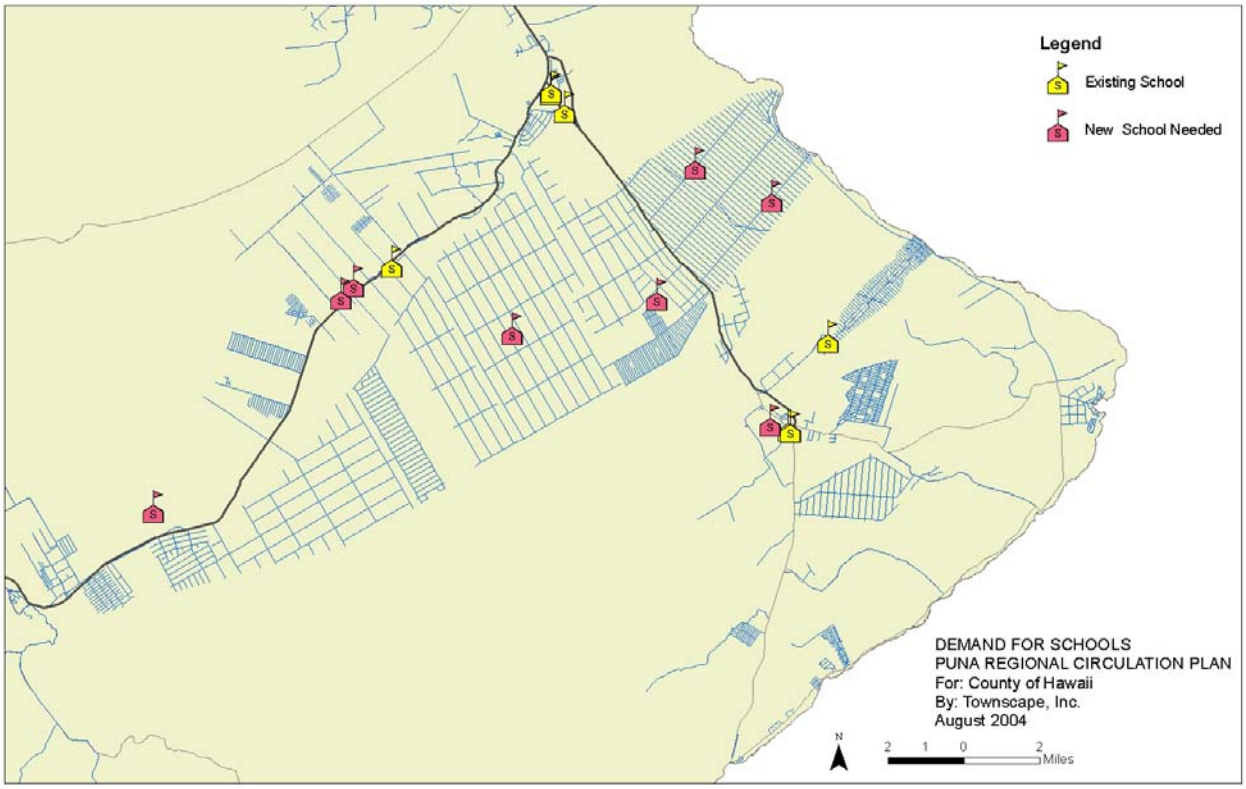


TABLE 5.8: PUNA SCHOOLS

	SCHOOLS	GRADES	ENROLLMENT
PUBLIC	Kea'au Elementary School	K-5	493
	Kea'au Middle School	6-8	650
	Kea'au High School	9-12	475
	Mountain View Elementary School	K-5	430
	Pāhoa High School and Intermediate School	7-12	1002
	Pāhoa Elementary	K-6	550
	Keonepoko Elementary	K-5	672
PUBLIC CHARTER	Kua o ka Lā	6-9	38
	Waters of Life	K-12	131
	Volcano School of Arts and Sciences	K-8	100
	Hawai'i Academy of Arts and Sciences	7-12	130
	Ke Kula Nawahi Okalaniopu'u Iki Lab (PCS)	K-6	69
PRIVATE	Kamehameha Schools	K-12	1,120
	Malamalama Waldorf School	K-8	N/A
	Christian Liberty School	PK-12	N/A

TABLE 5.9: 2030 SCHOOL FACILITY PROJECTIONS*

School Type	Design Size	Census Tract			Total
		210.01	210.02	211	
2030 TOTAL FACILITY DEMAND					
Elementary Schools	725	**4**	**3**	**2**	**9**
Middle Schools	1300	**1**	**1**	**1**	**3**
High Schools	1800	**1**	**1**	**1**	**3**
2030 NEW FACILITIES NEEDED					
Elementary Schools	725	**3**	**2**	**0**	**5**
Middle Schools	1300	**0**	**1**	**1**	**2**
High Schools	1800	**0**	**1**	**0**	**1**

**Standard: State DOE multiplier: Elementary – 0.279, Middle – 0.143, High – 0.154, per household.*

5.1.7. Parks

Several parks are located in the Puna District. Generally, parks in the Puna District are inadequate to serve the population needs (County of Hawai'i *General Plan* 2005). County community parks are located at Hawaiian Beaches subdivision, Mountain View, and Kurtistown, and the Pāhoa Neighborhood Center. School playgrounds are used at Kea'au, Mountain View, and Pāhoa.

Approximately 60,000 acres of the 229,176-acre Hawai'i Volcanoes National Park is located within the Puna District. The facilities of the park for passive and active recreation are readily accessible.

The County's 1.7-acre Isaac Hale Beach Park offers picnicking, camping, fishing, surfing, and swimming. The County has plans to expand the park and has purchased 22 acres of land near the existing park. Additional parking areas, playgrounds, boat parking area, picnic facilities, and restrooms will be developed. Nearby, Ahalanui Park features a warm spring (Mauna Kea Pond) and grassed area. The County's Glenwood Park is located along the Volcano Highway.

Lava Tree State Park.

Ahalanui Park.

MacKenzie State Recreation Area (13.1 acres) is an ocean and forest park located between Pohoiki and 'Opihikao at the edge of the Malama-ki Forest Reserve. The State's undeveloped Nānāwale Park site consists of 78.3 acres, along the Puna Coastal Road between Kapoho and the Hawaiian Shores Subdivision. The Lava Tree State Monument features lava trees and large volcanic earth cracks near the Kapoho-Pohoiki junction.

Although park lands are not traditionally a large generator of trips during peak-hour travel, this land use was nevertheless considered. Parks and recreation areas also determine travel routes during non-peak hours. Children are especially affected by the location and access of these facilities. Park acreage demand was calculated based on the County of Hawai'i standard of 5 acres per 1,000 people. The rural nature of the Puna District is problematic in developing and maintaining park lands. The need for more park land can be partly achieved by acquiring bike and pedestrian paths as "linear parks."

TABLE 5.10: TOTAL PARK ACREAGE DEMAND*

Year	Census Block Groups			Total**
	210.01	210.02	211	
Existing	1.1	25	21.4	**47.5**
2004	76	65	49	**190**
2030	181	136	84	**401**

**Standard: 5 acres per 1,000 population.*
***Does not include private or National Parks.*

5.2. Land Use Scenarios

Scenario planning provides a framework for developing a shared vision for the future by analyzing various forces (e.g., health, transportation, economic, environmental, land use, etc.) that affect growth.

The planning process depicted three scenarios of land use that could potentially develop in Puna's future. The objective was to evaluate transportation needs and devise projects in the context of different land uses.

"Scenario planning tests various future alternatives that meet state and community needs. Effective scenario planning will actively involve the public and elected officials on a broad scale, educating them about growth trends and tradeoffs, and incorporating their values and feedback into future plans."

Federal Highways Administration (FHWA).

Each land use scenario of the PRCP differs primarily in the distribution of commercial and industrial development. Based on population projections, land use demands were assigned to village centers, town centers, and/or the regional center in Hilo. Table 5.11 outlines the different types of land use centers. Village centers describe neighborhood-level development that services a population of 5,000 to10,000. Village centers typically occupy between one and ten acres and are often within walking distance. Comparatively, town centers serve between 25,000 and 50,000 people, and occupy 10 to 30 acres of land area. Finally, regional centers, serve a population between 100,000 and 150,000 and require longer routes of travel. Both Hilo and Kona are regional center locations that serve the entire island population at times.

TABLE 5.11: LAND USE CENTERS

Center Type	Pop. Served	Site (Ac.)
Village Center (VC)	5,000 -10,000	1-10
Town Center (TC)	25,000 - 50,000	10 - 30
Regional Center (Hilo)	100,000-150,000	10 - 60

TABLE 5.12: LAND USE SCENARIOS

Scenario	Distribution of Demand		
	Village	Town	Hilo
A – Existing Continued	5%	20%	75%
B - Town Centers	5%	55%	40%
C - Village Centers	50%	25%	25%

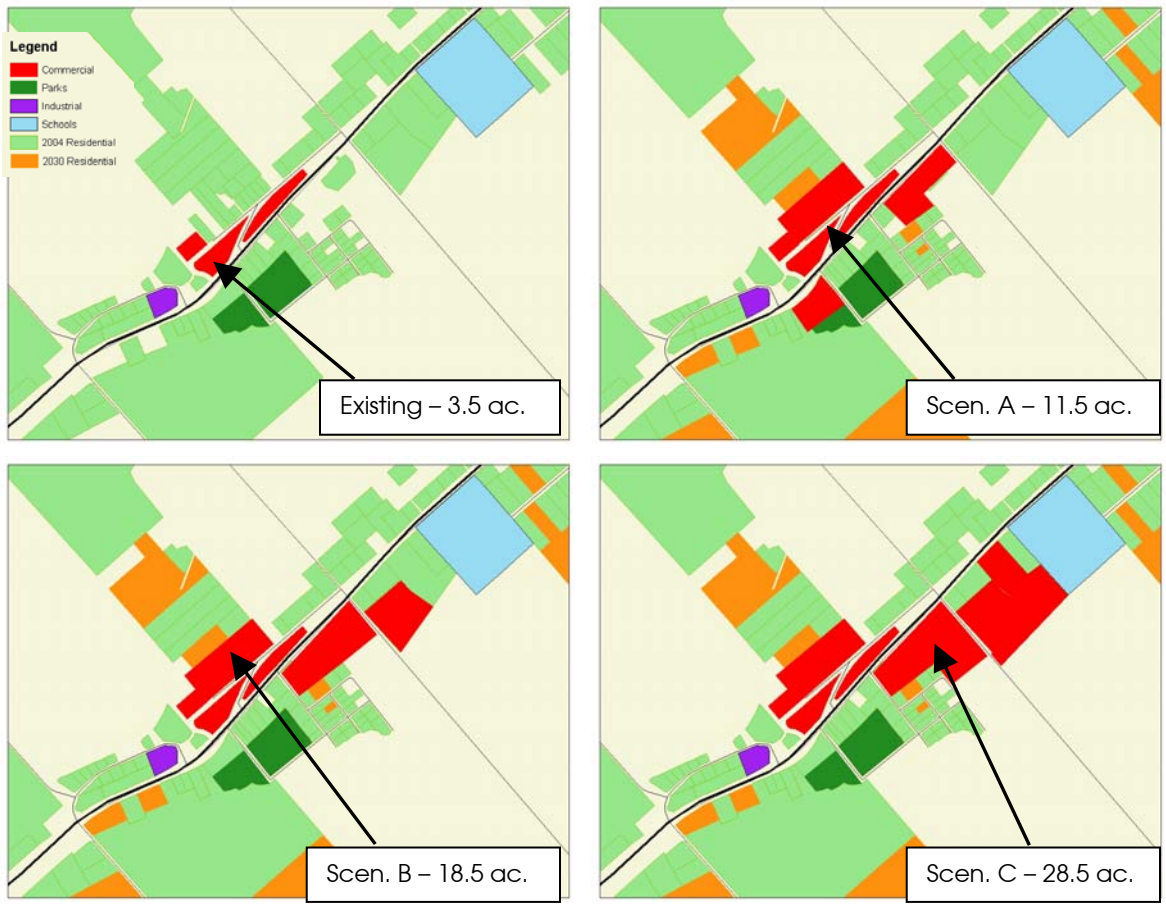
All of the acreage demands calculated in Section 5.1 were applied to varying land use scenarios. The locations of land use acreages have a direct impact on travel patterns and volumes. Each land use scenario places emphasis on a different "location." For example, Table 5.12 depicts Scenario A with an emphasis on a regional center. Therefore, at least 75 percent of land use demands are fulfilled in the regional center of Hilo. Approximately 20 percent of demand is located in commercial service centers at Kea'au and Pāhoa. Finally, eight small village locations at Kalapana, Nānāwale, Orchidland, Hawaiian Paradise Park, Kurtistown, Mountain View, Glenwood, and Volcano provide services for only 5 percent of demands. As a result, travel patterns continue to and from Hilo for employment, school, services, and recreation.

Scenario B depicts more demand fulfilled in existing and expanded town centers. At least 55 percent of land acreage is provided in eight town centers at Kea'au, Orchidland, Kurtistown, Mountain View, Volcano, Pāhoa, Hawaiian Beaches/Shores/Parks, and Nānāwale. The Hilo region still fulfills 40 percent of demands. Eleven small village centers through the region provide for 5 percent of demands. This scenario focuses on shifting travel patterns to town centers within the Puna region.

Finally, the Village Centers Scenario C places an emphasis on small neighborhood-level areas. As much as 50 percent of demand is fulfilled through the development of 18 village centers. Three town centers and the Hilo region center each provide 25 percent of population demands. Comparatively, this scenario should create more opportunities for shorter neighborhood-level trips that can be accommodated by walking and biking.

Figure 5.5 illustrates commercial development as it varies by land use scenario for the Mountain View area. Each land use scenario impacts travel patterns and trip characteristics differently. While Scenario A generally extends the need for commuting to Hilo, Scenario C results in more local non-highway trips.

FIGURE 5.5: MOUNTAIN VIEW COMMERICAL ACREAGE BY SCENARIO



5.3. Employment and Jobs

Based on the U.S. Census, the male workforce of the District is primarily employed in agriculture and construction. The largest occupation for women is the educational, health, and social services profession. Retail trade, arts, entertainment, recreation, and accommodation and food services are important employment sectors for both men and women.

This study also calculated future jobs as a measurement of future travel demands. The jobs in year 2030 were developed based on population projections and land use scenarios. The main question is: how many jobs can the Puna District create and support? Analysis of land use illustrated that regardless of the land use scenario considered, the job base would support a maximum of 35 percent of the labor force. The absence of a major job center requires that as many as 65 percent of workers would have to leave the Puna District for employment.

More jobs need to be created within Puna.

These calculations could be refined with data on the number of Puna residents employed in home-based businesses. An increase in farming and agricultural use of lands could also affect jobs. How many of the Hilo jobs that are filled by Puna residents can be re-created in the District? Finally, this analysis finds that only job creation on the scale of a "second city" would adequately provide jobs for Puna residents and therefore significantly reduce the need for travel to Hilo.

TABLE 5.14: JOB PROJECTIONS BY LAND USE SCENARIO

CENSUS TRACT	Scenarios		
	A Existing Continues	B Town Centers	C Village Centers
210.01	2,127	3,844	4,396
210.02	1,667	2,837	3,297
211	1,027	1,666	1,584
TOTAL	**4,821**	**8,347**	**9,278**

Includes Commercial retail/office, Industrial, and Schools.

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6. EXISTING TRANSPORTATION SYSTEM

6.1. Infrastructure

6.1.1. Road Network

Primary routes within the Puna District are the Volcano Road (Highway 11), which provides access to Hilo and serves the upper Puna region; the Puna Road (Highway 130), serving lower Puna from Keaʻau to Kalapana-Kaimū; the Kapoho Road (Highway 132), from Pāhoa to Kapoho; and the Puna Coast Road (Highway 137), linking Kapoho and Kalapana-Kaimū. The two primary routes, Highway 130 and Highway 11, are congested by Hilo-bound commuters during the week. The Keaʻau By-Pass Highway routes traffic around the town of Keaʻau.

Private roadways, owned by area residents, are maintained by community association road maintenance corporations. Subdivision associations collect annual road maintenance fees currently ranging from $60 to $150 per year. Some associations have mandatory fees while others are voluntary. Most residents in the area rely on private vehicles and car pools to reach their destinations.

6.1.2. Transit

The Hele-On Bus is administered by the Hawaiʻi Mass Transit Agency. Most residents rely on private vehicle and about 24 percent of the workforce carpools. The Hele-on Bus serves Puna makai with a Pāhoa-Hilo route that includes five round trips a day. The Hele-On also has a Volcano-Hilo route operating once a day. Fares range from $0.75 to $2.25.

6.1.3. Bikeways

There is an existing signed bikeway along the Keaʻau Bypass. A popular unimproved bike route is the "Puna Triangle." This triangular route starts and ends in Pāhoa and travels along area highways and roads. The State of Hawaiʻi completed *Bike Plan Hawaiʻi* in 2003. The plan recommends many bikeways in the Puna District. The development of a bike path along Railroad Avenue, from its existing terminus in Panaewa to Kapoho, is a priority project that is supported by the County Council (Resolution No. 206-2K). The first phase of the project is under private ownership (W.H. Shipman). Shipman and the ʻŌlaʻa Historical Society also have plans for a network of bike paths throughout Keaʻau.

6.1.4. Trails

There are also many hiking trails in the Puna District. These trails include the Puna Coast Trail to Paki Bay, Haena Trail and Old Puna Road Trail. A section of the Ala Kahakai National Historic Trail is located along the coast in Puna. Due to the magnitude and sensitivity of the cultural and natural resources that exist along the trail, the trail is not open to the public as a National Historic Trail pending the completion of the Comprehensive Management Plan.

Since at least the 19th century, the Old Volcano Trail from Hilo to the current Hawai'i Volcanoes National Park afforded travelers a means to visit Kīlauea (volcano) and points beyond[7]. This trail was originally abandoned after completion of the 1894 "Carriage" Road, which is now Highway 11. The original route from Hilo town to the Kīlauea summit was about 30 miles, leaving Hilo via Kīlauea Avenue, toward Kea'au town, then along the fringes of the 'Ola'a forest and on to the summit. From Hilo, the trail rises 4,000 feet above sea level to the summit. For more detail on restoration of the trail, see Section 9.6.

[7] *Kapono, Eric M. and YWCA. Old Volcano Trail: Historical Background. January 2004.*

6.2. Traffic Accidents and Safety

The Puna district noticeably has the highest five-year total motor vehicle fatality rate of all Hawai'i County districts. According to *North Hawai'i Motor Vehicle Fatality Research Project,* a district by district comparison of total rates indicated the difference was statistically significant. The difference between Puna and South Hilo was 161 versus 91. While Puna is less densely populated than Hilo, the 2000 U.S. Census results indicate that Puna is one of the fastest growing districts on Hawai'i Island. According to the Motor Vehicle Fatality Research Project, a number of risk factors are associated with increased fatality rates in rural areas such as Puna. They include:

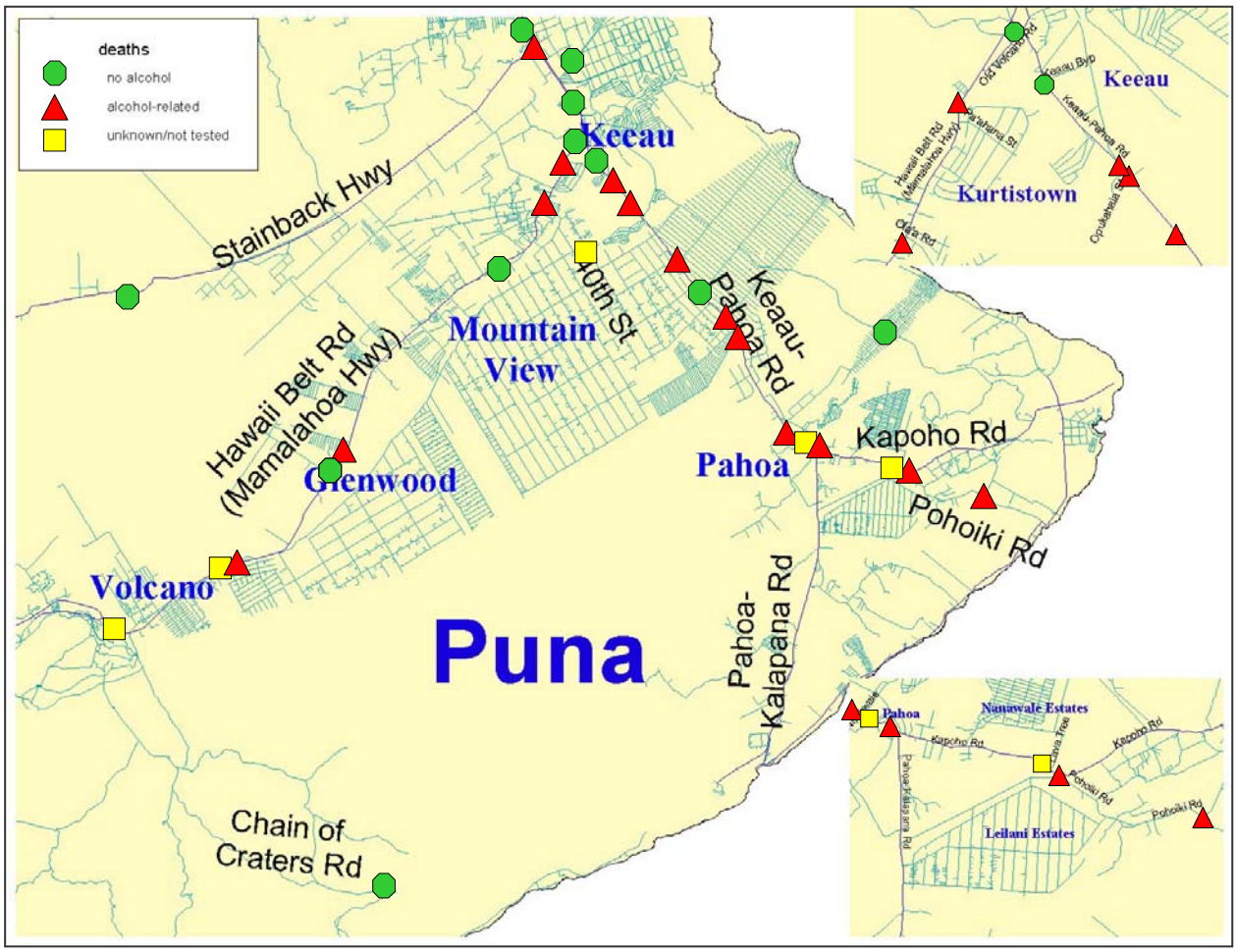
- Two-lane highways
- Narrow or non-existent shoulders
- Limited sight distance due to hills and curves
- Higher posted speed limits
- Lower rates of seat belt and child safety seat use
- Delays in discovery and extended EMS response times
- Lack of medical emergency and trauma care facilities
- Excess commuting distances, especially by workers holding down two or more jobs
- More frequent alcohol and/or drug use and higher levels of intoxication
- Higher proportion of young male and elderly drivers, known high risk groups
- More frequent and more severe crashes on gravel roads or off-road

TABLE 6.1: MAJOR TRAFFIC ACCIDENTS IN PUNA, YEAR 1990 & 2000

Roadway	Number of Major Traffic Accidents								Number of Persons Killed		Number of Persons injured	
	Fatal		Injury Only		Property Damage Only		Total					
	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000	1990	2000
Kahakai Blvd.	1	0	7	12	8	7	16	19	1	0	11	14
Pohoiki Rd.	0	0	5	4	2	1	7	5	0	0	10	12
Hwy. 11	5	3	79	42	81	44	165	89	5	3	165	89
Hwy. 130	2	1	114	53	98	36	214	90	2	1	197	95
Hwy. 132	1	0	17	13	12	4	30	17	1	0	30	23
Hwy. 137	0	0	2	3	5	0	7	3	0	0	5	6
Total	9	4	224	127	206	92	439	223	9	4	418	239

Source: Hawai'i County Police Department.

FIGURE 6.2: MOTOR VEHICLE ACCIDENTS & ALCOHOL



Source: Andrew G. Ten Have, M.D., M.P.H., North Hawai'i Motor Vehicle Fatality Research Project. October 2002.

The *North Hawai'i Motor Vehicle Fatality Research Project* identified several key ways to increase traffic safety and prevent motor vehicle accidents.

1. Provide public transportation.

   Many traffic-related fatalities in rural areas are due to increased exposure (more vehicle miles traveled per person). Increasing the availability of convenient forms of public transportation on the island, such as mini-buses and vans would help address this risk.

2. Increase safety awareness.

   Increased awareness of traffic safety by beginning a regular public campaign could help prevent accidents. Crash and injury prevention relies several agencies including county and state health and transportation departments, law enforcement, communities, media,

schools, employers, and healthcare providers. Raising the level of awareness within these organizations that motor vehicle injury is the 4th most deadly disease on Hawai'i Island is a prerequisite to crash and injury prevention.

3. Use data to help allocate road maintenance and improvement resources.
An evidence-based or data driven process, such as the Haddon matrix approach, could be used by the County and DOT to make implementation decisions. The data would help government allocate and prioritize resources for road maintenance and transportation improvement projects.

4. Implement drunk driving prevention programs.
There are a number of innovative approaches to the problem of driving while intoxicated. Other states have implemented solutions including the "scarlet letter" marking of license plates of convicted driving under the influence offenders, lowering of legal blood alcohol limits, mock drunk driving crash drills, mass communication and advertising, designated driver programs, and vehicle confiscation.

Traffic safety improvement can focus on three areas vehicles and equipment, roads or human factors. There are also three periods of opportunity for intervention: pre-crash, crash and post-crash. The Haddon matrix cross-tabulates the three focus areas by the three time periods. This results nine possible options for addressing roadway safety. Table 6.2 is an example of this matrix.

TABLE 6.2: "HADDON MATRIX" OF ROAD SAFETY ELEMENTS

Haddon Matrix[8]: Basic road safety elements		**FACTORS**		
		Human Factors	**Vehicle**	**Road & Environment**
PHASES	**Pre-crash (crash prevention)**	Alcohol and drug intoxication; Public transport.	Roadworthiness (brakes, lights, etc)	Road design (divided highways)
	Crash (injury prevention)	Seatbelt and helmet use.	Crashworthiness (airbags, frame)	Protection (barriers, crosswalks)
	Post-crash (saving lives)	Vulnerability to hemorrhage; first-aid skill	Ease of emergency access; fire risk.	Emergency response system

[8] *Haddon WH Jr., Suchman EA, Klein D. Accident Research: Methods and Approaches. New York: Harper & Row. 1964.*

Circulation plans and engineering designs can help address the "Road and Environment" section of the Haddon matrix. Traffic safety improvements are achieved with new engineering designs and standards. Moreover, transportation amenities such as traffic calming and landscaping are proven to improve driving conditions and safety of pedestrians and bicyclists. Buffers and separation of cars and bicyclists and pedestrian can also be helpful. Community residents also note speeding as a major safety issue. The "Human Factor" of the matrix can also be addressed with increased enforcement of traffic speeds and education. Programming of police manpower and educational programs is an integral part of a healthy and holistic transportation system.

6.3. Existing Transportation Projects

The island is faced with an increasing demand for the development of new transportation facilities and systems. While many major transportation projects have been completed others are currently in the planning stage. Projects include expansion or improvement of existing facilities. A sizable portion of the new construction either planned or underway is an incremental part of a long-range program. Table 6.3 summarizes some of the existing projects in the Puna region. There are several active planning, design, and construction projects in the Puna District which are being implemented by various agencies.

6.3.1. State of Hawai'i

The State of Hawai'i, Department of Transportation (DOT) is working on intersection improvements on Highway 11 at Kūlani Road, Huina Road, and Kipamana Road. These projects should help improve site distances and assist the overall safety and efficiency of the intersections. DOT has also committed to conducting an in-house study of intersection along Hwy. 130. This study will help determine which intersections warrant improvements such as signalization, restriping, left-turn pockets, or acceleration lanes.

The State DOT is also in the process of designing the "formal" conversion of a third lane along Highway 130 from Shower Drive to the Kea'au Bypass. The shoulder is now used at peak hour periods to accommodate traffic congestion. This widening will regrade and convert the shoulder for regular use. The project also includes intersection improvements at Paradise Drive and Kaloli Drive.

Over $1.75 million was allocated to study widening of Highway 130. An Environmental Impact Assessment will be conducted as a part of this project. The outcome of this project has the potential to significantly affect travel patterns for Puna makai residents.

6.3.2. County of Hawai'i

There are also several County of Hawai'i projects that affect transportation in the Puna District. The Mass Transit Agency (MTA) completed a Rural Paratransit Study that is explained in more detail in Section 7.0. In January of 2005, MTA also began implementation of a Kokua Zone, with fare-free transit between Pahoa and Hilo. Ridership has already significantly increased since the implementation of the program. Ridership has increased by over 120 percent. In February of 2005, ridership was 2,899 compared to that of 1,263 in February of 2004.

The County has received a total of $188,084 for environmental studies and preliminary engineering of a Puna Makai Alternative Route (PMAR). This funding[9] is from the Federal Highways Administration (FHWA).

A recent County bond also provided $7 million for improvements to existing county roadways in the Puna District. The County has worked with the communities of Ainaloa and Hawaiian Acres to create emergency access through the Puna Emergency Access Road (PEAR) project. Of the $7 million it is expected that $2-3 million will be used to fund improvements to existing roadways of the PEAR. The County has secured ownership of the Ainaloa roadway section and an easement through Hawaiian Acres section[10]. For more information on connectivity issues, see Section 10. The Department of Public Works (DPW) continues to work with subdivision associations to address access, "roads in limbo," and paper roads.

Transportation projects 12-19 in Table 6.2 are concepts that were identified in the County of Hawai'i *General Plan* and the Hawai'i Long Range Transportation Plan. The PRCP considered these concepts in identifying projects.

[9] Project No. TCSP-0100 (70), FHWA Transportation, Community, and System Preservation (TCSP).
[10] Office of Assistant Registrar, Land Court. State Bureau of Conveyances, Doc No. 3330861, September 23, 2005.

6.4. Transportation Related Plans

6.4.1. Transportation Equity Act for the 21st Century

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) was enacted August 10, 2005, as Public Law 109-59. The Act authorizes the Federal surface transportation programs for highways, highway safety, and transit for the 5-year period 2005-2009. Although SAFETEA-LU has been passed and a certain amount of funds have been identified for the State of Hawai'i it is still uncertain as to the nature of the funds and how they can be appropriated. The estimates provided here are based the assumption that funding of the State of Hawai'i will continue without major change.

The SAFETEA-LU, which follows the Transportation Equity Act for the 21st Century (TEA-21) and the Intermodal Surface Transportation Efficiency Act (ISTEA), allows (but does not require) cities, counties, and states receiving federal transportation dollars to rethink their choices about spending transportation money. The Act encourages comprehensive transportation planning in ways that enhance use of multi-modal options, integrate transportation services with land use patterns, and involve a wide array of stakeholders. The act also endorses better use of existing highways through car pools and HOV lanes, bus and rail transit, walking and biking, and other non-car travel options.

6.4.2. Hawai'i Long-Range Land Transportation Plan (HLRLTP) 1998

The Hawai'i Long Range Land Transportation Plan is a cooperative planning effort by the State Department of Transportation and the County of Hawai'i. The plan identifies the major transportation improvements needed to support growth of Hawai'i Island until 2020. This plan is also used in developing a statewide transportation plan that fulfills requirements of the SAFETEA-LU. Although the State DOT has not indicated when they will begin revisions to the HLRLTP, projects in the current plan were considered in the formulation of this plan.

6.4.3. County of Hawai'i Draft Revised General Plan (2005)

The *General Plan* is a policy document for the long-range comprehensive development of the island of Hawai'i. The *General Plan* serves as the legal basis for all zoning, subdivision and related ordinances. It also provides authority for the implementation of all public improvements and projects. The *General Plan* articulates goals, policies, and standards to address the demand for new transportation facilities. Specific policies and actions that relate to the Puna Regional Circulation Plan include:

- Develop a comprehensive, island-wide multi-modal transportation plan that identifies the location and operation of automobile, mass transit, bicycle and pedestrian systems, in coordination with appropriate Federal and State agencies.
- Explore the possibility of developing a mid-level roadway to be located makai of Highway 130, beginning at Hawaiian Beach Subdivision and extending through Hawaiian Paradise Park Subdivision with its eventual connection to Railroad Avenue in South Hilo. Consider establishing a bikeway along the same alignment.

The *General Plan* (2005) also includes Facilities Maps for each of the nine districts of Hawai'i County. There is no further information provided about the status or regulatory implication of the maps. The transportation facility maps illustrate future collector and arterial roads island wide. The maps provide only conceptual locations of roadways and do not consider topography, TMK parcel lines, and other environmental data. Moreover, the transportation maps do not address multi-modal transportation for bikeways, pedestrian paths, or transit.

6.4.4. Puna Community Development Plan (1995)

This community development plan outlines the landscape envisioned for the future of Puna. The plan identifies concerns, courses of action, implementation and financing on various land use, economic, transportation, and policy issues. The plan specifically identifies transportation needs including congestion relief, transit-ready development; use of old railroads for bike and pedestrian paths, preservation of scenic roads, and mitigation for substandard private subdivision roads. Proposed actions for transportation include development of a Puna Roadway Master Plan, widening of Highway 130, and development of transportation routes via a makai mid-level parkway through Hawaiian Paradise Park and a mauka central subdivision corridor through Hawaiian Acres. The 1995 plan was never fully adopted by the County Council. The County Planning Department is beginning a new CDP process in 2006.

6.4.5. State Transportation Improvement Program/Capital Improvement Projects

The Hawai'i Statewide Transportation Improvement Program (STIP) provides a multi-year listing of State and County transportation projects and identifies those projects programmed for federal funding. It is a multi-modal transportation improvement program that is developed utilizing existing transportation plans and policies, and current highway, transit and transportation programming processes. Table 6.2 includes some projects that were listed on the STIP for 2004-2006.

TABLE 6.2: PREVIOUSLY PLANNED TRANSPORTATION PROJECTS

ID No.	Project Name	Project No.	Jurisdiction	Class	Description	Improvement	Source	Status
1	**STIP** CRATER RIM ROAD IMPROVEMENTS	HS3	NPS	COLLECTOR	CRATER RIM DR./KILAUEA VIS. CTR/JAGGAR MUS.	IMPROVEMENTS	STIP 04-06 AM	
2	KEEAU PAHOA ROAD (130) SHOULDER LANE CONVERSION	HS12	State of Hawaii	ARTERIAL	BYPASS ROAD - SHOWER DRIVE	WIDEN	STIP 04-06 AM	State consultant Wilson Okamoto is currently in the design stage of the project.
3	VOLCANO RD. (11)	HS20	State of Hawaii	ARTERIAL	AT KULANI RD.	INTERSECTION IMP	STIP 04-06 AM	DOT is in the process of getting a consultant. POC: State DOT Jeffrey Fujimoto
4	VOLCANO RD.(11)	HS21	State of Hawaii	ARTERIAL	KEEAU TO PAAHANA ST	WIDEN	STIP 04-06 AM	Pending
5	VOLCANO RD. (11)	HS27	State of Hawaii	ARTERIAL	AT KIPIMANA DRIVE	INTERSECTION IMP	STIP 04-06 AM	
6	HUINA RD.		State of Hawaii	ARTERIAL	VOLCANO RD. AT HUINA	INTERSECTION IMP	PRIVATE	Isemoto Contracting handling construction. Project managed by State DOT Highways Div.
7	OLD KEEAU-PAHOA RD. (131)		State of Hawaii	COLLECTOR	OLD KEEAU-PAHOA RD.	REPAVE, SIDEWALKS, SIGNAL	HWY. BUDGET	State upgrading road section so it can be dedicated to County of Hawaii.
8	STUDY EXPANSION OF KEEAU-PAHOA HWY. (130) & ALT ROUTE		State of Hawaii	ARTERIAL	KEEAU-PAHOA HWY.	PLAN & EIS-WIDENING	STATE	DOT in process of contracting consultant POC: State DOT Planning, Nelson Sagum
	COUNTY OF HAWAII							
9	RURAL PARA-TRANSIT STUDY		County of Hawaii	N/A	PUNA DISTRICT	PLAN	COUNTY	Plan in process.
10	PEAR		County of Hawaii	EMERGENCY	VOLCANO HWY - RD 8 - RD F - RD 9 - AINALOA	IMPROVEMENTS	COUNTY	Awaiting infrastructure improvements
11	PMAR	HC-20	County of Hawaii	UNDETERMINED	HILO-HAWN PAR PARK	PRELIM. DESIGN - NEW	STIP 05	
12	NEW ROAD (General Plan)	C-25		ARTERIAL	RAILROAD AVE - HAWN BEACHES (15th Ave)	NEW	General Plan	
13	NEW ROAD (General Plan)	C-24		ARTERIAL	RAILROAD AVE - HAWN PAR PARK	NEW	General Plan	
14	NEW ROAD (General Plan)	C-19		ARTERIAL	KUPULAU TO KEEAU	NEW	General Plan	
	HLRTP (STATE)							
15	VOLCANO HWY (11)	1a	State of Hawaii	ARTERIAL	KURTISTOWN TO KEAAU	WIDEN	HLRTP	TIER 2
16	VOLCANO HWY (11)	1b	State of Hawaii	ARTERIAL	MT VIEW-KURTISTOWN	WIDEN	HLRTP	TIER 3
17	KEAAU - PAHOA HWY (130)	5a	State of Hawaii	ARTERIAL	KEAAU BYPASS-PARADISE DR.	WIDEN	HLRTP	TIER 1
18	KEAAU - PAHOA HWY (130)	5b	State of Hawaii	ARTERIAL	PARADISE DR - PAHOA BYPASS	WIDEN	HLRTP	TIER 2
15	RAILROAD AVE.	11a	State of Hawaii	ARTERIAL	RAILROAD AVE - HAWN PARADISE PARK	NEW	HLRTP	TIER 3
16	RAILROAD AVE.	11b	State of Hawaii	ARTERIAL	HAWN PARADISE PARK TO HAWN BEACHES	NEW	HLRTP	TIER 4
17	KOMOHANA EXTENSION	8a	State of Hawaii	ARTERIAL	LEIMAMO ST. TO VOLCANO HWY.	NEW	HLRTP	TIER 4
18	N. KULANI RD.	9	County of Hawaii	COLLECTOR	VOLCANO HWY. (11) TO STAINBACK HWY.	RECONSTRUCTION	HLRTP	TIER 4
19	STAINBACK HWY.	12	State of Hawaii	COLLECTOR	N. KULANI - HI BELT RD (11)	RECONSTRUCTION	HLRTP	TIER 4

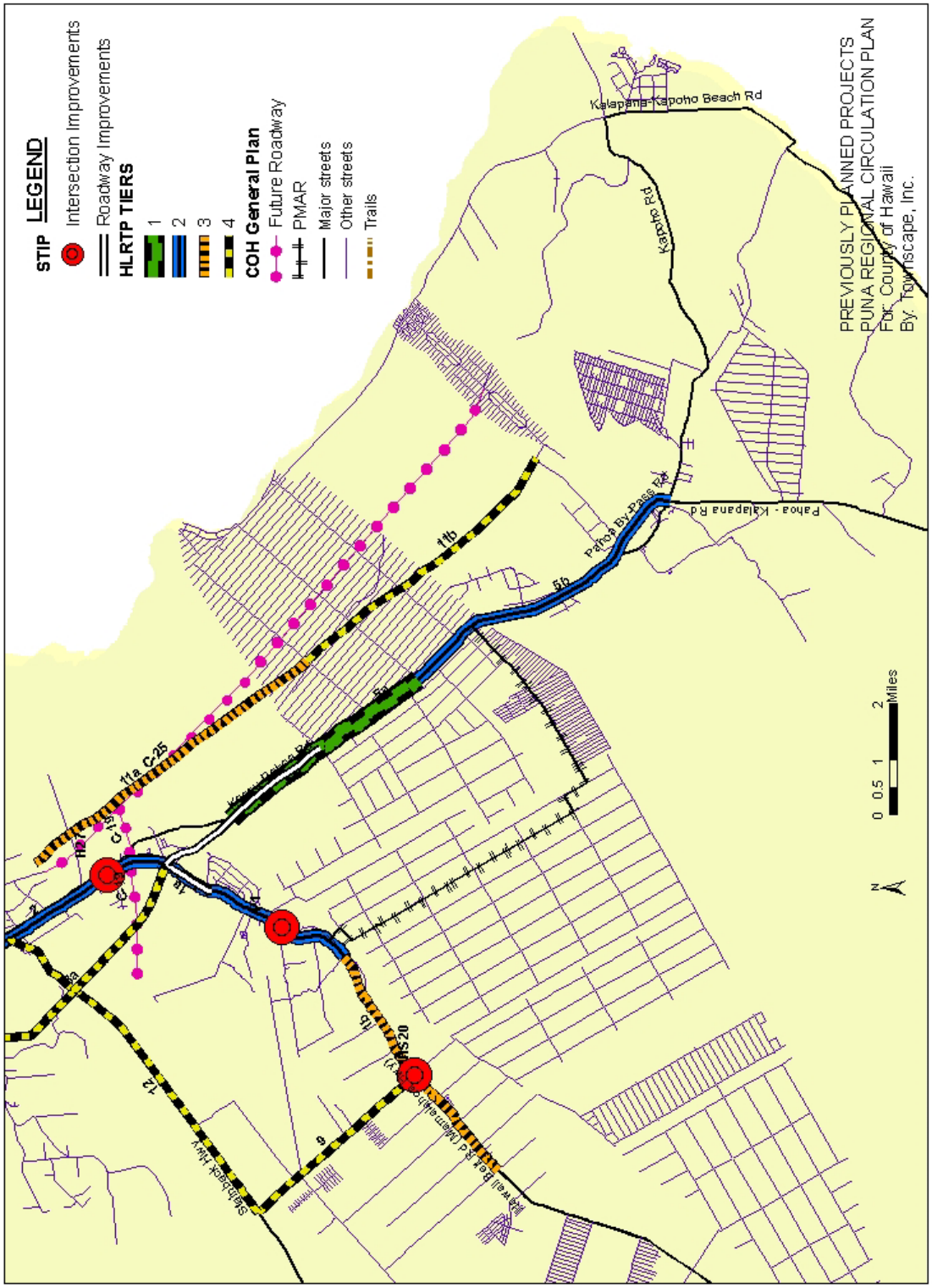


FIGURE 6.2: PREVIOUSLY PLANNED TRANSPORTATION PROJECTS

6.5. Origins and Destinations

Traffic information on origins and destination is not available and would require large effort and cost to collect[11]. A preliminary list of major generators of origins and destinations (e.g. schools, other work centers) are identified in Table 6.3.

6.5.1. Public Facilities (Fire, Police, Healthcare)

County funded and staffed fire stations, with emergency medical service, are located in Pāhoa and Kea'au. The Pāhoa station serves the Pāhoa-Paradise Park and Kalapana-Kapoho areas. Hawaiian Beaches, Hawaiian Paradise Parks, Hawaiian Acres, Fern Acres, Fern Forest and Waa Waa subdivisions and Volcano Village have 24-hour volunteer facilities. The County will also assume responsibilities at the fire station located in Volcano at Kīlauea Military Camp in 2005.

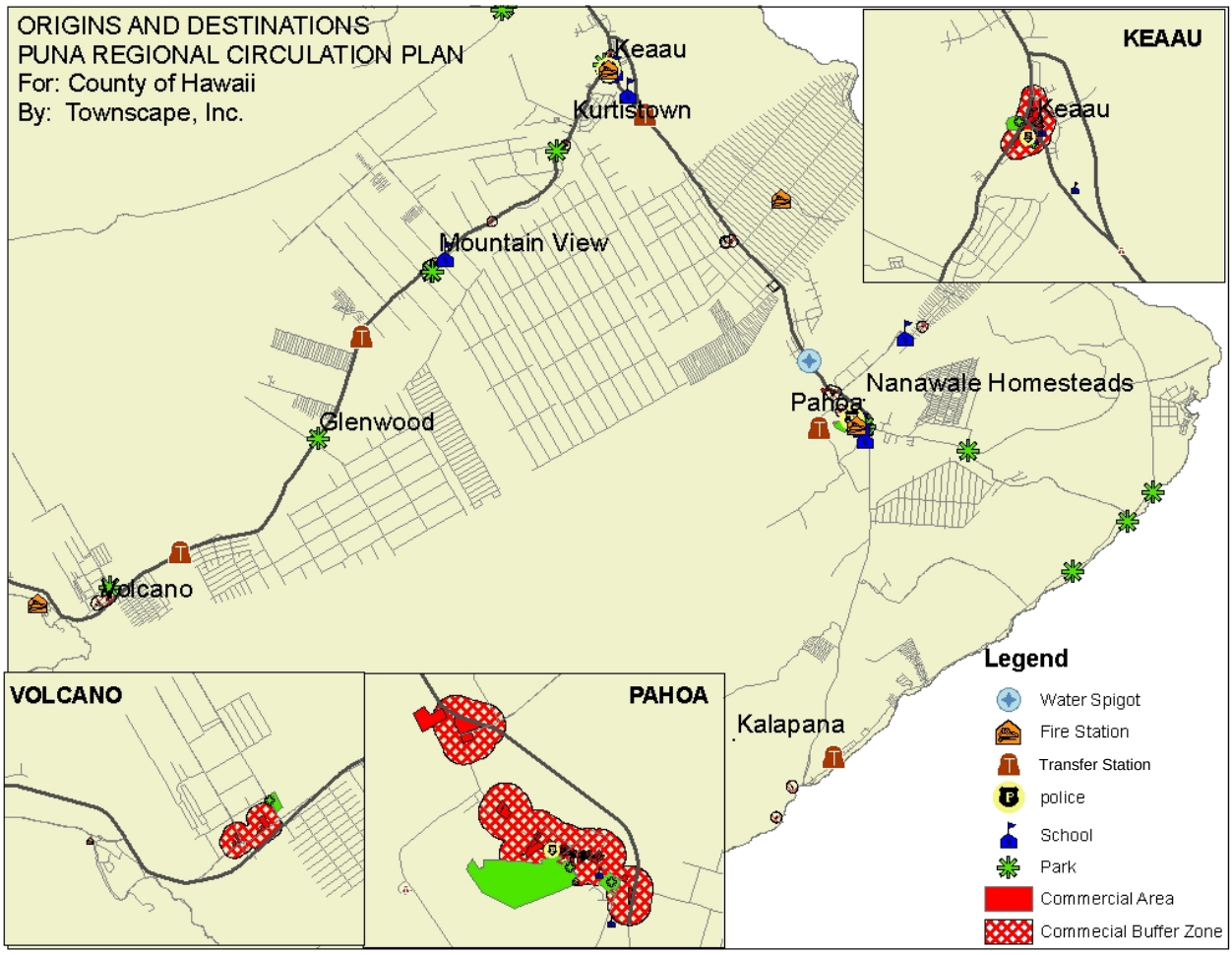
The police station headquarters for Puna is located in the Kea'au public office complex serving the entire district. A district substation is also located in Pāhoa. Puna police stations often experience a shortage of police manpower with only one or two officers on duty at a time for the entire region. There are no hospitals located in Puna. There is also a medical clinic located in Pāhoa.

[11] *Typically, transportation planning studies will collect origin/destination information in order to calibrate mathematical models that simulate existing traffic and would be used to forecast future travel demand. Information would be collected through various travel surveys (e.g. mail-out to a sample of residents and ask that they record the trips taken on a specified date, a roadside survey sampling drivers passing a designated point, employee survey at the work place, etc.) to create trip tables (matrices showing the number of trips from various origin zones to various destination zones). From the trip tables, traffic volumes are compiled and compared with traffic count data to create the transportation model. An alternative method of estimating future traffic (which was used as part of this study) evaluates traffic data and applies growth trends. See Section 11.4 for more information on traffic projections.*

TABLE 6.3: ORIGIN/DESTINATION GENERATORS

Schools	Business Centers	Recreation	Community Centers	Public Facilities
Keaʻau Elementary	Pāhoa Town	Shipman Park	Ainaloa Longhouse	Police Station
Keaʻau Intermediate	Keaʻau Shopping Center	Isaac Hale Park	Hawaiian Beaches (Community Center)	Fire Station
Keaʻau High School	Keaʻau Farmers Market	Ahalanui Park	Hui Hanalike (HPPOA)	Keaʻau Transfer Station
Mountain View Elementary	Kurtistown (Hara Store)	Hawaiian Beaches Park	Keaʻau Community Center	Pāhoa Transfer Station
Keonepoko Elementary	Mt. View	Mountain View Gym	Leilani Estates Community Longhouse	Kalapana Transfer Station
Pāhoa Elementary	Wiki Wiki Mart at Orchidland	Lava Tree State Park	Nānāwale Community Longhouse	Keonepoko Water Spigots
Pāhoa Intermediate and High School	Glenwood (Hirano Store)	"Sand Hill"	Pāhoa Neighborhood Facility	Bay Clinic Pāhoa Family Health Center
Kua o ka La (PCS)	Volcano Village	Kehena Beach	Cooper Center (Volcano)	State of Hawaiʻi Department of Health (Puna)
Waters of Life (PCS)	Makuʻu Farmers Market	Hilo – shopping/ movies/ etc.	Fern Acres Association	Hui Ho'ola O Na Nahulu O Hawaiʻi (HPP)
Volcano School of Arts and Sciences (PCS)	Shipman Industrial Park	Hawaiʻi Volcanoes National Park		
Hawaiʻi Academy of Arts and Sciences (PCS)	Mauna Loa Macadamia Nut			
Ke Kula Nawahi Okalaniopuʻu Iki Lab (PCS)	Milo Street (Keaʻau) (Autofair/Greenhouse)			
Kamehameha Schools (Priv.)				
Malamalama Waldorf School (Priv.)				
Christian Liberty School (Priv.)				

FIGURE 6.3: ORIGIN DESTINATION SITES



7. ELEMENT: TRANSIT

The Puna Regional Circulation Plan has an emphasis on transit. Overall the plan recommends significant expansion of the Hele-On Bus system, routes, service, and programming. This section outlines transit goals, improvements projects, and further planning studies that are needed. Although the Puna District is still quite rural, this plan also identifies what it means to be "transit ready" for the future. In addition to community guidelines listed in Section 2, there are also more specific, transit-oriented goals and objectives for the Puna District (Table 7.1).

"Transit-ready" development includes:

- Mixed land uses and diversity of housing types.
- Pedestrian friendly plan with generous transit stops.
- Public and commercial facilities designed as transit targets and community focal points.
- Marketing plans that take advantage of transit-supportive strategies.
- Bus priority lanes that increase the capacity of streets without widening.
- Reliable and affordable service.

TABLE 7.1: TRANSIT GOALS AND OBJECTIVES

Goal	Objectives
Increase transit ridership	• Increase bus headways on routes with strong ridership demand. • Install ITS and other passenger infrastructure at bus stops (i.e., shelter, lighting, seating, bus schedules, route connectivity maps, bike racks, etc.). • Maintain schedule adherence through operational improvements.
Enhance local and regional connectivity	• Develop major transfer stations where major transit corridors intersect. • Integrate transit routes and mode connections with service schedules to facilitate efficiency. • Encourage adoption of County ordinances that support Transit Oriented Development and pedestrian and bicycle enhancements.
Implement transit improvements that support land use goals	• Provide a transportation system that is coordinated and consistent with plans of County agencies, its communities, and neighbors • Support collaborative land use and planning efforts that ensure the community develops in an efficient and sustainable way.
Develop cost effective transit alternatives	• Implement short-range small-scale transit projects that will be needed to support larger long-range improvement projects in later years. • Implement an "evolutionary process" that gradually builds up service for Bus Rapid Transit.
Increase funding opportunities for Hawai'i County Mass Transit Agency (MTA)	• Seek to move flex funds from highway projects to transit projects. • Identify and pursue opportunities of joint development with private sector. • Determine favorability of various options for increasing local funds for transit, including options for a sales tax to finance transportation improvements.

7.1. Expanded Bus Service

The County of Hawai'i, Mass Transit Agency (MTA) has already started expansion of the Pāhoa to Hilo routes in Puna. The addition of new buses will also help expand schedules. The agency will be implementing a "Kokua Zone" in Puna that provides free bus transit. This program and data generated will provide useful information about the future of ridership.

The Hele-On Bus.

However, major expansion of busing systems will be required in order to switch residents from the vehicle mode of transportation. The MTA currently utilizes an average of four buses in Pāhoa-Hilo and Ka'u-Hilo (through Volcano) routes. Depending on the Transportation alternative provided (A-E), the required bus fleet ranges from 11 to 36. Bus "headways" calculated range from 2 buses per hour (Scen. B) to 36 buses per hour (Scen. A).

Existing bus routes service a few subdivisions including Hawaiian Beaches, Nānāwale, and Volcano. Other subdivisions with paved roadways, such as Hawaiian Paradise Park and Ainaloa, might also be served with expanded or new routes.

7.2. Dedicated Bus Way for "Rapid Transit"

In order to attain bus ridership at significant levels (above 1 percent), a dedicated busway will be required. Busways are special roadways designed for the exclusive use of buses. A busway can be totally separate roadway or operate within highway right-of-way separated from other traffic by barriers.

Bus service within vehicle traffic will be adversely affected by increased traffic and long travel times. An analysis of travel times will be conducted as a part of this plan. Overall, bus travel time with a busway could be shorter or equal to that of vehicles in traffic. A busway with convenient and reliable transportation service would likely be a popular modal choice.

Bus Rapid Transit involves improvements in a transit system's infrastructure, equipment, operations, and technology that give preferential treatment to buses on roadways. Buses use exclusive busways or HOV lanes with other vehicles and operate more flexibly than Light Rail systems. Bus Rapid Transit can also respond to changes in employment, land-use, and community patterns by increasing or decreasing capacity. The systems differ from Light Rail systems in that they provide greater flexibility in how they can be implemented and operated. Finally, in constructing a Bus Rapid Transit system, it is possible to phase in improvements over time. It is not necessary to include all the final elements before beginning operations.

According to the U.S. General Accounting Office (GAO), Bus Rapid Transit projects cost less on average to build than Light Rail projects, on a per mile basis. Federal support for Bus Rapid Transit projects may come from several different sources, including Federal Transit Authority's (FTA) New Starts and Bus Capital Grants programs.

7.3. Rural Para-Transit

The County of Hawai'i, Mass Transit Agency (MTA) is currently developing a Rural Para-Transit System. Mobility issues are essential to independent living, quality of life, and are usually dependent upon access to transportation. The goal of the system is to provide transportation services for the elderly and disabled population and reduce duplication of efforts to ensure better services. The transportation system will fill critical needs by connecting rural residents and their community to healthcare, shopping, and economic well-being.

An example of a "para-transit" system.

The existing paratransit service in the County has been uncoordinated among the four major agencies: Mass Transit Agency (MTA), Hawaii County Economic Opportunity Council (HCEOC), Coordinated Services for Elderly (CSE), and the Center for Independent Living (CIL). The recent study "Rural Paratransit Study for Puna and Kona," proposes a feeder service integrated with the existing Hele-On Bus routes. The study conducted an evaluation of Computer-assisted scheduling and dispatching software and recommended Trapeze NOVUS. Estimated costs are $218,000 (capital) and $521,000 (operating and administrative).

Other key recommendations include:

- Feeder service consisting of four lift equipped vans, two serving Puna.
- Kea'au Community Center is selected as the transfer point for Puna.
- The feeder service would operate from 6:00am till 7:00pm daily.
- Transfer from feeder services to Hele-On Bus is free.
- One centralized dispatch office will be established in Hilo to take reservations calls.
- Establish a curb-to-curb policy for cost savings, except for those needing special assistance.
- Staff needed include: one paratransit service manager, one reservationist, one dispatcher, and eight part-time drivers (four for Puna).

7.4. Park and Ride Facilities

Park-and-ride lots can be classified as intermodal transfer facilities. They provide a staging location for travelers to transfer between the vehicle mode and transit or between the single occupant vehicle (SOV) and other higher occupancy vehicle (HOV or carpools) modes.

Park-and-ride lots can serve a much wider array of intermodal transfers, thereby increasing the activity at the park-and-ride facility, and better integrating it with the surrounding community. Other modes potentially supported by a park-and-ride facility include: pedestrian, bicycle, paratransit, carpool and vanpool, and other modes, based on the location and opportunities available. The park-and-ride lot can encourage a shift from the single occupancy vehicle to higher occupancy modes, meeting the efficiency needs of future travel.

7.4.1. Park and Ride Lot Types

A hierarchy of park-and-ride facilities can be developed for the Puna region based on the functional characteristics of the individual park-and-ride lot. Facilities include informal lots, joint use lots, and park and pool lots. The informal park-and-ride lot is often simply a transit stop to which motorists regularly drive their cars and leave them parked on-street or in an adjacent property. Opportunistic or joint use lots are characterized as sharing the facility with another activity such as a church, theater, shopping mall, or special events center. Park-and-pool lots are typically smaller lots, intended exclusively for the use of carpool and vanpool formation.

A park-and-ride lot with lighting and pavement.

There are several ways to provide park-and-ride facilities, including:

- Promoting existing excess parking capacity using signage and map references,
- Providing incentives to private owners of parking to share capacity,
- Providing incentives for the private owners to increase capacity, and
- Construction of new parking facilities.
- Marketing of park and ride lots is essential to help change driver habits.
- Publicize park-and-ride and related options for travel through programs
  - County of Hawai'i, Mass Transit Agency
  - Bicycle Associations
  - Major employers
- Signage at the park and ride lots
- Public service announcements

7.4.2. Identifying Facilities for Puna

The Puna Regional Circulation Plan estimates that 30 to 50 percent of transit riders will use a park and ride facility. Transit routes, headways, and location of stops are affected by the low density distribution of population in Puna. Even with an expansion of the transit system these conditions may require many riders to drive to transit stations. Depending on the transit ridership in each alternative, between two and twelve park and ride lots are needed. The preferred plan requires at least seven facilities each with 100 stalls.

TABLE 7.2: PARK AND RIDE LOTS BY ALTERNATIVE

Alternatives	Transit Peak Period Trips	Park & Ride Users		Required Lots		Allocated Lots	Cost (Mil)
		30%	50%	*(1 lot = 100 stalls)*			*($450,000/lot)*
A	5285	793	1321	8	13	11	$5.3
B	1069	160	267	2	3	0	$1.1
C	5868	880	1467	9	15	12	$5.9
D	5868	880	1467	9	15	12	$5.9
E	3301	495	825	5	8	7	$3.3
PLAN	3714	557	929	6	9	7	$3.7

7.4.3. Feasibility Study and Site Selection Plan

The location of a park and ride facility is very important to its success. Site selection criteria include:

- Transit System Availability - Potential sites for park-and-ride should be located along the existing or proposed transportation system route.
- Site Accessibility - A site must be easily accessible and convenient to both commuters and transit vehicles when transit service is anticipated.

- Site Visibility - Potential sites should be visible from their access roads. Visibility of park-and-ride facilities contributes to the recognition by passing motorists of their availability and also contributes to vehicle security.
- Projected Demand - Demand provides a guideline for the number of potential spaces and estimated lot sizes that must be identified within each corridor.
- Development and Operating Cost - Park-and-ride lots generally do not collect fees, so sites which can be developed economically are desirable. Shared use of existing facilities can be a factor in development and operating costs.
- Available User Benefits - Sites which provide users with time and cost savings are preferable to those that provide only a transfer opportunity.
- Environmentally Sensitive Areas - Park lands, flood plains, and culturally sensitive areas can be problematic.

This plan proposes a Feasibility Study and Site Selection Plan for park and ride facilities. The County of Hawai'i, Mass Transit Agency has already received some funding for developing park and ride facilities throughout Hawai'i County. The proposed study would identify site locations, ownership, opportunities and constraints, and recommended improvements.

Work elements of the study would address:

- Purpose and need for a park-and-ride system, travel needs to be served, and the size and general character of such a system (Site demand forecasts)
- Determination of goals and objectives
- Establishment of an evaluation process framework (definition of a successful park and-ride facility)
- Development of a "systemwide service network" (serving the proposed park-and-ride system by connecting it to major employment destinations)
- Development of intergovernmental agreements outlining general policies for facility acquisition, maintenance, and service
- Site evaluation and ranking (site selection criteria, consideration of alternatives, etc.)
- Environmental Assessment document (Site Location specific impacts)
- A public involvement and review process

7.5. ITS and TDM

7.5.1. Intelligent Transportation Systems (ITS)

Intelligent Transportation Systems (ITS) applies advanced technologies including information processing, electronic, and communication, in combination with management strategies to improve overall transportation system operations. ITS applications include weather and road condition information for highway users, the use of automatic vehicle location and computer-aided dispatch systems for rural transit, automated collision notification, and improved travel information to improve safety and security for transportation users.

7.5.2. Transportation Demand Management (TDM)

Transportation Demand Management consists of programs and facilities, which are developed in order to change demand on the transportation system. TDM measures reduce traffic congestion by changing user behavior. TDM programs include information and incentives to encourage employees to travel by means other than the single occupant vehicle during peak travel periods. Examples of TDM measures include flexible work hours, ridesharing, and preferential parking for those who rideshare. Examples of TDM facilities include carpool and vanpool staging areas, transit shelters, bicycle lockers and showers. Table 7.3 lists some strategies for reducing trips.

Transportation demand management (TDM) has emerged as a response to growth management and traffic congestions problems. TDM programs and tools include:

- Rideshare and carpool matching
- Park and ride lots
- Designated High Occupancy Vehicle (HOV) travel lanes for car/vanpoolers/transit
- Employer-based incentives
- Coordination of TDM strategies, work and education sites, and educational events.

A TDM Program is an institutional framework for implementing a set of TDM strategies. Such a program has stated goals, objectives, a budget, staff, and a clear relationship with stakeholders. It may be a division within a transportation or transit agency, an independent government agency, or a public/private partnership.

The DOT administers the Vanpool Hawai'i Program.

Possible responsibilities of a TDM Program include:

- Coordinates TDM Planning, Evaluation and Data Collection.
- Implements marketing programs.
- Responds to problems and complaints.
- Provides Ride-matching, Shuttle Services, Pedestrian and Cycle Promotion, and Special Event Transportation Management services.
- Provides Parking Management, Parking Pricing and parking brokerage services.
- Coordinates arrangements for Shared Parking.
- Supports Pedestrian and Bicycle Improvements, Freight Transportation Management and Security Improvements that encourage use of alternative modes.
- Coordinates activities with other organizations, such as Transportation Management Associations, Commute Trip Reduction Programs and Institutional Reforms.
- Supports integrated transportation and land use planning to improve Accessibility and reduce vehicle travel (Access Management, Smart Growth and Location Efficient Planning).

TDM Programs insure that specific strategies are complementary and coordinated, for maximum effectiveness. For example, Transit Improvements and Pedestrian Improvements can have far greater travel impacts and consumer benefits when implemented as a coordinated program. A general rule is that TDM Programs should include a balance of improved travel choice and incentives to reduce automobile travel.

TABLE 7.3: STRATEGIES FOR REDUCING TRAVEL DEMAND

Traffic Engineering Strategies	Parking Management Policies
- preferential treatment for HOVs - traffic signal timing - on-street parking and maintenance - corridor management and route guidance - intersection improvements	- control of supply and location - pricing policies - preferential allocation, location, and price for HOVs
Alternative Commute Modes	**Land Use Strategies**
- transit - ridesharing - bicycling - walking	- match land development to transportation capacity - restrict traffic intensive uses - jobs/housing balance - mixed use development - on-site/near-site services - density increases/bonuses in areas served by transit - trip reduction ordinances
Improvements in Transit Level of Service	
- express services - times transfers - more direct routes - denser networks-reduced access time - park-and-ride - increased frequency - preferential treatment: e.g. express lanes	**Other Trip-Reduction Strategies** - telecommunications substitutes for travel - work-at-home options (telecommuting) - flextime, compressed work week

Car pooling is an effective way to reduce trips.

7.6. Transit Master Plan

The PRCP also recommends a Transit Master Plan for Hawai'i County. A Transit Master Plan would provide an overall framework for transit improvements. The plan could recommend cost-effective transit projects for implementation throughout Hawai'i County. It would also develop funding options that generate revenues to finance transit capital investments and operation and maintenance of new transit services.

As a part of the master plan short, mid, and long range projects would be identified. Types of transit service improvement recommendations would likely include service frequency improvements, extension of existing bus routes, addition of new bus routes and passenger infrastructure.

Examples of possible transit improvements:

- Improved Headways
- Comprehensive Routes (what is appropriate for a "rural area" – 1.5 mile, 1 mile, 1/2 mile?)
- Facility Improvements to passenger infrastructure and neighborhood transit centers
- Capital Improvements
- Service Improvements
- Operations and Capital Budgets

7.7. Community Perspectives

The CAG identified transit expansion as the second most important project, after emergency connections. Residents asked for more frequent stops and expanded service areas, particularly into subdivisions and to the airport. Many expressed frustration with the existing "taxi block" that prevents bus service to the airport. Overall participants want comprehensive bus service island-wide with linkages to other transportation modes.

Bike racks on buses provide connectivity between modes.
Source: Dan Burden, www.pedbikeimages.org

Many participants noted the need for more education and publicity of bus schedules and stops. Furthermore, residents suggested bus shelters, bus stops, bike racks on buses, and park and ride facilities that are appropriate for a rural landscape. The communities expressed that improvements would increase visibility and convenience of the transit program and therefore increase ridership as well.

8. ELEMENT: PMAR

The Puna Regional Circulation Plan proposes an alternate route from Hilo to Puna Makai. The alternate route concept was previously identified in several plans including the Hawai'i County General Plan (2005), the Hawai'i Long Range Transportation Plan (1998), the Puna Community Development Plan (1995), and an Environmental Impact Statement for Beach Road (1972).

This Plan proposes implementation of the PMAR from Hilo to Shower Drive as soon as possible. The PRCP does not determine the exact alignment, scope, or implementation of a Puna Makai Alternate Route (PMAR) concept. However, this plan identifies and discusses the various options for the alternative rights-of-way, multi-modal amenities, corridor locations, and street alignments. This section also identifies community viewpoints in favor and against the project. Environmental studies, preliminary engineering, and continued consultation with the community will determine whether a PMAR will be feasible in the future. That process will identify environmental and social impacts, costs, benefits, and implementation.

The PRCP and the PMAR address community needs while respecting the diversity of residents in the district. Everyone agrees that the Puna District is a rapidly growing community. Growth has a major impact particularly because so many lots are available and infrastructure is limited. By year 2030, nearly 53,000 people are projected to live in Puna Makai. As a result, early identification of needs, careful planning, and context-sensitive design can help assure that a PMAR project fits properly into the community landscape.

The PMAR has been considered for several reasons. Currently there is one way in and out of Puna via the Kea'au-Pahoa Highway (130). In the event of a traffic accident, the road is blocked and traffic is not allowed in or out of the community. A second route would provide redundancy and route choice. The area also needs emergency access for evacuation in the event of lava inundation, tsunami, or other hazards.

Based on population growth and traffic projections increased transportation capacity will be needed by year 2030. The projections show that transportation capacity will be needed in addition to widening of Highway 130. A new transportation route could also include amenities for rapid bus transit, bike lanes, and multi-purpose paths. The proposed Puna Makai Access Route (PMAR) project could provide redundancy, connectivity, emergency access, and multi-modal choices.

8.1. What Kind of Corridor?

Traffic demands and community needs should help to determine the "scope" of the PMAR. Who should the project service and how will these people travel? Are they driving, biking, walking, or riding the bus? How much space is needed for safe travel? The cross-section of any road can include some of the following elements:

- Travel way (the portion of the roadway provided for the movement of vehicles, exclusive of shoulders)
- Roadway (the portion of a highway, including shoulders, provided for vehicular use)
- Median area (the physical, landscaped, or painted separation provided on divided highways between two adjacent roadways)
- Bike lanes
- Multi-purpose path
- Dedicated Bus Lane
- Utility and landscape areas
- Drainage channels, swales, and side slopes

Some of these functions can fit within 60' or 100' right of way depending on the compromises the community is willing to accept. The required right-of-way width for the PMAR will depend on the number, type, and design of these elements. The roadway type and width could also vary depending on what is appropriate for each section. Specific details on the right of way will be addressed in an alignment alternatives study.

8.2. Alternative Corridors and Alignments

Several corridors were investigated to provide emergency access, redundancy, and multi-modal capacity from Hilo to Puna Makai. Various routes from Hilo to Puna Makai were identified by past plans and community input:

1. Railroad Corridor
2. Beach Road Corridor
3. Mid-level Corridor
4. Multiple Corridors (5th and 15th)

8.2.1. Railroad Corridor

The old Railroad Right-of-Way alignment was considered as an alternate route. According to County Tax Map Key, the right-of-way ranges from 20 to 40 feet wide and is owned by several landowners.

The complete 12-mile right-of-way has several land owners:

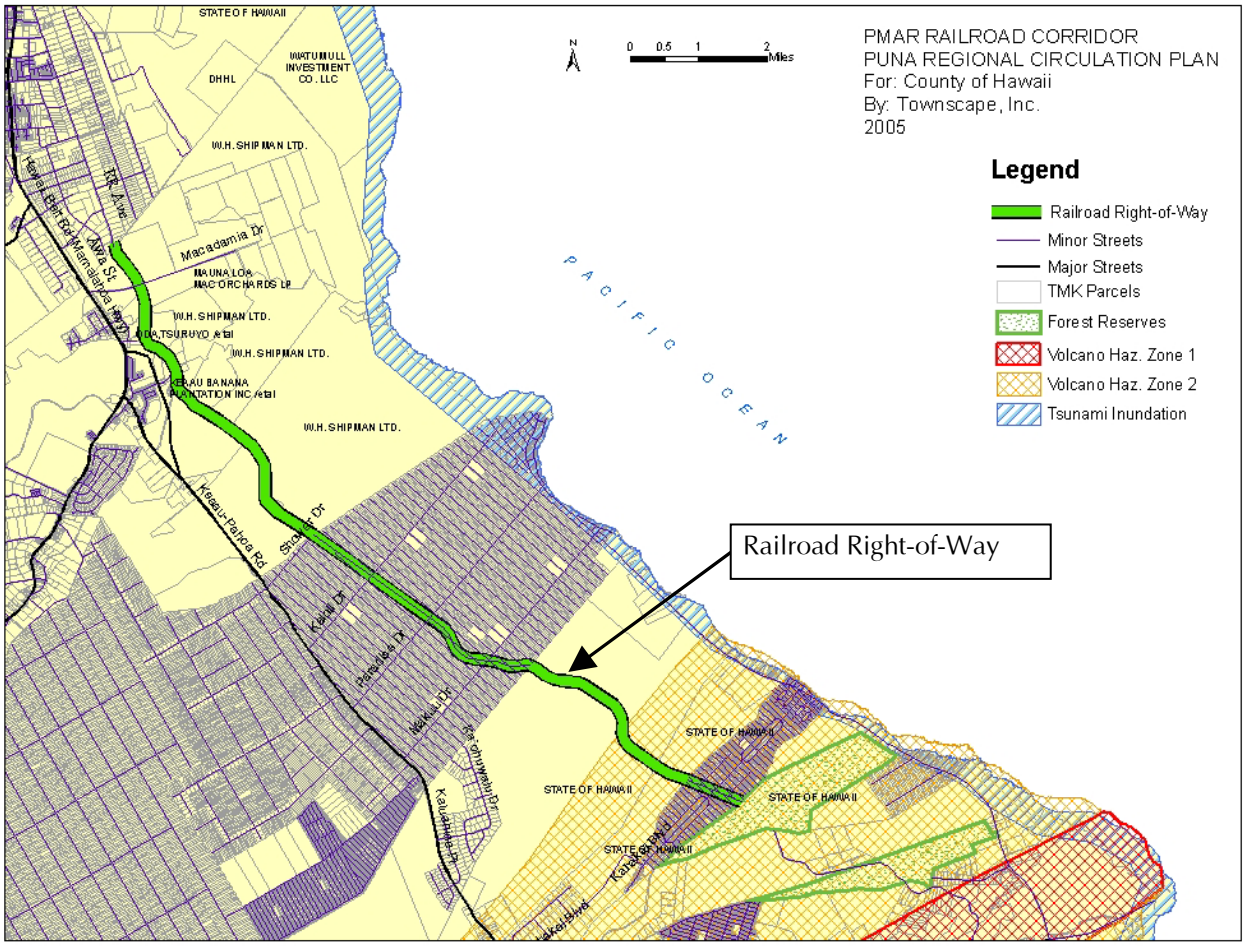
- W.H. Shipman, Ltd.
- Hawaiian Electric Light Company (HELCO)
- Hawaiian Paradise Park Corporation
- State of Hawai'i
- County of Hawai'i
- Kamehameha Schools
- Kapoho Land and Development Co. Ltd.

This corridor is not acceptable for regular vehicular transportation. The railroad right-of-way is best used as a pathway for non-motorized public use, with the exception of maintaining present access to area farmers and other lessees. The existing right-of-way cuts through farms. As a result, improvement to the corridor would significantly disrupt the agricultural functions of the area. A Mayoral Advisory Committee on Bicycle and Pedestrian Safety has also worked with the community for many years towards implementation of a multi-purpose pathway along the right-of-way. In 2000, the County Council also passed a Resolution (206-2K) supporting acquisition of the alignment for use as a pathway.

Nevertheless, the rail road corridor could also be used as an interim emergency access route. Although high densities of traffic could not be accommodated, the route would provide one alternative for residents in an emergency evacuation situation. The route alignment from Hilo to Shower Drive could serve as a feasible bypass.

For more information on the pathway, see Section 9.

FIGURE 8.1: PMAR RAILROAD CORRIDOR

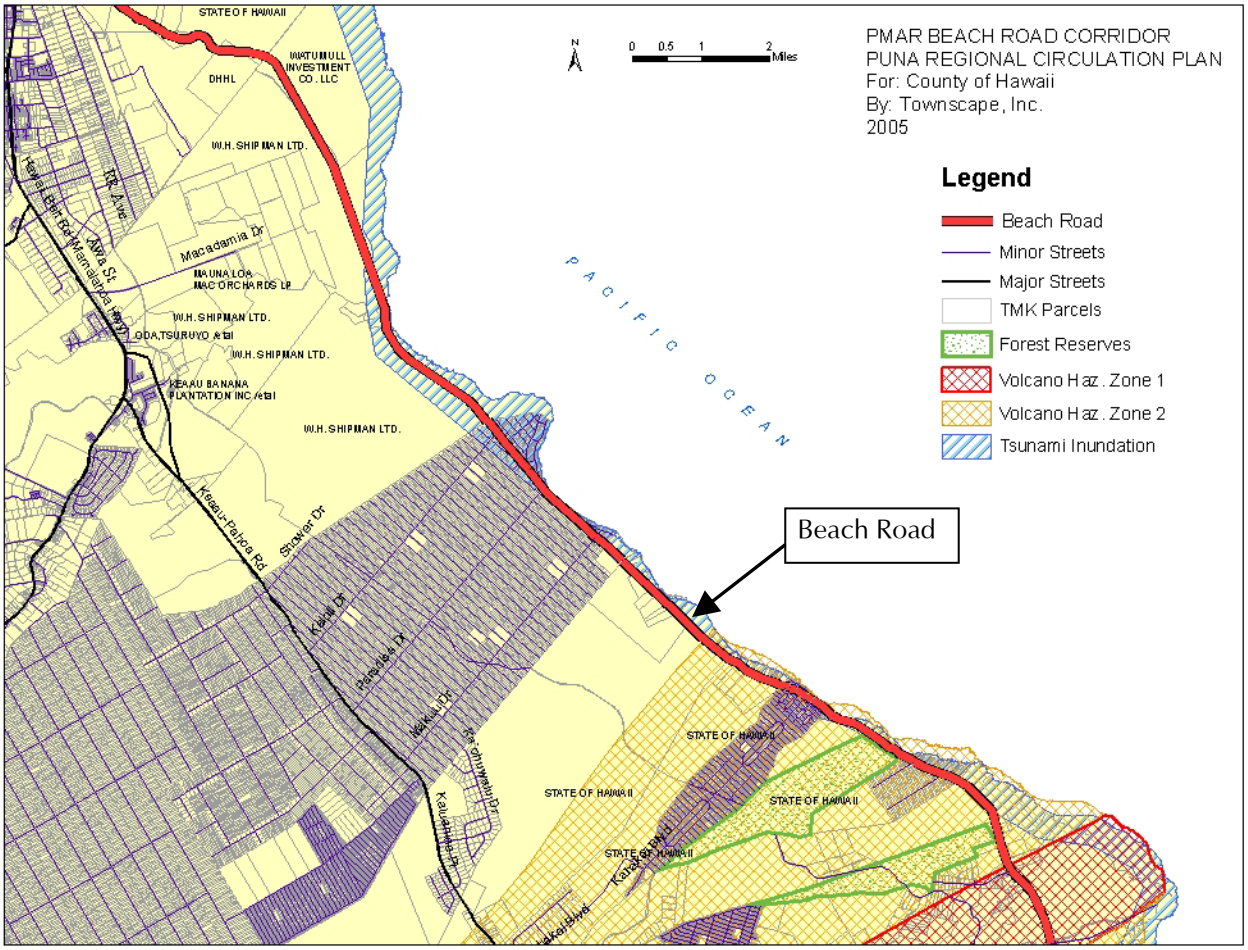


8.2.2. Beach Road Corridor

Community members have also suggested the use of the Beach Road for alternate access. Many believe the coastal views would provide a scenic highway highly desirable for visitors. In 1972, an EIS was conducted evaluating an oceanfront scenic road. Major difficulties exist with this option because of hazard zones. Most of the Beach Road is within the tsunami inundation area and several parts are in the lava hazard zones. The location of the alignment through such areas would preclude Federal highway funding for the project. However, the Beach Road has the potential to qualify for designation as a Scenic Byway due to its historic quality.

The route would nevertheless fail to provide emergency access during high surf or flooding conditions. According to Hawaiian Paradise Park residents, several subdivision roads near the shore have been closed due to erosion under cliffs. They believe a PMAR route must be located above the elevation of 7th Avenue. For these reasons, the Beach Road was also removed from consideration.

FIGURE 8.2: PMAR BEACH ROAD CORRIDOR



8.2.3. Mid-level Corridor

A new mid-level corridor would provide service to Puna Makai residents. The design of a new transportation corridor halfway between Highway 130 and the coastline would provide access for a variety of residents. This corridor is also away from major hazard zones.

The PMAR mid-level corridor can be broken up into four sections. The need for implementing each section will have to be considered. There are several alternative alignments for each section of a mid-level corridor. Mid-level alignments include:

1. **Hilo to Hawaiian Paradise Park (HPP)**
   - 1A. Hilo International Airport to Shower Dr.
   - 1B. Railroad Avenue to Shower Drive
   - 1C. Shower Dr. Extension

2. **Through Hawaiian Paradise Park (Shower Dr. to Maku'u Dr.)**
   - 2A. In between 15th and 16th Avenues (back of parcels)

3. **Hawaiian Paradise Park to Hawaiian Beaches**
   - 3A. Maku'u Dr. to Kahakai Blvd. (Middle)
   - 3B. Maku'u Dr. to Kahakai Blvd. (Upper)

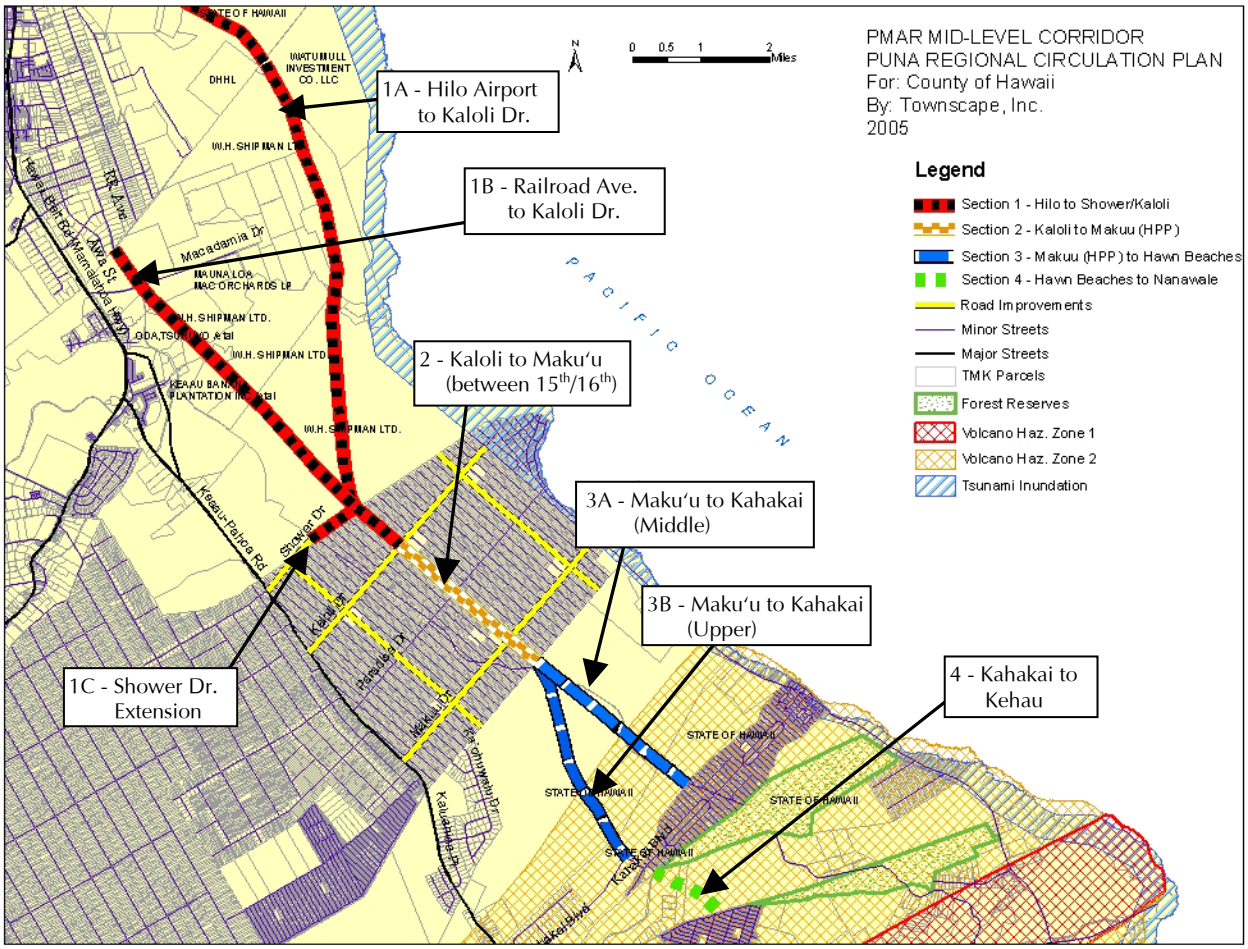
4. **Hawaiian Beaches to Nānāwale**
   - 4A. Kahakai Blvd. to Kehau St.

There are several alternatives for the alignment of section one. Further study and consideration of each alternative is needed before one alignment can be selected for implementation. The first alternative alignment could begin in Hilo, potentially from Hilo International Airport (Section 1A). This alignment would travel southeast through three properties owned by the State of Hawai'i, Watumull Investment Co., and W.H. Shipman, Ltd. The route is preferred because only three large landowners are affected.

Another alternative could begin at the terminus of Railroad Avenue in Panaewa (Section 1B). This alternative is also advantageous because the existing avenue has sufficient right-of-way for vehicular traffic. However, this route travels through homesteads owned by the Department of Hawaiian Home Lands (DHHL).

The Section 1 of the alternative could continue to Shower Drive, after traveling through W.H. Shipman property. Another suggested alternative is to extend Shower Drive makai to intersect with the PMAR.

FIGURE 8.3: PMAR MID-LEVEL CORRIDOR



If the PMAR is intended to primarily serve HPP, the route could connect to Kaloli Drive. Residents would use existing HPP roads to access the alternate route. Travelers would cross on all numbered streets without any one being preferred, thus distributing traffic. Additional improvements in pavement or road width may be needed on Kaloli Drive, Shower Drive, and/or a few of the numbered streets such as 5th Avenue and 25th Avenue.

The alignment at the back of parcels on 15th and 16th Avenues, previously discussed, would continue from Kaloli Drive to Maku'u Drive. Potentially, the alignment could travel across the back of lots, parallel to a numbered street like 15th or 16th Avenue. Approximately 63 landowners in the Hawaiian Paradise Park subdivision could be affected by the connection to Kaloli Drive. According to County Real Property Data (August 2004), there are 13 existing homes in this section.

HPP lots are 135 feet wide by 322 feet long. Depending on the cross-section design, condemnation of 30 to 50 feet from the back of each parcel may be required. This would still have some impact on residents of the area. However, this new alignment would allow access management. Therefore, driveways and connections would not be permitted in an effort to preserve capacity and protect homes.

If the PMAR should continue towards Hawaiian Beaches, a main route will be needed through Hawaiian Paradise Park from Kaloli. Additional improvements in pavement or road width may be needed on Maku'u Drive. The backyards of approximately 181 parcels would be impacted from Kaloli Drive to Maku'u Drive. According to County Real Property Data (August 2004), there are 31 existing homes in this section. Further investigation will be conducted to identify detailed locations of existing development.

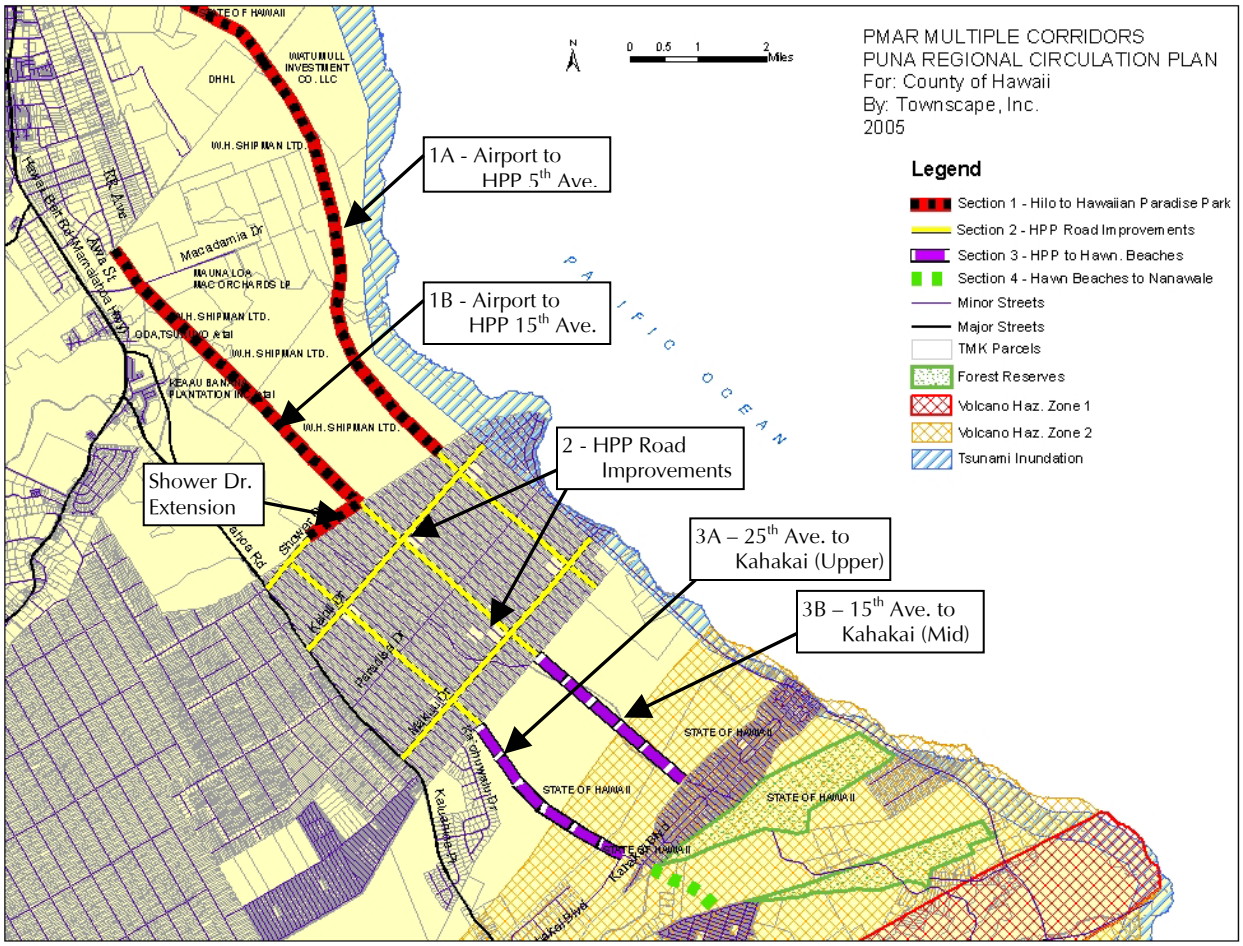
The PMAR would continue in Section 3 from Maku'u Drive to Kahakai Boulevard in Hawaiian Beaches. The alternate route could take a mid-level alignment into the middle of the subdivision (3A). This alignment would be most central to residents. However, it would travel through existing residential development. An alignment that instead extends up towards Keonepoko School also has the merit of serving the trip generator (3B). This alternative would serve the school and also provide options for future connections to Nānāwale. Either alignment would travel through property owned by the State of Hawai'i.

The alignment could continue to the Nānāwale subdivision from Kahakai Boulevard to Kehau Street. This alignment would avoid the State Forest Reserve and would connect to an existing County street at Kehau. This section would likely be a very long-term project in phasing plans. The alignment would cross through property currently owned by Kamehameha Schools.

8.2.4. Multiple Corridors

Instead of developing a single PMAR corridor, this alternative considers development of several connections that would distribute traffic congestion more evenly. Two alignments could travel from Hilo to Hawaiian Paradise Park. A makai route from Hilo Airport could connect to the existing 5th Avenue in HPP. Similarly, a mid-level route could connect the existing Railroad Avenue to 15th Avenue in HPP. Shower Drive could be extended to meet this route. Only limited improvements to existing streets would be required. Condemnation of private property would be limited or unnecessary with this option. Each route could continue on to Kahakai Boulevard in Hawaiian Beaches.

FIGURE 8.4: PMAR MULTIPLE CORRIDORS



8.3. Community Perspectives

Throughout the rounds of subregional community meetings, many residents stressed the importance of an alternate access route to Highway 130. However, other residents opposed development of new transportation corridors. These residents are concerned about the environmental, social, and economic impacts of a PMAR route. The idea of a "high-speed freeway" development is obviously distressing to Puna residents who value their quiet, low-density, rural-like communities. This plan does not propose such a project.

In addition to public meetings, the PRCP process took comments regarding the draft report. Community sentiment for the PMAR varies and seems to depend somewhat on where residents live. Residents along Highway 130 or beyond Ainaloa (Pahoa, Nānāwale, Leilani Estates, Kāpoho, etc.) would really need alternate access if there is an emergency or road closure. Many of these residents favor an alternate access route for this reason.

Most of the opposition to the PMAR through HPP comes from HPP residents who feel such a route would significantly change the character of their neighborhood. Many Hawaiian Paradise Park residents in the vicinity of 15th and 16th Avenue were concerned with takings of private property and impacts to their quality of life and community. A group of residents opposed to the single route "Mid-level" PMAR alternative provided a petition with over 50 signatures. However, there were also many HPP residents who believe alternate access is needed given the number of homes and developable lots in the area.

Other residents stressed that an alternate route is needed and noted that some would be unhappy no matter where the alignment is located. Many participants also advocated for a PMAR project with multi-modal amenities including bike lanes, pathways, transit corridors, as well as native greenscaped buffers,

It is clear that this PRCP planning process was NOT intended nor equipped to be a deciding factor in either the fast-tracked implementation or "killing" of a PMAR project. This plan summarizes various alternatives, their benefits and/or detriments, and community reactions.

8.4. Next Steps: Alignment Alternatives Study

The County received $188,084 in Federal funding for further investigation, community consultation, and study of a PMAR. There is also the possibility of additional funds through other federal programs. The PRCP provides details on how the funding might be used to identify more specific alignments, conduct environmental studies, and determine feasibility. The PRCP identifies broad alternative alignments based on community input, 50-foot contours, major environmental hazards, and existing development.

This plan proposes that an alternate route from Hilo to Shower Drive should be pursued as soon as possible. Besides providing needed capacity, this alternate route would provide redundancy to Highway 130 in the event of highway closure. Other unresolved issues at this time include whether this road should be improved through HPP, and if so, the appropriate alignment and design standards. Because of the extent of the unresolved issues, an alignment alternatives study should be done to analyze the alternatives and recommend a definitive alignment. The scope of this study should include: 1) whether to connect to Railroad Avenue or to create a new corridor connecting to the Airport and Hilo Harbor; 2) whether and how to traverse HPP; 3) major network connections such as the improvement of 40th Avenue and Pohaku Drive; and 4) feasibility of the interim use of the Railroad ROW as an emergency bypass and bus-only route from Railroad Avenue to Shower Drive.

More funding will then be needed for environmental studies, preliminary engineering, an EA or EIS, community consultation, and final design and construction. Environmental studies including flora, fauna, archaeology, culture, and speleology of the 12-mile long and 500-foot wide corridor could total at least $1 million. The identification of environmental constraints early in the process can avoid costly changes in design and construction. Throughout the process, continued contact with community stakeholders is important.

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9. ELEMENT: BIKEWAYS AND PEDESTRIAN PATHS

Safety for bike riders and pedestrian is an important issue for Puna residents. The inclusion of bike facilities on highways, rural roads, and off-road multi-purpose paths help provide safe options for all different levels of bike riders. Many bikeways use the highway shoulder and require signage indicating bike use. Adequate right-of-way width and pavement are necessary for bikeways along shoulders. When possible, grade separation or buffers from the highway are also desirable ways of protecting bicyclists.

Pedestrian friendly highways are also necessary in the rural environment of Puna. Safe usable crosswalks that include pedestrian refuges are useful. Improved lighting, signage, landscaping, and traffic signals are all ways to help protect pedestrians. Use of these amenities are essential in school zones. School areas, village centers, and other well-used areas should be identified as favorable area for implementing median crosswalks and roundabouts. In some situations, these tools can in fact improve both safety and capacity.

There are several types of transportation facilities that serve bicyclists, these include:

- **Shared Bike Routes** – Any street/road designated for shared use along (a) a widened curb lane in urban areas, (b) a paved shoulder in rural areas. Bike routes can also be designated with signs to provide continuity with the entire bike system. Signage also advises motorists of the presence of potential bicyclists.

- **Bike lanes** – A portion of roadway designated by striping, signing, and pavement markings for preferential or exclusive use of bikes. Typically bike lanes are 4-5 feet wide.

- **Multi-purpose paths** – A completely separated right-of-way designated for exclusive or semi-exclusive use of bikes separated from the roadway with open space and landscaping physical barriers. Typically bike paths are 10 feet wide and accomodates two-way travel. This facility does not replace roadside bicycle facilities.

A rough multi-purpose pathway.
Source: Dan Burden, www.pedbikeimages.org

9.1. Bike Plan Hawai'i

Bike Plan Hawai'i (2003) represents community consensus about bicycling policies and programs, and the development of future bike facilities. It is part of the overall Statewide Transportation Plan (STP), which provides a mechanism for generating, selecting, and implementing transportation improvement projects. Bike Plan Hawai'i guides the bicycle-related component of the STP and is needed to support requests for federal transportation funds.

Proposed projects of the Bike Plan Hawai'i Draft Report are listed in Table 9.2. The projects listed are proposed as Priority I, II, or III. Priority I projects are proposed for implementation in less than 10 years. Priority II projects are proposed for implementation in less than 20 years and Priority III in less than 30 years. Project numbers are also listed in the table.

The plan integrates bicycling into Hawai'i's transportation system and summarizes how communities can accommodate and promote bicycling. The plan also outlines different bikeway improvements for bicycle riders of varying experience. They include:

- **Group A: Advanced Bicyclists -** Experienced riders who can operate under most traffic conditions.
- **Group B: Basic Bicyclists -** Casual or new adult and teenage riders who are less confident of their ability to operate in traffic without special provisions for bicycles.
- **Group C: Children -** Pre-teen riders whose roadway use is initially monitored by parents.

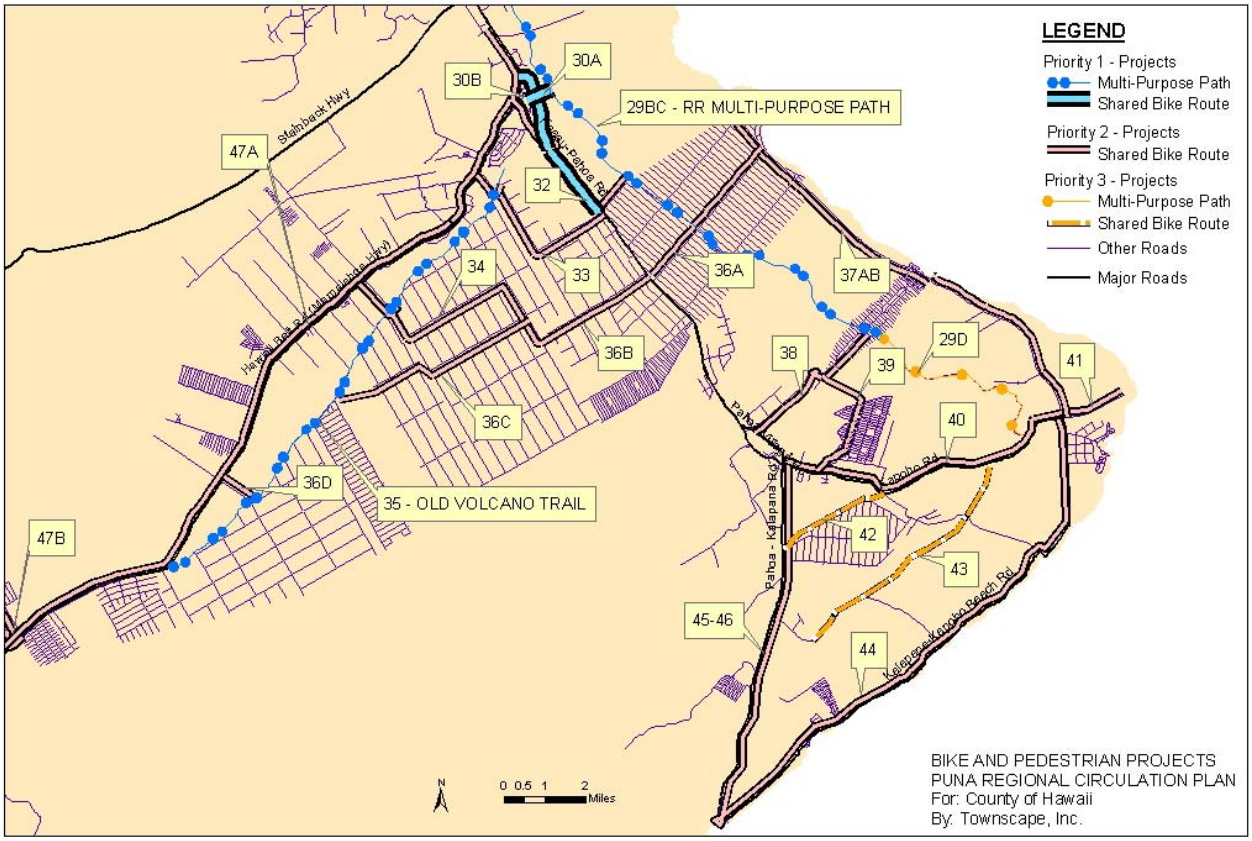
A bicyclist rides on the shoulder of Highway 11 into Hilo.

TABLE 9.1: BIKE PLAN HAWAI'I PROJECTS

Project No.	Facility Location	Type	Juris.*	Cost Class.**	Length (mi.)	Cost Estimate	Bike Plan Priority
29b	**Railroad Avenue Bikeway** Kaaahi Rd. / RR Ave (end)- Hawn. Paradise Park	Path	C/P	C	5.6	$2,160,000	I
30a	**RR Avenue Bikeway connection to Kea'au schools** RR Ave Bikeway-Kea'au Bypass	Path	C	C	0.5	$193,000	I
32	**Kea'au-Pahoa Road** Kea'au Bypass Road-Shower Drive	SSR	S	C	2.4	$781,000	I
35	**Old Volcano Trail** Vol. Hwy-Glenwood Rd.-Kahikopele-Puhala-Olaa Rd.	Path	S	B	12.5	$3,220,000	I
29c	**Railroad Avenue Bikeway** Hawn. Paradise Park -Hawn. Beaches Subdivision	Path	C/P	C	6.8	$2,623,000	II
30b	**Various local roads and off-road paths** Kea'au Town	Path	C/P	C	2.0	$772,000	II
31a	**Old Kea'au-Pahoa Road** Volcano Hwy-Kea'au-Pahoa Bypass	SSR	S	C	1.1	$358,000	II
31b	**Old Kea'au-Pahoa Road Remnant**	SSR	C/S?	B	0.5	$25,000	II
33	**Shower Dr/PohakuDr/Olaa/40th** Kaaahi Road-Volcano Hwy	SSR	P/C	C	5.4	$1,758,000	II
34	**Paradise Acres - 9 Rd / C Rd / Kūlani Rd.** 9 Road-Volcano Hwy near Mountain View	SSR	P/C	C	5.6	$1,823,000	II
36a	**N. Puna Corridor--Makai along Paradise orMakuu Drive** Hawaiian Paradise Park-Kea'au-Pahoa Rd	SSR	P/C	C	4.2	$1,367,000	II
36b	**North Puna Corridor--Mauka** Kea'au-Pahoa Rd-11 Rd	SSR	P/C	C	3.7	$1,204,000	II
36c	**North Puna Corridor--D Rd/Rose Street** 9 Rd-Pikake St	SSR	P/C	C	4.1	$1,335,000	II
36d	**S. Glenwood Rd. – Fern Forest Volcano Hwy. – S. Glenwood Rd.-Old Volcano Trail**	Path	P/C	C	4.6	$260,000	II
37a	**Ala Hele O Puna (going north)** Hawaiian Beaches Subdivision- Hawn. Paradise Park	SSR	C	C	6.1	$1,985,000	II
37b	**Ala Hele O Puna (going south)** Hawn. Beaches Subdivision-Jct. Pahoa-Kapoho Rd	SSR	C	C	5.2	$1,693,000	II
38	**Kahakai Blvd. (mauka-makai corridor)** Railroad Avenue-Pahoa schools complex	SSR	C	C	4.0	$1,302,000	II
39	**Ag Road/Kehau Road** Railroad Ave (Waiakahiula)-Nānāwale Blvd to Pahoa-Kapoho Rd	SSR	C	C	3.8	$1,237,000	II
40	**Pahoa-Kapoho Road** Volcano Hwy-Pahoa Coast	SSR	C	A	7.2	$26,000	II
41	**Lighthouse Road** Pahoa-Kapoho Rd-Kumukahi Lighthouse	SSR	C	C	1.6	$521,000	II
44	**Kalapana-Kapoho Beach Road** Pahoa-Kapoho Rd-Kea'au-Pahoa Rd	SSR	C	A	15.0	$55,000	II
45	**Old Kalapana Hwy Remnants**	Path	C?	C	4.5	$1,736,000	II
46	**Pahoa-Kalapana Hwy** Kapoho-Kalapana Beach Rd-Kea'au-Pahoa Rd	SSR	C	A	9.0	$33,000	II
47a	**Volcano Highway[Mamalahoa Hwy]** Kea'au-Pahoa Bypass-Hawai'i Volcanoes Natl. Park	SSR	S	A	23.2	$85,000	II
47b	**Volcano Village Collector Roads, Shoulder Improvements** Wright Rd., Haunani Rd.	SSR	C	B	1.6	$79,000	II
29d	**Railroad Avenue Bikeway** Hawn. Beaches - Kapoho-Kalapana Beach Road	Path	C/P	C	6.5	$2,507,000	III
37c	**Koae Access** Railroad Path/Kaaahi Rd-Ala Hele O Puna	Path	C	C	0.8	$309,000	III
42	**Pahoa-Kapoho Powerline Trail** Pahoa-Kapoho Rd-Pahoa-Kalapana Rd	Path	C/P	C	2.8	$1,080,000	III
43	**Kapoho-Kalapana Ridge Trail** Off Pahoa-Kapoho Rd-Kamoamoa Hmstds	Path	C/P	C	8.1	$3,125,000	III

SSR - Signed Shared Roadway

FIGURE 9.1: BIKE PLAN HAWAI'I MAP



9.2. Safe Bike and Pedestrian Routes

9.2.1. Safe Routes to Schools ("SR2S")

Developing Safe Routes to Schools (SR2S) is a goal of the Puna Regional Circulation Plan. SR2S efforts can increase the numbers of children who walk and bike safely to school. Walking and bicycling are healthy for children and decreased traffic congestion and pollution benefit communities. The goal of a SR2S program is also to measurably reduce crashes, injuries, and deaths involving child pedestrians or cyclists near schools.

Bicycle and Pedestrian Safety Awareness Education.
Source: People's Advocacy for Trails Hawai'i (PATH).

The challenges to increasing the number of children who walk or bike to school are associated with transportation facilities, motor vehicles, and school location. Good planning is critical to both prevent these problems and to help fix them where they exist. These issues can be addressed by a Safe Routes to School (SR2S) Improvement Plan using the four Es:

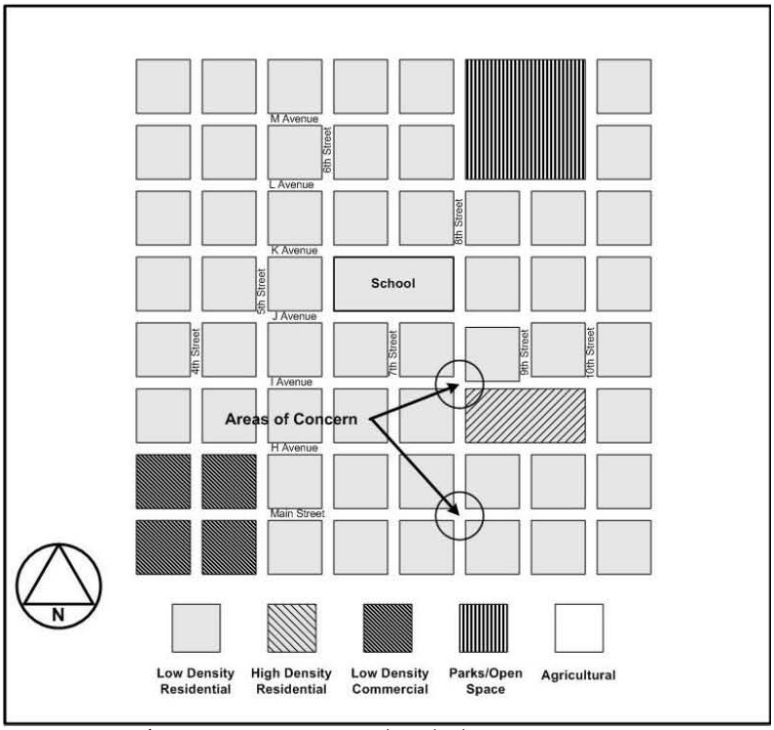
The key factors for a successful SR2S project include the "Four E's"[12]:

- **Encouragement** – Make walking and bicycling more attractive by planning special events to celebrate active travel, beautifying walking/bicycling routes, and by sponsoring classroom activities and contests.
- **Education** – Teach children, adults, pedestrians, cyclists, and motorists about traffic laws and safe and courteous behavior on the road; and about the health, environmental, and safety benefits of walking and bicycling.
- **Enforcement** – Pass new laws or enforce existing ones to make it safe for children and adults to walk and bicycle.
- **Engineering** – Build a better environment for walking and bicycling. Plan compact neighborhoods and school sites; construct or maintain sidewalks and bike lanes; and install traffic signals or change the design of streets through traffic-calming structures such as bulb-outs.

[12] Center for Health Training, National Highway Traffic Safety Administration. *Safe Routes to School: Practice and Promise.* 2004.

A Safe Routes to School Improvement Plan[13] can be developed to address issues by mapping the routes to school and planning for a safe and attractive environment for pedestrians and bicyclists. Infrastructure improvements can reduce congestion around schools, slow vehicle speeds, and provide opportunities for safe crossings, bicycle facilities, and sidewalks. A Task Force can conduct an inventory of the areas around the school and map out the primary routes used by children. Task Force members can walk the neighborhoods, identifying significant problems, and record their findings using photos and maps.

FIGURE 9.2: EXAMPLE OF SCHOOL ZONE MAP



Source: Center for Transportation Research and Education, Iowa State University.
Handbook of Simplified Practice for Traffic Studies. November 2002.

Important questions to address include:

- Does school policy encourage bicycling to school?
- Are there trails and pathways that provide a direct link between the school site and the surrounding neighborhoods? Is there an old railroad bed or overgrown footpath that could be converted to a public trail?
- What are the traffic volumes and average speeds on heavily used walking routes? Are there opportunities for traffic calming to slow or discourage through traffic?

[13] National Highway Traffic Safety Administration. Safe Routes to School Tool Kit. http://www.nhtsa.dot.gov/people/injury/pedbimot/bike/Safe-Routes-2002/index.html

- Are crossing points strategically located and well marked, including designated crosswalks at controlled intersections and mid-block crossings? Do the children have enough time to get across the street?
- Is there clear visibility for drivers to see pedestrians throughout the area? Can they see pedestrians under five feet tall?
- Is the school building easily accessible to pedestrians and cyclists? Are there parking lots and drop-off points blocking their paths?
- Are there conflicts between buses, cars, bicycles and pedestrians on the school site? Are there opportunities to provide each mode with its own designated area for traveling?
- Is there adequate and secure bicycle parking?
- Is there hands-on, school-based program for bicycle riding skills/safety instruction?

TABLE 9.2: KEY INDICATORS OF SR2S PROGRAMS

Outcome	Objectives
Behavior of children	• Increase numbers of children walking to and from school • Increase numbers of children bicycling to and from school • Improve skills for walking and bicycling safely
Behavior of drivers	• Reduce the numbers of vehicles arriving and departing school at morning drop-off and evening pick-up times • Decrease speed of vehicles in and around school area • Prevent aggressive driving behavior (e.g., not yielding to pedestrians) • Decrease number of driving trips by parents and length of commute
Community facilities	• Improve the quality of walking environment: number and usefulness of sidewalks and bike lanes • Safely design intersections (lights, crosswalks, etc.)
Crashes and Injuries	• Reduce the number of traffic crashes involving children walking or biking to and from school • Decrease severity of injuries to children from traffic on their way to and from school • Reduce the number of conflicts between vehicles and pedestrians/bicyclists which would be likely to lead to crashes (i.e., "near misses")
Community buy-in	• Increase the diversity of people involved in SR2S efforts • Heighten the level of commitment and energy displayed by the SR2S collaborators • Develop parent enthusiasm about SR2S and allowing their children to walk or bike
Environmental quality	• Decrease level of air and noise pollution in school area • Reduce land devoted to parking and drop-off/pick-up areas
Health, Responsibility and Empowerment	• Provide children with activity of daily living (ADL) which contributes to physical and mental health. • Reduce public health concerns related to juvenile obesity. • Provide opportunity for empowerment of children taking a responsible and active role in their own transportation needs. • Provides children choice of flexible transportation schedule that accommodates after-school activities.

9.3. Engineering Techniques

Traffic engineering can help change motorist behavior, reduce speeding and reckless driving near schools, and improve the pedestrian environment.

9.3.1. Traffic Calming

According to the Institute of Transportation Engineers, "Traffic calming is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users." Many traffic-calming enhancements have the added benefit of providing attractive landscaping for the street, establishing a greater sense of place, which entices residents to spend more time outside enjoying their neighborhood.

9.3.2. Bumps, Humps, and Tables

Speed humps are parabolic or trapezoidal in shape, are longer than speed bumps (generally 12 to 14 feet long), are not as noisy, and are easier on cars. Speed humps are a low-cost solution and tend to be the most effective in limiting speeds to 25 mph, when closely spaced along a roadway. Speed tables are flat-topped speed humps that stretch across the road. They also can be used as raised crosswalks for pedestrian crossings. Speed tables bring the street up to sidewalk level making it pedestrian territory with slower traffic and better pedestrian visibility. Speed tables are more expensive than speed humps and may be too gentle to solve certain speeding problems. Other communities have chosen textured pavements—roadway surfaces paved with brick, concrete pavers, stamped asphalt, or other materials—that produce enough vibration to tell the motorists to slow down. These solutions tend to be loud and can be as hard on bicycles and pedestrians, especially those with disabilities, as they are on cars. At best, textured pavement can be used as a visual cue to slow down.

9.3.3. Barriers

Traffic diverters, medians, islands, and other barriers can discourage or eliminate through traffic on certain streets in the neighborhoods surrounding schools. Selected streets, designated as safe routes, are designed to decrease traffic and give pedestrians and/or bicyclists safer passage. Other traffic-calming techniques narrow the roadways and use landscaping, and curb extensions, roundabouts, and traffic circles to create the effect of a narrow winding road. Traffic circles and roundabouts are often used instead of stop signs to slow traffic.

9.3.4. Marked Crossings

Marked crossings can identify the best places to cross the street. Clearly marked crosswalks, signage, special lighting, and raised crosswalks alert motorists to pedestrian activity and increase their willingness to yield. Typically, zebra-style or ladder-crossing designs are used for streets with higher traffic volumes while the simpler parallel lines are used for lower-volume streets. Some other techniques include reducing the distance through curb extensions and creating more visibility through raised crosswalks.

9.3.5. Bridges

Grade separated pedestrian overpasses are installed when it is necessary to physically separate the crossing of a heavy volume of pedestrians from a roadway with steady motor vehicle traffic. While often considered prohibitively expensive, a little ingenuity can sometimes greatly reduce the cost.

9.3.6. Bike and Pedestrian Facilities

People and children feel more secure when they have a place to walk separated from traffic. Obviously much of the Puna District lacks sidewalks. The higher speed of traffic and general absence of lighting in Puna makes the need for pedestrian pathways even more imperative. Bicycle facilities also need to be developed in a comprehensive manner to provide continuous, uninterrupted access to all routes to school. Schools can encourage more bicycling by teaching bicycle safety, offering bicycle repair classes, and providing adequate bicycle parking facilities that shield bikes from inclement weather and that guard against theft.

Communities commonly use trails and pathways in parks and other open spaces as both recreational facilities and travel corridors. Many older neighborhoods still have footpaths from the pre-automobile era, which can be reclaimed by clearing away the brush and weeds. Newer developments are incorporating multi-use paths into their circulation systems.

Abandoned railroad rights-of-way have become popular venues for conversion into multi-use pathways. These trails are an excellent way to provide separated paths for children to walk and bike to school, unimpeded by motorized traffic. Off-road trails require adequate connectors when schools are not directly on the path. The designation of specific routes that are less traveled by cars should be accompanied by easy-to-read signage and striping, where appropriate.

Multi-purpose paths serve a variety of user groups.
Source: Dan Burden, www.pedbikeimages.org

9.4. Costs and Funding

Bike Plan Hawai'i calculated cost estimates using factors per mile according to classification. The PRCP used these factors in its cost estimates as well. Table 9.3 outlines the cost classifications. The majority of bikeway projects in Puna are Cost Classification B (Moderate Change) or C (Major Change).

Capital funding is used to develop infrastructure. The government is always seeking grants for capital funding to build sidewalks, create bicycle lanes, develop multi-use pathways, and to complete other identified projects. It is important to note that generally the State and/or County must be the "applicant" for any capital funding projects that relate to changing public infrastructure. Possible sources of capital funding include:

- Transportation Enhancements
- Congestion Mitigation and Air Quality (CMAQ) funds
- State Funding Programs
- Air Quality Management Programs
- Local County-
- Sales Tax

Program funding could also be required for hiring a coordinator, purchasing incentives, printing newsletters, or for managing community and school participation. In order to receive tax-deductible donations, which are important to charitable donors, a bike advocacy or safe routes to school group needs to be affiliated with a non-profit agency or school. Possible sources of program funding include private donations from businesses, foundations, individuals. Public events and partnership can also be planned with schools and Parent Teacher Associations (PTAs). Sources include:

- School Funding
  - Maintenance Funds
  - Crossing Guard Funds
  - PTA or SAC Committee Fundraising efforts
- County Public Works
  - Maintenance of sidewalks, crossings, etc.
  - Traffic Operations – Signs, signalization, etc.
  - Utility Easements - for walking and bicycling
- Hawai'i Police Department
- State Transportation Enhancement Funds
- Private Business Donations

TABLE 9.3: COST FACTOR PER MILE (BIKE PLAN HAWAI'I)

Type	Cost Classification A (Minor Change)	Cost Classification B (Moderate Change)	Cost Classification C (Major Change/New Facility)
Signed Shared Bike Route	$2,500	$33,968	$222,856
Bike Lane	$8,004	$30,444	$860,154
Multi-Purpose Path	$4,418	$176,368	$264,118

Notes:
Routes and lanes assume construction on two sides of the roadway
Path assumes single facility with two-way travel
Facilities are designed to AASHTO minimum guidelines
Neighbor island projects incur a 15 percent premium
Engineering and design costs estimated at 12 percent of construction cost
Contingency estimated at 15 percent of construction cost

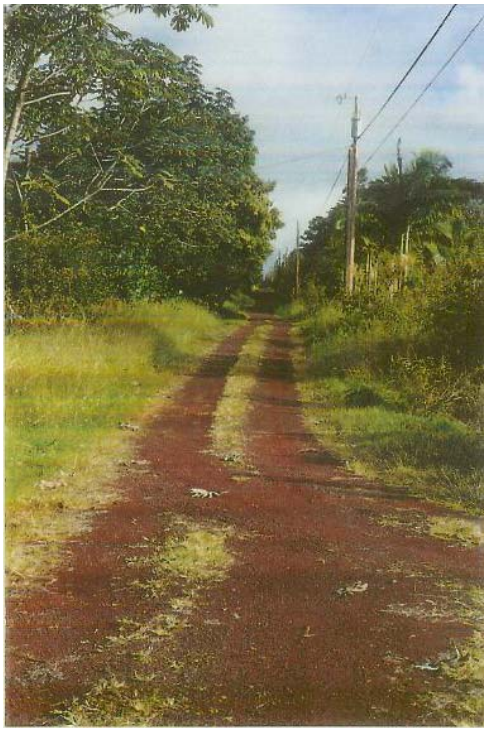
TABLE 9.4: TRAFFIC CALMING MEASURES[14]

Measure	Estimated Cost
Traffic Education Campaign	Varies
Speed Display	$250/day
Neighborhood Sign	$200/sign
High Visibility Crosswalks	$1K-$5K
Police Enforcement	$75/hour
Narrowing Lanes	$1K-$3K
Speed Limit Signing	$200/sign
Stop Signs	$200/sign
Bike Lane	$25K-$75K/mile
Sidewalk	$20-$30/foot
Median Island	$10K-$75K
Gateway	$10K-$20K
Curb Extension	$10K-$20K
Choker	$15K
Speed Hump	$5K
Raised Crosswalk	$5-$10K
Raised Intersection	$25K-$50K
Traffic Circle	$15-$25K
Intersection Channelizing	$15-$20K
Movement Barrier	$5K
Entrance Barrier	$15-$20K

[14] National Highway Traffic Safety Administration. Safe Routes to School Tool Kit. http://www.nhtsa.dot.gov/people/injury/pedbimot/bike/Safe-Routes-2002/index.html

9.5. Railroad Pathway

The PRCP proposes implementation of many Bike Plan Hawai'i projects. A total of 24 Bike Plan Hawai'i projects, priorities 1 and 2, should be implemented as a part of the PRCP. The projects include Signed Shared Bike Routes and Multi-Purpose pathways that total $26.6 million. Implementation of bikeways should begin with the Railroad Pathway Project.



Railroad Right-of-Way looking south towards HPP.

A Mayoral Advisory Committee on Bicycle and Pedestrian Safety has worked with community groups for over ten years towards implementation of this project. A Draft Federal Highway Administration (FHWA) "Transportation Enhancement" application form was completed by the Advisory Committee in 2001. The first phase of the proposed concept would develop six miles of the former Hilo to Kapoho railroad right-of-way as the Railroad Pathway: a multi-use pathway for non-motorized public use. The pathway would be suitable for a wide variety of user groups including bicyclists, joggers, walkers, and equestrians,

The complete 12-mile long right-of-way has several land owners:

- W.H. Shipman, Ltd.
- Hawaiian Electric Light Company (HELCO)
- Hawaiian Paradise Park Corporation
- State of Hawai'i
- County of Hawai'i
- Kamehameha Schools
- Kapoho Land and Development Co. Ltd.

Implementation of this project provides many benefits which include:

- Provides emergency access between Puna Makai and Hilo.
- Provides options for travel and connectivity to other modal options.
- Connects to State, County, and private subdivision roads.
- Provides safe bicycling access away from highway traffic.
- Drives sustainable community economic development.
- Enhances recreational opportunities.

Railroad Avenue would only be used as a bike route through Hawaiian Paradise Park (HPP) subdivision, thus continuing to provide complete access to motor vehicles. The portion through Shipman property from Hilo to HPP would also continue to allow motor vehicle access only for farmers and others with legal access.

W.H. Shipman and HELCO are landowners in the first phase of the project and expressed concerns regarding development of the pathway. Their concerns included responsibilities for safety, liability, security, and maintenance. In 2000, the western regional director of Rails-To-Trails[15], participated in planning of the pathway. She noted that all of the landowner concerns in Puna had been encountered and successfully dealt with and/or mitigated in other Rails-to-Trails projects.

There are low, medium, and high cost options to implementing the Railroad Pathway. The lowest cost option could include having the county or state acquire ownership or a long term lease of the existing Railroad right-of-way. Signage and minor access modifications at both ends would allow non-motorized public use and prevent motorized access. The route would then be suitable for mountain bike use immediately. This would legalize the present illegal use by bicycle trespassers and remove the burden of liability from Shipman.

9.6. Old Volcano Trail

The PRCP supports the restoration of the Old Volcano Trail as a multi-purpose path for various users. The trail remains a public right-of-way and is owned fee simple by the State of Hawai'i. In 1930, 14 miles of trail were surveyed and marked.

A group of community volunteers originally formed the Kea'au Planning Group (KPG) to address health and recreational needs within the Kea'au to Volcano area. The group quickly identified that more recreational opportunities were needed in Puna. In 2003, the group received a grant from the Hawai'i Tourism Authority (HTA) Natural Environment Program for restoration efforts.

The first phase of trail restoration involved identification of the location of the original 1930 markers. The volunteer group assisted in land clearing from November of 2003 till October of 2004. Ten miles of the original trail were surveyed with the assistance of R.M. Towill. The next phase of restoration is to conduct a "mauka survey" to identify a 30-foot right-of-way that can be restored. The County of Hawai'i has received $100,000 from the U.S. Department of Transportation, Public Lands Discretionary Fund, to begin this survey. Difficulty in resolving responsibility for the future of the trail has delayed efforts.

[15] *http://www.railtrails.org/*

There are several options currently being considered for future ownership and maintenance of the Old Volcano Trail:

1. designation as a Na Ala Hele trail under the State Department of Land and Natural Resources;
2. designation under the National Park Service (NPS) as part of the existing Ala Kahakai National Historic Trail or Hawai'i Volcanoes National Park; or
3. development as a County pathway project under the Department of Public Works (DPW) and/or Department of Parks and Recreation (DPR).

Public meetings were held by the KPG and its consultant and the trail has received wide community support. The project is also included in the State Bike Plan Hawai'i (2003) as a tier one multi-purpose path project. The plan estimates construction costs at $3,220,000. Many in the community have advocated for maintaining the natural roughness of the trail. Costs would be significantly reduced without the addition of pavement. This restoration could include leveling and gravel resurfacing of a 4-foot wide area and development of access, signage, and interpretation.

9.7. PRCP Plan Alternatives

Each plan alternative proposes implementation of various bike and pedestrian facilities originally presented in Bike Plan Hawai'i.

Alternative A has a multi-modal focus and thus proposes implementation of 29 Bike Plan Hawai'i projects for a total of $33.7 million. Alternative B, comparatively includes more road projects and proposes implementation of five Bike Plan projects for $5.4 million. The Railroad multi-purpose path is not proposed in both Alternative B and D because a pathway is included in the PMAR project. Alternatives C, E, and the preferred plan all call for implementation of 24 projects according to the priorities of Bike Plan Hawai'i. Priority one projects include the Railroad pathway, the Old Volcano Trail, and bikeway facilities along the Kea'au-Pahoa Highway (130) for a total of $6.4 million. The second phase of projects includes bikeways along major highways; Volcano, Pahoa-Kalapana, Kapoho, and Kalapana-Kapoho Beach Road. There are also several bikeway projects connecting various subdivisions from mauka to makai. Priority two projects total nearly $20.3 million.

9.8. Community Perspectives

The community is very supportive of bicycle projects. PRCP participants were often asked "how do you feel about the Bike Plan Hawai'i projects?" Generally community was in favor of projects. The exception relates to bike routes (No. 34 and 36c) proposed through Hawaiian Acres. Residents noted that the routes travel through private, rough, and often flooded roads. Furthermore, blind hills and narrow easements would compromise feasibility of these routes.

Specifically, residents were concerned about bike safety and suggested bikeway design with grade separation, green buffers, or completely off roadways. Community members also called for bike racks on Hele-On buses and at park and ride facilities to create linkages between modes of travel. There were also some skeptical residents who asked "how realistic is it for the average person to ride their bike to Hilo."

Many community members advocated strongly for the Railroad multi-purpose path regardless of the construction of a PMAR pathway. There is no certainty that a PMAR pathway along a roadside would serve bicyclists as the Railroad project intends to. Most residents favored bike and pedestrian paths that link communities together. The community has worked very hard over the past decade towards the implementation of this project. There also many community members who support the restoration of the Old Volcano Trail. Implementation of both the Old Volcano Trail, serving upper Puna, and the Railroad Pathway, serving Puna Makai are important to the Puna community.

TABLE 9.5: PRCP BIKE PLAN PROJECTS BY PLAN ALTERNATIVE

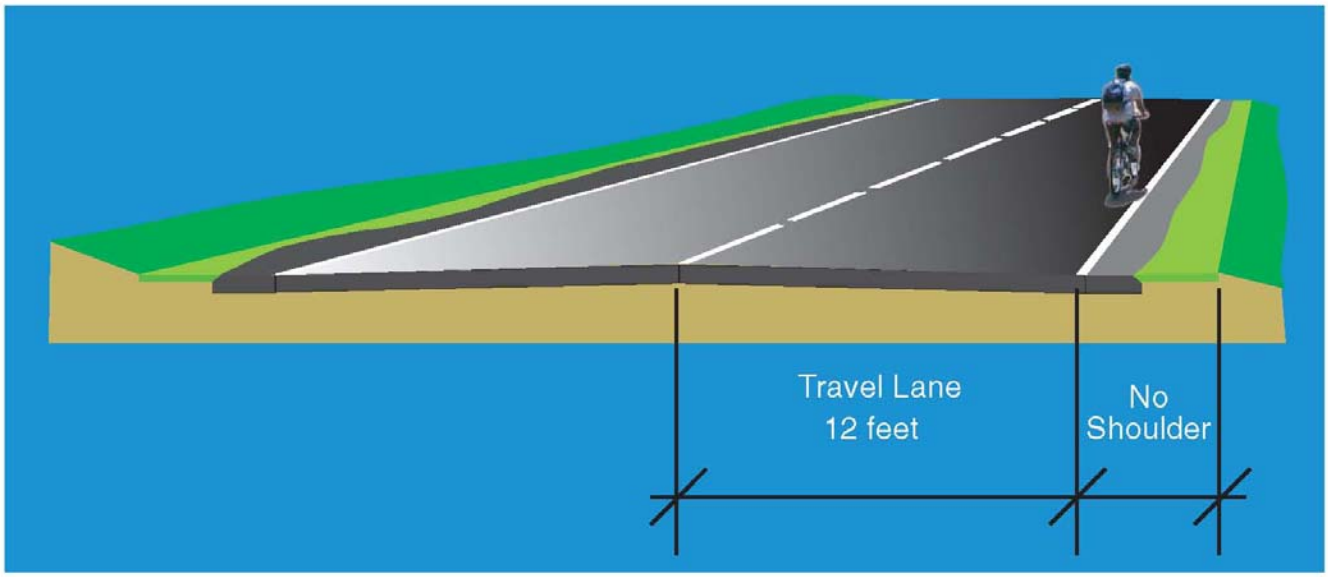
Proj No.	Facility Location	Type	Bike Plan Priority	SCENARIO ($MIL)					
				A	B	C	D	E	PRCP PLAN
29b	**Railroad Avenue Bikeway** Kaaahi Rd. / RR Ave (end)- HPP	Path	I	X	(P)	X	(P)	X	X
30a	**RR Avenue Bikeway connection to Kea'au schools** RR Ave Bikeway-Kea'au-Pahoa Bypass	Path	I	X	X	X	X	X	X
32	**Kea'au-Pahoa Road** Kea'au Bypass Road-Shower Drive	SSR	I	X	X	X	X	X	X
35	**Old Volcano Trail** Kea'au Stream Trail-Pohaku?	Path	I	X	X	X	X	X	X
29c	**Railroad Avenue Bikeway** Hawn. Paradise Park -Hawn. Beaches Subdivision	Path	II	X	(P)	X	(P)	X	X
30b	**Various local roads and off-road paths** Kea'au Town	Path	II	X	X	X	X	X	X
31a	**Old Kea'au-Pahoa Road** Volcano Hwy-Kea'au-Pahoa Bypass	SSR	II	X	X	X	X	X	X
47a	**Volcano Highway[Mamalahoa Hwy]** Kea'au-Pahoa Bypass-Hawai'i Volcanoes NP	SSR	II	X	X	X	X	X	X
31b	**Old Kea'au-Pahoa Road Remnant**	SSR	II	X	**$5.4**	X	X	X	X
33	**Shower Dr/PohakuDr/Olaa/40th** Kaaahi Road-Volcano Hwy	SSR	II	X		X	X	X	X
34*	**Paradise Acres - 9 Rd / C Rd / Kūlani Rd.** 9 Road-Volcano Hwy near Mountain View	SSR	II	X		X	X	X	X
36a	**N. Puna Corridor--Makai along Paradise orMakuu Drive** Hawaiian Paradise Park-Kea'au-Pahoa Rd	SSR	II	X		X	X	X	X
36b	**North Puna Corridor--Mauka** Kea'au-Pahoa Rd-11 Rd	SSR	II	X		X	X	X	X
36c*	**North Puna Corridor--D Rd/Rose Street** 9 Rd-Pikake St	SSR	II	X		X	X	X	X
37a	**Ala Hele O Puna (going north)** Hawaiian Beaches Subdivision- HPP	SSR	II	X		X	X	X	X
37b	**Ala Hele O Puna (going south)** HB Subdivision-Jct. Pahoa-Kapoho Rd	SSR	II	X		X	X	X	X
38	**Kahakai Blvd. (mauka-makai corridor)** Railroad Avenue-Pahoa schools complex	SSR	II	X		X	X	X	X
39	**Ag Road/Kehau Rd** -Railroad Ave -Nānāwale Blvdto Pahoa-Kapoho Rd	SSR	II	X		X	X	X	X
40	**Pahoa-Kapoho Road** Volcano Hwy-Pahoa Coast	SSR	II	X		X	X	X	X
41	**Lighthouse Road** Pahoa-Kapoho Rd-Kumukahi Lighthouse	SSR	II	X		X	X	X	X
44	**Kalapana-Kapoho Beach Road** Pahoa-Kapoho Rd-Kea'au-Pahoa Rd	SSR	II	X		X	X	X	X
45	**Old Kalapana Hwy Remnants**	Path	II	X		X	X	X	X
46	**Pahoa-Kalapana Hwy** Kapoho-Kalapana Beach Rd-Kea'au-Pahoa Rd	SSR	II	X		X	X	X	X
47b	**Volcano Village Collector Roads, Shoulder Improvements** Wright Rd., Haunani Rd.	SSR	II	X		X	X	X	X
29d	**Railroad Avenue Bikeway** Hawn. Beaches - Kapoho-Kalapana Beach Road	Path	III	X		**$26.6**	**$21.8**	**$26.6**	**$26.6**
36d	**North Puna Corridor--Kahikopele Street/Kea'au Stream Trail** Pikake St	Path	III	X					
37c	**Koae Access** Railroad Path/Kaaahi Rd-Ala Hele O Puna	Path	III	X					
42	**Pahoa-Kapoho Powerline Trail** Pahoa-Kapoho Rd-Pahoa-Kalapana Rd	Path	III	X					
43	**Kapoho-Kalapana Ridge Trail** Off Pahoa-Kapoho Rd-Kamoamoa Hmstds	Path	III	X	**$33.7**				

*X – Project included, (P) – No Railroad Pathway due to PMAR multi-purpose path project. * Project feasibility needs more study*

9.9. Bike Way Cross Sections

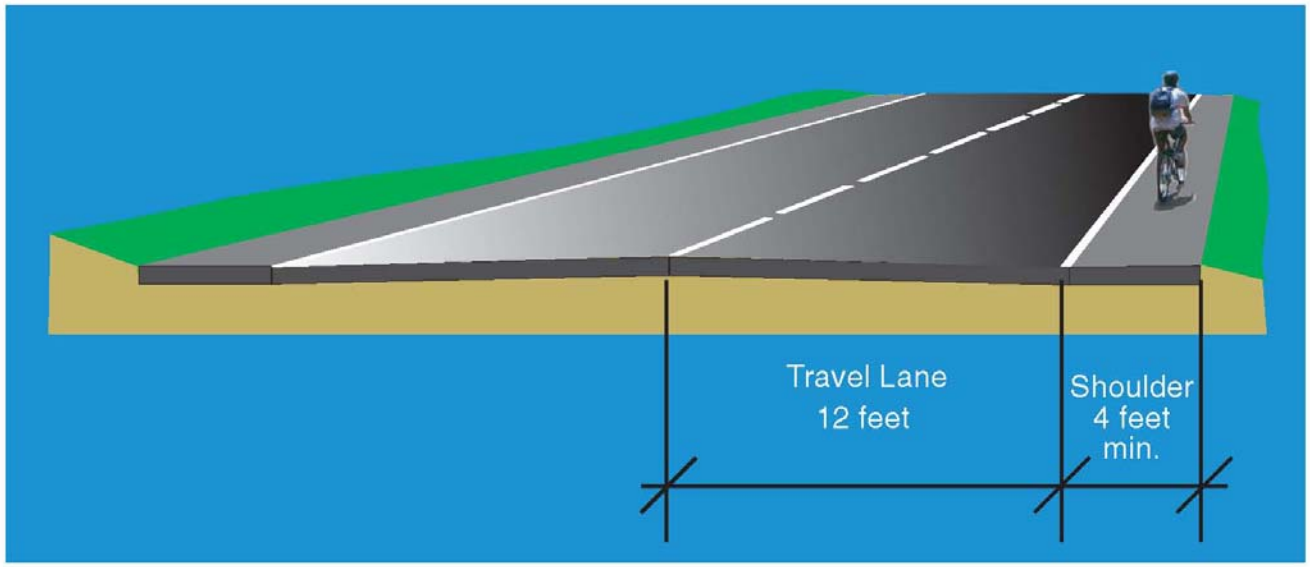
Variations of bike ways are depicted in Figures 9.3 – 9.9. The cross-sections illustrate shared road bike routes using shoulders and signage. They also show bike lanes that are separated from traffic with a paint stripe. Finally, Figure 9.9 shows a multi-purpose path that could be used for both bicyclists and pedestrians. Bikeway and pedestrian projects should be planned on highways, rural roads, and off-road pathways to provide facilities for a variety of users.

FIGURE 9.3: SHARED ROADWAY



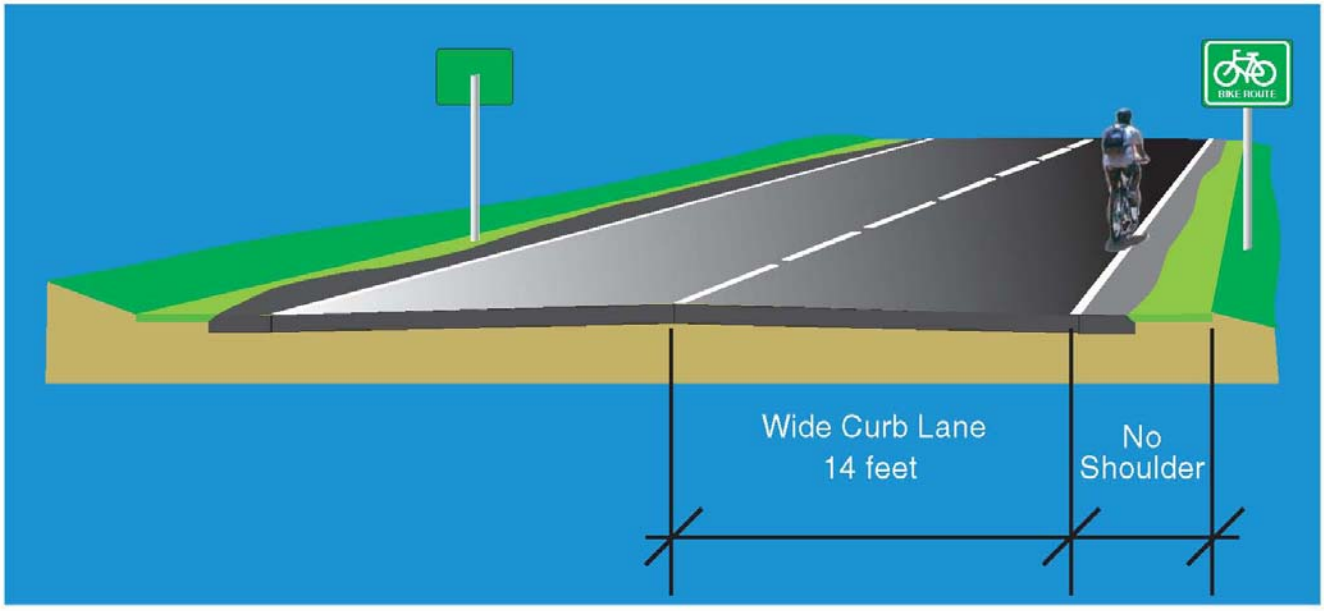
State Dept. of Transportation, Bike Plan Hawai'i, 2003.

FIGURE 9.4: SHARED ROADWAY WITH PAVED SHOULDER



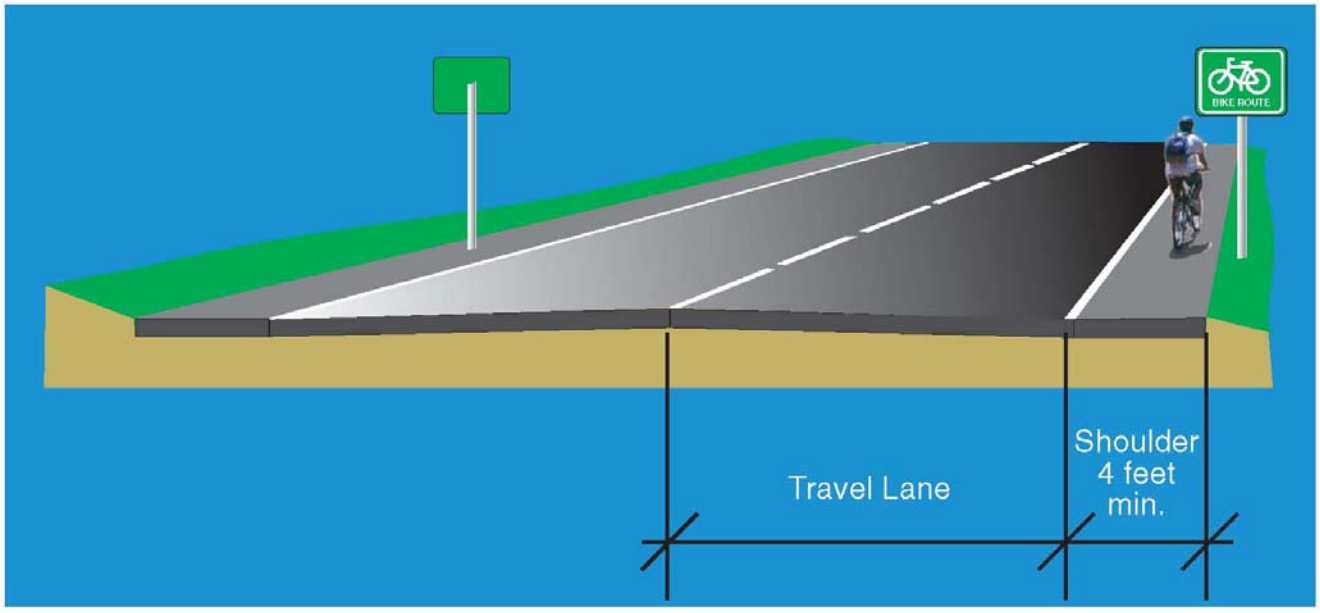
State Dept. of Transportation, Bike Plan Hawai'i, 2003.

FIGURE 9.5: SIGNED SHARED ROADWAY WITH WIDE CURB LANE



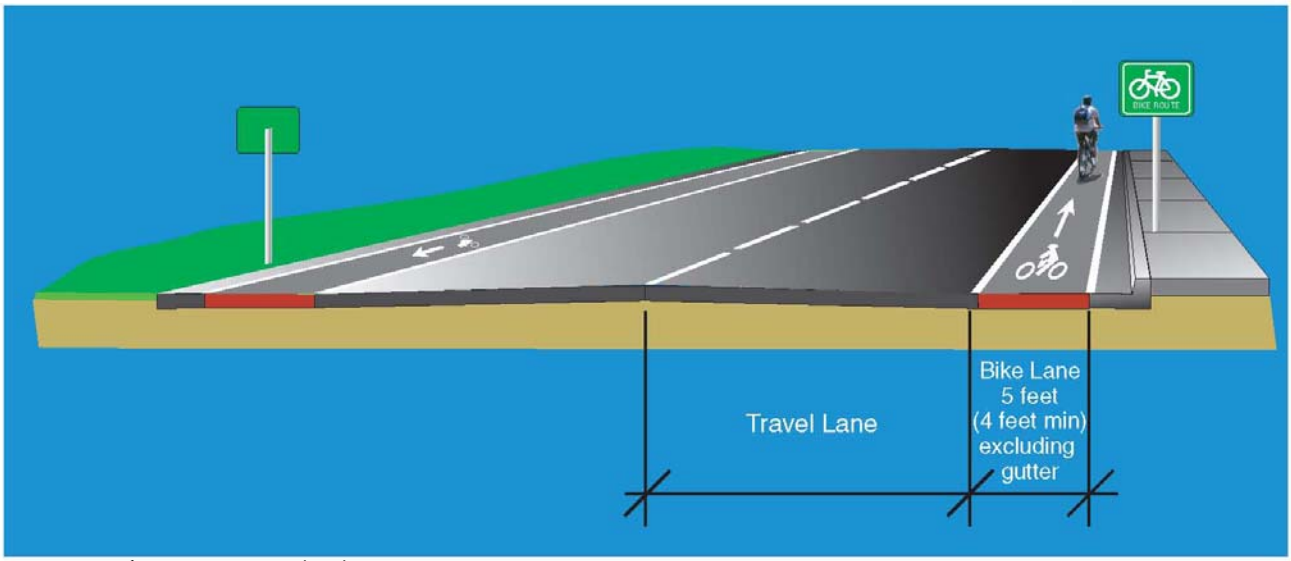
State Dept. of Transportation, Bike Plan Hawai'i, 2003.

FIGURE 9.6: SIGNED SHARED ROADWAY WITH PAVED SHOULDER



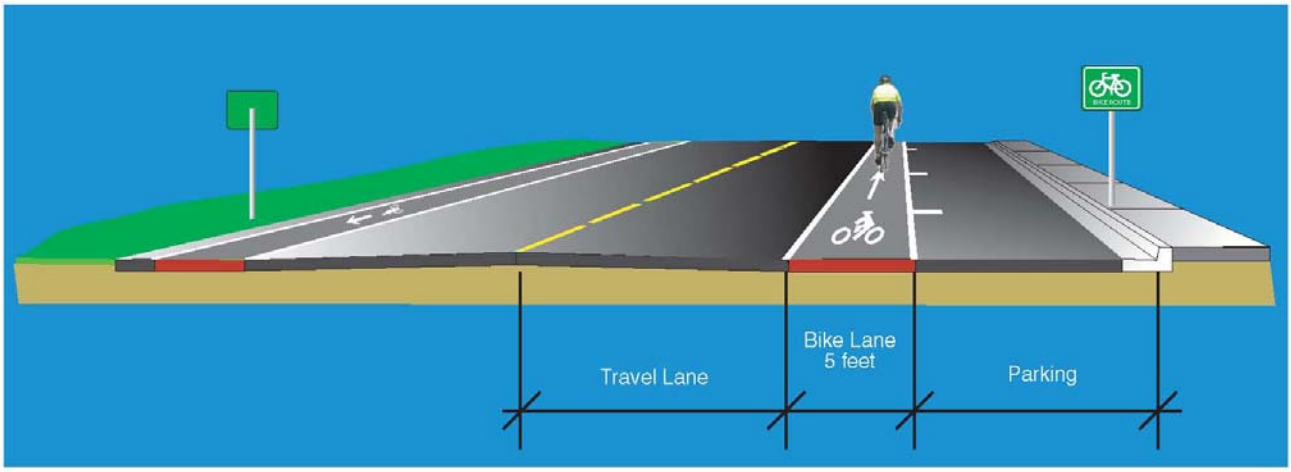
State Dept. of Transportation, Bike Plan Hawai'i, 2003.

FIGURE 9.7: BIKE LANE



State Dept. of Transportation, Bike Plan Hawai'i, 2003.

FIGURE 9.8: BIKE LANE WITH ON-STREET PARKING



State Dept. of Transportation, Bike Plan Hawai'i, 2003.

FIGURE 9.9: MULTI-PURPOSE PATH

State Dept. of Transportation, Bike Plan Hawai'i, 2003.

10. ELEMENT: CONNECTIVITY

10.1. The Problem

When Puna subdivisions were developed in the 1960's, there were few regulations. Each subdivision was developed as its own "pod" without connections to adjacent areas. Generally, subdivisions have access, in and out, through Highway 11 or 130. As more homes are built and the population increases, so does the demand on road systems. The disconnected pattern of streets results in large intersections at major junctions, greater congestion along major arterial streets, and an environment that discourages pedestrian and bicycle travel. The absence of connectivity impedes local circulation and does not provide residents with an option to traveling on major highways.

Good connectivity maximizes the efficiency of the transportation network, facilitating local and regional circulation. Overall, maximum connectivity is attained through limiting occurrences of cul-de-sacs; dead-end streets, isolated pod developments, and poorly connected subdivisions. When too many of these elements exist in a region, severe stress is placed on the few main arteries that hold them together. These arteries must then be widened to five or six lanes or larger to handle the heavy regional and local traffic demands placed onto them. The concentration of more daily vehicles onto each of these roadways invites continued strip development, which induces even more traffic.

10.2. What is Connectivity?

"Connectivity" suggests a system of streets with multiple routes and connections serving origins and destinations. Connectivity relates to the number of intersections along a segment of streets and how the entire area is connected to the system.

Connectivity between local streets and high-volume streets is a significant transportation issue. Interconnected streets ease traffic flow problems because they provide alternative routes, which help decrease the demand on any single street. Connectivity allows greater access for fire, medical, and law enforcement. The interconnected streets and neighborhoods also make emergency access easier, which improves overall safety in the community. In addition, connectivity reduces out-of-direction travel and vehicle miles traveled (VMT), enhances accessibility between various modes, and balances traffic levels between streets. Connectivity improvements to the street system include internal and adjacent site connections, which provide route choices for pedestrians, bicyclists, and automobiles. The benefits of connectivity fulfill values and guidelines established by this plan.

Many homes are tucked away because roads are disconnected and there is little through traffic. However, such a system is a "trade-off" because major traffic and congestion occur once residents leave their subdivision. The isolated "pods" of subdivisions are auto dependent and do not provide equal access for people without vehicles. Disconnection also increases costs for public transportation.

Connectivity benefits include:

- More direct routes to more places and with shorter trips.
- More choices in paths mean congestion can be relieved.
- Direct routing encourages walking and biking.
- Connected neighborhoods foster a greater sense of community.
- School bus routes for children are safer and shorter.
- Emergency service response times are shorter.
- Facilitates roadway maintenance.

There are some potential negative impacts associated with connectivity, including diversion of traffic into residential neighborhoods and agricultural areas and the diminished capacity on major streets due to new intersections. These impacts can be mitigated. To protect existing neighborhoods from potential traffic impacts, connector roadways should incorporate traffic calming into their design and construction. All stub-out streets should have signs indicating the potential for future connectivity so the community is aware of these plans.

10.3. How Do We Increase Connectivity?

The plan proposes to enhance connectivity with street connections and extensions throughout the Puna District. In addition to funding and constructing new connectors, other policy issues to pursue include emphasis on minimum network connections for new developments, support for traffic calming efforts designed to deter cut-through traffic in neighborhoods, and adoption of connectivity standards.

Actions to increase connectivity include:

- Implement connecting roads for large-scale plans that were ignored.
- Connect roads where connections were planned but never built.
- Seek to connect adjacent roads where there was a lack of planning in prior decades.
- Ensure that interconnected roads are designed to include adequate traffic calming devices.
- Ensure that all new subdivision and development plans contribute to an interconnected transportation system.

10.3.1. Connectivity Standards

New development that constructs new streets, or street extensions, should provide proposed street maps. Connectivity standards should be adopted to enforce requirements on vacant or re-developable parcels larger than five acres. Possible standards include:

- Subdivision provides full street connections with spacing of no more than a half-mile between connections except where prevented by barriers.
- Provides bike and pedestrian access ways in lieu of streets except where prevented by barriers.
- Limits use of cul-de-sacs and other closed-end street systems to situations where barriers prevent full street connections.
- Includes no close-end street longer than 220 feet or having no more than 25 dwelling units.
- Consideration of traffic calming devices.

10.4. Identifying Connectivity Routes

Existing streets were evaluated to identify where new connections could improve traffic circulation. Criteria were set to identify connection routes. Selection considered existing rights-of-way, street networks, parcels, and subdivision boundaries. A one-mile grid overlay was also used to identify where connections were critically needed. Whenever possible, at least one connection per mile was identified. Every effort was made to provide interconnection of various subdivisions. The CAG helped locate dead-ends and cul-de-sacs that could be connected to neighboring streets. Connections were selected based on emergency bypass, circulation, and location of schools.

Meetings and coordination with area landowners, community associations, and road maintenance corporations will be needed to develop connectivity where it is appropriate. In many cases, land acquisition is necessary to create connections. Parcel ownership or easements should be acquired now while land prices are still relatively affordable and development is still scattered. Each connection will require detailed analysis to resolve development issues. In some instances, it seems infeasible for the County to own and maintain small sections of roadway among private roads. Issues include:

- Does the immediate community (neighboring subdivisions) want the convenience of a connection?
- Should the connection be gated for emergency access only or remain open?
- Should the connection be consistent with adjacent street design with respect to right-of-way width, pavement, gravel, and street amenities?
- Who owns the connections? Neighboring subdivisions? Road maintenance corporations? The County? Collective ownership?
- Who is liable for connections and who is responsible for maintenance?

The PRCP identifies 34 alternative routes that could provide connections for vehicular, bicycle, transit, and/or pedestrian access within a one-mile grid. Of these alternatives, several were identified for emergency access routes. Figure 10.1 identifies proposed emergency access routes for upper Puna and Puna makai including:

1. PEAR
2. PEAR II
3. Railroad ROW Access
4. Kehau to Punawai
5. N. Peck Rd. to Ihope Rd.
6. N. Kulani Rd. to Stainback Hwy.

10.5. Community Perspectives

Improvements and connections need to be developed with respect to community desires, especially because majority of the identified connections are in private subdivisions. Many residents enjoy the seclusion that undeveloped roads afford and are adamantly against connectivity. Several residents commented that construction of connector roads would result in further destruction of native habitat, introduction of invasive weeds, increased noise levels and associated increase in property theft.

Other residents commented that they might be receptive to connectivity if it was done all at once. Piecemeal implementation would not be supported because of the possibility that the individual route would be expanded in the future. The proposed connections should be undertaken comprehensively as an entire system. "Connectivity as a whole sounds best or not at all." There needs to be a mechanism (not verbal promises) that guarantees protection to residents. In this way communities may be more accepting of connections if others also experience similar improvements. The goal of connectivity is to create alternative routes and improve circulation. If successful the "intrusion" caused by connectivity and through traffic can be diminished by resulting benefits.

Specifically residents opposed:

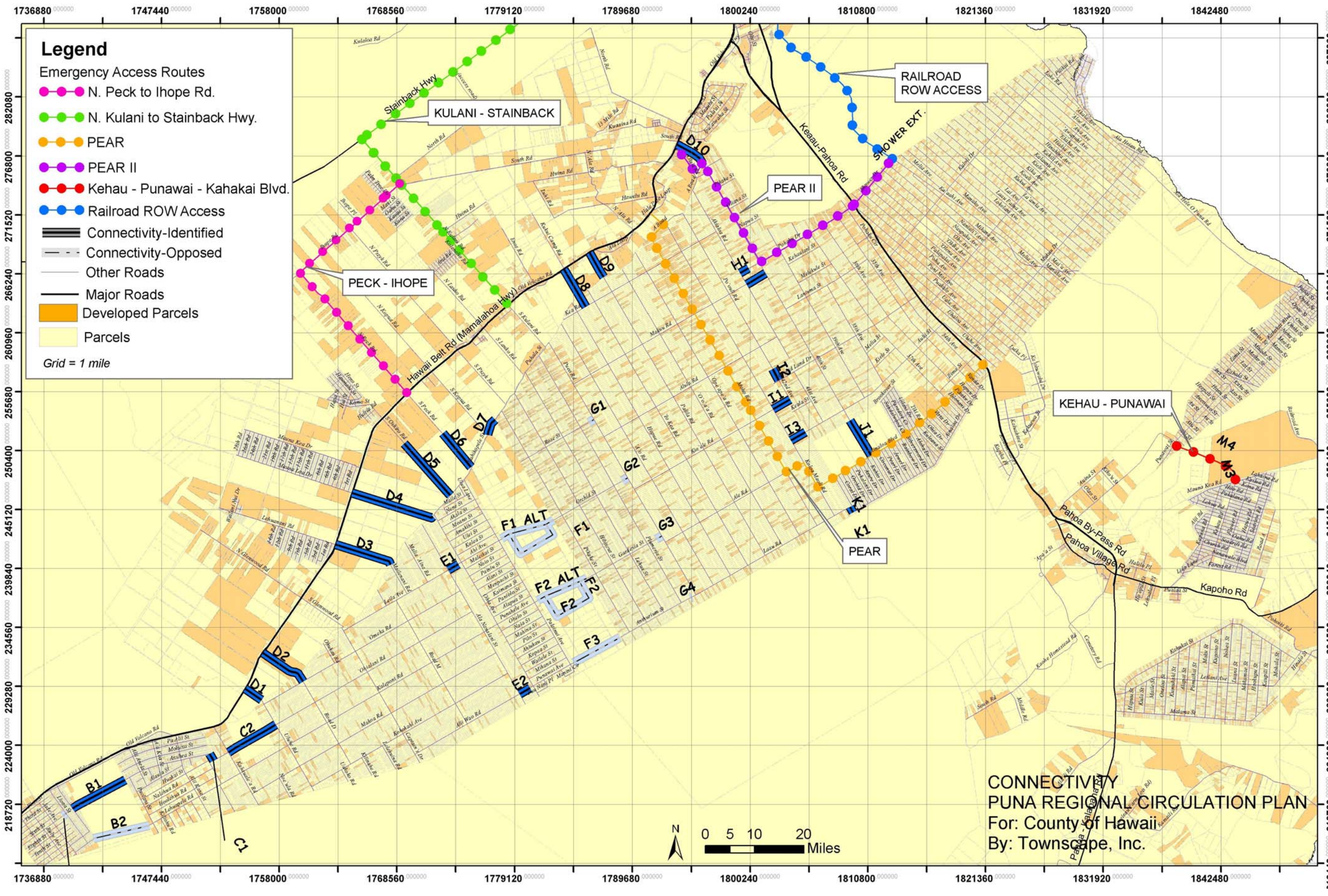
- A1 connecting 6th Street to Uliuli Street in Mauna Loa Estates
- B2 connecting Volcano and Aloha Estates – this connection establishes a corridor to expand Kaleponi Drive in Fern Forest. Many do NOT want this corridor as a future highway. This connection would "open the door" (even if gated emergency only);
- F1, F2, F3 connecting Eden Rock and Fern Acres through Kopua Farmlots; and
- G1, G2, G3 connecting Fern Acres and Hawaiian Acres.

TABLE 10.1: CONNECTIVITY ROUTE ANALYSIS

MAP NO.	Route/Alt./Parcel	Distance FT.	Construction cost	Connection Parcel	Tot. Parcel Size	Owners	Street 1	Street 2	Owner 1	Owner 2
A	A	350	$70,000	-	-	-	6th St.	Uliuli St.	Mauna Loa Estates Rd. Maint.	Road
				311063097	0.3214	Garetha Pty Limited				
B1	B1	5730	$1,146,000	-	-	-	Uliuli St.	Anuhea St.	Road (Other)	Manoa Finance Company
	B1-a	350	$70,000	311058075, 311058076	0.21, 0.36	Yamabe, Harry				
	B1-b	350	$70,000	311058078, 311058077	0.21, 0.37	Blosser, Mark Chandler				
	B1-c	130	$26,000	311058062	3.572	Howard, Richard Lee				
	B1-d	4900	$980,000	311004010	785	W.H. Shipman Ltd.				
B2	B2	5125	$1,025,000	-	-	-	Ala`ohi`a St.	Lehuapele Rd.	Road (Other)	Manoa Finance Company
	B2-a	75	$15,000	311060029	0.25	Hiestand, Marilyn				
	B2-b	5050	$1,010,000	311004010	785	W.H. Shipman Ltd.				
C1	C1	725	$145,000	-	-	-	Anuhea	Kilikaa Rd. (Road X)	Manoa Finance Company	Fern Forest Community Assn.
				311020139	3.4	Williams, Margaret				
C2	C2	4940	$988,000	-	-	-	Kilika Rd. (Road X)	Ohialani Rd.	Fern Forest Community Assoc.	Fern Forest Community Assn.
	C2-a	3200	$640,000	311004013	271.00	LEE,ALFRED H S TRUST /etal				
	C2-b	800	$160,000	311020105	3.00	MELEMAI,LUCILLE L				
	C2-c	940	$188,000	311023078	3.44	ADACHI,JANET I /etal				
D1	D1	1776	$355,200	-	-	-	Ulehe	Hawaii Belt Rd.	Fern Forest Community Assoc.	State of Hawaii
	D1	1776	$355,200	318009019	n/a	State of Hawaii				
D2	D2	4400	$880,000	-	-	-	Road D	Hawaii Belt Rd.	Fern Forest Community Assoc.	State of Hawaii
	D2-a	1600	$320,000	311024152	3	Kerley, Joseph, etal				
				311023173	3	Milord, James				
	D2-b	2800	$560,000	318009018	101.5	Oshiro, Lillian, etal				
D3	D3	5550	$1,110,000	-	-	-	Hawaii Belt Rd.	Mailenani Rd.	State of Hawaii	Fern Forest Community Assn.
	D3-a	5250	$1,050,000	318008999	n/a	Road				
	D3-b	300	$60,000	318008008	n/a	State of Hawaii				
D4	D4	7500	$1,500,000	-	-	-	Hawaii Belt Rd.	Kahikopele St./Ohia	State of Hawaii	Hawaii Mountain View Dev. Corp.
		7500	$1,500,000	318008999	n/a	Road				
D5	D5	6300	$1,260,000	-	-	-	S. Oshiro Rd.	Kahikopele St.	Road (Other)	Hawaii Mountain View Dev. Corp.
		6300	$1,260,000	318008999	n/a	Road				
D6	D6	4000	$800,000	-	-	-	S. Peck Rd.	Kahikopele St.	Road (Other)	Hawaii Mountain View Dev. Corp.
				318004084	54.4	Fabrigas, Andres				
				318004095	118.4	Pace, John H.				
D7	D7	1500	$300,000	-	-	-	Kahikopele St.	Puhala St.	Hawaii Mountain View Dev. Corp.	Fern Acres
				318002999		Road (other)				
				311100042	28	H. Tanouye & Sons, Inc.				
D8	D8	3800	$760,000	-	-	-	Road B	Hawaii Belt Road	Nishimura, Mitsushi TR (HA)	State of Hawaii
				316033036	3	Bush, James				
				316033035	3	Kitamori, Kuniyaki				
				316033037	3	Cameron, Lisa Mae				
				316033049	3	Frech, Carmen				
				316033038	3	Pukini, Howard				
				316033048	3	Chee, Annette				
				316033039	3	Pukini, William				
				316033047	3	Lau, Rueben TR				
				316033040	8.4	Cernek, Cecile				
				317009999	n/a	Road (Other)				
D9	D9	2500	$500,000	-	-	-	Road 5	Hawaii Belt Road	Nishimura, Mitsushi TR (HA)	State of Hawaii
				317009001	17.7	Todd, Marion, TR				
				317009021	2.75	Oga, Lucille				
				317009019	2.5	Johnston, Anthony				
D10	D10	3000	$600,000	-	-	-	40th	Hawaii Belt Road	Hawaii Development Inc.	State of Hawaii
				317001058	18	Kay, Erlinda TR				
				317001003	12.9	Suzuki, Harry				
				317001059	0.6	Suzuki, Harry				
E1	E1	2100	$420,000	-	-	-	Leila	Ahi Ave	Fern Forest Community Assoc.	Hawaii Mountain View Dev. Corp.
	E1-a	1050	$210,000	311034037	3	Westfall, Monte Fay				
	E1-b	1050	$210,000	311034038	3	Altizer, Lowell				
E2	E2	1085	$217,000	-	-	-	Alii Wao	Punawai Ave.	Fern Forest Community Assoc.	Hawaii Mt. View Dev. Corp
		1085	$217,000	311034139	3	SIMPSON,PAUL LEROY				
				311034140	3	ALLAN M. YOZA TR.				
F1	F1		$280,000	-	-	-	Ahi Ave.	Orchid St.	Hawaii Mountain View Dev. Corp.	Fern Acres (Cresent Acres)
	F1-a	700	$140,000	311100002	20	Rees, Kanita				
	F1-b			311100051	73	Kopua Farm Lots				
	F1-c	700	$140,000	311100050	20	Peneku, John				
F1 ALT	F1 ALT	3320	$664,000	-	-	-	Ahi Ave.	Orchid St.	Hawaii Mountain View Dev. Corp.	Fern Acres (Cresent Acres)
				311100021	20	GERVAIS,JENNIFER LYNNE /etal				
				311100022	20	PATTEN,ROBERT WAINE /etal				
				311100027	20	SANTIAGO,NORMAN J JR				
				311100028	20	SANTIAGO,NORMAN J JR				
F2	F2	1400	$280,000	-	-	-	Punahele Ave.	Gardenia St.	Hawaii Mountain View Dev. Corp.	Fern Acres (Cresent Acres)
	F2-a	700	$140,000	311101007	20	Jameeluddin, Mohammed				
	F2-b			311100051	20	Kopua Farm Lots				
	F2-c	700	$140,000	311101059	20	Hlavaty, Edward				
F2 ALT	F2 ALT	3288	$657,600	-	-	-	Punahele Ave.	Gardenia St.	Hawaii Mountain View Dev. Corp.	Fern Acres (Cresent Acres)
		3288	$657,600	311101019	20	SCHRADER,JODIANN KIMI /etal				
				311101046	20	SANCHEZ,OSCAR O				
F3	F3	4700	$940,000	-	-	-	Punawai Ave.	Anthurium St.	Hawaii Mountain View Dev. Corp.	Fern Acres (Cresent Acres)
	F3-a	100	$20,000	311100051	20	Kopua Farm Lots				
	F3-b	700	$140,000	311101032, 311101001	20	Farrar, Christine				
	F3-c	1600	$320,000	311101031	20	Baxster, Brian				
	F3-d	1600	$320,000	311101033-311101034	20	Cumming, Tom			Fern Acres (Cresent Acres)	
	F3-e	700	$140,000	311101064	20	Bennett, Suzanne				
G1	G1	550	$110,000	-	-	-	Rose St.	Pueoo (Road 1)	Fern Acres (Cresent Acres)	Nishimura, Mitsushi
		550	$110,000	316016084	1.868	Hogge, Marcella Irenes				
G2	G2	550	$110,000	-	-	-	Orchid St.	Pueoo (Road 1)	Fern Acres (Cresent Acres)	Nishimura, Mitsushi
		550	$110,000	316018080	1.868	Takeshita, Herbert				
G3	G3	550	$110,000	-	-	-	Gardenia St.	Pueoo (Road 1)	Fern Acres (Cresent Acres)	Nishimura, Mitsushi
		550	$110,000	316020076	1.868	Sala, Gaynell Kamlin Cabral				
G4	G4	160	$32,000	-	-	-	Anthurium St.	Laau (Road G)	Fern Acres (Cresent Acres)	Nishimura, Mitsushi
		160	$32,000	316022118	3.1	Meriwether, Kanoa				
H1	H1	875	$175,000	-	-	-	Akialoa Rd. (Road 11	Pohaku Drive	Nishimura, Mitsushi TR (HA)	Hilo Development Inc.
		875	$175,000	316058080	3	Uruu, Helen				
H2	H2	2800	$560,000	-	-	-	Akialoa Rd. (Road 11	40th Street	Nishimura, Mitsushi TR (HA)	Hilo Development Inc.
	H2-a	1800	$360,000	316058073, 316058090	3.4	Marshall, Jaime				
	H2-b	1000	$200,000	316012156	3	Simeona, July				
I1	I1	1800	$360,000	-	-	-	Kioele St. (Road E)	42nd Ave.	Nishimura, Mitsushi TR (HA)	Hilo Development Inc.
	I1-b	1300	$260,000	316048073	5.1	Lowden, David George				
	I1-a	500	$100,000	316005132	4.14	Neel, Sharon				
I2	I2	1500	$300,000	-	-	-	Road 9	Aulii	Nishimura, Mitsushi TR (HA)	Hilo Development Inc.
	I2-a			316046087	5.3	Hauschildt-Purres, Marens				
	I2-b			316046088	5.3	Smith, Alan Dean				
I3	I3	1200	$240,000	-	-	-	Road 10	42nd Ave.		
	13-a			316005144	2.98	Wilson, Waldo TR				
	13-b			316061033	3.019	Hirayama, Carol				
J1	J1	3600	$720,000	-	-	-	40th Ave.	Ainaloa Blvd.	Hilo Development Inc.	Ainaloa Community Association
	J1	3600	$720,000	316004022	200	Shellstone Realty Corp.				
K1	K1	600	$120,000	-	-	-	Laau Road (Road G)	Ainaloa Drive	Nishimura, Mitsushi TR (HA)	Ainaloa Community Association
	K1	600	$120,000	316044091	2.8	Vaughn, Illume				
*COUNTY/STATE HIGHWAY? ($400/LF)***										
M1	M1	5600	$2,240,000	-	-	-	Aama St.	Kehau	County of Hawaii	
	M1-a	1900	$760,000	315009006	58.14	Kamehameha Schools				
	M1-b	700	$280,000	315009005	58.14	Kamehameha Schools				
	M1-c	3000	$1,200,000	314003011	930	Kamehameha Schools				

** All Rural road costs: $200/LF*

FIGURE 10.1: CONNECTIVITY



11. REGIONAL CIRCULATION PLAN

11.1. The Puna Regional Circulation Plan

The *Puna Regional Circulation Plan* proposes projects that provide multi-modal choices, connectivity, equity, capacity, and safety. Implementation of *Bike Plan Hawai'i* projects is assumed to serve two percent of the peak hour travel demand. Transit serves as much as 12 percent of the peak hour travel demand. Needed roadway improvements include a two-lane PMAR from Hilo to Puna Makai, widening of Highway 130 between Kea'au and Pahoa, and widening of Highway 11 between Kea'au and Kurtistown. The plan also identifies emergency connectivity routes.

The Puna Regional Circulation Plan is based on several assumptions:

- A level of congestion is acceptable to help switch transportation mode choices. As a result, the plan will NOT improve existing congestion levels.
- Village centers will develop within the planning horizon bringing jobs and services closer to residents. This change will reduce the trip demand.
- Optimistic levels of transit and bike ridership are attainable with capital and programmatic improvements.

The Puna Regional Circulation Plan proposes:

1. **Bus Transit Expansion** - addressing schedules, headways, and fleet providing more equity in transportation service for elderly, children, low income. Projects include programming for marketing and education, seven park and ride facilities, and a transit master plan. The plan proposes the development of a bus only lane along the Puna Makai Alternate Route (PMAR) and expansion of the bus fleet to 24 with 15-minute headways during peak-hour traffic. (For more detail on transit projects see Section 7.0).
2. **Bike and Pedestrian Facilities** - that are interconnected and integrated with other transportation modes (car, bus, etc.) The plan proposes implementation of Bike Plan Hawai'i Priority 1 and 2 projects. Development of any new road facilities should provide adequate rights-of-way for bike facilities. The plan identifies two key projects, the Railroad Avenue Multi-purpose Pathway and Old Volcano Trail. A Safe Routes to School (SR2S) program should also be implemented. (For more details on bike paths and multipurpose paths see Section 9.0).

3. **Connectivity -** projects that interconnect subdivisions and create emergency connections. This would improve local circulation patterns and provide equal access. The plan proposes 6 emergency access routes. (For more details on methodology and projects see Section 10.0).
4. **An alternate route to Highway #130** - An alternate route to Kea'au-Pāhoa Highway providing redundancy, emergency access, multi-modal choices, and capacity. The project could include infrastructure for bicyclists, pedestrians, and transit. The plan identifies several alternative alignments from Hilo to Hawaiian Paradise Park, Hawaiian Beaches, and/or Nānāwale. (For more information on the PMAR alternatives see Section 8).
5. **Widening** – of Highway 130 from two to four lanes from Kea'au to Pahoa. Widen Highway 11 from two to four lanes from Kea'au to Huina Street in Kurtistown. Shifts in mode choices and village center development will take time so road expansion continues to be needed.

TABLE 11.1: THE PUNA REGIONAL CIRCULATION PLAN

TRANSPORTATION ELEMENT	PROJECTS	TOTAL COST (MIL)	FORMULA
THE PRCP PLAN			
Village Land Use Development			
Transit EXPANSION - MIN 12.5%		**$15.5**	
Capital Costs (24 buses)		$12.0	
Park & Ride Facilities (7 - 1 acre sites with 100 stalls each)		$3.50	*$500,000/lot*
New Dedicated "Bus Lane" (PMAR)		$0.0	*12 Miles * $4 mil/mile*
Bikeway Improvements - serve (2%)	Priority 1 and 2	**$26.6**	*Bike Plan Hawaii*
PMAR - 2 vehicle lanes & bus lane		**$120.0**	*12 Miles * $10 mil/mile*
Widening		**$63.0**	
Keaau-Kurtistown (Hwy. 11) - 2 to 4 lanes (2.5 miles)		$15.0	*2.5 Miles * $6 mil/mile*
Keaau-Pahoa (Hwy. 130) - 2 to 4 lanes (8 miles)		$48.0	*6 Miles * $6 mil/mile*
Connectivity Projects	12 projects	**$7.7**	*Connection LF * $400/SF*
	TOTAL	**$232.8**	
Operations and Maintenance (annual)		$7.5	*See Bus Calculations*
Bus Transit		$7.5	
Transportation Demand Management		Varies	

FIGURE 11.1: PUNA REGIONAL CIRCULATION PLAN

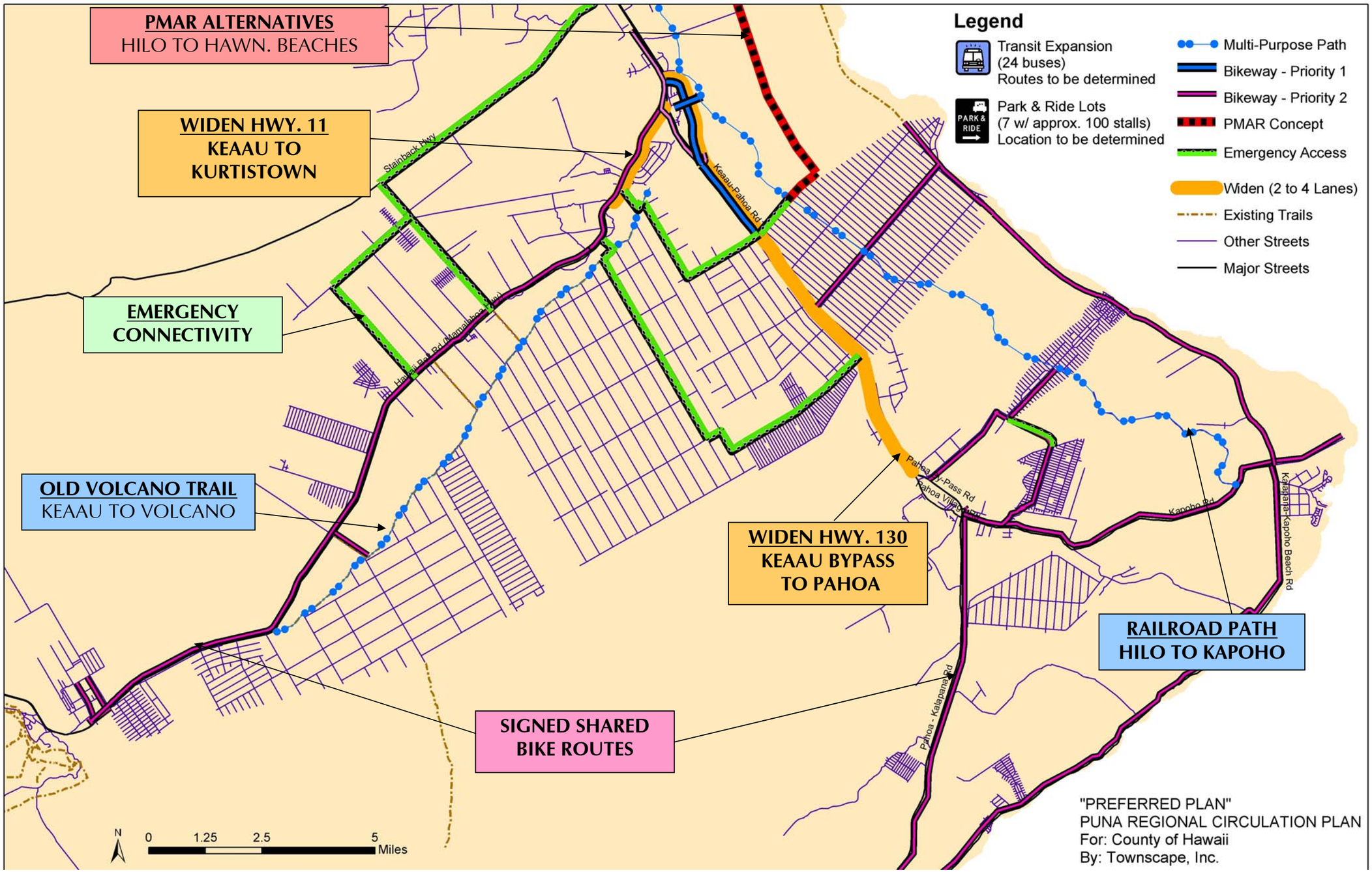


TABLE 11.2: PRCP PROJECTS AND COSTS

TRANSPORTATION ELEMENT	PROJECTS	TOTAL COST (MIL)	FORMULA
A. "LIMITED ROAD CONSTRUCTION" - Multi-modal Emphasis			
Village Land Use Development			
Transit MAJOR EXPANSION - serves (7-36%)		**$76.5**	
Capital Costs (46 buses)		$23.0	*See Bus Calculations*
New Dedicated "Bus Lane" (Hwy. 130)		$48.0	*12 Miles * $4 mil/mile*
Park & Ride Facilities (11 - 1 acre sites with 100 stalls each)		$5.50	*$500,000/lot*
Bikeway Improvements - serve (2-11%)	All Bike Plan HI Projects	**$33.7**	*Bike Plan Hawaii Priority 1-3*
Widening (Committed)		**$48.0**	
Keaau-Pahoa (Hwy. 130) - 4 lanes (8 miles)		$48.0	*8 Miles * $6 mil/mile*
Connectivity Projects	12 projects	**$7.7**	*Connection SF * $400/SF*
	TOTAL	**$165.9**	
Operations and Maintenance (annual)		**$9.4**	
Bus Transit		$9.4	*See Bus Calculations*
Transportation Demand Management		Varies	
B. "LIMITED MULTI-MODAL" - Vehicle Emphasis			
Past Trends Land Use Development			
Transit IMPROVED - serves 5-10%		**$11.5**	
Capital Costs (21 buses)		$10.5	*See Bus Calculations*
Park & Ride Facilities (2 - 1 acre sites with 100 stalls each)		$1.00	*$500,000/lot*
Bikeway Improvements - serve (1%)	Proj 30a, 32, 35, 30b, 31a, 47a	**$5.4**	*Bike Plan Hawaii*
PMAR - 2 lanes with multi-purpose path		**$75.2**	*12 Miles * $6 mil/mile + 12*$264,000/mile*
Widening		**$81.0**	
Hilo-Keaau - 4 to 6 lanes (5 miles)		$30.0	*5 Miles * $6 mil/mile*
Keaau-Kurtistown (Hwy. 11) - 2 to 4 lanes (2.5 miles)		$15.0	*2.5 Miles * $6 mil/mile*
Keaau-Ainaloa (Hwy. 130) - 2 to 4 lanes (6 miles)		$36.0	*6 Miles * $6 mil/mile*
	TOTAL	**$173.1**	
Operations and Maintenance (annual)		**$6.0**	
Bus Transit		$6.0	*See Bus Calculations*
C. "EXISTING ROUTES" - Multi-modal & Vehicle Balanced			
Past Trends Land Use Development			
Transit EXPANSION - serves 15%		**$57.0**	
Capital Costs (38 buses)		$19.0	
New Dedicated "Bus Lane" (Hwy. 130)		$32.0	*8 Miles * $4 mil/mile*
Park & Ride Facilities (12 - 1 acre sites with 100 stalls each)		$6.00	*$500,000/lot*
Bikeway Improvements - serve (2%)	Priority 1 and 2 Projects	**$26.6**	*Bike Plan Hawaii*
Widening		**$81.0**	
Hilo-Keaau - 4 to 6 lanes (5 miles)		$30.0	*5 Miles * $6 mil/mile*
Keaau-Kurtistown (Hwy. 11) - 2 to 4 lanes (2.5 miles)		$15.0	*2.5 Miles * $6 mil/mile*
Keaau-Ainaloa (Hwy. 130) - 2 to 4 lanes (6 miles)		$36.0	*6 Miles * $6 mil/mile*
Connectivity Projects	12 projects	**$7.7**	*Connection SF * $400/SF*
Additional Capacity Needed - WIDEN		**$15.0**	
Hilo-Keeau 1 lane -OR- increase TDM		$15.0	*5 Miles * $3 mil/mile*
	TOTAL	**$187.3**	
Operations and Maintenance (annual)		$9.0	*See Bus Calculations*
Bus Transit		$9.0	
Transportation Demand Management		Varies	

TRANSPORTATION ELEMENT	PROJECTS	TOTAL COST (MIL)	FORMULA
D. "NEW ALTERNATE ROUTES" - Multi-modal & Vehicle Balanced			
Past Trends Land Use Development			
Transit MAJOR EXPANSION - serves 15%		**$24.3**	
Capital Costs (38 buses)		$19.0	
New Dedicated "Bus Lane" (PMAR)		$0.0	*12 Miles * $4 mil/mile*
Park & Ride Facilities (12 - 1 acre sites with 100 stalls each)		$5.30	*$500,000/lot*
Bikeway Improvements - serve (2%)	Priority 1 and 2, No RR	**$21.8**	*Bike Plan Hawaii*
PMAR - 2 vehicle lanes, multi-purpose path & bus lane		**$123.2**	*12 Miles * $10 mil/mile + 12*$264,000/mile*
Widening		**$45.0**	
Hilo-Keaau - 4 to 6 lanes (5 miles)		$30.0	*5 Miles * $6 mil/mile*
Keaau-Kurtistown (Hwy. 11) - 2 to 4 lanes (2.5 miles)		$15.0	*2.5 Miles * $6 mil/mile*
Connectivity Projects	12 projects	**$7.7**	*Connection SF * $400/SF*
	TOTAL	**$222.0**	
Operations and Maintenance (annual)		$9.0	*See Bus Calculations*
Bus Transit		$9.0	
Transportation Demand Management		Varies	
E. "REASONABLE CHANGE" - Multi-modal & Vehicle Balanced			
Past Trends Land Use Development			
Transit EXPANSION - serves 10%		**$13.5**	
Capital Costs (21 buses)		$10.0	
Park & Ride Facilities (7 - 1 acre sites with 100 stalls each)		$3.50	*$500,000/lot*
New Dedicated "Bus Lane" (PMAR)		$0.0	*12 Miles * $4 mil/mile*
Bikeway Improvements - serve (1%)	Priority 1 and 2	**$26.6**	*Bike Plan Hawaii*
PMAR - 2 vehicle lanes & bus lane		**$120.0**	*12 Miles * $10 mil/mile*
Widening		**$81.0**	
Hilo-Keaau - 4 to 6 lanes (5 miles)		$30.0	*5 Miles * $6 mil/mile*
Keaau-Kurtistown (Hwy. 11) - 2 to 4 lanes (2.5 miles)		$15.0	*2.5 Miles * $6 mil/mile*
Keaau-Ainaloa (Hwy. 130) - 2 to 4 lanes (6 miles)		$36.0	*6 Miles * $6 mil/mile*
Connectivity Projects	12 projects	**$7.7**	*Connection SF * $400/SF*
	TOTAL	**$248.8**	
Operations and Maintenance (annual)		$6.5	*See Bus Calculations*
Bus Transit		$6.5	
Transportation Demand Management		Varies	
THE PRCP PLAN: "COMMUNITY VALUES & GOALS"			
Village Land Use Development			
Transit EXPANSION - MIN 12.5%		**$15.5**	
Capital Costs (24 buses)		$12.0	
Park & Ride Facilities (7 - 1 acre sites with 100 stalls each)		$3.50	*$500,000/lot*
New Dedicated "Bus Lane" (PMAR)		$0.0	*12 Miles * $4 mil/mile*
Bikeway Improvements - serve (2%)	Priority 1 and 2	**$26.6**	*Bike Plan Hawaii*
PMAR - 2 vehicle lanes & bus lane		**$120.0**	*12 Miles * $10 mil/mile*
Widening		**$63.0**	
Keaau-Kurtistown (Hwy. 11) - 2 to 4 lanes (2.5 miles)		$15.0	*2.5 Miles * $6 mil/mile*
Keaau-Pahoa (Hwy. 130) - 2 to 4 lanes (8 miles)		$48.0	*6 Miles * $6 mil/mile*
Connectivity Projects	12 projects	**$7.7**	*Connection SF * $400/SF*
	TOTAL	**$232.8**	
Operations and Maintenance (annual)		$7.5	*See Bus Calculations*
Bus Transit		$7.5	
Transportation Demand Management		Varies	

11.2. Plan Alternatives

A total of six alternatives were considered in the Puna Regional Circulation Plan. Two variations of land use were applied to the alternatives: "past trends continued" and "village centers" (see Section 5 for more details). Alternatives B-E used the "past trends continued" land use scenario. Alternative A and the Preferred PRCP Plan applied the "village centers" land use scenario. This resulted in Kea'au-Hilo travel demands about 80 percent of that in the "past trends" scenario. With "village centers", travel demands for road segments farther from Hilo are slightly higher. This difference is the result of an increase in local trips.

TABLE 11.3: DESCRIPTION OF ALTERNATIVES

ALTERNATIVE	DESCRIPTION
A	"LIMITED ROAD CONSTRUCTION" Multi-modal Emphasis
B	"LIMITED MULTI-MODAL" Vehicle Emphasis
C	"EXISTING ROUTES" Multi-modal & Vehicle Balanced
D	"NEW ALTERNATE ROUTES" Multi-modal & Vehicle Balanced
E	"REASONABLE CHANGE" Multi-modal & Vehicle Balanced
PRCP PLAN	**"PREFERRED PLAN"**

Level of Service (LOS) is defined as a "qualitative measure describing operational conditions within a traffic stream". LOS is one of several factors to consider when reviewing alternatives. Several factors help determine LOS including speed, delay, vehicle density, freedom to maneuver, traffic interruptions, and driver comfort. LOS "A", "B", and "C" are considered satisfactory levels of service. LOS "D" is generally considered a "desirable minimum" operating level of service. LOS "E" is an undesirable condition, and LOS "F" is an unacceptable condition. Table 11.4 presents criteria for Level of Service for signalized and unsignalized intersections.

TABLE 11.4 – INTERSECTION LEVEL OF SERVICE CRITERIA[16]

LOS	Signalized Intersections		Unsignalized Intersections	
	Delay (sec/veh)	Description	Delay (sec/veh)	Description
A	≤10	Few stops, little or no delay	≤10	Little or no delays
B	>10-20	Good progression, short cycle lengths	>10-15	Short delays
C	>20-35	Cycle failures begin to occur, i.e. vehicles stop at more than one red phase	>15-25	Average delays
D	>35-55	Noticeable number of cycle failures, unfavorable progression	>25-35	Long delays
E	>55-80	Frequent cycle failures, poor progression, long delays	>35-50	Very long delays
F	>80	Over saturation, many cycle failures, high delays	>50	Extreme delays

11.2.1. Description of Alternatives

In Alternative A, "Limited Road Construction", road widening would be limited to committed projects; i.e., widening of Highway 130 between Kea'au and Pahoa. The community requested an alternative that assumed no new road construction or widening projects. If all available funds were used for alternate modes of travel, what might this look like? Improved bicycle and pedestrian facilities are estimated to divert up to 100 peak hour trips, up to a maximum of 10 percent of the total demand. The highway system is assumed to operate at or near capacity conditions, and the remaining travel demand is assumed to be served by transit, specifically express buses. A bus dedicated lane on Highway 130 would be required to increase transit travel times at least equal to vehicle travel. Time saving is necessary to attain high-level ridership.

[16] *According to Highway Capacity Manual (HCM), Special report 209, Transportation Research Board.*

TABLE 11.5: ALTERNATIVE ELEMENTS

Plan Alternative	Land Use	Transit Ridership Buses Req.	Bus Only Lane[1]	Bike Ridership	Railroad Path	PMAR 2 Lanes	Connectivity Projects	Widen Hwy.130	Widen Hwy. 11 Kea'au-Huina	Widen Hwy. 11 Hilo-Kea'au	Cost Estimate (mil)
A	Village	7-36% / 46	✓ 130	2-11%	✓		✓	✓			$166
B	Past Trends	0-9% / 21		1%		✓ [2]		✓ [3]	✓	✓	$173
C	Past Trends	15% / 38	✓ 130	2%	✓		✓	✓ [3]	✓	✓	$187
D	Past Trends	15% / 38	✓ PMAR	2%		✓ [2]	✓		✓	✓	$222
E	Past Trends	10% / 21	✓ PMAR	1%	✓	✓	✓	✓	✓	✓	$249
PLAN	**Village**	**12.5% / 24**	✓ **PMAR**	**2%**	✓	✓	✓	✓	✓		**$233**

In Alternative A, 36 percent of the travel demand between Kea'au and Hilo would be served by transit, requiring 36 bus trips during the peak hour. Highway 11 from Hilo to Mountain View would be congested with LOS E as well as Highway 130 from Kea'au to Ainaloa with LOS E-F. Benefits of this alternative include reduced roadway construction costs and environmental impacts, and creation of multi-modal choices. Projects under Alternative A help fulfill many of the community guidelines outlined in Section 2. However, estimated ridership for transit and bikeways represent extreme goals. The feasibility of this alternative could be compromised by such high and unreasonable ridership expectations. Alternative A has the lowest capital cost estimate at $166 million. This would be offset by sizable operations, maintenance, and programmatic costs necessary to attempt highly optimistic ridership goals.

[1] *Bus Only Lanes accommodated on Hwy. 130 or PMAR project.*
[2] *Project includes multi-purpose path.*
[3] *Widening only till Ainaloa Blvd.*

FIGURE 11.2: ALTERNATIVE A

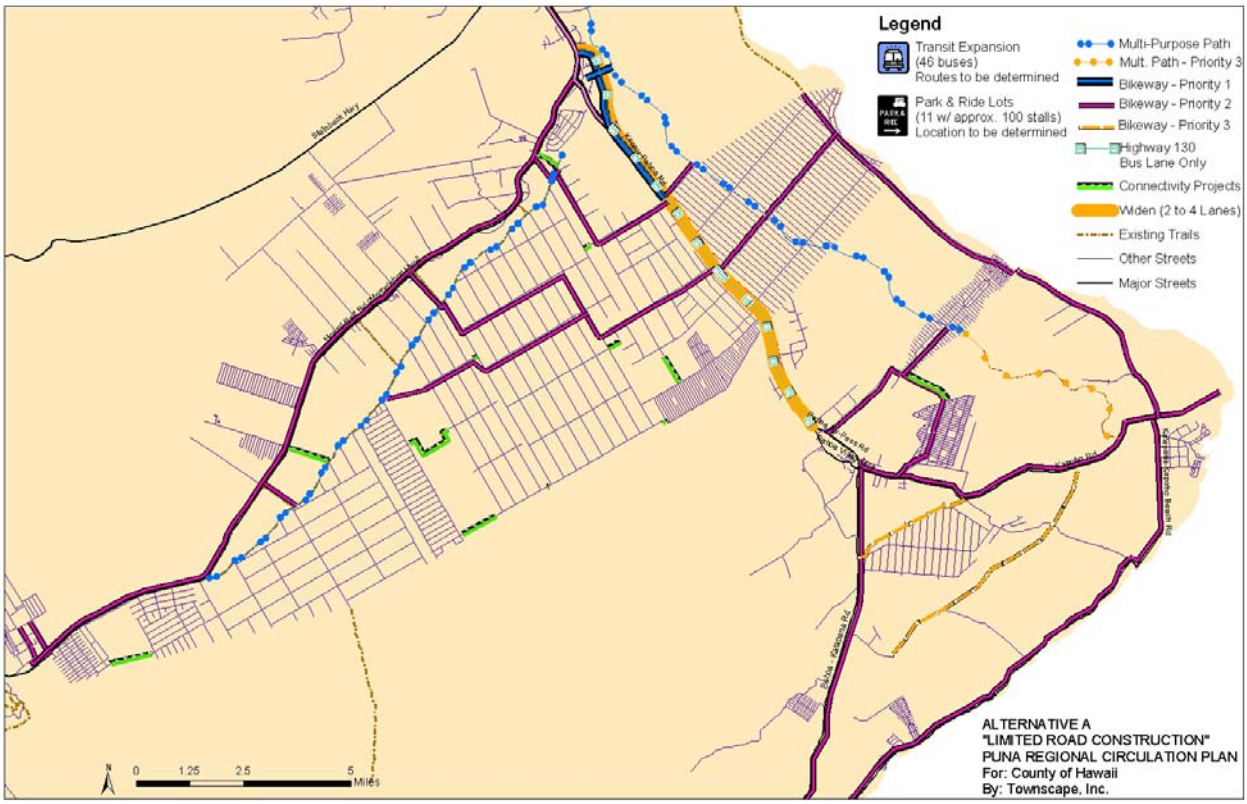
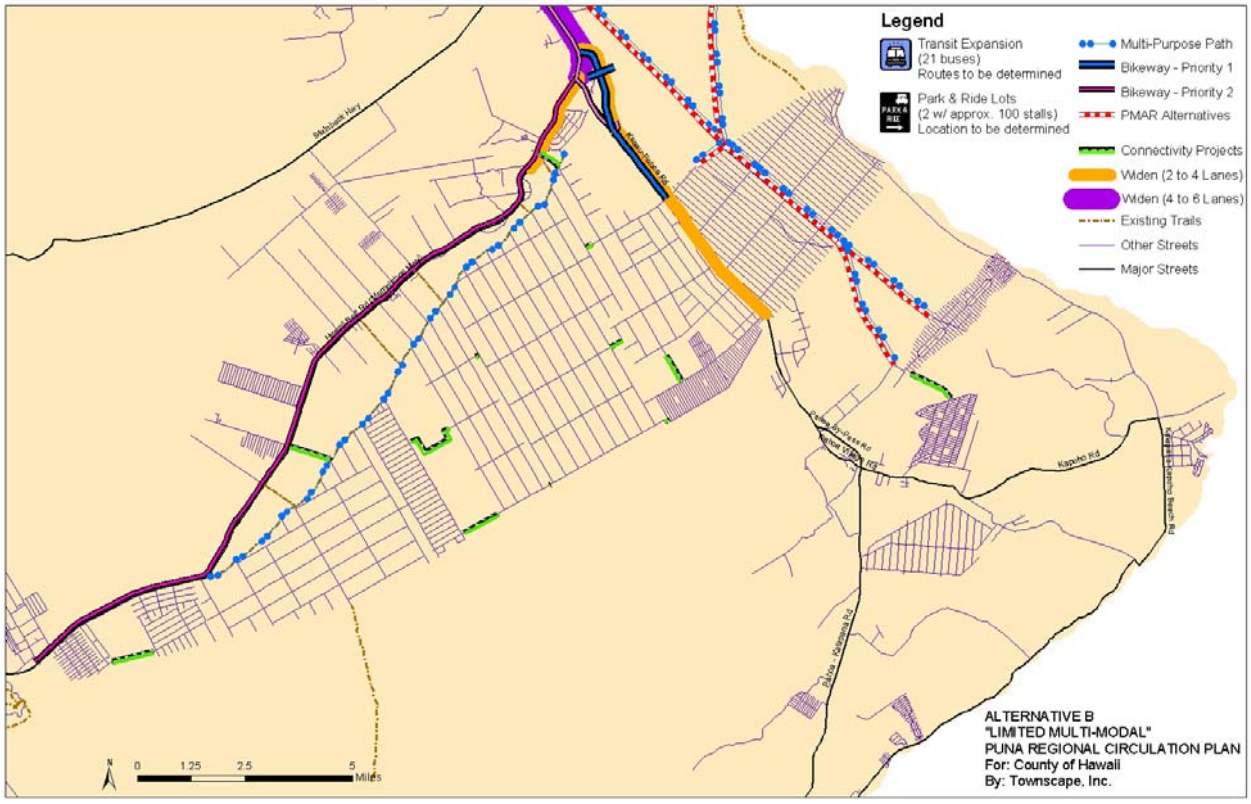


FIGURE 11.3: ALTERNATIVE "B"



Alternative B, "Limited Multi-modal", represents more of a traditional approach to transportation planning. Generally, highway improvements were used to satisfy future travel demands. Road widening would include an additional lane in each direction on Highway 11 from Hilo to Kurtistown, and on Highway 130 from Kea'au to Ainaloa. In addition, a new two-lane Puna Makai Access Road (PMAR) would be constructed from Hilo to Pahoa. The PMAR project does include a multi-purpose path for bicyclists and pedestrians. This pathway and the restoration of the Old Volcano Trail will serve 1 percent of the total travel demand. Transit improvements would increase bus service to as much as six buses per hour. With this alternative, peak hour traffic congestion is expected between Hilo and Kea'au (LOS E) and between Kurtistown and Mountain View (LOS D).

Alternative B does succeed in providing some multi-modal transportation choices by expanding busing and bikeway systems. However, the emphasis on vehicles is problematic due to high costs of roadway construction, environmental impacts, and little guarantee of such a system effectively managing future travel demands. This approach fulfilled demand with roadway projects, therefore leaving little opportunity to truly focus on busing systems. Community response also found that this more traditional approach was not suited to the Puna District and its community values. The total capital cost estimate for Alternative B is $173 million.

Alternative C, "Existing Routes", first identified the maximum amount of trips that bikeways and transit could provide. Transit improvements serve 15 percent of the travel demand and pedestrian/bicycle improvements accommodate 2 percent of the travel demand. Nineteen bus trips between Kea'au and Hilo would be needed in the peak hour. A bus dedicated lane would be required to increase transit travel times and attain high-level ridership. In order to address remaining travel demands, this alternative proposes widening of existing routes. No new alternate routes are identified. Two additional lanes will be needed in each direction between Hilo and Kea'au, Kea'au and Kurtistown, and Kea'au and Ainaloa. With this alternative, peak hour traffic congestion (LOS E) is expected between Ainaloa and Pahoa.

This alternative is desirable for its balanced approach to meeting transportation goals including mobility choice, equity, and quality of life. Identification of projects and associated trips started first and foremost with transit and bikeways. Ridership percentage goals were set, assuming traffic congestion, as a means to push people to shift modes of transportation. Widening and new construction were considered only after maximum trips were placed on alternate transportation modes. Alternative C also lists substitutes to additional widening such as increased vehicle occupancy (1.15 to 1.3). Nevertheless, this approach does not include an alternate route for redundancy or emergencies. The total capital cost estimate for Alternative C is $187 million.

FIGURE 11.4: ALTERNATIVE "C"

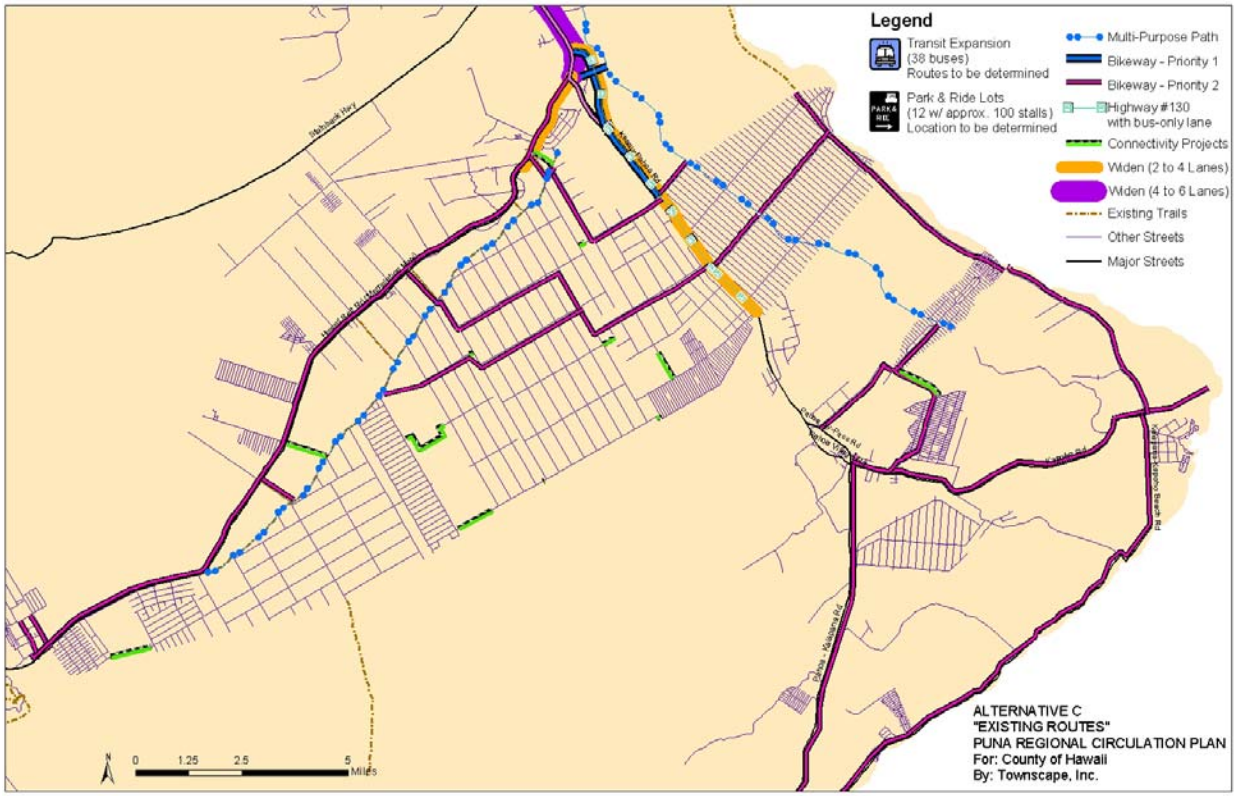
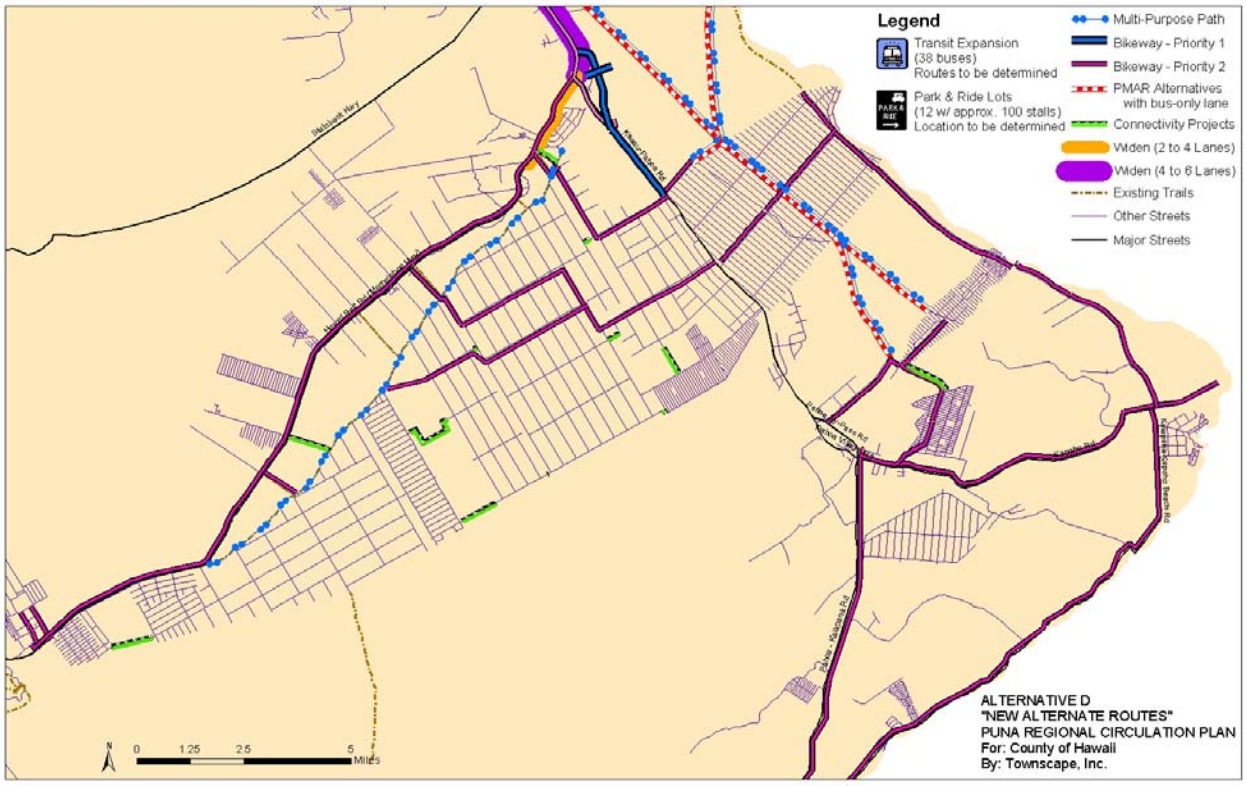


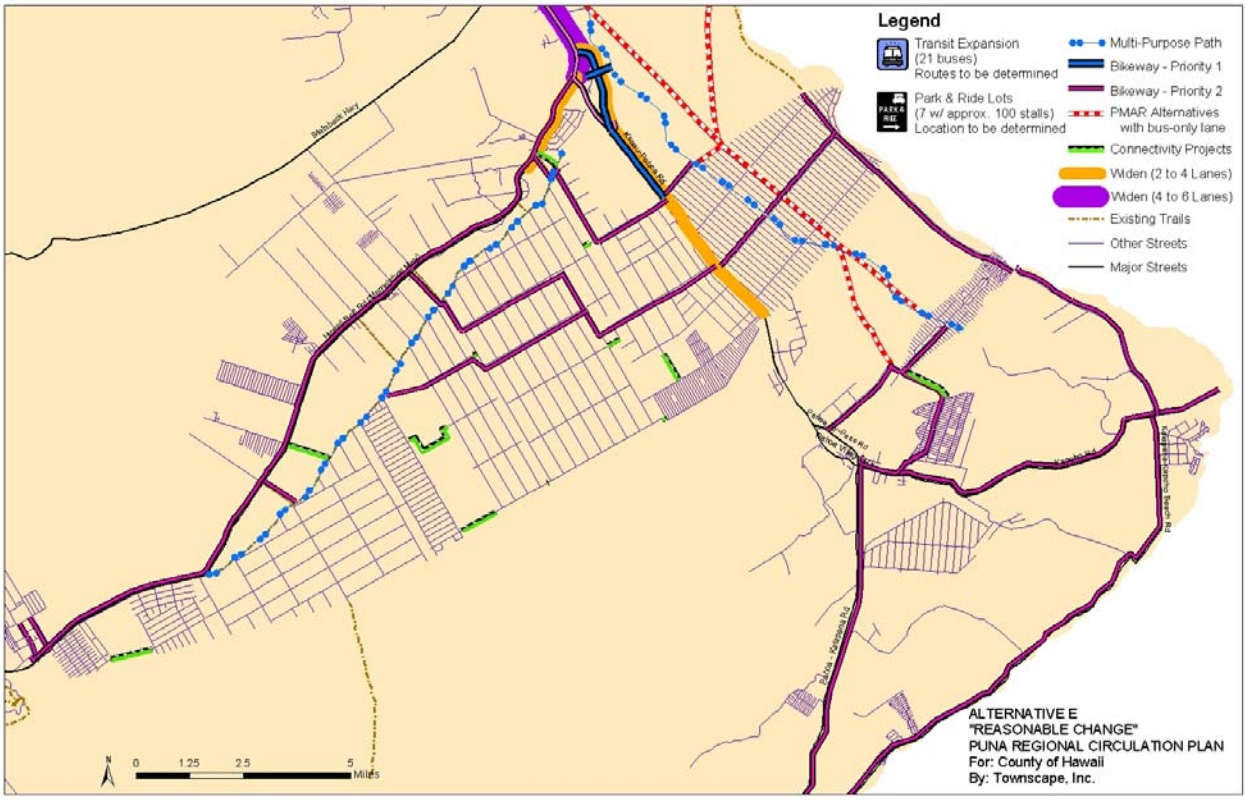
FIGURE 11.5: ALTERNATIVE "D"



Alternative D, "New Alternate Routes" is similar to Alternative C. A two-lane Puna Makai Alternate Route (PMAR) is proposed instead of widening of Highway #130 from Hilo to Ainaloa. Additional road widening would be needed between Hilo and Kurtistown. With this alternative, peak hour traffic congestion is expected between Ainaloa and Pahoa (LOS E), however the remaining roadways would have LOS D or better. The addition of the Puna Makai Alternate Route fulfills the guideline to provide redundancy and connectivity. As a result, Alternative D meets more community guidelines than Alternative C. Multi-modal facilities are provided through implementation of Bike Plan Hawai'i priority one and two projects. The PMAR also includes a multi-purpose path. The total capital cost estimate for Alternative D is $222 million.

Alternative E, "Realistic Change", also approaches demands using multi-modal projects first. However, this alternative considers that changes in land use patterns, human behavior and mode choice could take much longer than 25 years. If these conditions take time to occur how do we plan for year 2030? This alternative sets the proportion of trips in the bicycle/pedestrian at 1 percent and transit at 10 percent. These ridership estimates are still considered optimistic and will require new facilities. These proportions are believed to be more realistic for the land use densities and other conditions in Puna. Required roadway improvements include a two-lane PMAR between Hilo and Pahoa and widening of Highway 11 between Hilo and Mountain View. With this alternative, all roadways would operate at Level of Service E or better during the peak hours. Nevertheless, this alternative has the highest capital costs at $249 million.

FIGURE11.6: ALTERNATIVE "E"



11.2.2. Comparing Plan Alternatives

Some from a purely transportation planning perspective may argue that Alternative E is more desirable than the preferred plan. These land use development assumptions and ridership goals are reasonable within the planning horizon. The preferred plan does assert aggressive goals for multimodal ridership and transportation demand management. However, these optimistic goals are set precisely to address the community values of the district and promote shifts in modes.

The Puna Regional Circulation Plan (when compared with Alternative E):

- LOS D or better (except for Hilo to Kea'au)
- Has desirable village land use instead of existing pattern.
- Has 2% of peak hour travel using pedestrian/bicycle instead of 1%.
- Has up to 1/8 of the peak hour trips on transit instead of 1/10th.
- Does not require widening of Highway 11 from Hilo to Kea'au.

The Community Advisory Group (CAG), County, and community accept higher pedestrian, bike, and transit goals, knowing that these may be higher than "standardized" ridership goals. They recognize that efforts to achieve these goals will require a conceptual shift in the way transportation improvements are implemented. Existing funds would be used more for multi-modal projects and new sources of revenue will likely be needed. The Puna Regional Circulation Plan can improve both transportation choice and mobility and thus meet community values and guidelines.

TABLE 11.6: LEVELS OF SERVICE WITH BUS-ONLY LANE

CORRIDOR	ALTERNATIVE					
	A	B	C	D	E	PLAN
Hilo to Keaau	E	E	C	C	E	E
Keaau to Kurtistown	E	D	B	C	C	C
Kurtistown to Mountain View	E	E	D	D	E	E
Mountain View to Volcano	B	B	A	A	B	B
Keaau Bypass	E	C	C	C	E	C
S. of Keaau to Ainaloa	F	C	B	C	E	C
Ainaloa to N. of Pahoa	B	B	E	E	E	B
Pahoa Bypass	C	C	C	C	C	D
Pahoa to Leilani Blvd.	B	B	A	A	B	B
Leilani Blvd. to Kaimu	A	A	A	A	A	B
Kaimu to end of road	A	A	A	A	A	A

11.3. Implementing Village Centers

The Puna Regional Circulation Plan incorporates a "village land use" scenario. Developing "village centers" is key to the success of the plan because other land use patterns have higher transportation demands compared to village land use. The PRCP improvement projects specifically address the lower trip demands of village land use.

The Puna community cannot depend on the County to implement this change. The County is responsible for zoning and planning but cannot be expected to play the role of "developer". In order to create real village centers, community organizations, government and business should collaborate through a community entity such as a Community Development Corporation (CDC).

It is unlikely that village centers will be built if lands are simply rezoned. Private sector investment in village center commercial buildings and related facilities requires existing concentrations of people and dollars. Puna is still a relatively low density district, and cannot yet naturally support significant private business investment. A CDC comprised of private landowners, residents, and government, could help "incubate" new businesses and facilitate growth. For example, a CDC could purchase land, finance infrastructure, construct the first buildings in a village center, and lease space to businesses at below market rents. A CDC type of organization would be eligible for grants that government would not qualify for. Alternatively, tax credits could be granted to land owners in Puna who develop small businesses furthering the village center concept. Further research of the feasibility of using Federal Highway funds to subsidize village centers, as opposed to roadway improvements, should also occur. Ultimately, efforts to allow mixed land uses, develop commercial and village centers, and create more jobs through out Puna will require strong organization and mobilization.

11.4. Calculating Traffic Demands

A system of bikeways, multi-purpose paths, and bus service will provide choices for travel. Such a system has the potential to promote use of alternative modes within and outside of Puna. These alternative modes can also help in meeting peak period travel demands, thereby minimizing the need to construct additional roadway facilities.

The improvements to multi-modal facilities would be supplemented by roadway improvements to improve connectivity, redundancy, emergency access, and traffic congestion. Roadway improvements could also support alternative modes; e.g., bus-only or high occupancy vehicle (HOV) lanes, bike lanes, and sidewalks. Analyses were conducted to identify needed improvements. The analyses assumed congestion on existing and new roadways (peak hour volumes at capacities) and maximum use of alternative travel modes.

11.4.1. Travel Demand Analyses

Travel demand projections were made for year 2030 using population and land use estimates that were developed as part of growth projections and land use planning. Population data for the years 1990 and 2000 were used to develop a spreadsheet model that estimated traffic volumes on various segments of the major highways in Puna. Several factors in the model were calibrated to replicate the estimates of actual traffic on these roadway segments. The model was applied to population and employment forecasts for year 2030 and projected future travel demands on major corridors. Peak hour travel demands were estimated assuming that the time-of-day patterns in 1990 continue in the future. While the model was calibrated for traffic volumes, forecasts for future travel demand were made for person-trips, using an estimated occupancy of 1.15 persons per vehicle in 2000.

Tables 11.5 and 11.6 compare the 1990 and 2000 traffic volumes and model estimates, and show forecasts for two future land use scenarios. One projection assumes that past land use trends will continue, while the other assumes a village land use scenario. Village land use shifts some travel destined to and from Hilo, to local trips within Puna.

The demand calculations listed in Table 11.6 are based on several assumptions and variables. Travel demand is expressed in terms of person-trips in the peak direction during the peak hour. The "trips" represent actual person trips as opposed to vehicle trips. Calculations used existing vehicle trip data from State DOT because it is the only source available. This information was used as a basis to help project the total person trips. Trips in the "2000 Land Use" column were computed from 2002 average daily traffic (ADT) and "K" (peak hour volume/daily volume) and "D" (directional) factors from State Highway Planning Section's *Traffic Summary – Island of Hawai'i* report.

The highest peak hour volumes were used as the target capacities for the major roadways. There may be poor conditions during other hours if assumptions used for peak hours are not applicable (e.g., Saturday mid-morning when transit would not be expected to be the mode choice for very many travelers). Local circulation will be adequately served by the minimum local street system.

The maximum demand served at capacity and various levels of service were developed using existing volumes, heavy vehicle percentages, and an estimated existing occupancy of 1.15 persons per vehicle. The estimated capacity per lane for undivided highways was estimated to be 90 percent of the per-lane capacity on a divided highway; Level of Service E range is 90 percent-100 percent of capacity for divided highways, 70 percent -100 percent of capacity for undivided highways. Figures 11.7 -11.9 illustrate traffic demands with line thickness and color.

TABLE 11.5: COMPARISON OF PEAK HOUR DIRECTION TRIPS

CORRIDOR	STREET SEGMENTS	PEAK HOUR PERSON TRIPS PER HOUR (PTPH) 2000* LAND USE EXISTING	2030 LAND USE PAST TRENDS CONTINUED	2030 LAND USE VILLAGE CONCEPT
Route 11				
Hilo-to-Kea'au	Hilo to Kea'au Bypass	2,530	5,510	4,410
Kea'au-to-Kurtistown	Kea'au Bypass to Huina St.	860	1,880	1,730
Kurtistown to Mt. View	Huina St. to S. Pszyk Rd.	600	1,230	1,330
Mt. View to Volcano	S. Pszyk Rd. to Wright Rd.	260	490	520
Route 130				
Around Kea'au	Kea'au Bypass	1,350	3,980	3,200
S. of Kea'au to Ainaloa	S. of Kea'au to Ainaloa Blvd.	1,170	3,290	2,700
Ainaloa to North of Pahoa	Ainaloa Blvd. to Pāhoa	630	1,340	1,510
Around Pahoa	Pāhoa Bypass	410	900	1,000
Pahoa to Leilani Blvd.	Pāhoa to Leilani Blvd.	160	450	570
Leilani Blvd. To Kaimū	Leilani Blvd. to Kaimū	80	320	530
	Kaimū to end of road	70	170	290
Reference Figure:		Figure 11.1	Figure 11.2	Figure 11.3

TABLE 11.6: TRANSPORTATION MODEL FORECASTS

Road Corridor	1990 VPD		2000 VPD		2030 Forecast VPD			
					Past trends		Village Land Use	
	ADT *	modeled	ADT *	modeled	PTPD	PTPH	PTPD	PTPH
Route 11								
Hilo-to-Kea'au	23,898	23,412	32,657	31,019	75,100	5,510	60,100	4,410
Kea'au-to-Kurtistown	9,248	9,557	14,154	13,835	31,200	1,880	28,700	1,730
Kurtistown to Mt. View	7,268	7,463	10,591	9,981	22,000	1,230	23,700	1,330
Mt. View to Volcano	4,539	4,771	5,074	5,456	10,200	490	10,800	520
Route 130								
Around Kea'au	16,158	14,998	14,460	17,955	47,900	3,980	38,500	3,200
S. of Kea'au to Ainaloa	15,380	14,780	16,839	19,344	50,900	3,290	41,800	2,700
Ainaloa to North of Pahoa	10,471	10,973	10,545	11,504	25,900	1,340	29,100	1,510
Around Pahoa	7,988	8,230	6,017	5,752	13,000	900	14,500	1,000
Pahoa to Leilani Blvd.	3,173	3,774	2,759	3,443	6,700	450	8,400	570
Leilani Blvd. To Kaimū	2,357	2,762	1,377	2,386	5,700	320	9,500	530

VPD = vehicles per day
PTPD= person-trips per day
PTPH = peak hour person-trips per hour, peak direction
** Source: State of Hawai'i Department of Transportation Highway Planning Branch, Traffic Summary – Island of Hawai'i.*

11.4.2. Local Circulation and Street System

Two-way traffic on local roads would be adequate, as most are within the following criteria. Each two-lane roadway (one lane in each direction) in a grid system can typically serve up to 500 occupied dwellings; however, if the roadway is the only one serving a number of lots, it should provide access to no more than 100 lots. A wider street (minor collector with one lane and shoulder in each direction and the ability to have two lane approaches at intersections) would be adequate for up to 1,000 occupied dwellings. Adequacy of local streets does not seem to be a concern for the low-density Puna area.

If necessary, some of the existing local streets could be upgraded to collectors by increasing the right-of-way by 20 feet (10 feet each side). Road widening setbacks could be imposed to provide for this future widening. The selection of these streets should be such that a desirable roadway network e.g., collectors every mile, will be created. Local street intersections with the highway should be eliminated. Collector street intersections with the arterial streets (highway) should be considered for traffic signals when warranted.

FIGURE 11.7: 2000 TRAFFIC DEMANDS

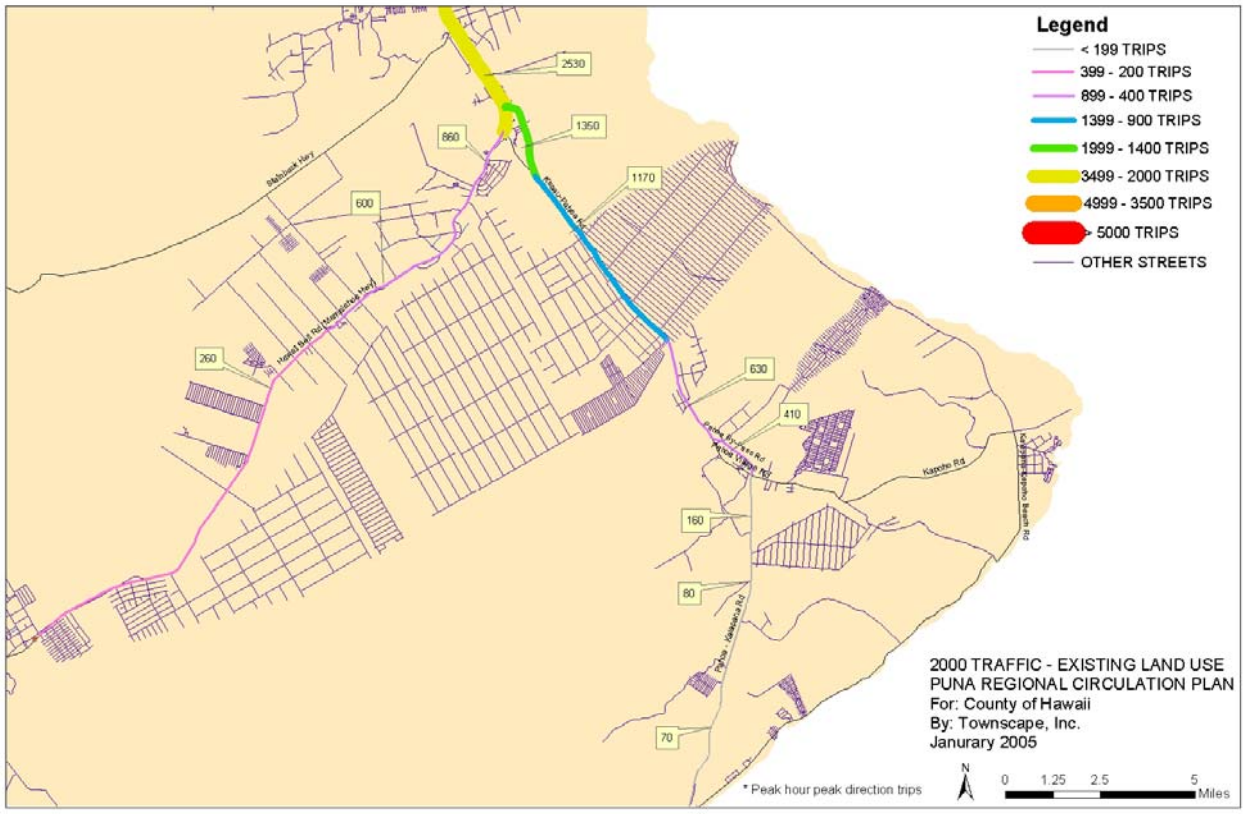


FIGURE 11.8: 2030 TRAFFIC PROJECTIONS – VILLAGE LAND USE

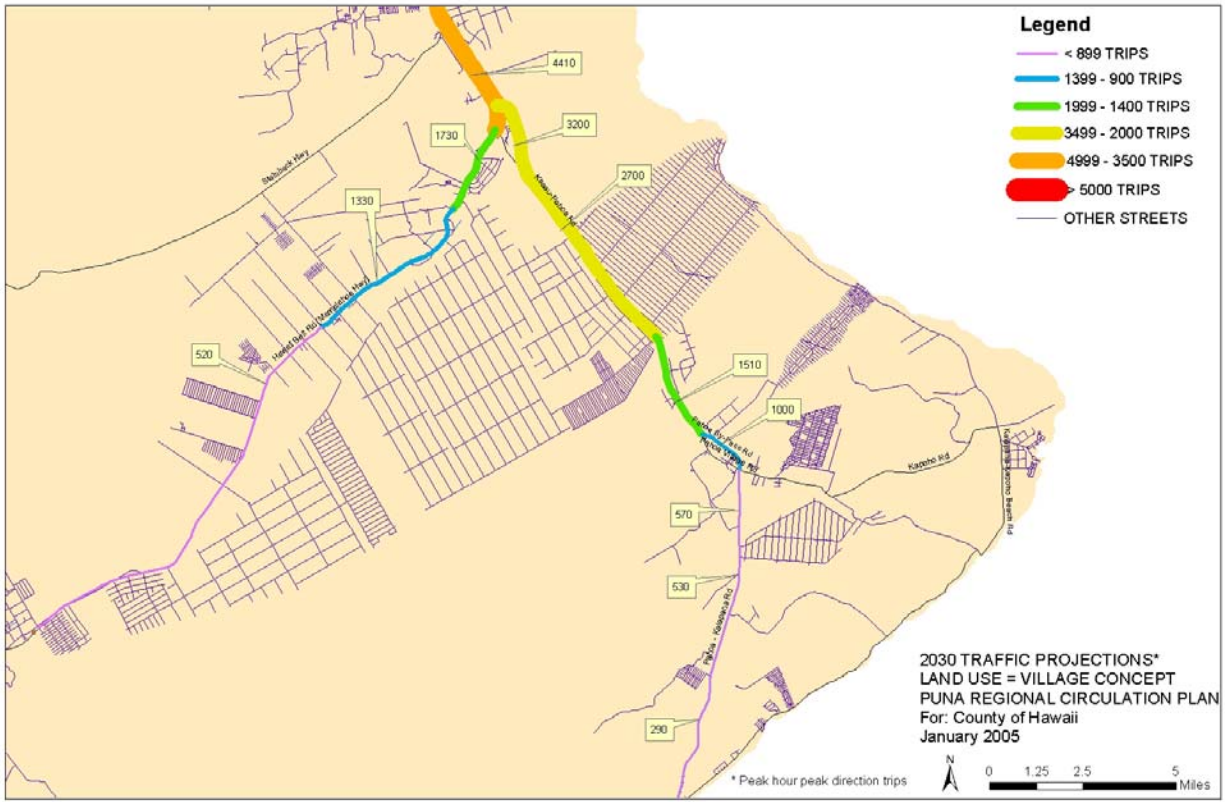


FIGURE 11.9: 2030 TRAFFIC PROJECTIONS

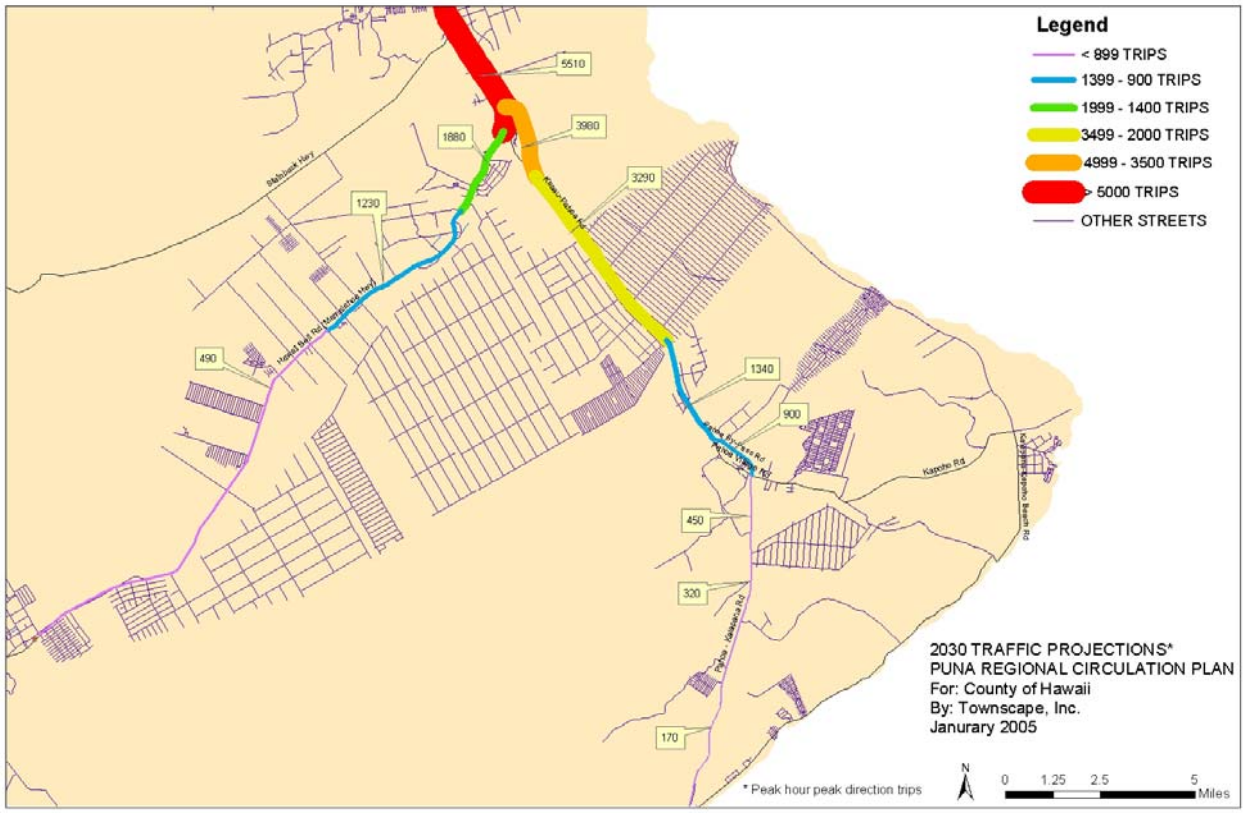


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TABLE 11.6: PLAN ALTERNATIVES

	VILLAGE LAND USE	ALTERNATIVE A - MULTI-MODAL EMPHASIS (WITH LIMITED WIDENING)										
		BIKE & PED		EXISTING HIGHWAY			COM. ROAD WIDENING		TRANSIT			HWY LOS
CORRIDOR	2030 DEMAND PEAK HOUR DIRECTION	TRIPS	% OF TOTAL	CAPACITY	TRIPS ON HIGHWAY	% OF TOTAL	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	BUSES REQUIRED/HOUR	W/ BUS ONLY LANE
Hilo to Keaau	4,410	100	2%	2,720	2,701	61%	0	0%	1,609	36%	36	E
Keaau to Kurtistown	1,730	100	6%	1,140	1,137	66%	0	0%	493	29%	11	E
Kurtistown to Mountain View	1,330	100	8%	1,140	1,140	86%	0	0%	90	7%	2	E
Mountain View to Volcano	520	50	10%	1,140	470	90%	0	0%	0	0%	0	B
Keaau Bypass	3,200	100	3%	2,650	2,650	83%	0	0%	450	14%	10	E
S. of Keaau to Ainaloa	2,700	100	4%	1,830	1,733	64%	1,155	43%	0	0%	0	F
Ainaloa to N. of Pahoa	1,510	100	7%	1,220	705	47%	380	25%	0	0%	0	B
Pahoa Bypass	1,000	100	10%	1,220	900	90%	0	0%	0	0%	0	C
Pahoa to Leilani Blvd.	570	60	11%	1,080	510	89%	0	0%	0	0%	0	B
Leilani Blvd. to Kaimu	530	50	9%	1,290	480	91%	0	0%	0	0%	0	A
Kaimu to end of road	290	30	10%	1,290	260	90%	0	0%	0	0%	0	A

	PAST TRENDS LAND USE	ALTERNATIVE B - VEHICLE EMPHASIS (WITH WIDENING & PMAR)											
		EXISTING HIGHWAY		BIKE & PED		ROAD WIDENING		PMAR (2 LANES)		TRANSIT			HWY LOS
CORRIDOR	2030 DEMAND PEAK HOUR DIRECTION	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	BUSES REQUIRED/HOUR	BUS IN MIXED TRAFFIC
Hilo to Keaau	5,510	2,703	49%	55	1%	1,351	25%	1,133	21%	268	5%	6	E
Keaau to Kurtistown	1,880	1,123	60%	19	1%	561	30%	0	0%	177	9%	4	D
Kurtistown to Mountain View	1,230	1,129	92%	12	1%	0	0%	0	0%	89	7%	2	E
Mountain View to Volcano	490	485	99%	5	1%	0	0%	0	0%	0	0%	0	B
Keaau Bypass	3,980	2,041	51%	40	1%	1,021	26%	878	22%	0	0%	0	C
S. of Keaau to Ainaloa	3,290	1,242	38%	33	1%	991	30%	1,025	31%	0	0%	0	C
Ainaloa to N. of Pahoa	1,340	686	51%	13	1%	0	0%	641	48%	0	0%	0	B
Pahoa Bypass	900	891	99%	9	1%	0	0%	0	0%	0	0%	0	C
Pahoa to Leilani Blvd.	450	446	99%	5	1%	0	0%	0	0%	0	0%	0	B
Leilani Blvd. to Kaimu	320	317	99%	3	1%	0	0%	0	0%	0	0%	0	A
Kaimu to end of road	170	168	99%	2	1%	0	0%	0	0%	0	0%	0	A

	PAST TRENDS LAND USE	ALTERNATIVE C - BALANCED MULTI-MODAL & VEHICLE (WITH WIDENING)													
		EXISTING HIGHWAY		BIKE & PED		TRANSIT			DELTA		ROAD WIDENING (+1||+1)		DELTA	ADD. ROAD WID. ?*		HWY LOS
CORRIDOR	2030 DEMAND PEAK HOUR DIRECTION	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	BUSES REQUIRED/HOUR	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	TRIPS	TRIPS	% OF TOTAL	W/ BUS ONLY LANE**
Hilo to Keaau	5,510	2,720	49%	110	2%	827	15%	19	1,853	34%	1,360	25%	493	493	9%	C
Keaau to Kurtistown	1,880	1,140	61%	38	2%	282	15%	7	420	22%	420	22%	0	0	0%	B
Kurtistown to Mountain View	1,230	1,021	83%	25	2%	185	15%	5	0	0%	0	0%	0	0	0%	D
Mountain View to Volcano	490	407	83%	10	2%	74	15%	2	0	0%	0	0%	0	0	0%	A
Keaau Bypass	3,980	2,650	67%	80	2%	597	15%	14	653	16%	653	16%	0	0	0%	C
S. of Keaau to Ainaloa	3,290	1,830	56%	66	2%	494	15%	11	901	27%	901	27%	0	0	0%	B
Ainaloa to N. of Pahoa	1,340	1,112	83%	27	2%	201	15%	5	0	0%	0	0%	0	0	0%	E
Pahoa Bypass	900	747	83%	18	2%	135	15%	3	0	0%	0	0%	0	0	0%	C
Pahoa to Leilani Blvd.	450	374	83%	9	2%	68	15%	2	0	0%	0	0%	0	0	0%	A
Leilani Blvd. to Kaimu	320	266	83%	6	2%	48	15%	2	0	0%	0	0%	0	0	0%	A
Kaimu to end of road	170	141	83%	3	2%	26	15%	1	0	0%	0	0%	0	0	0%	A

* Alternatives to Additional Road Widening for Hilo-Keaau (1 lane) include increasing Vehicle Occupancy from 1.15 to 1.3 persons.

** LOS calculated with additional widening, without it LOS=F

TABLE 11.6: PLAN ALTERNATIVES (CONTINUED)

	PAST TRENDS LAND USE	ALTERNATIVE D - BALANCED MULTI-MODAL & VEHICLE (WITH PMAR)													
		EXISTING HIGHWAY		BIKE & PED		TRANSIT			DELTA		PMAR		DELTA	ROAD WID. ? (+1||+1)*		HWY LOS
CORRIDOR	2030 DEMAND PEAK HOUR DIRECTION	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	BUSES REQUIRED/HOUR	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	TRIPS	TRIPS	% OF TOTAL	W/ BUS ONLY LANE**
Hilo to Keaau	5,510	2,720	49%	110	2%	827	15%	19	1,853	34%	1,140	21%	713	713	13%	C
Keaau to Kurtistown	1,880	1,140	61%	38	2%	282	15%	7	420	22%	0	0%	420	420	22%	C
Kurtistown to Mountain View	1,230	1,021	83%	25	2%	185	15%	5	0	0%	0	0%	0	0	0%	D
Mountain View to Volcano	490	407	83%	10	2%	74	15%	2	0	0%	0	0%	0	0	0%	A
Keaau Bypass	3,980	2,650	67%	80	2%	597	15%	14	653	16%	653	16%	0	0	0%	C
S. of Keaau to Ainaloa	3,290	1,830	56%	66	2%	494	15%	11	901	27%	901	27%	0	0	0%	C
Ainaloa to N. of Pahoa	1,340	1,112	83%	27	2%	201	15%	5	0	0%	0	0%	0	0	0%	E
Pahoa Bypass	900	747	83%	18	2%	135	15%	3	0	0%	0	0%	0	0	0%	C
Pahoa to Leilani Blvd.	450	374	83%	9	2%	68	15%	2	0	0%	0	0%	0	0	0%	A
Leilani Blvd. to Kaimu	320	314	98%	6	2%	48	15%	2	0	0%	0	0%	0	0	0%	A
Kaimu to end of road	170	141	83%	3	2%	26	15%	1	0	0%	0	0%	0	0	0%	A

* Alternatives to Additional Road Widening for Hilo-Kurtistown (1 lane) include increasing Vehicle Occupancy from 1.15 to 1.3 persons AND increased transit ridership from 15% to 20-25%. ** LOS calculated with additional widening, without it LOS=F, D

	PAST TRENDS LAND USE	ALTERNATIVE E - "REALISTIC CONSTRAINED"													
		EXISTING HIGHWAY		BIKE & PED (RR PATH)		TRANSIT		10.0%	DELTA		ROAD WIDENING (+1||+1)		DELTA	PMAR		HWY LOS
CORRIDOR	2030 DEMAND PEAK HOUR DIRECTION	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	BUSES REQUIRED/HOUR	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	TRIPS	TRIPS	% OF TOTAL	W/ BUS ONLY LANE**
Hilo to Keaau	5,510	2,720	49%	55	1%	551	10%	13	2,184	40%	1,100	20%	1,084	1,084	20%	E
Keaau to Kurtistown	1,880	1,140	61%	19	1%	188	10%	5	533	28%	533	28%	0	0	0%	C
Kurtistown to Mountain View	1,230	1,140	93%	12	1%	78	6%	2	0	0%	0	0%	0	0	0%	E
Mountain View to Volcano	490	490	100%	0	1%	0	0%	0	0	0%	0	0%	0	0	0%	B
Keaau Bypass	3,980	2,650	67%	40	1%	398	10%	9	892	22%	892	22%	0	0	0%	E
S. of Keaau to Ainaloa	3,290	1,830	56%	33	1%	329	10%	8	1,098	33%	1,098	33%	0	0	0%	E
Ainaloa to N. of Pahoa	1,340	1,220	91%	13	1%	107	8%	3	0	0%	0	0%	0	0	0%	E
Pahoa Bypass	900	900	100%	0	1%	0	0%	0	0	0%	0	0%	0	0	0%	C
Pahoa to Leilani Blvd.	450	450	100%	0	1%	0	0%	0	0	0%	0	0%	0	0	0%	B
Leilani Blvd. to Kaimu	320	320	100%	0	1%	0	0%	0	0	0%	0	0%	0	0	0%	A
Kaimu to end of road	170	170	100%	0	1%	0	0%	0	0	0%	0	0%	0	0	0%	A

	VILLAGE LAND USE	PUNA REGIONAL CIRCULATION PLAN													
		EXISTING HIGHWAY		BIKE & PED (RR PATH)		TRANSIT: up to		12.5%	DELTA		ROAD WIDENING (+1||+1)		DELTA	PMAR		HWY LOS
CORRIDOR	2030 DEMAND PEAK HOUR DIRECTION	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	BUSES REQUIRED/HOUR	TRIPS	% OF TOTAL	TRIPS	% OF TOTAL	TRIPS	TRIPS	% OF TOTAL	W/ BUS ONLY LANE**
Hilo to Keaau	4,410	2,720	62%	88	2%	551	12.5%	13	1,051	24%	0	0%	1,051	1,051	24%	E
Keaau to Kurtistown	1,730	1,140	66%	35	2%	216	12.5%	5	339	20%	339	20%	0	0	0%	C
Kurtistown to Mountain View	1,330	1,140	86%	27	2%	163	12.3%	4	0	0%	0	0%	0	0	0%	E
Mountain View to Volcano	520	520	100%	0	2%	0	0.0%	0	0	0%	0	0%	0	0	0%	B
Keaau Bypass	3,200	2,650	83%	64	2%	400	12.5%	9	86	3%	86	3%	0	0	0%	C
S. of Keaau to Ainaloa	2,700	1,830	68%	54	2%	338	12.5%	8	479	18%	479	18%	0	0	0%	C
Ainaloa to N. of Pahoa	1,510	1,220	81%	30	2%	189	12.5%	5	71	5%	71	5%	0	0	0%	B
Pahoa Bypass	1,000	1,000	100%	0	2%	0	0.0%	0	0	0%	0	0%	0	0	0%	D
Pahoa to Leilani Blvd.	570	570	100%	0	2%	0	0.0%	0	0	0%	0	0%	0	0	0%	B
Leilani Blvd. to Kaimu	530	530	100%	0	2%	0	0.0%	0	0	0%	0	0%	0	0	0%	B
Kaimu to end of road	290	290	100%	0	2%	0	0.0%	0	0	0%	0	0%	0	0	0%	A

12. FUNDING

Implementation of the Puna Regional Circulation Plan will require significant funding. The cost for these services should provide an overall economic and social benefit to the community. The cost of improvements is particularly controversial in lava hazard zones where volcanic destruction is a significant threat.

Federal programs are critical in supporting and funding highways and public transportation projects. Federal-aid Highway programs are administered by the Federal Highway Administration (FHWA) as grant-in-aid programs. Programs distribute funds to states based on formulas that take into account factors such as pollution, mileage, costs, needs, and the State's contribution to the Highway Trust Fund. States and Counties generally must provide 20 percent match to receive funds from FHWA programs.

Other major sources of surface transportation funds are the programs administered by the Federal Transit Administration (FTA). These funds come from the Mass Transit Account of the Highway Trust Fund. The state distributes federal funds to eligible small urban, rural, and disabled and elderly programs based on formula.

Transportation funding allocation is generally:

- FHWA 80 percent (through method of reimbursement)
- Local (County/State) 20 percent (Fair market value of donated labor, land, materials, and non-FHWA funds)

The FHWA will not "reimburse" State and/or County unless the project is on the Statewide Transportation Improvement Program (STIP). Hawai'i Dept. of Transportation (DOT) Director decides which projects are on the STIP. Transportation improvement projects can only use State funds with legislature appropriation and Governor allotment. Similarly, using County funds requires County Council appropriation and Mayoral allotment. Federally funded transportation programs and revenue sources are listed in Table 12.1.

TABLE 12.1 FEDERAL TRANSPORTATION PROGRAMS AND REVENUE SOURCES

Mode	Major Federal Programs	Federal Revenue Sources
Highways	Interstate Maintenance	Highway Trust Fund with funds from the federal:
	National Highway System	Motor fuel tax (15.44 cents/gallon of gasoline, varies for other fuel types)
	Bridge Replacement and Rehabilitation	Truck and trailer tax
	Congestion Mitigation and Air Quality Improvement (CMAQ)	Tire tax
	Surface Transportation	Heavy vehicle use tax
	National Corridor Planning and Development and Coordinated Border Infrastructure	
	High Priority (Demonstration) Projects	
	Intelligent Transportation Systems	
	Minimum Guarantee	
Public Transportation	Capital (Section 3009)	Mass Transit Account of the Highway Trust Fund:
	Urbanized Area Formula 9Section 3007)	Motor fuel tax (2 cents/gallon)
	Other urbanized Area Formula (Section 3014)	General Fund
	Surface Transportation Program (portion)	Interest
	Congestion Mitigation and Air Quality Improvement (CMAQ) (in air quality non-attainment and maintenance areas)	
	Formula Grants for Special Needs of Elderly Individuals and Persons with Disabilities (Section 3037)	
	Clean Fuels Formula Grants (Section 3008)	
Bicycle Transportation and Pedestrian Walkways	Surface Transportation, including enhancements	Highway Trust Fund
	National Highway System	
	Congestion Mitigation and Air Quality Improvement	
	Federal Lands	
	Scenic Byways	
	Recreational Trails	

12.1. Surface Transportation Construction Programs

There are several different types of surface transportation construction programs. Each program has different requirements, funding levels, and flexibility. Program details are listed in Table 12.2. Hawai'i County is potentially eligible for programs marked with and asterisk *.

- Interstate Maintenance (IM)
- Surface Transportation Program (STP)*
  - Transportation Enhancement
  - Safety
- National Highway System (NHS)
- Bridge Replacement and Rehabilitation*
- Congestion Mitigation and Air Quality Improvement Program (CMAQ)*
- Minimum Guarantee*

There are 12 types of improvements that qualify as Transportation Enhancement (TE) projects:

- Provision of facilities for pedestrians and bicycles.
- Provision of safety and educational activities for pedestrians and bicyclists.
- Acquisition of scenic easements and scenic or historic sites.
- Scenic or historic highway programs
- Landscaping and other scenic beautification.
- Historic preservation.
- Rehabilitation and operation of historic transportation buildings.
- Preservation of abandoned railway corridors (including conversion for bicycle and pedestrian trails).
- Control and removal of outdoor advertising.
- Archaeological planning and research.
- Environmental mitigation to address water pollution due to highway runoff.
- Establishment of transportation museums.

TABLE 12.2: MAJOR FEDERAL-AID HIGHWAY PROGRAMS UNDER TEA-21

Program	Eligible Uses	Distribution Mechanism	Federal Share 2001 $	Transferability
Interstate Maintenance	Resurface, restore, and rehabilitate routes on interstate highways.	33.3% based on interstate lane miles in state as a % of total interstate miles in all states	90% 6.9 mil	Up to 50% to NHS, STP, CMAQ
Surface Transportation (STP)* (Highways, bridges, transit capital for bus service, safety, research and development, bike/ped, and ADA	Broad range of surface and transportation capital needs, including main roads, transit, sea-airport access, vanpool, bike, and pedestrian facilities	25% based on total lane miles of federal-aid highways in state as % of total federal-aid highway lane miles in all states 40% based on VMT on federal aid highways in state as % of total VMT on all federal-aid highways 35% based on estimated tax payments form highway users in the state to the Highway Account of the Highway Trust Fund as % of total payments of all states	80% 27.7 mil	Up to 50% to CMAQ, NHS, bridge. (Suballocations cannot be transferred)
National Highway System (NHS) Road improvements for NHS or connectors, transit improvements, parking, carpool/vanpool, bike/ped	Interstate routes, major urban and rural arterials, connectors to major intermodal facilities, national defense network	25% based on lane miles of pricipal arterials (excluding Interstate) in state as % of all principal arterial lane miles 35% based on VMT on principal arterials (excluding the interstate system) as % of VMT on all principal arterials 10% based on lane miles of pricipal arterials divided by total population as % of this ration for all states 30% based on diesel fuel used in state as % of all diesel fuel used	80% 35.9 mil	Up to 50% to STP, CMAQ, and or Brudge Replace.
Bridge Replacement and Rehabilitation*	Replacement and rehabilitation of any public bridge	Relative share of total cost to repair or replace deficient bridges	80% 19.3 mil	Up to 100% to STP if approved by Secretary
Congestion Mitigation and Air Quality Improvement Program (CMAQ)* Open for all for HI	Projects and programs in air quality nonattainment and maintenance areas for ozone, carbon monoxide (CO), and small particulate matter (PM-10) which reduce transportation related emissions	100% based on weighted nonattainment and maintenance area population	80% 6.6mil	Up to 50% to NHS, STP, CMAQ, Bridge Replace.
Minimum Guarantee*	Provides funding to States based on equity considerations. These include specific shares of overall program funds and a minimum return on contributions to the Highway Trust Fund.	The % shares are adjusted each year to ensure that each State's share of apportionments for the specified programs is at least 90.5% of its percentage contributions to the Highway Account based on the latest data available at the time of the apportionment	80% 33.0 mil	N/A

TABLE 12.3: PRINCIPAL FTA PROGRAMS

Program	Eligible Uses	Distribution Mechanism	Federal Share of Funded Projects
Urbanized Areas (91.23%) (Section 3007)	Capital and operating expenditures	Population and population density	80%, 90% for incremental costs of vehicle-related equipment to comply with CAAA and ADA
Other than Urbanized Areas (6.37%): (Section 3014)	Capital and operating expenditures in non-urbanized areas (under 50,000)	Formula based on rural populations in all states	80%, 90% for incremental costs of vehicle-related equipment to comply with CAAA and ADA
Special Needs of the Elderly and Inidivduals with Disabilities (2.4%): (Section 3013)	Capital assistance to organizations providing specialized services for the elderly and disabled	Fixed minimum for each state and formula based on population of elderly and disabled individuals	80%, 90% for incremental costs of vehicle-related equipment to comply with CAAA and ADA
Clean Fuels (set-aside before allocation to areas) (Section 3008)	Purchase, lease of clean fuel buses and facilities; improvements to existing facilities to accommodate clean fuel vehicles	Nationwide among eligible applications based on non-attainment rating, number of buses, and bus passenger miles	80%
Rural Transportation Accessibility (set-aside before allocation to areas (Section 3038)	Incremental capital and training costs related to ADA compliance for over the road bus service. Applies to local fixed route, commuter, charter, tour service	Nationwide among eligible applications based on identified need for service, early acquisition of equipment, financial capacity, service impacts	50% of costs related to ADA compliance
Capital investment Grants and Loans (Section 3009)	New starts or extensions to existing fixed guide way systems (40%)	Discretionary	80%, 90% for incremental costs of vehicle-related equipment to comply with CAAA and ADA
	Fixed guide way modernization (40%)	Formula distribution to urbanized areas in 7 tiers	
	Bus and related facilities (20%)	Discretionary	
Job Access and Reverse Commute Grants (Section 3037)	Capital and operating costs of job access transportation services	Discretionary based on: % of population on welfare, need for additional services, coordination with existing providers and welfare agencies, use of innovative approaches, existence of regional plan and long-term funding strategies	50%
	Promotion of special services and programs		

12.2. Other Funding Opportunities

The Federal Transit Administration (FTA) also funds mass transportation systems. Hawai'i County, Mass Transit Agency currently receive funds from FTA. Table 12.3 lists programs and eligible uses. There is an increasing need to seek funds from non-traditional sources. FHWA and FTA have funding mechanisms for innovative financing including "flexible match", credit assistance, and revolving funds. These tools can help states and local agencies ability to solicit funds for transportation projects. They are intended to accelerate schedules and attract private capital.

12.3. Estimating Future Transportation Funds

The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) was enacted August 10, 2005, as Public Law 109-59. TEA-21 authorizes the Federal surface transportation programs for highways, highway safety, and transit for the 5-year period 2005-2009. Although SAFETEA-LU has been passed and a certain amount of funds have been identified for the State of Hawai'i it is still uncertain as to the nature of the funds and how they can be appropriated. The estimates provided here are based the assumption that funding of the State of Hawai'i will continue without major change.

This summary is an only an estimate of future transportation funds. Based on historical funding the State of Hawai'i receives approximately $150 million per year. The County of Hawai'i generally receives $24 million of State funds. Of these funds, at least 20%, or 4.8 million/year is spent on bridge maintenance. Estimating that another 30%, $7.2 million, is spent on safety and maintenance, approximately $12 million a year remains for capacity improvements. If more is spent on maintaining existing infrastructure, less in available for new projects.

Table 12.4 estimates possible funding for the Puna District. Transportation funding is actually allocated on a project by project basis. However the estimate assumes, that overall, Puna receives project funding close to its share of projected Hawai'i Island population growth (20-40 percent). Federal funding usually requires a local match of 20 percent from State and/or County agencies. Over the 25 year planning horizon approximately $75 – $150 million may be available for various multi-modal capacity improvements. Furthermore, there is also a recent trend towards direct Congressional involvement in funding of projects. These congressional "earmarks" are separate from the Federal Highway Administration budget.

TABLE 12.4: ESTIMATED PUNA TRANSPORTATION FUNDING

Based on Historical Funding:	**%**	**Amount**
Entire State of Hawai'i:		$150 mil/ year
County of Hawai'i receives:		$24 mil/year *(More than population share.)*
Estimated Allotment of Funds		
Total Funds/Year:	100%	$24 mil/year
Bridges (required)/Year:	20%	$4.8 mil/year
Maintenance & Safety/Year:	30%	$7.2 mil/year
		$12 mil/year
What is left for capacity?		
Capacity Improvements/Year:	50%	$12 mil/year
2005-2030 funds (25 yrs.):	* 25 yrs	**$300 mil**
Districts Compete for Funding		
Each district must compete for funding on a project-by-project basis.		
Estimate Puna District receives:	20-40%	$2.4-$4.8 mil *(based on est. population growth.)*
2005-2030 funds (25 yrs.):	* 25 yrs	**$60-120 mil**
Local Matching Funds		
Local government (State/County) match funding 80/20	20%	$0.6-1.2 mil
2005-2030 funds (25 yrs.):	* 25 yrs	**$15-30 mil**
Total Puna Funding Estimate		
Federal + Local 2005-2030 funds:		**$75-150 mil**

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13. ACTION PLAN

This section is a quick reference guide to projects and required actions of the Puna Regional Circulation Plan. This section offers steps towards plan implementation. For each project the following information is listed:

- Objective
- Project name
- Project description
- Lead responsible
- Funding: (Planning, Design, Right-of-way Acquisition, Construction)
- Estimated Year

13.1. "Easy Wins"- Short Term Projects

Community participants consistently asked for "easy-wins" or other short-term projects that would improve transportation conditions now! A number of steps have to occur before major public infrastructure is built. After the need is identified, preliminary studies including archaeology, preliminary engineering, an environmental assessment/impact statement, and land use approvals are required. Thereafter, construction funds must also be sought. The entire process for new infrastructure can take as long as 10 to 20 years.

In the meantime there are "easy-win" projects that the State, County, and even community can help to implement including:

- Intersection Improvements Study
- Railroad Emergency Bypass and Multi-Purpose Pathway
- Puna Emergency Access Route
- N. Peck/Kulani/Stainback Emergency Access Route
- Rural Para-transit
- Hele-On Expansion - Increased bus frequency and routes
- Park and Ride Lots
- Puna CDP – CAG Involvement

13.2. Transit

The Puna Regional Circulation Plan proposes implementation of the Rural Para-transit System. The outcome of the ongoing study will lend more information about specific costs and actions required of a RPT system. The pilot project will help identify funding needs for capital equipment, operations, and staff training.

The PRCP also recommends that the MTA develop a Transit Master Plan. This document will plan mass transportation improvements for a 20-year planning horizon. The plan will identify needs for improved or new schedules, capital costs for buses or passenger infrastructure, and transportation demand management programs. The plan should also address transportation demand management programs such as rideshare, employee incentive, and marketing, The plan also outlines specific transit improvements such as increased bus headways and development of a bus-only lane. This lane will speed travel for bus riders and increase transit desirability.

Park and Ride facilities are another TDM tool that the PRCP proposes. Limited funding is already available for a Feasibility Study and Site Selection Plan for the first four lots. An Environmental Assessment (EA) would also be conducted as a part of this process. As funding becomes available a complete integrated "network" of park and ride lots should be implemented.

13.3. Connectivity

Connectivity Projects interconnect subdivisions and create emergency access connections. Meetings and coordination with area landowners, community associations, and road maintenance corporations will be needed to develop connectivity where it is appropriate. More importantly, does the immediate community (neighboring subdivisions) want or need the convenience or safety of a connection? The PRCP identifies possible connections for vehicular, bicycle, transit, and/or pedestrian access within a one-mile grid. Of these alternatives, several were identified for implementation of emergency access routes. Proposed emergency access routes for upper Puna and Puna makai include:

1. PEAR
2. PEAR II
3. Railroad ROW Access
4. Kehau to Punawai
5. N. Peck Rd. to Ihope Rd.
6. N. Kulani Rd. to Stainback Hwy.

The emergency access routes identified in Section 10 should be prioritized. Actions call for a County staff assignment to track coordination and negotiations with landowners, subdivision associations and road maintenance corporations.

13.4. Bikeways and Multi-Purpose Paths

The action plan calls for implementation of the Railroad bike/multipurpose pathway. The pathway is also considered a connectivity project because it will provide emergency access. To restart the implementation of the pathway the County should restate its commitment to the project (Resolution). Thereafter, continued coordination and facilitation with landowners such as W.H. Shipman Estate, will be required. The neighboring subdivision associations, community, and the Bike Advisory Committee should be involved throughout the process. As the project moves to garner funds it will be important to have interagency coordination and define roles and responsibilities for the pathways. This process should identify who builds or improves the path, who maintains it and who regulates it. A Memorandum of agreement (MOA) or Memorandum of Understanding (MOU) may be helpful in this process.

Similarly, the Kea'au Planning Group (KPG) should continue to coordinate with the County of Hawai'i, State DLNR, and National Park Service (NPS) to resolve maintenance responsibilities for the Old Volcano Trail. Once an agreement is reached survey work can continue. Funding and implementation follow.

Following implementation of these pathway projects the State of Hawai'i and County should move forward with bike improvements phases 1 and 2 according to Bike Plan Hawai'i (2003). The plan outlines projects throughout the district to create a network of bikeways. The County's Bike Advisory Committee will need to advocate for bike projects and participate more intensely in the implementation of projects.

13.5. PMAR

The action plan also outlines next steps for an Alignment Alternative Study to analyze the alternatives and recommend a definitive alignment. The County received $188,084 in Federal funding for further investigation, community consultation, and study of a PMAR. There is also the possibility of additional funds through other federal programs.

This plan proposes that an alternate route from Hilo to Shower Drive should be pursued as soon as possible. Other unresolved issues at this time include whether this road should be improved through HPP, and if so, the appropriate alignment and design standards. The scope of this study should include: 1) whether to connect to Railroad Avenue or to create a new corridor connecting to the Airport and Hilo Harbor; 2) whether and how to traverse HPP; 3) major network connections such as the improvement of 40th Avenue and Pohaku Drive; and 4) feasibility of the interim use of the Railroad ROW as an emergency bypass and bus-only route from Railroad Avenue to Shower Drive.

13.6. Widening

The PRCP does find that some widening of highways is needed. According to transportation projections outlined in Section 7.0, widening of Highway 11 to Huina Road will be necessary. Moreover, widening of Kea'au-Pahoa Hwy. (130) will be required to accommodate vehicle travel. Actions for widening projects involve coordination with State DOT to ensure that projects are placed on future State Transportation Improvement Programs (STIP). Continued coordination with community will also be required. Once funding is secured planning, design, and right-of-way acquisition will commence.

13.7. Administration

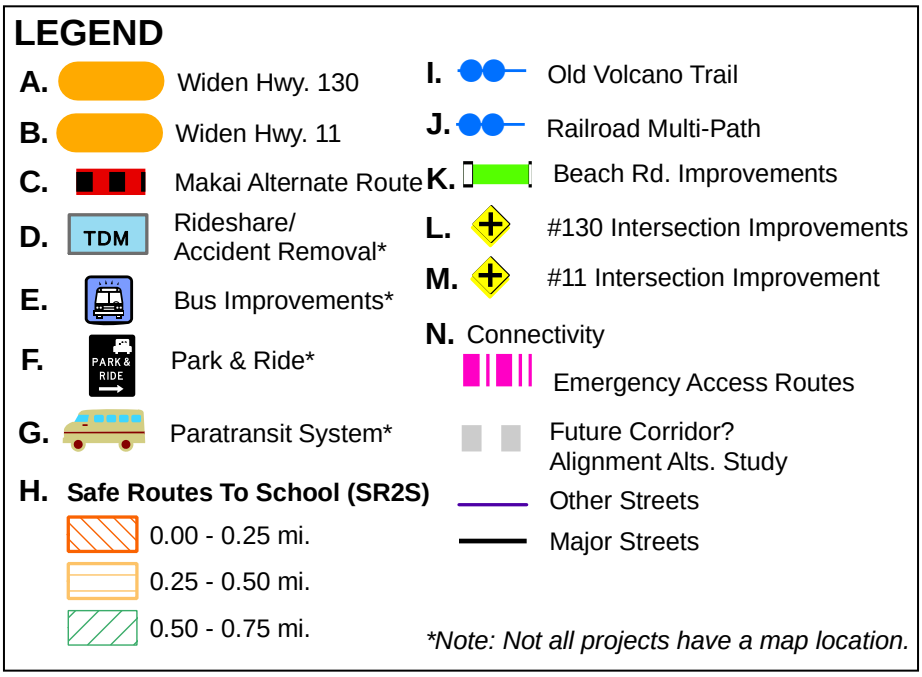
Organization, administration, and staffing of projects will have an impact on the implementation of the PRCP. The PRCP includes many projects that require follow-up, fieldwork, and continued consultation with agencies, landowners, and residents. This plan proposes that consolidation of the County's transportation functions may be more efficient under one department of division. This would consolidate the transportation functions of planning, engineering, construction, transit, traffic, and perhaps even highway maintenance. Such reorganization may provide the oversight, staffing, and commitment to transportation projects on the Hawai'i Island. Actions should also occur to update the County General Plan and Hawai'i Long Range Transportation Plan with PRCP projects. Briefings and meetings with key decision makers is also important to continued progress toward implementation of the plan.

The PRCP focus on providing mode choice will likely require that flexible funding is used for implementation of multi-modal projects (transit/bike/ped). Continued coordination with State DOT, FHWA and FTA will be required to oversee this change. Finally, to address the major funding needs, the County agencies should work with State DOT to apply for the discretionary funds that are available on a project by project basis. The State is potentially eligible for many of these programs should the right project be introduced.

13.8. Continued Community Participation

The County of Hawai'i is expected to begin a new Puna Community Development Plan process in early 2006. PRCP participants, CAG members, and other stakeholders are encouraged to participate in this planning process. The Puna CDP will be able to address many issues that were limited in this Plan such as land use, public services and facilities, and other infrastructure needs. Planning processes should continue to inform community on how projects are funded and implemented. This will help community to better understand how and why major transportation projects take decades to implement and how sound planning can provide a foundation and evolve as things change.

13.9. Projects by Objective



OBJECTIVE: MITIGATE PEAK-HOUR CONGESTION.

A. Widen Highway 130 in affordable increments:

i. Permanently convert the shoulder lane from Shower to a travel lane. This additional lane would provide 2 lanes in the Hilo direction from Shower Drive all the way to Hilo. To offset the negative impact on bicycle use by removing the shoulder, the improvement of Railroad right-of-way as a bicycle path needs to be timed in conjunction with this project.

1. Lead responsible: DOT
2. Funding:
   a. Design: completed
   b. ROW: STIP 04-06, HS-12, $0.3M
   c. Construction: STIP 04-06, HS-12, $6.0M

iii. Widen to 4-lanes from Keaau to Pahoa. Planning and design will be for the full stretch. Planning should include analysis of dedicated bus lane alternatives. Construction will be in increments.

1. Lead responsible: DOT
2. Funding:
   a. Planning: STIP 02-04, $1.5M
   b. Design: Proposed STIP 06-08, $3.0M
   c. Construction: not programmed, earliest likely start 2009

B. Widen Highway 11 to 4 lanes in affordable increments:

i. Keaau to Paahana

1. Lead responsible: DOT
2. Funding:

a. Planning/Design: completed
b. Construction: STIP 04-06, $1.75M

ii. Paahana to Huina
1. Lead responsible: DOT
2. Funding:
d. Planning: not programmed
e. Design: not programmed
f. Construction: not programmed

C. Construct new makai alternate route:

Besides providing needed capacity, this alternate route would provide redundancy to Highway 130 in the event of highway closure. Unresolved issues at this time include whether this road should be improved through HPP, and if so, the appropriate alignment and design standards. Because of the extent of the unresolved issues, an alignment alternatives study should be done to analyze the alternatives and recommend a definitive alignment. The scope of this study should include: 1) whether to connect to Railroad Avenue or to create a new corridor connecting to the Airport and Hilo Harbor; 2) whether and how to traverse HPP; 3) major network connections such as the improvement of 40th Avenue and Pohaku Drive; and 4) feasibility of the interim use of the Railroad ROW as an emergency bypass and bus-only route from Railroad Avenue to Shower Drive.

i. Alignment Alternatives Study
1. Lead responsible: County Planning Dept
2. Funding: Proposed STIP 04-06 Amendment, $0.2M

ii. Planning (EIS)
1. Lead responsible: County DPW
2. Funding: Proposed federal funds, $0.2M

iii. Design: not programmed
iv. Construction: not programmed

D. Transportation Demand/System Management:

Transportation Demand Management techniques strive to reduce the number of automobiles during peak periods (e.g., imposing tolls during peak periods, flexing work times, ride-sharing programs). Transportation System Management techniques strive to make more efficient use of existing highway facilities (e.g., zipper lanes, HOV lanes, coordinated traffic signals, rapid accident removal). The strategy for this Plan is to initiate programs that exist elsewhere, that are not costly, and are relatively effective. For these reasons, the Plan focuses on two techniques: a ride-sharing program that the State already has in place, and which the County Mass Transit Agency is willing to coordinate and expand to this County; and a rapid accident removal program that may require improved coordination of existing resources and hopefully negligible additional expenses.

i. Ride-sharing Program
1. Lead responsible: County Mass Transit Agency
2. Funding: Existing State DOT Program Fund?

ii. Rapid Accident Removal Program
1. Lead responsible: County Police Department
2. Funding: to be determined

OBJECTIVE: PROVIDE MULTI-MODAL CHOICES.

E. Increase bus frequency and routes.

i. Initiate a circuit routing system. This system has three circuit routes that intersect at Keaau: Volcano/Keaau, Pahoa/Keaau, Hilo/Keaau. The shopping center or community center in Keaau would serve as the hub. The initial roll-out of this system will provide bus service at 1-hour intervals throughout the day. Commuter express service from Pahoa and possibly Volcano would supplement the regular service during peak commuting hours.
   1. Lead responsible: County Mass Transit Agency
   2. Funding:
      i. Bus acquisition: Approximately $500,000/bus

ii. Initiate fixed scheduled feeder routes in the more built-out subdivisions. These feeder routes would enable residents in the interior of the subdivisions to get to the circuit routes along the main highways. The feeder route system will be part of the paratransit system.
   1. Lead responsible: County Mass Transit Agency
   2. Funding: Undetermined (MTA)

F. Construct park/ride facilities.

To expedite, the preference is to use existing facilities (e.g., church, shopping center). Consultant hired to identify most strategic locations, site requirements, and estimated cost.

i. Lead responsible: County Mass Transit Agency
ii. Funding: Undetermined (MTA)

G. Supplement bus transit with paratransit.

The paratransit system would coordinate underutilized resources (e.g., school buses, social services vans, taxis) to service the feeder routes and to also provide on-demand, door-to-door service coordinated through the Internet and GPS.

i. Lead responsible: County Mass Transit Agency
ii. Funding: To be determined by Para-transit Study

H. Ensure safe routes to schools to encourage walking and biking by school children.

The nonprofit group called PATH has planned and implemented such programs at Kealakehe and other schools. They have access to DOH and other funding sources to leverage County funding.

i. Lead responsible: County Planning Department
ii. Funding: Undetermined

I. Improve the Old Volcano Road Trail.

Besides its recreational function, this trail could serve as an off-highway pedestrian route to Mountain View Elementary School.

i. Lead responsible:Kea'au Planning Group, NPS, Na Ala Hele (DLNR), County of Hawai'i DPR?
ii. Funding: Undetermined

J. Acquire and improve Railroad ROW.

Although this ROW will be a pedestrian and bike path, the driving justifications to proceed immediately with this project is to provide an alternate pedestrian/bike route when the shoulder lane is converted and its interim value as an emergency bypass to Highway 130.

i. Lead responsible: Planning Department
ii. Funding: Undetermined

K. Investigate Beach Road Improvements.

At this point, the value of improving the Beach Road is to provide a recreational pedestrian/bicycle link to Kapoho. Since there are no multi-purpose reasons, and the regional transportation value is low, and it is located in the tsunami inundation and high lava hazard zones, the priority to allocate funds is low.

i. Lead responsible: Undetermined
ii. Funding: Undetermined

OBJECTIVE: INCREASE HIGHWAY SAFETY.

L. Improve intersections along Highway 130.

DOT has committed to do an in-house study to determine whether improvements are warranted at the intersections along Highway 130. This Plan recommends that DOT do this study before installing the traffic signal at Shower; the funds for that traffic signal may be better used at another intersection. (E.G.: Kaloli Drive, Paradise Drive, Orchidland Drive, Maku'u Drive)

i. Lead responsible: DOT
ii. Funding:
    1. Planning: in-house
    2. Design: not programmed
    3. Construction: not programmed

M. Improve intersections along Highway 11.

The intersection improvement at Huina has been completed. Construction funds have been committed to improve the Kūlani intersection.

i. Lead responsible: DOT
ii. Funding: STIP 04-06, HS20, R/W ($500,000); Proposed STIP 06-08, CON ($2.8M)

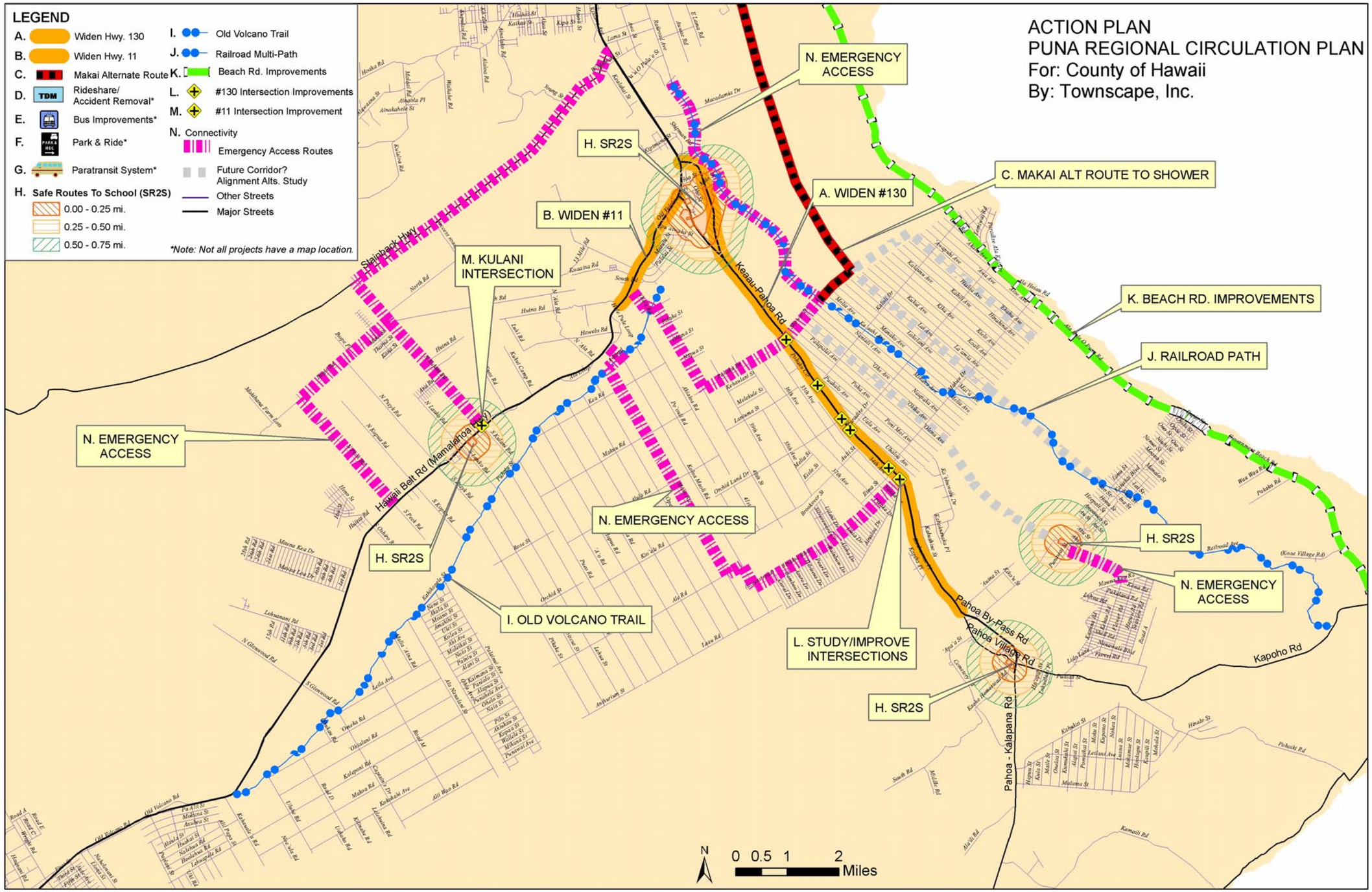
OBJECTIVE: DEVELOP INTERCONNECTIVITY TO PROVIDE EMERGENCY BYPASS AND RELIEVE TRIPS ONTO ARTERIALS

N. Emergency Bypass/Connectivity Projects

Ideally, roads interconnecting subdivisions or providing alternative access from the highways to the subdivisions should occur every 500'. However, many of the roads within the subdivisions are private. The focus for this plan are those interconnections that have regional benefit in terms of providing alternate roads to major destinations, or providing emergency bypass or faster response times. Where necessary, the County may condemn private roads and assume control/liability to relieve owners of the private roads of the maintenance/liability responsibilities. For those roads that will serve as emergency bypass, improvements such as bridge reinforcements may be necessary to accommodate truck or bus traffic. (E.G. Shower → Pohaku → 40TH Ave. → Hwy. 11).

i. Lead responsible: County DPW
ii. Funding: Undetermined

FIGURE 13.1: ACTION PLAN



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