

Planning for Sustainable Tourism



Part II: Infrastructure Overview Study

Volume III: Hawaii County

Prepared for

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THE DEPARTMENT OF BUSINESS, ECONOMIC DEVELOPMENT & TOURISM
STATE OF HAWAII

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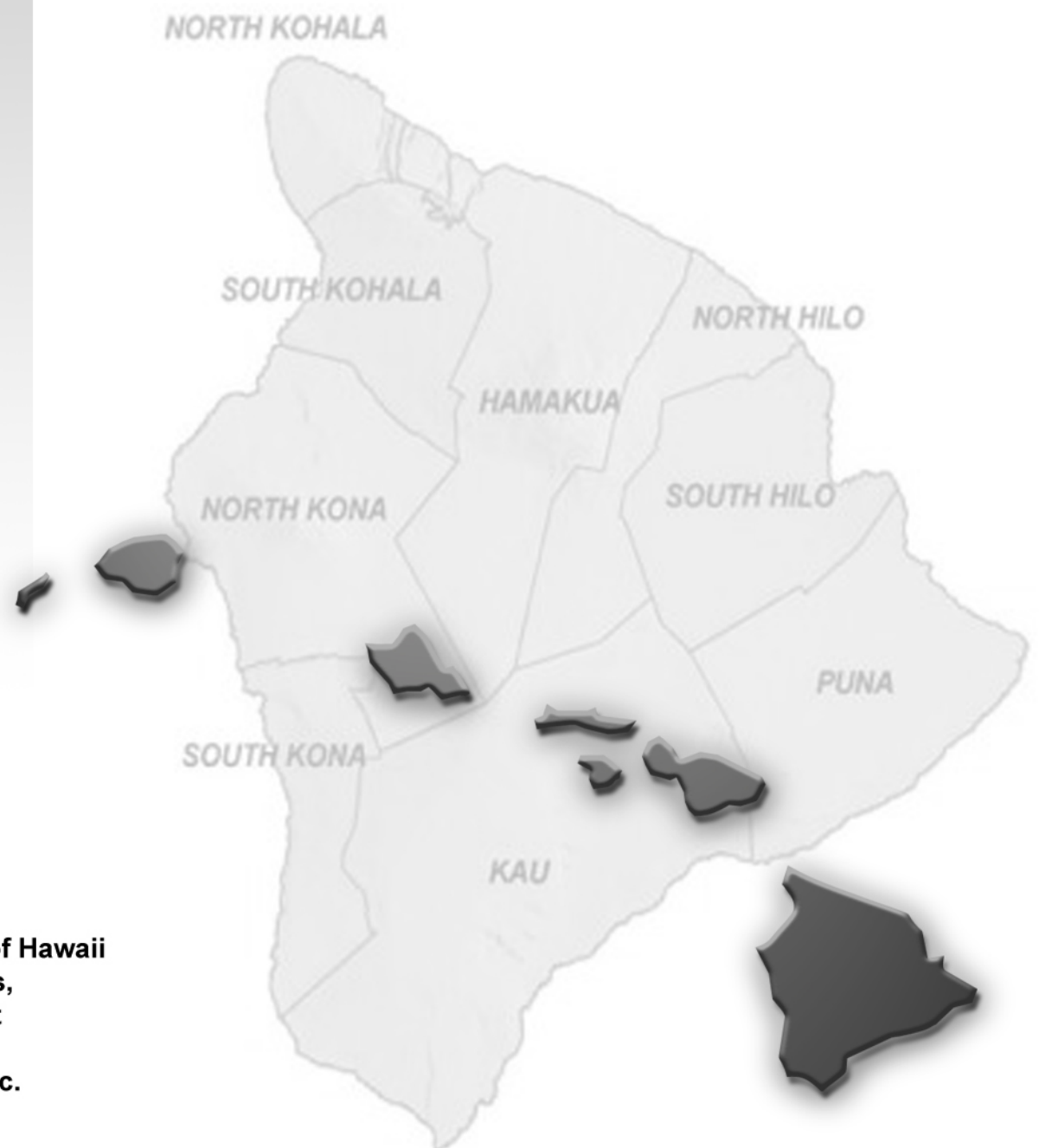
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Planning for Sustainable Tourism in Hawaii

INFRASTRUCTURE & ENVIRONMENTAL OVERVIEW STUDY

Volume III: County of Hawaii



Prepared for the State of Hawaii
Department of Business,
Economic Development
and Tourism
By Carter & Burgess, Inc.

December, 2002

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Introduction to County of Hawaii

All of the information and data mentioned in the introduction is directly from the *County of Hawaii General Plan Revision*, unless otherwise noted.

The County of Hawaii encompasses 4,028 square miles of the Big Island, the southeastern most island in the Hawaiian Archipelago. Its diverse climate, topography and environments vary from snow-capped Mauna Kea to black, white and green sand beaches, from tropical rainforests to Kau desert and from the flowing lava of Mauna Loa to the resorts of the Kona-Kohala coast. There is a recognized need to preserve the natural beauty of this island and to protect the natural resources.

According to *County of Hawaii General Plan Revision*, the Department of Business, Economic Development and Tourism economic forecast for Hawaii **assumes** diversification and growth in technology. Only recently (since the 1960s) has the visitor industry supplanted agriculture as the dominant economic force. The downfall of the sugar industry has resulted in diversification of the agriculture sector. Technological fields such as astronomy, renewable energy, and research and development are also aiding in diversifying the Big Island's economy.

According to *County of Hawaii General Plan Revision*, several issues must be considered. Agriculture, especially the sugar industry, has been declining for the past 10 years. Diversified agriculture, macadamia nut, papaya, flower and other agriculture are expanding, but not enough to replace the sugar industry. Tourism is an area of rapid expansion and employment. According to the *General Plan*, it is anticipated that the tourism industry will increase substantially. Cruise ships, resort based tourism, direct flights into Kona and local products and services geared toward the tourism industry generate a healthy economic base. Other areas of expansion cited by the *General Plan* include: fishing and aquaculture, astronomy, renewable energy, forestry and research and development.

As illustrated in Table 3.01 and 3.02 taken from the *General Plan*, three scenarios were projected for the Big Island. Scenario A, the most conservative situation, assumes a 1% annual growth in the tourism and papaya industries and University of Hawaii - Hilo will only grow by 16 positions per year. Scenario B, moderate growth, assumes a 2% annual growth in tourism, 70 new positions at UH – Hilo and 1000 students over the next 10 years, and the Hilo Call Center will create 300 new jobs. Scenario C, the most aggressive and optimistic situation, assumes a 3% tourism annual growth rate, 4% papaya industry growth due to utilization of post-harvest treatment facility, and construction of the State prison - resulting in 2000 construction jobs over three years and 1000 permanent support positions for the facility. From these scenarios, a distribution of the resident population has been made. Planning information from *County of Hawaii General Plan Revision* uses Scenario B. Any other assumptions made by State or

County governmental agencies have been noted in the Summary for that infrastructure element.

Table 3.01 -- Population and Visitor Projections by Scenario ^{27,2001}

	Resident Population	Visitors to County
Scenario A		
2000	148,677	1,231,700
2010	175,388	1,364,600
2020	213,452	1,507,400
Scenario B		
2000	148,677	1,265,700
2010	176,937	1,551,100
2020	217,718	1,890,700
Scenario C		
2000	148,677	1,278,700
2010	188,031	1,729,200
2020	237,323	2,323,900

Source: *County of Hawaii General Plan Revision*

Table 3.02 -- Distribution of Resident Population for the Year 2020 ^{27,2001}

District	A	B	C
Hamakua	7,184	7,328	7,988
Kau	8,243	8,408	9,165
North Hilo	1,842	1,879	2,048
North Kohala	11,053	11,273	12,289
North Kona	41,447	42,275	46,082
Puna	57,105	58,246	63,491
South Hilo	48,815	49,791	54,274
South Kohala	23,947	24,426	26,625
South Kona	13,816	14,092	15,361

Source: *County of Hawaii General Plan Revision*

Table 3.03 shows the average visitor census for Hawaii County in 2001 as compared to the State as a whole.

Table 3.03 --Average Visitor Census in Hawaii 2001

County or island	2001		
	Total	Domestic	International
State total	158,243	118,106	40,136
Hawaii County	21,064	17,394	3,669

Source: *Annual Visitor Research Report*

District Summaries

Puna

According to the *General Plan*, the population in Puna is expected to grow at a rapid rate. Population growth is outpacing the employment rate as a bedroom

community to Hilo. Agriculture, its main economic force, is expected to expand quickly, once the appropriate infrastructure is in place. Geothermal industry is another promising sector of growth. There are few government facilities in Puna District.

The General Plan also states, “the visitor industry has very little visible effect on the Puna district. . . .” There are visitor attractions – Volcanoes National Park and the Painted Church, but few visitor accommodations. Existing visitor accommodations are in the form of vacation rentals and bed & breakfast units.
27,2001

South Hilo

As stated in the *General Plan*, the city of Hilo, the county seat, is the only metropolitan area in the county. As such, it functions as the governmental, industrial, commercial and population distribution center. New economic based activities give South Hilo the potential for economic growth. Several projects are planned that could further augment this economic growth.

Within the city of Hilo, there has been a 6.2% growth in population. The remainder of South Hilo District had little growth. 27,2001

Tourism in Hilo is on the decline since the 1970s. Most visitors are business and local tourists draw in by special events. While tourism from cruise ships is on the increase, overall tourism is expected to remain the same. 27,2001

North Hilo

Overall, according to the *General Plan*, the North Hilo population has been declining for the past 50 years. The main reason for this decline is due to its dependence upon the declining sugar industry. The major population and service center is Laupahoehoe.

Much of the sugar cane fields are divided into smaller holdings where a range of crops is raised. Agriculture is expected to remain the economic base of the district. Forestry, especially native hardwoods, is an area of expected growth. As stated in the *General Plan*, there are no visitor accommodations presently, and that is not expected to change due to predicted land uses. 27,2001

Hamakua

Hamakua is growing, despite the decline of sugar operations, as state in the *General Plan*. This growth is due to resort activities in South Kohala District and businesses providing products and services to the visitor industry. The main commercial and residential center is Honokaa. There is a small hotel in Honokaa, in addition to some bed and breakfast units throughout the district.

The economic force for the district is diversified agriculture. There are plans a cooperative effort by several governmental and local groups for cultivation of

native hardwood forests. Another economic factor is the astronomy facilities on Mauna Kea. As the world's premier astronomical site, 13 observatories are located at its summit. ^{27,2001}

North Kohala

North Kohala has grown dramatically due to the resort activity along the South Kohala coast. Diverse agriculture is supports the economy, along with tourism. Several natural and historical features are conducive to tourism development. Plans for resort development have been proposed. Upolu Airport, a small airport, services primarily inter-island carriers and sightseeing charters. There are efforts to preserve the rural, agricultural character of the area. ^{27,2001}

South Kohala

The economic activities in South Kohala are tourism, diversified agriculture, educational institutions and research and development associated with the astronomy sector. Many base facilities for the astronomic observatories are located in Waimea. Kawaihae Harbor, the second deepwater port on the Big Island, provides for recreational and commercial boating activities.

The South Kohala coast is a world premier resort destination. Other attractions that draw tourists in are the environment, fishing, golfing and the beaches. The potential for tourism growth is becoming a major economic force for the island. ^{27,2001}

North Kona

The town of Kona is considered the center for government, commercial and industrial services for West Hawaii. It is also the retail, banking and special events center.

There has been tremendous population growth in North Kona due to the expansion of the tourism industry. This growth can be attributed to the expansion of the runway and terminal facilities at Kona International Airport in Keahole. Although once the major visitor destination on the Big Island, North Kona and South Kohala now share this distinction. The tourism industry and associated services is expected to keep a moderate growth rate. One of the facilities and services available to visitors is the Honokohau Harbor for world-class big game fishing.

Another economic factor in North Kona is the Kona coffee industry. Although the other islands have surpassed the Big Island in production, there is still demand for the distinctive Kona coffee flavor. Other agricultural sectors include cattle ranching, fruits, nuts and vegetables. There are also quarrying operations, manufacturing, wholesale and retail services and an ocean science and technology park. ^{27,2001}

South Kona

South Kona's population growth is slowing to about 12% annual growth. This area is known for primarily for its agriculture – coffee, fruits, nuts, vegetables and cattle ranching. ^{27,2001} The tourism industry has a limited presence here, although, there are increasing bed & breakfast units and visitor attractions.

Kau

Kau, the largest district on the Big Island, has the second smallest population. Agriculture is the main economic force. Coffee, flowers, vegetables and nuts are grown here, in addition to raising cattle. There are limited visitor accommodations. ^{27,2001}

Recommendations for County of Hawaii

Public Infrastructure

Terrestrial Water Supply Quality and Quantity

Overall, there is more supply than demand for terrestrial water. However, West Hawaii, the driest part of the island, and the area with the lowest recharge is also the area with highest growth. The Kohala and Kona areas will see water restrictions before the rest of Hawaii, if exploratory wells with their corresponding distribution infrastructure do not keep ahead of demand. Aquifer levels will also need to be monitored to note any serious aquifer depletion. This could be a possible constraint for the visitor industry and development.

Sewage

The Hilo and Kona regions have community sized wastewater treatment facilities, which currently are adequate for their wastewater disposal needs. The other regions in Hawaii County depend on on-site wastewater disposal systems and cesspools, which in most cases do not satisfactorily treat the wastewater.

It is recommended that a Hawaii County wastewater feasibility study be developed. The study should include the estimated future growth, development trends, a cost analysis for any proposed infrastructure, and a review of existing on-site wastewater disposal systems. The feasibility study would aid in the recognition of deficient areas of treatment and in the placement of future infrastructure.

Solid Waste Disposal

The County of Hawaii Solid Waste Division is faced with many challenges. Both the State and County failed to meet the waste reduction goals for 1995 and 2000; the program is operating at a loss, the tipping fees only account for 35% of the Divisions budget; and illegal dumping of solid waste continues to be a problem. These challenges are being met with the encouragement of recycling programs, the consideration of curbside pickup, and tipping fees that are more in line with the actual cost of solid waste disposal.

It is recommended that a solid waste option plan be developed to provide potential alternatives and solutions to the existing problems. The plan should evaluate the existing transfer stations. A review of the transfer station locations and their usage should be considered. The study should consider potential ways to upgrade some of the transfer stations so waste could be compacted on site and more efficiently transferred to the landfill.

Storm Water

The County of Hawaii has recognized many of the challenges it faces and has outlined a comprehensive list of future requirements. The changes the County is considering include but are not limited to a revision of the Drainage Master Plan, a review of land use policy as it relates to flood plain, high surf, and tsunami hazard areas.

No recommendations for Hawaii County Storm Water are forthcoming at this time.

Roads

Federal and state funding for transportation projects are waning. It is recommended that alternative funding sources be identified for future maintenance and new infrastructure.

The Long Range Land Transportation Plan for the island of Hawaii, which identifies major transportation improvements to support projected growth through the year 2020 should be implemented.

Airports

Airports in the County of Hawaii are capable of meeting projected passenger demand. Hilo Airport was built with expectations of more passengers from overseas than it currently has. Monies should now be spent toward improved cargo facilities on East Hawaii to support the diversified agricultural industry, especially the export of papayas, coffee and flowers.

Harbors

It is recommended that the improvements outlined by the Harbors Division be implemented at both Hilo and Kawaihae Harbors. Hilo harbor should provide the same level of service as large harbors on the island of Oahu. There is little discussion regarding improvement to cruise ship terminals and facilities. This is an area of further study, as cruise ships are a growing segment of the visitor industry.

Small boat harbors in Hawaii are heavily utilized. Currently, there is a waiting list for mooring spaces. It is recommended that the small boat harbors charge comparable rates as those seen at private harbors. The increased revenue would allow for better maintenance and potentially provide new facilities to decrease the waiting list. It is important that sufficient funding is generated for future renovations and repairs.

Parks

Crowding is generally due to inadequate or undeveloped park acreage, facilities and amenities. Further study and detailed plans for each district are needed to identify resource areas with recreational value and to develop these areas by

their assets and/or public needs assessment. Recreation programs requirements need to be taken into account in the developmental stages of the park planning process.

Normal funding sources, strained as they are, are stretched to their limits to maintain current infrastructure. Additional sources of funding for new facilities, renovations and staffing need to be identified to expand and/or improve Hawaii County parks. Some possibilities of funding are private operation/maintenance or concession stands. There may be sources of sector specific funds or partnerships with resort management or developers.

Police, Fire and Emergency Services

The economic crunch experienced by both the State of Hawaii and County of Hawaii are impacting all infrastructure elements. Current funding falls short of providing the police services expected by the public. While service calls have increased, funding has not kept pace. Research into monies available through Homeland Security and other sources needs to be done.

The number of service calls for both the Police Department and Fire Department exceeds the manpower needed to respond in a timely manner. Another reason is the enormous physical area with scattered settlements. Arriving at a scene in a timely manner is challenging.

Further study, long-range planning, cost projections and study of demographics within each district is vital to efficiently and strategically place manpower and emergency response equipment and facilities. Correlation between demographics and geography may shed light on differences between resident and visitor usage of emergency services.

Private Infrastructure

Visitor Accommodation

Monitor growth in west Hawaii to assure that it does not outpace existing infrastructure capacities.

Private Transportation

There is inadequate information available to make a thorough assessment of private transportation at the county level in Hawaii County. Nevertheless, as privately run businesses, the industry will tend to expand to meet the demands of service calls.

Recommend monitoring of private transportation and data collection if a more thorough evaluation is desired.

Energy Systems

West Hawaii is the fast growing area in Hawaii County. As such, a new power source is needed. HELCO has been searching for a power plant site on West Hawaii since the 1980s. They have met with strong opposition. The County Council has recently approved rezoning of a site in West Hawaii for the near future development of a power plant. This could be a possible constraint to the visitor industry.

Energy systems recommendations are to fast track the additional power source once a site is approved; other considerations are energy conservation and utilization of more alternative and renewable energy sources.

Sewer Systems

Many of the private sewer systems are owned and maintained by the resort management companies. Aside from information gleaned from environmental impact statements, information regarding sewer systems is not found in county documents.

Recommend monitoring of private sewer systems and data collection if a more thorough evaluation is desired.

Environmental Features

Coastal Water Quality

The coastal water quality for Hawaii is excellent except when impaired by severe storms, cesspools and construction where best management practices were not followed. Recommendations include the provision of educational information and interpretive programs to residents and visitors regarding the importance and uniqueness of Hawaii's natural marine environment.

Marine Ecosystem Health

Recommendations include providing educational information and interpretive programs to residents and visitors regarding the importance and uniqueness of Hawaii's natural marine environment. Also recommended is the creation of more marine conservation areas. The conservation areas would circumvent the problem of over fishing along the coast, which creates localized depletion of various marine biota.

Forestry / Green Space

Recommendations for forestry include that more funding be directed toward the maintenance and upgrading of forest reserves and trails. The condition of the forest reserves directly effects water quality within the watershed.

Air Quality

The biggest threat to air quality in Hawaii County is volcanic related haze and fog. The direction and speed of the tradewinds can help or impede the problem, depending upon one's location relative to the source. The majority of the time the tradewinds efficiently diffuses and reduces the intensity of the vog.

Recommendation includes continued monitoring of air quality.

Beach Erosion

There is insufficient information to provide accurate recommendations at the County level. Recommendation is for additional research for two purposes – to establish a baseline data set for beach erosion and to give support to management and their policies and practices.

Invasive Species

Recommendations include maintaining and enforcing the quarantine program and review the quarantine and noxious species law. Coordination of manpower and funding by formulation of a consortium of governmental and other interested parties can maximize resources. Identification of infestations and regular performance assessments of the successes and failures of eradication programs can aid in stopping the spread of problems.

Also recommended is the garnering of public support for programs, though public relations, media and education, encourage nurseries and landscape business to stock and cultivate native plant species.

Other Appropriate Natural and Scenic Resources

There is insufficient information to provide detailed recommendations at the County level, however it is recognized that the aesthetic pleasing features of Hawaii attract many tourist each year. Recommend that scenic resources be reviewed by public input until more quantitative measures are utilized.

Native Species / Extinction Issues

The Invasive Species Committee is a new organization. Recommend monitoring their progress in the fight against invasive species.

Riparian / Wetlands

Only recently has the status of the state streams been brought to light. Recommend continued monitoring of the preliminary research and actions will help ensure the restorative programs stay on course.

County of Hawaii – Water Quality and Quantity

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, the county Department of Water Supply operates and maintains twenty-three water systems. The State operates agricultural water systems in Lalamilo and Hamakua. There are several privately owned agricultural and domestic systems within the county.

Below are several tables depicting water usage in the County of Hawaii. The numbers have been broken down to the district level where the data is available. Services are defined as the number of accounts or users of water. Maps and additional tables, especially water quality tables, can be found in the Appendix section.

**Table 3.04 -- Water Services And Consumption, Hawaii County^{142, 2001}:
 1990 TO 2000 (Year ended June 30)**

Year	Number of services	Consumption (millions gallons)
1990	29,820	7,064
1991	30,848	7,356
1992	31,564	8,025
1993	31,982	7,937
1994	32,381	7,999
1995	32,828	8,378
1996	33,094	8,363
1997	33,402	7,804
1998	33,716	8,158
1999	34,254	8,173
2000	35,084	8,352

Source: *County of Hawaii Data Book, 2001*

**Table 3.05 -- County Waterworks Services, Hawaii County^{142,2001}
 By Districts: 1997 To 2002**

District	1997	1998	1999	2000	2001	2002
Hawaii County	33,402	33,716	34,254	35,084	35,962	36,490
Puna	2,737	2,738	2,747	2,771	2,815	2,834
South Hilo	14,314	14,378	14,473	14,561	14,767	14,833
North Hilo	423	473	520	523	535	535
Hamakua	1,657	1,672	1,669	1,839	1,944	1,975
North Kohala	1,487	1,505	1,522	1,556	1,578	1,596
South Kohala	2,912	2,944	3,002	3,107	3,211	3,271
North Kona	6,873	6,984	7,270	7,623	7,984	8,300

Source: *County of Hawaii Data Book 2001*

Table 3.06 -- Average Daily Consumption In Millions Of Gallons Per Day

District	Average MGD in consumption
Puna	1.22
South Hilo	1.20
North Hilo	0.11
Hamakua	0.73
North Kohala	0.33
South Kohala	7.81
Kona	15.73
Kau	0.51
Total	27.63

Source: *County of Hawaii General Plan Revision*

Although the *General Plan* states that average water consumption for the County water system as 22.35 mgd, when totaled, the average is closer to 27.633, as stated in the table above.

Average water consumption county-wide has not reached the sustainable yields for aquifers around the island. However, resort areas and developed in West Hawaii will reach their sustainable yield sooner than other areas. This is due to a low recharge rate in West Hawaii.

Table 3.07 -- Island Of Hawaii Aquifer Sustainable Yields ^{254,2001}

Sustainable yield is the term used for the maximum rate that water may be withdrawn from a source without impairing the source as determined by the Water Commission.

Aquifer	MGD Sustainable Yield
Kilauea	618
NE Mauna Loa	740
E Mauna Loa	388
Kohala	154
W Mauna Kea	24
NW Mauna Loa	30
Hualalai	56
SW Mauna Loa	130
SE Mauna Loa	291
TOTAL	2431

Source: *County of Hawaii – Commission on Water Resource Management*

Water pumped from aquifers under the influence of surface water and surface water is required to be monitored and treated. Groundwater not under the influence of surface water needs only to be chlorinated. ^{27,2001}

Existing Problems, Issues and Opportunities

The *General Plan* states that many systems are inadequate for fire protection. They also do not meet the needs of current agricultural production. Such systems, especially those serving urban areas, need to be upgraded.

Another problem is that several subdivisions utilize roof catchments as the primary means of water supply. During drought, this is supplemented by trucking water in. These subdivisions were approved prior to the adoption of the Subdivision Control Code. ^{27,2001}

Another concern is the possible shortage of water in resort areas. Many resorts are located in the Kona-Kohala area of west Hawaii. This area has a low recharge rate due to the lack of precipitation.

Future and Planned Usage

Future and planned usage is detailed in the individual district summaries and summaries of visitor related areas.

Future and Planned Requirements or Changes

The *General Plan* notes planned changes to include programs to monitor rainwater catchments systems and backflow and cross-connection controls. The program for rainwater catchments systems would be non-regulatory in nature and educational. The backflow and cross-connection controls include safety measures to prevent backflow and certification fro operators to prevent cross-connection controls. Other changes include:

- Water system improvements will correlate to areas of growth with priority given to areas of need;
- Improve and replace inadequate systems;
- Water sources shall be monitored and protected to prevent depletion and contamination from natural and man-made sources;
- The fire prevention systems shall be coordinated with water distribution systems will be coordinated with fire prevention systems to ensure adequate water supplies;
- Develop standards for the construction and use of rainwater catchments systems;
- Ensure groundwater sources meet State Department of Health water quality standards;
- Develop a water master plan that considers water yield, present and future demand, alternative sources, and policies for the issuing of water commitments. ^{27,2001}

Anticipated Costs for the Future

The *General Plan* states that within the next seven years (2001-2008) approximately \$20 million will be spent for compliance projects. Actual figures are outlined in Appendix: County of Hawaii – Department of Public Works Capital Improvement Projects for Fiscal Year 2000-2001. Actual costs for future projects were not available and would require further study.

Problems, Issues and Opportunities Associated with Costs

Review of various documents and an understanding of issues faced by agencies in Hawaii County shows that one issue, regarding costs, is the cost of tapping into and transmitting water to sparse populations in outer lying areas.

Opportunities to take advantage of, as outlined in the *General Plan*, are to continue participation in the United States Geological Survey's exploratory well drilling program and to obtain State and Federal funds for financing compliance projects. ^{27,2001}

Compare Visitor and Resident Impact

Distinctions between residential use and visitor use of water, when data is available, are presented at the district levels.

Major Assumptions

Hawaii County is responsible for the water systems. Assumptions regarding water consumption are made at the county and district/community levels. Some of these assumptions are outlined further in the Visitor Related Area Summaries, especially assumptions regarding development and anticipated water consumption.

The State acts primarily as a regulatory branch to ensure safe drinking water. Any assumptions regarding water quality and standards would be made at the state level.

County of Hawaii – Sewage

Present Capacity and Usage

According to the *County of Hawaii Annual Report 1999-2000*, the division of wastewater **treated and disposed of 1.75 billion gallons of sewage** that fiscal year and maintained over **47 miles of sewer lines**.^{255,2001} No capacity data was uncovered.

Considering the percentage of the island's wastewater that is treated, there is approximately 8 million gallons/day of wastewater treatment.^{102c, 2002} (This calculates to 2.848 billion gallons of wastewater treatment per year.) The capacity and usage of other forms of wastewater disposal is unknown.

About 77 percent of the County's population is served by cesspools.^{102c, 2002} There is an increasing need to create a better system than individual cesspools, particularly in highly urbanized and shoreline areas. More stringent pollution controls, especially water quality standards, are being imposed by regulatory agencies.^{27, 2001} In August 1991, the State Department of Health adopted rules that require the use of septic systems in the most critical wastewater disposal areas.

Hawaii County presently operates municipal sewerage systems in Hilo, Papaikou, Kapehu, Pepeekeo and Kealakehe. The remaining communities are served by private wastewater treatment facilities or individual facilities such as cesspools or septic tanks.

Adequate sewer disposal systems are vital to safeguard public health and preserve the environment. An adequate system minimizes contamination of the ground water supply and the coastal waters, beaches and waterborne recreational areas and is not a visual or olfactory nuisance.

Existing Problems, Issues and Opportunities

There are several issues pertaining to sewage on the Big Island. Many of the issues require further study before fully informed decisions can be made.

- It is difficult to measure the adequacy or inadequacy of cesspools in a given area. Many factors, such as density of population, porous condition of the soil, underground geologic structure, and rainfall levels, have to be taken into account to determine the effects of cesspools. Further study is needed prior to any determination; especially as sewage disposal system designs must be examined with the particular area in mind,
- Another area for study is examining the cost of a sewerage disposal system for a community, including construction and operation costs. These costs vary with the characteristics of each area,
- Land development plans for resort-residential complexes located in shoreline areas pose a potential water quality problem for adjacent near

shore waters. Adequate treatment facilities are essential prerequisites for development, ^{27, 2001}

- Funding, and
- Equipment repairs. ^{102c, 2002}

Future and Planned Usage

Planned usage of Hawaii County sewage includes:

- Plans to expand the sewage system, recycled and reclaimed water is currently being used for erosion and dust control at landfills, ^{102c, 2002}
- Plans for wastewater reclamation and reuse for irrigation and biosolids composting (solids remaining after treatment is processed into a reusable organic material) shall be utilized where feasible and needed,
- Require major developments to connect to existing sewer treatment facilities or build their own,
- Land developers for major resort and other developments along shorelines and sensitive higher inland areas shall install private systems, except where connection to nearby treatment facilities is feasible, compatible with the County's long-range plans, and in conformance with State and County requirements and
- Designate treatment plant sites, sewerage pump station sites, and sewer easements according to the facility plans to facilitate their acquisition. ^{27, 2001}

Future and Planned Requirements or Changes

Long-range planning and further study is required for sewerage systems to be designed for a particular area, depending on topography, geology, density of population, costs, connectivity to existing systems and other considerations of the specific area. ^{27, 2001}

PROJECT ACTIVITIES – FISCAL YEAR 2000-2001 ^{256,2001}

Construction In Progress

Pahoehoe Sewage Pump Station	\$ 2,435,358
Banyan Drive SPS Rehab	\$ 388,500
Hilo WWTP – Repair Secondary Clarifier #1	\$ 63,337
Hilo WWTP – Repair Secondary Clarifier #2 & #3	\$ 179,732
FEMA Hazard Mitigation	\$ 193,204
Kealakehe Effluent Reuse Ph I	<u>\$ 646,271</u>
	\$3,906,402

Design Completed

Kaumana Gardens Collector Sewer	\$ 299,500
Kealakehe Effluent Reuse Master Plan and Ph I Construction	\$ 355,000
Kailua-Kona Southern Zone Sewerage System	<u>\$ 837,419</u>
	\$1,491,919

Design in Progress

Pueo Community Collector Sewer	\$ 196,400
Ainako Aina-Nani Collector Sewer	\$ 300,000

Wailoa Sewage Force Main Replacement	\$ 150,000
Kulaimano WWTP UV Disinfection Upgrade	\$ 24,200
Waiakea Mill Pond Sewer Easement Improvement	\$ 31,325
Hilo Biotower Pump Replacement	\$ 12,100
Wailoa SPS Modification Project	\$ 28,300
Hilo WWTP Comprehensive Facility Review	<u>\$ 325,257</u>
	\$1,067,582

Anticipated Costs for the Future

See Future and Planned Requirements or Changes section above for information on costs.

Problems, Issues and Opportunities Associated with Costs

There is a need to continue to seek State and Federal funds to finance the construction of proposed sewer systems and improve existing systems. ^{102c, 2002}

Compare Visitor and Resident Impact

Lack of available documentation from the Department of Public Works indicates need for further research.

Major Assumptions

According to the Department of Public Works major assumptions include that needed funding will be made available at the rate needed or to match population growth and keep pace with regulatory changes. ^{102c, 2002}

County of Hawaii – Solid Waste Disposal

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, there are two active landfill sites- one for east Hawaii in Hilo, the other in West Hawaii at Puuanahulu. The County also maintains twenty-one solid waste transfer sites throughout the island. Private haulers haul approximately 50% of the solid waste accumulated, while the other 50% is do-it-yourself. Below are data in tabular format or tables from the *Addendum to the Integrated Solid Waste Management Plan*. Additional tables and a map of existing a proposed landfills and transfer station can be found in Appendix: County of Hawaii Landfills and Transfer Stations. ^{27,2001}

Table 3.08 -- Data for County of Hawaii Landfills as of 2001 ^{171,2002}

Landfills	Cubic Yards Remaining	Time to Fill Remaining Space
South Hilo	500,000	2004 less than 2 years
Puuanahulu	12,000,000	2030 – 2050 approx. 40 years

Source: *Addendum to the Integrated Solid Waste Management Plan*

The landfill at Puuanahulu was constructed in 1994 the same year the landfill in Kailua was closed. Most residents take their solid waste to one of 21 transfer stations around the island. The solid waste is then hauled to either the Hilo or Puuanahulu landfills. In some areas, residents pay private haulers to pick-up their refuse from their residences for disposal at a landfill. ^{27, 2001}

The table below outlines the tonnage and percentages of waste collected at the transfer centers and the landfills.

Table 3.09 – Quantities of Solid Waste from Convenience Centers: 2000.
 171,2002

Convenience center	Annual Tonnage	Percent of Subtotal	Percent of Total
East Side			
Hilo	11,757.41	35.9%	17.5%
Keaau	6,371.34	19.5%	9.5%
Pahoa	4,515.53	13.8%	6.7%
Kalapana	767.15	2.3%	1.1%
Glenwood	2,244.23	6.9%	3.3%
Volcano	1,351.15	4.1%	2.0%
Pahala	1,196.79	3.7%	1.8%
Papaikou	2,901.95	8.9%	4.3%
Honomu	1,565.22	4.8%	2.3%
Other	48.68	0.1%	0.1%
SUBTOTAL	32,719.45	100.0%	48.7%
West Side			
Kailua	7,535.19	21.8%	11.2%
Keauhou	4,741.25	13.7%	7.1%
Keei	2,022.37	5.9%	3.0%
Waiea	1,844.51	5.3%	2.7%
Milolii	228.79	0.7%	0.3%
Waiohinu	2,363.94	6.8%	3.5%
Waimea	4,956.04	14.4%	7.4%
Puako	2,495.01	7.2%	3.7%
Kohala	3,157.38	9.1%	4.7%
Honokaa	2,976.06	8.6%	4.4%
Paauiilo	1,107.32	3.2%	1.6%
Laupahoehoe	985.88	2.9%	1.5%
Other	112.75	0.3%	0.2%
SUBTOTAL	34,526.49	100.0%	51.3%
TOTAL	67,245.94		100.0%

Source: Addendum to the Integrated Solid Waste Management Plan

The table below from the *Annual Report Fiscal Year 2000 – 2001*, shows the amount of solid waste taken from 21 County transfer stations, and by commercial haulers and residents to the Hilo and West Hawaii landfills respectively for the past five fiscal years. The figures are in tons. The “Other” category represents solid waste taken by commercial haulers and residents to either landfill. ^{241, 2001}

Table 3.10 – Tons of Solid Waste for East and West Hawaii Transfer Centers 2000-2001

Fiscal Year	East Hawaii		Total	West Hawaii		Total
	Transfer	Other		Transfer	Other	
2000-2001	33,302	38,021	71,323	35,757	56,745	92,502
1999-2000	30,397	32,259	62,656	33,184	54,147	87,331
1998-1999	31,303	30,756	62,059	31,665	52,692	84,357
1997-1998	31,343	34,716	66,059	30,633	47,864	78,497
1996-1997	29,747	31,257	61,004	29,552	46,836	76,388

According to the *County of Hawaii General Plan Revision*, the South Hilo landfill, an unlined landfill, will be closing in 2004 or 2005, and a waste reduction facility cannot be built and operable until several years after that.

Existing Problems, Issues and Opportunities

According to the *County of Hawaii General Plan Revision*, existing facilities and equipment are not adequate to transport the east Hawaii waste stream to Puuanahulu. The existing Hilo Convenience center is not configured or equipped to consolidate waste for transport. Because of development of new subdivisions and the expansion of existing communities, many existing transfer stations are no longer located at the most convenient site to serve the majority of residents.

The Opala Recycling Enterprise expressed a strong desire for an expanded county recycling program. The County of Hawaii has not been as successful as other Counties in other parts of the country. This lack of success is associated with the geographic disadvantages that make export of recyclable materials expensive and a lack of manufacturing facilities that use recyclable materials.

The table listed below is also from the *County of Hawaii General Plan Revision*, and reviews the quantity of waste, some of which is disposed, and some is diverted. Diverted can be recycled, reused or otherwise prevented from being put into the landfill. ^{27, 2001}

Table 3.11 – Hawaii County Waste Generation 1998-1999

WASTE GENERATED (in tons)	WASTE DISPOSED (in tons)	WASTE DIVERTED (in tons)	DIVERSION RATE (percent)
168,851	146,416	22,435	13

Source: *Addendum to the Integrated Solid Waste Management Plan*

Table 3.12 – Hawaii County Waste Diversion by Material 1998-1999

MATERIAL TYPE	WEIGHT (in tons)	MATERIAL TYPE	WEIGHT (in tons)
TOTAL METALS	16,673	TOTAL PAPER	1,391
Ferrous Scrap Metal	16,673	Cardboard	1,221
Auto Scrap	–	Newspaper	72
Aluminum	–	Mixed Paper	–
Other Non-ferrous	–	High-grade Paper	74
TOTAL OTHER MATERIALS	361[2,269]	Magazines	–
Petroleum Contaminated Soil	–	Other Paper	24
Concrete, Asphalt, Miscellaneous	348	TOTAL CONTAINERS	15
Tires	13	Glass	–
TOTAL ORGANICS	3,995	Plastic Containers	15
Green Waste/Wood Waste	3,995	TOTAL	22,435
Food/Wet Waste	–		

Source: *Addendum to the Integrated Solid Waste Management Plan*

Also mentioned is that the illegal disposal of solid waste continues to be a problem throughout the County. Illegal dumping is a visual nuisance to residents adjacent to these dumps as well as a health hazard to the rest of the community. Some of the waste disposed of is considered hazardous materials and has the potential to contaminate the soil and ground water. ^{27, 2001}

Other changes for Hawaii include:

- The drainage problem at Pahoia Transfer Station was corrected and the refuse trailer parking area was paved;
- Chain link fence was installed at the Papaikou, Keaau, and Honomu transfer stations. The Puako Transfer Station is in the process of being reconditioned to restore it to its original condition; and

- A green waste collection and processing site was established in Waimea.

Future and Planned Usage

Planned usage as mentioned in the *General Plan* includes six new transfer stations and improvements to existing stations are planned for the near future. A county recycling program is foreseen, however, there must be sustained commitment by the county government and the public to establish a more aggressive recycling program will take up-front investments of capital and labor with lagging economic benefits.

Future and Planned Requirements or Changes

As stated in the *County of Hawaii General Plan Revision*, the State of Hawaii's Integrated Solid Waste Management Act included waste reduction goals of 25 percent by 1995 and 50 percent by 2000. Both the County and the State as a whole failed to meet the desired goal of 50 percent by 2000. To reach the reduction of 50 percent, the County needs to implement an integrated solid waste management system as follows:

- Continue to encourage programs such as recycling to reduce the flow of refuse deposited in landfills;
- Investigate the possibility of developing new landfill sites on the island;
- Encourage the full development and implementation of a green waste recycling program; and
- Locate well-designed and cost-effective solid waste transfer stations in areas that are convenient to the public. ^{27, 2001}

Anticipated Costs for the Future

The *County of Hawaii General Plan Revision* provides an analysis of the long-term costs of solid waste management that shows that recycling probably will be more costly than waste reduction (incineration, thermal gasification, and anaerobic digestion) less costly than landfill disposal. This is due to the recycling market being low. This in turn reduces the incentive for recycling.

Tipping fees (fees charged for dumping) account for 35% of revenue to operate the Solid Waste Division. The remainder of the funds needed to operate the division comes from the general fund. Various options have been studied. The most recent is a Pay-As-You-Throw concept where each resident and business is assessed a fee based on the amount of solid waste disposed. This program would help to promote greater recycling and diversion to minimize the amount of refuse being disposed of at landfills. However, the most effective means of making a Pay-As-You-Throw program work is to implement curbside pickup. The question becomes how best to transition from a public accustomed to self-hauling to a transfer station, to paying a private hauler or increase taxes for the County to commence this service. ^{27, 2001}

Problems, Issues and Opportunities Associated with Costs

The *County of Hawaii General Plan Revision* lists the barriers associated with implementing a solid waste management system include:

- A recycling ethic is not yet firmly rooted among Hawaii's people and businesses;
- The average person does not know the total cost of waste disposal;
- The high cost of operating a recycling business in Hawaii; and
- Local recycled materials markets are underdeveloped, and access to out of state markets is expensive due to Hawaii's isolated geography.

Overcoming these barriers is possible but it will require a commitment of energy and resources from the public and private sectors. In August of 1993, the Department of Public Works published an *Integrated Solid Waste Management Plan for the County of Hawaii*. The major objective of the plan was to "...provide a foundation for decision making that would guide solid waste management on the island." It was not intended to provide specific details on the day-to-day operation of solid waste management programs, but rather to provide assistance to the County administration and Council as to the type of programs to fund, implement, and administer. ^{27, 2001}

Compare Visitor and Resident Impact

According to the *County of Hawaii General Plan Revision*, resident impact for Hawaii can be categorized as follows:

- The east side of island appears to be stable with no foreseeable increase; and
- The west side of the island should see an increase of three tons per year due to new development. ^{27, 2001}

Analysis of the above information leads the investigator to believe that the east side of Hawaii, primarily residential with few visitor accommodations, is stable and little additional impact is expected. However, the west side of Hawaii, where the majority of visitor accommodations and some new residential developments are located, is anticipated to have an increased impact on the amount of solid waste disposed.

Major Assumptions

The concept of 'pay as you throw' could potentially backfire. Individuals who do not want to pay extra tipping fees will find ways of illegally disposing of their solid waste.

County of Hawaii – Storm Water

Present Capacity and Usage

Few sources were found with relevant capacity and usage data for storm water. Further research into the hydrological properties of all the valleys, streams and wetlands would need to be conducted to gain enough data to adequately measure the capacity and usage of storm water for the County of Hawaii. The most relevant information is where flooding has occurred previously and what has been done to prevent or divert it.

The *County of Hawaii General Plan Revision*, states that the coastline of Hawaii Island is susceptible to high seas and tsunami inundation. Of the nearly 305 miles of coastline, approximately 225 miles, or 75 per cent of the coastline is predominantly undeveloped cliff area and not subject to property damage from coastal flooding or tsunami inundation.

Although earthquakes and tsunamis are not storms, they can produce severe flooding. Tsunamis may be of local or distant origination. Historically, those of distant origin have caused the most damage. Property damage from tsunami activity has occurred in Hilo-Waiakea, Laupahoehoe Point, Waipio Valley, Kawaihae-Puako, and portions of Napoopoo, Keauhou, and Kailua-Kona areas of the coastline. Low lying coastal areas of Kau and Puna have been devastated by tsunamis generated by local, large offshore earthquakes.

Record downfalls have overflowed streams and gullies, flooding roadways throughout downtown Hilo and isolating neighborhoods in some areas of the eastern side of the island. The districts of South Hilo, Puna and Kau are hardest hit.

Hawaii County exercises flood plain regulations because of the need for better coordination between the construction of properly planned drainage systems and urban development. These regulations serve to promote public health, safety, and general welfare, and minimize public and private losses due to flood conditions.

Since 1971, much progress has been made in alleviating flood and drainage problems and establishing flood plain regulation. The general plan for the development of a comprehensive drainage system is the *Drainage Master Plan for the County of Hawaii*. This report, along with newer reports, has guided the flood control and drainage improvements made to date. ^{27, 2001}

Existing Problems, Issues and Opportunities

The problems of flooding in the County of Hawaii, as noted by the *General Plan*, are attributed to: ponding, surface runoff, high seas, storm surge, and tsunami inundation. Flood control is usually limited to confining runoff within natural or

man-made watercourses and standing bodies of water. Drainage involves the collection and conveyance of runoff. The problems of high seas and tsunami inundation are generally alleviated by structural criteria, building setbacks, and land use restrictions. ^{27, 2001}

The island is geologically very young and has not had a chance to develop defined watercourses in many areas. These poorly defined watercourses often overflow during rainstorms. The South Kohala, North Kona, South Kona, Kau, Puna and South Hilo districts are particularly impacted by this problem. Present drainage and flood problems can be due to development of vacant lands. These areas are often subject to serious flooding without any development of new drainage systems or expansion of the existing drainage systems. In many areas, the storm water drainage capabilities have been exceeded during heavy rains. Additional problems occur when debris accumulates and clogs waterways. The absence of easements in drainage and flood courses also hinders maintenance.

Except for Hilo and portions of Kona and South Kohala, most of the existing flood and drainage systems were provided by the sugar plantations. In the past, each plantation town developed its own sewerage, water, and drainage systems. However, government needs to take an active role in providing flood control.

Federal Emergency Management Agency has published the *Flood Insurance Study* for Hawaii County, an investigation of the existence and severity of flood hazards in Hawaii. Flood boundaries for streams, and the flood insurance zones and base flood elevation lines are delineated on the *Flood Insurance Rate Maps*.

Unfortunately, there are problems with the *Flood Insurance Rate Maps*. It has been demonstrated that the current *Flood Insurance Rate Maps* are not very accurate as to the location, position, and formation of geographic and geologic attributes. There are also many areas with no data available to determine flood potential. ^{27, 2001}

Future and Planned Usage

The *General Plan* maintains that technical and financial assistance from governmental agencies has been instrumental in drainage and flood control in Hawaii County. The U.S. Army Corps of Engineers has provided studies, the Natural Resources Conservation Service has provided technical assistance for flood plain management studies, and the Natural Resources Conservation Service and the Soil and Water Conservation Districts provide conservation programs to reduce and control surface water and sediment runoff for individual agricultural and conservation landholders. The continued assistance of these agencies is essential for further progress in flood control and drainage and erosion and sedimentation control in the County. ^{27, 2001}

The *Plan* also proposes future goals to include:

- Preservation of human life;
- Prevent damage to man-made improvements;
- Control pollution;
- Prevent damage from storm water inundation;
- Reduce surface water and sediment runoff; and
- Maximize soil and water conservation.

Future and Planned Requirements or Changes

Policies for changes in County of Hawaii, consistent with the *General Plan* include:

- The *Drainage Master Plan* should be revised and updated to include the new studies that have become available.
- Enact restrictive land use and building structure regulations in areas vulnerable to severe damage due to the impact of wave action. Only uses that cannot be located elsewhere due to public necessity and character, such as maritime activities and the necessary public facilities and utilities, shall be allowed in these areas;
- Review land use policy as it relates to flood plain, high surf, and tsunami hazard areas;
- Update and improve the *Flood Insurance Rate Maps* and other flood maps in compliance with the National Flood Insurance Program as needed;
- Assure that all development within the Federal Emergency Management Agency designated flood plain is in compliance;
- Assure that development-generated runoff shall be disposed of in a manner acceptable to the Department of Public Works and in compliance with all State and Federal laws;
- Develop a comprehensive program for the coordinated construction of a drainage network along a single drainage system.
- Explore new methods of funding for the provision of adequate drainage systems and regulating potential flood inundation areas;
- Assure that the county and the private sector are responsible for maintaining and improving existing drainage systems and constructing new drainage facilities;
- Develop an integrated shoreline erosion management plan that ensures the preservation of sandy beaches and public access to and along the shoreline, and the protection of private and public property from flood hazards and wave damage;
- Continue to promote public education programs on tsunami, hurricane, storm surge, and flood hazards;
- Develop drainage master plans from a watershed perspective that considers non-structural alternatives, minimizes channelization, protects wetlands that serve drainage functions, coordinates the regulation of construction and agricultural operation, and encourages the establishment of floodplains as public green ways; and

- Where applicable, natural drainage channels shall be improved to increase their capacity with special consideration for the practices of proper soil conservation, and grassland and forestry management. ^{27, 2001}

Anticipated Costs for the Future

Table 3.13 – Engineering Division Project Activities for 2000-2001 ^{255,2001}

Project Bid/Awarded/Under Construction	Cost
Kuauli Road Flood Repairs	29,524
Hoaka Road Bridge Flood Repairs	21,520
Wilder Road Flood Repairs	9,620
Flood Debris Removal From Kau Streams	94,274
New/Construction Design	
FHWA Flood Damage Repairs	240,000
Upper Palai Stream FEMA Firm Update	228,074
NRCS Channel Repairs	170,000

Source: *County of Hawaii Annual Report 2000-2001*

According to the *County of Hawaii Capital Projects Fund*, \$11,735,921 will be spent on the following eight projects:

- Waiakea Stream Project – Federal Funds -\$14,605
- Alenaio Stream Flood Control - \$126,900
- Wailuku/Alenaio Watershed – Federal Funds - \$3,381,000
- Upper Waiakea Stream Flood Control – \$899,947
- North Kona Flood Control Phases 1 & 2 - \$125,000
- Stream Repairs – Federal Funds - \$1,500,000
- Flood Repairs – Federal Funds - \$4,188,469
- Flood Disaster Repairs - \$1,500,000

Total flood related repairs, spread over several years, are estimated at \$11.5 million. ^{255,2001}

Problems, Issues and Opportunities Associated with Costs

Lack of available documentation from the Department of Public Works revealed no data for future costs in Hawaii County.

Compare Visitor and Resident Impact

Visitors and residents have little impact on the predominantly natural forces behind flooding.

Major Assumptions

Major assumptions include the availability of needed funding, the rate of population growth and properly planned developments.

County of Hawaii – Roads

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, of over 1,393 miles of roads in Hawaii County, there are approximately 360 miles of primary and secondary arterials. These provide the major intra-island route between the major urban centers of Hilo, Kailua-Kona and Waimea and the major commercial airports and harbors. Major and minor collectors total approximately 200 miles. Local streets comprise about half of the total number of miles of public roads, or approximately 600 miles. The major highway systems on the island are the Hawaii Belt Highway and the Mamalahoa Highway. Combined, they link major towns of all districts except North Kohala. Some of these roads do not meet present standards and require improvements.

Table 3.14 -- Miles of Road for County of Hawaii: 2000 ^{27, 2001}

Type of Road	Miles of Road
Public Roads	1393
State Highways	394
County Roads	879
County Roads unpaved	24

Source: *County of Hawaii General Plan Revision*

Table 3.15 -- Miles Of County Road By District: 2000 ^{64,2001}

District	Total	Unimproved	Concrete
All	901.78	22.25	879.53
Puna	187.92	6.60	181.32
South Hilo	274.68	4.00	270.68
North Hilo	33.04	1.30	31.74
Hamakua	69.05	7.65	61.40
North Kohala	27.86	1.05	26.81
South Kohala	99.39	0.30	99.09
North Kona	122.51	0.35	122.16
South Kona	26.63	-	26.63
Kau	60.70	1.00	59.70

Source: *State of Hawaii Data Book - 2001*

The above tables represent the capacity of Hawaii County roads in miles. Usage for these roads would require more study. The State Department of Transportation keeps voluminous records of traffic counts for the roads in each county. The County does not. As there is no summary for the State traffic counts, further study is required to make an evaluation of road usage in Hawaii county.

Through cooperation between State and County agencies and citizen committees, the Long Range Land Transportation Plan for the Island of Hawaii was developed. It identifies major transportation improvements to support projected growth through the Year 2020. ^{27, 2001}

Existing Problems, Issues and Opportunities

The problem of distance between east and west Hawaii is an issue identified by the *General Plan*. A project planned by the Federal, State and County governments can improve the commute along Saddle Road. This project will modernize Saddle Road to Federal highway design standards and address the conflicts of shared use by the public and military. Upon completion, the commute between East and West Hawaii could be reduced by 20 - 30 minutes.

Review of various documents and public input has revealed the following bottlenecks for traffic on Hawaii:

- North Kona has pau hana traffic problems;
- Waimea By-pass; and
- Hilo has the beginnings of pau hana traffic problems.

Future and Planned Usage

Facilitate the rapid, safe and economical movement of people and goods into, within, and out of the state by providing and operating transportation facilities and supporting services. ^{37, 2001}

Future and Planned Requirements or Changes

Over the past three decades, several transportation projects have been completed, while many others are in the planning stage. Much of the current construction, however, is either expansion or improvement of existing systems of facilities. A sizable portion of the new construction either planned or underway is but an incremental part of a long-range program. Several of the planned construction is listed in the next section.

Anticipated Costs for the Future

Transportation systems are expensive to construct and maintain. Modern transportation planning emphasizes the total transportation system rather than isolated facilities. It considers all modes of transport that are economical in an area, as well as all types of improvements, including traffic engineering improvements. Below are costs for various projects in varying degrees of completion. In the Appendix is the County of Hawaii Capital Project Fund budget. This spreadsheet covers roads as well as other public infrastructure elements.

Table 3.16 -- 1999-2000 Consultant Design (on-going/new) ^{51, 2000}

Ainaola/Kawailani/Iwalani Traffic Signals	\$386,196
Alii Drive Culvert Replacement	185,664
Honomu/Mamalahoa Bridge Replacement	129,636
Inoino Gulch Bridge Replacement	130,000
Kaahakini/Mamalahoa Bridge Replacement	110,000
Kalapana Road Realignment and Resurfacing	390,274
Kalopa/Mamalahoa Bridge Replacement	101,000
Komohana Street/Alenaio Stream Bridge Replacement	183,533
Mamalahoa Highway (Hualalai Intersection North)	138,200
Mohouli Improvements	374,718
Onomea Camp Road Bridge Replacement	62,508
Waikaalulu/Mamalahoa Bridge Replacement	101,000

The following tables were listed in the *County of Hawaii: 1999 – 2000 Annual Report*:

Table 3.17 -- 1999-2000 Projects Bid/Awarded/Under Construction ^{51, 2000}

Kapiolani Street/Ululani Street Reconstruction	\$1,379,266
Lindsey Road Improvements	1,551,708
Mamalahoa Highway (Kamamalu to Lindsey)	5,896,803
Mamalahoa Highway Improvements	862,962
Mohouli Street Extension	9,551,209
Oshiro, Kalopa/Aliipali & Kaumoali Bridge Replacement	2,050,000
Saddle Road/Kaumana Drive Curve Improvements	91,565
Waikoloa Road Improvements	1,075,898

1999-2000 Consultant Design (on-going/new) ^{51, 2000}

Ainaola/Kawailani/Iwalani Traffic Signals	\$386,196
Alii Drive Culvert Replacement	185,664
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Mohouli Improvements	374,718
Onomea Camp Road Bridge Replacement	62,508
Waikaalulu/Mamalahoa Bridge Replacement	101,000

The following projects are funded through the State Department of Transportation Highways Division and other sources (2000).

- Construction on the \$3.65 million Auwaiakeakua and Popoo Bridge Replacements started in June 2000. Both substandard wooden bridges are being replaced with concrete girder bridges.

- Approximately \$17.4 million of bridge seismic retrofit projects and \$15.8 million of highway resurfacing projects throughout the island were bid, ongoing or completed in the fiscal year.
- A \$33,000 traffic signal system was installed at the Queen Kaahumanu Highway/Kaiminani Drive intersection. Another \$2 million has been contracted for traffic signals and flashing warning lights at Queen Kaahumanu Highway/Hina Lani Drive, Keaau-Pahoa Road/Pahoa-Kapoho Road, Kanoelehua Avenue/Kahaopea Street, and at various other locations.
- Another \$4.2 million of work continues for guardrail improvements along the Hawaii Belt Road and Akoni Pule Highway, and \$1.5 million is being spent for drainage improvements at various locations in the Hamakua and North Kona Districts.
- Bids were opened for the \$6.4 million Keaau-Pahoa Road Widening; \$1.3 million Puainako Street Improvements; \$500,000 Queen Kaahumanu Highway Intersection Improvements at eh Kaloko-Honokohau National Historic Park Access; \$300,000 Hawaii Belt Road Realignment at Opea Stream; \$1.4 million Hilo, Kau and Honokaa Base yards Improvements; and \$400,000 for miscellaneous tree trimming, bridge joint repair, and white topping projects. ^{102, 2000}

According to the *County of Hawaii Capital Projects Fund*, a total of \$126,555,010 will have been spent on several road, highway and bridge extensions and improvements for the fiscal year ending June 2001.

Problems, Issues and Opportunities Associated with Costs

As stated in the *County of Hawaii General Revision Plan*, roadway systems in Hawaii County are generally financed through Federal, State, and County programs. Recent funding limitations are reducing the availability of such monies. Consequently, additional sources will have to be sought to implement the needed improvements. ^{27, 2001}

Funding sources for future improvements may have to be expanded given decreasing Federal and State government capital expenditures. Traditionally, much of the funds for the major elements of the transportation system have come from these levels of government. In recent years, however, such funding has been declining and the financing of these improvements directly by the private sector may be required. These funding considerations will become more significant as the level of federal government financial support declines.

Roadway systems in Hawaii County are generally financed through Federal, State, and County programs. Recent funding limitations are reducing the availability of such monies. Consequently, additional sources will have to be sought to implement the needed improvements. ^{27, 2001}

Compare Visitor and Resident Impact

Both visitors and residents alike use roads. Distinguishing between the two is difficult.

Major Assumptions

Analysis of several county and state documents indicates that growth will continue to occur on Hawaii. As such, roads will continue to need to be maintained and improved upon. However, funding limitations to finance these projects due to budget cutbacks is inevitable.

County of Hawaii – Airports

Present Capacity and Usage

The tables below illustrate the usage for airports in Hawaii County. No documentation was found regarding actual numbers for capacity of the airports, just generalized comments.

Table 3.18 – Airports and Heliports in Hawaii County: 1999

Island	Airports 1/				Heliports 2/	
	Com- mercial	General aviation	Military	Semi- private	State: commercial	Semi- private
State total	9	7	6	1	-	5
Hawaii	2	2	1	-	-	4

Source: *State of Hawaii Data Book - 2001*

Table 3.19 – Passengers, Cargo and Mail, Overseas and Inter-island By Airport: 2001

Airport	Passengers		Cargo (U.S. tons)		Mail (U.S. tons)	
	Enplaned	Deplaned	Enplaned	Deplaned	Enplaned	Deplaned
OVERSEAS						
Total	7,263,415	7,270,532	121,478	102,294	25,340	51,291
Kona	275,062	356,118	5,778	1,785	876	8
Hilo	-	162	-	-	-	-
INTERISLAND						
Total	9,169,182	9,169,182	75,037	75,037	21,433	21,433
Kona	1,054,349	954,789	4,223	9,754	948	4,077
Hilo	733,107	747,329	12,187	10,907	1,126	2,415
Upolu	-	-	-	-	-	-
Waimea-Kohala	1,242	1,230	-	1	69	278
Hana	2,933	2,781	51	16	-	-

Source: *State of Hawaii Data Book – 2001*

According to the *County of Hawaii General Plan Revision*, airports supporting inter-island transportation are located at Hilo, Waimea, Upolu, and Kona. The terminals at Hilo and Kona include overseas facilities. Overseas flights through Hilo International Airport are important to the agricultural industry in East Hawaii. Overseas passenger carriers underutilize the Hilo terminal; many may be going directly to Kona. Domestic and international passenger traffic is up 0.2% at Kona International Airport, making it the fourth busiest airport in the State. ^{27, 2001}

The following tables depict the number of passengers, tons of cargo and mail and number of operations performed by Keahole and Hilo airports. Each table is referenced, as there are multiple sources.

Table 3.20 -- Domestic Visitors To Hilo And Kona: 2000 By Months,
 142,2001

Month and year	Total State	Total Hawaii County	Total Hilo	Total Kona
2000	4,446,936	925,357	272,963	809,866
January	312,574	66,671	17,367	58,810
February	354,611	79,039	22,140	70,101
March	403,063	87,514	23,121	77,259
April	376,937	79,895	23,702	70,162
May	365,671	75,007	23,305	65,116
June	422,653	85,770	25,260	74,730
July	434,132	92,864	27,987	80,110
August	398,880	77,356	23,181	67,105
September	326,897	62,815	19,877	55,123
October	358,855	80,368	25,434	71,222
November	337,212	67,109	17,611	59,091
December	355,451	70,947	23,981	61,036

**Table 3.21 -- Aircraft Operations, By Type, At Hilo International Airport
 And Keahole Airport: 1990 To 1998**

An aircraft operation is an aircraft arrival or departure.

Year	All Movements	Air Carrier	Air Taxi	General Aviation	Military
HILO INTL. AIRPORT					
1990	98,755	19,709	42,249	23,550	13,247
1991	88,206	19,596	38,504	20,802	9,304
1992	91,055	21,426	37,182	21,593	10,854
1993	92,297	20,779	34,886	23,999	12,633
1994	86,292	21,194	36,564	20,519	8,015
1995	84,917	21,402	33,084	22,384	8,047
1996	87,862	21,109	36,228	22,845	7,680
1997	101,521	21,616	47,229	25,020	7,656
1998	112,479	21,537	54,894	28,087	7,961
KEAHOLE AIRPORT					
1990	60,086	27,608	10,838	17,504	4,136
1991	56,140	26,478	11,069	15,265	3,328
1992	63,939	29,447	9,200	21,066	4,196
1993	25,353	25,353	10,697	18,326	5,528
1994	66,438	24,923	14,460	21,003	6,052
1995	73,537	25,436	17,556	21,444	9,101
1996	77,025	29,195	16,556	21,591	9,683
1997	87,358	27,462	14,954	37,549	7,393
1998	81,285	27,068	9,346	37,137	7,734

Existing Problems, Issues and Opportunities

In accordance to the *General Plan*, there may be an increase in demand for airstrips and helipads stemming from the growth of the visitor industry. A statewide need for a second gateway, especially for cargo, exists. The State, in coordination with the County and the affected communities, has been developing master plans for each of the four airport facilities to assess current and future demand as well as specific recommended improvements. ^{27, 2001}

Future and Planned Usage

As mentioned in the *General Plan Revision*, plans are currently underway to construct a new cargo facility at Hilo International Airport to centralize cargo operations at a location closer to terminal facilities. ^{27, 2001}

Future and Planned Requirements or Changes

The *General Plan* states that planned changes include:

- Future land uses in the vicinity of the Hilo International Airport should have an adequate open space buffer and/or be compatible with the anticipated aircraft noise exposure levels for that vicinity;
- Construction of an Agricultural Processing and Packing Center at the old Hilo Airport, the planning of which shall be coordinated with future development plans for Hilo Harbor; and
- Construction of a centralized air cargo distribution complex at the Hilo International Airport. ^{27, 2001}

Anticipated Costs for the Future

See State of Hawaii Airports Summary for information.

Problems, Issues and Opportunities Associated with Costs

See State of Hawaii Airports Summary for information.

Compare Visitor and Resident Impact

See State of Hawaii Airports Summary for information.

Major Assumptions

As stated by the *Final Statewide Airport System Plan*, between 1995 and 2020, inter-island passengers using Hilo International Airport are forecast to increase at an average annual rate of 3%. Total aircraft operations for the Hilo airport are forecast to increase from 91,055 in 1992 to 126,300 operations by 2020, an overall increase of 39 percent. Overall, air carrier operations are expected to dominate, followed by commuter/air taxi operations. The latter is primarily made up of helicopter operations, particularly to the volcano area. ^{127,1998}

County of Hawaii – Harbors

Present Capacity and Usage

There are two deep draft harbors on the island, one at Hilo and another at Kawaihae. While improvements continue to be made, both harbor terminals lack adequate docking and support facilities for the population they support. ^{27, 2001}

There are two types of users of the harbors, inter-island barges with cargo and passenger ships. It is unknown as to the exact contents of the cargo shipments. The tables below give the dimensions / capacity and cargo tonnage for the Hilo and Kawaihae Harbors.

Table 3.25 -- Hawaii County Commercial Harbors: 2001

Island and harbor	Harbor entrance depth (feet)	Harbor basin			Piers (linear feet)	Storage area (1,000 sq. ft)	
		Depth (feet)	Length (feet)	Width (feet)		Shedded	Open
Hawaii:							
Hilo	35	35	2,300	1,400	2,669	122	566
Kawaihae	40	35	1,500	1,450	1,562	23	427

Source: *State of Hawaii Data Book – 2001*

Table 3.26 --- Waterborne Commerce for Hilo and Kawaihae Harbors: 1990-2000

1,000 short tons. Excludes cargo by Army and Navy and cargo in transit

Year	Hilo	Kawaihae
1990	1,690	887
1991	1,556	745
1992	1,588	790
1993	1,469	655
1994	1,455	736
1995	1,354	873
1996	1,442	969
1997	1,489	980
1998	1,630	886
1999	1,701	1,090
2000	1,651	1,310

Source: *State of Hawaii Data Book – 2001*

Table 3.27 -- Visitor Arrivals By Cruise Ships: 2000

2000	State	Hawaii
January	3,158	3,255
February	1,695	-
March	1,139	1,139
April	7,414	7,238
May	3,180	3,150
June	343	-
July	458	-
August	2,379	1,601
September	4,922	3,564
October	11,366	10,764
November	1,189	1,189
December	3,456	3,147
Total	40,699	35,047

Source: *Annual Visitor Research Report*

Facilities for small boats, such as launching ramps, have been developed in various parts of the County; however further details were not uncovered as to how many facilities are in each district.

Table 3.28 –Small Craft Mooring Facilities for Hawaii County: 2001

Island	Catwalks and piers	Moored	Other mooring areas	Moored	Offshore mooring	
	Capacity		Capacity		Capacity	Moored
State total	1,716	1,488	407	332	501	325
Hawaii	324	308	74	73	74	73

Source: *State of Hawaii Data Book – 2001*

Existing Problems, Issues and Opportunities

Non point source pollution is a problem within several harbors, possibly from fuel spills. As a result, water pollution is a continuing problem in the vicinity of the harbors. ^{27, 2001}

Terminals and facilities for cruise ships are problematic as stated by the Hawaii tourism Authority.

Future and Planned Usage

It is anticipated, as stated in the *General Plan*, that the use of both deep draft harbors will expand substantially. As population grows, and resort areas develop in West Hawaii, cargo is re-routed from Hilo. Kawaihae Harbor especially is expected to experience a dramatic increase in its use. Cargo volume at

Kawaihae Harbor has increased significantly to support the population and development in West Hawaii as it continues to grow. Facilities to support this increase in volume need to grow as well. ^{27, 2001}

No documentation of cruise facilities improvements on Hawaii was uncovered. However, for the cruise industry to grow, improvements and enhancements need to be made. The Hawaii Tourism Authority believes that Kailua-Kona Harbor is one of three cruise facilities that should be improved upon.

Future and Planned Requirements or Changes

According to the *General Plan*, future and planned requirements for the County of Hawaii include:

- Encourage the programmed improvement of existing terminals, including adequate provisions for control of pollution.
- The State Department of Transportation should continue to implement its plans for transportation terminals and related facilities to promote and influence desired land use policies.
- Transportation terminals should be developed in conjunction with the different elements of the overall transportation system. The transportation terminals would be developed to facilitate the ferrying of cruise ship passengers to and from the area. No specific locations are mentioned.
- The County shall encourage maximum use of the island's airport and harbor facilities.
- Encourage the development, maintenance, and enhancement of Hilo and Kawaihae Harbors as detailed within the State's Hawaii Commercial Harbors 2020 Master Plan. ^{27, 2001}

Anticipated Costs for the Future

No documentation regarding improvements to Harbors other than Honolulu and Barber's Point Harbors were found.

See the State of Hawaii Harbor summary and the index for the capitol improvement projects.

Problems, Issues and Opportunities Associated with Costs

No documentation was located regarding commercial or cruise facilities improvement costs.

An opportunity for small boat harbors is the cost of new small boat harbors could be added to the requirements of the developer. This would allow new facilities to be built without taxing the existing general fund. A new small boat harbor would alleviate some of the stress from the multiple year waiting lists for mooring slips.

Compare Visitor and Resident Impact

No documentation regarding resident and visitor impacts on commercial harbors was found.

There was no documentation of resident or visitor impacts on cruise facilities. However, upon arriving in Hawaii, first impressions for visitors at cruise facilities should be a positive experience.

A greater number of residents have small boats moored at the harbors than visitors. The visitors typically utilize charter-fishing boats.

Major Assumptions

Aside from the assumption of availability of funding for improvements to harbor facilities, population projections and increased cruise passenger projections, no documentation was found.

See the State of Hawaii Harbor summary and the introduction to the County of Hawaii.

County of Hawaii – Parks

Present Capacity and Usage

According to *The County of Hawaii Annual Report 1999-2000*, the Parks Maintenance Division provides services for the County of Hawaii by supplying manpower, equipment, and funds to maintain, repair, and beautify facilities operated by the Department. The Parks Maintenance Division also provides support for special events sponsored by other divisions and various community groups. Parks Maintenance Division maintains neighborhood parks, beach parks, playgrounds, ball fields, Alae Cemetery, all Veterans Cemeteries and other recreational facilities. Panaewa Recreation Complex promotes recreational and educational activities at the zoological and botanical park. The Panaewa Rain Forest Zoo specializes in rain forest and native species. Parks also manages and maintains the Panaewa Equestrian Center for horse stall rentals and equestrian related activities.^{39, 2000}

The *County of Hawaii General Plan Revision* breaks down recreational facilities into two categories: resource-based and facility-based. Resource-based parks provide public access to and enjoyment of an outstanding natural or cultural resource. Examples of valued resources include sandy beaches, non-sandy but protected swimming areas, scenic areas and hiking areas. Facility-based parks are primarily developed by the County and provide for organized, spectator, or informal play recreational activities that are not dependent upon a natural resource. The County's resource-based parks are primarily beach parks. They total 260 acres.

The *General Plan* goes on to describe parks and recreational facilities within the districts. Some districts have benefited more than others in ratio of facilities-based parks and beach parks to population. North Kona, South Kona, South Kohala and Puna have the least County facilities-based parks and beach parks in relation to population. State beach parks within the South Kohala and North Kona districts help to offset, in part, some of these deficiencies. The North Hilo and North Kohala districts have a disproportionately large number of County park acreage in relationship to their small populations.

Outlined below is an inventory of the parks as mentioned by the *General Plan*. (Also see Appendix: Hawaii County Administration, Parks, Pools and Facilities, and the Hawaii State Table for Parks and maps.) The variety of County parks includes small neighborhood playgrounds, larger playfields, and countywide parks with a scope for active and passive recreation. On the island, there are 4 National parks, 20 State parks and 118 County park sites. (Note the different counts for State and County parks. Different sources quoted different numbers.) Additionally, there are regional, district, community, and neighborhood parks. The County manages recreational facilities including 9 swimming pools, 19 community/senior centers, 21 gymnasiums (includes 6 Department of Education

facilities), and 15 miscellaneous facilities such as rodeo arenas, boat ramps, scenic lookout, drag strip, etc. Of the 9 nine swimming pools operated, programs offer recreational swimming, water safety instruction, and competitive swimming activity. In Hilo, one of two pools is operated primarily for water safety purposes. Lifeguards are on duty every day at the most heavily utilized beaches. ^{27, 2001}

**Table 3.31 -- National, State And County Parks
 Hawaii County ^{142,2001}**

Parks	1998	1999	2000
National parks			
Number of areas	4	4	4
Acreage	230,621	230,621	230,621
Visits	3,401,995	3,449,705	3,325,651
State parks & historic sites			
Number of areas	16	16	16
Acreage	2694.6	2694.6	2694.6
Visits	6,955,596	5,259,000	5,259,000
County			
Number of areas	135	135	135
Acreage	1,361	1,378	1,378
Visits	NA	NA	NA

Existing Problems, Issues and Opportunities

The two main problems mentioned in the *General Plan* are expanded use and safe swimming areas at beach parks. Of the County's total 305 miles of tidal shoreline, only 1.2 miles are prime sand beach that is generally favorable for swimming and other water-oriented activities.

The demand on these limited areas for public recreation is heavy and crowding occurs in some areas. Crowding is usually due to inadequate or undeveloped park acreage, roads and parking areas occupying usable recreation area, and the lack of adequate facilities in adjoining areas or other parks.

The quality of recreation areas often diminishes with expanded use. Sewage and industrial waste have penetrated into some swimming, surfing, fishing, and boating areas, reducing the availability and/or quality of these areas for recreation.

An opportunity is to devise a plan for the County to identify significant resource areas with recreational value. A detailed plan will allow the development of an acquisition program that could utilize a variety of tools or coordinate with other involved agencies or organizations to acquire lands for parks or access. ^{27, 2001}

Future and Planned Usage

The *General Plan* noted areas of future need and further study including:

- A lack of adequate facilities and programs for pre-school children. This should be addressed with more intensity in the future;
- Additional enrichment programs in the mornings and afternoons when funding is available; and
- Intercession programs to accommodate students on year-round schedules.^{27, 2001}

Future and Planned Requirements or Changes

The *State Recreation Functional Plan*, DLNR, 1991 contains the following recommendations:

1. Address the problem of saturation of the capacity of beach parks and near shore waters. Acquire additional beach parkland and rights-of-way to remaining undeveloped shorelines to provide increased capacity for future public recreational use. Cite only the pertinent following areas.
Hawaii: Wailea Bay, Anaehoomalu Bay to Kaupulehu and Kua Bay
2. Establish near shore underwater areas for non-consumptive activities (e.g. Marine Life Conservation Districts, artificial reefs).
3. More aggressively manage and control the use of existing beach parks.
 - a. Develop and implement an ongoing capacity analysis program including beach counts and analyses to determine appropriate uses and the maximum number of allowable users at a facility (carrying capacity or "limits of acceptable change".)
 - b. Identify heavily stressed beach parks and near shore ocean areas, prioritize them in terms of need for action, carry out capacity analyses, determine appropriate activities, set limits, and develop measures to control use, such as permits, user fees, limiting the number of users, etc.
4. Develop areas mauka of existing beach parks to increase their capacities and to diversify and encourage activities away from the shoreline.
5. Reduce the incidence of ocean recreation accidents. Increase support for water safety programs.
 - a. Determine the effectiveness of enhanced signage at beaches and supplemental educational programs in reducing the number of drownings and near drownings.
 - b. Coordinate water safety information programs targeted at visitors.
6. Resolve conflicts between different activities at heavily used ocean recreation areas. Promote implementation and enforcement of an effective Ocean Recreation Management Plan.
7. Mitigate the impact of increased use of popular ocean recreation areas by visitors. Promote recreational activities for visitors away from popular or heavily used beaches.
8. Plan and develop facilities and areas that feature the natural and historic/cultural resources of Hawaii. Develop interpretive programs for these areas.
9. Proceed with planning, acquisition and development of trails.

- a. Provide adequate funding on a continuing basis for the Na Ala Hele Program.
 - b. Plan and develop demonstration and priority trails identified by the Na Ala Hele Program.
10. Prevent the loss of access to shoreline and upland recreation areas due to new developments. Prevent blocking of existing shoreline access paths.
- a. Draft a comprehensive public access code to require the provision of public access to shoreline and mauka recreation areas.
11. Resolve the problem of landowner liability that seriously hampers public access over private lands.
12. Promote and coordinate the development and implementation of environmental education and information programs to address subjects such as litter, vandalism, poaching, anchor damage of coral, depletion of recreational fisheries and destruction of native ecosystems.

Construction of new facilities, renovation of existing ones, and provisions for adequate staffing are all changes noted in the *General Plan* to be made in the future. To continue to provide the necessary parks and recreation areas Hawaii County must identify new resource areas of recreational value. An acquisition program would coordinate with other agencies or organizations to acquire lands for parks or access. If steps are not taken to identify new areas for recreational purposes, existing sights may receive irreparable damage due to over usage.^{27, 2001}

Anticipated Costs for the Future

According to the *County of Hawaii Capital Projects Fund* (2001), \$13,754,820 was spent on various cultural and recreation projects countywide.

There were no costs for future Projects mentioned in the *General Plan* or County of Hawaii *Annual Report Fiscal Year 2000-2001*. See the State of Hawaii Parks Summary or Appendix: County of Hawaii – Capital Projects Fund.

Problems, Issues and Opportunities Associated with Costs

As stated in the *General Plan*, options for developing beach parks should include privately operated or maintained facilities or private concessions of beach park facilities.^{27, 2001} However, further study into other funding sources should be done.

Compare Visitor and Resident Impact

There is competition for prime beach area between the visitor industry and the residents. This competition is anticipated to increase in the future, according to the *General Plan*.^{27, 2001} Some of the competition can be explained due to the location of visitor accommodations in prime beach areas, thus the higher likelihood of visitors attending those beaches due to their proximity. Analysis of several county documents indicates that long-range planning, partnerships with

developers / resort management, and further study can alleviate beach access and competition for beach resources issues.

Major Assumptions

Assumptions regarding visitor forecast, according to the *National Park Service Statistical Abstract 2001*, for the national parks are as follows:

- The 2002 forecast for the Hawaii Volcanoes National Park is of 1,264,446, 5.87% less visits than in 2001. The 2003 forecast projects 1,182,912 visits.
- The 2002 forecast for the Puuhonua o Honaunau National Historic Park is for 378,148 visits, 5.95 % less visits than in the year 2001. The 2003 forecast projected at 355,688 visits. ^{136, 2002}

There was no mention of any major assumptions by the Parks Department in the General Plan. Assumptions made by the Planning Department are stated in the Introduction to Hawaii County.

County of Hawaii – Police, Fire and Emergency Services: Fire and Emergency Services

Present Capacity and Usage

According to the *County of Hawaii General Plan* and the Fire Department, the County of Hawaii has **14 regular fire stations, 18 volunteer fire stations and 2 federal fire stations** throughout the island. (See the maps in the Appendix.) The federally operated fire stations are Kilauea Military Camp (KMC) and Pohakuloa. KMC is contracted to provide emergency medical services to the County. 24-hour fire fighting and EMS are provided by all regular fire stations and 3 volunteer fire stations. Waiakea and Kailua-Kona provide rescue services. Kaumana and South Kohala provide hazardous waste response. South Kohala provides air medical services. Additionally, there are **22 volunteer fire companies throughout the Island with about 250 volunteers**.

The State Department of Health has been contracted by the County for EMS ambulances. **75% of all incidences are EMS; fire-fighting accounts for 5%** and the remainder are rescue, hazardous waste, special services and natural disasters. ^{27, 2001 197,2001}

Existing Problems, Issues and Opportunities

According to the Fire Department, there are two primary problems impacting Fire Department services are funding and need versus manpower. Additionally, response time is also impacted by the sprawl of communities over such a great area. Service needs and usage has increased significantly over the last decade, however, funding has not kept pace. The result is that any expansion or desired growth will result in a significant budget increase simply to meet minimum industry standards. Finally, to maintain services with present resources is a potential safety risk to employees. ^{36c, 2002}

Future and Planned Usage

The Fire Department would like to expand services and the scope of practice to maximize resource efficiency. However, better long range planning and cost projection is needed. ^{36c, 2002}

Other planned usage includes:

- Increase the number of personnel to match anticipated increase in the service calls to population growth; ^{51, 2001}
- Fire stations within 5 miles of concentrated populations; and
- EMS located within 8 minutes of concentrated populations. ^{27, 2001}

Future and Planned Requirements or Changes

Further study into long-range planning and population growth for districts must be done to most strategically and efficiently place facilities and manpower, according to the Fire Department.^{36c, 2002}

Anticipated Costs for the Future

There are two capital improvement projects planned for the fire department (2001), according to the *County of Hawaii Capital Projects Fund*:

- HPP Volunteer Fire Station Water - \$1,000,000
- Kalaoa Fire Station – \$1,691,000^{193,2001}

Results from above mentioned long-range planning and population growth for districts will allow for a more accurate assessment of anticipated costs. Anticipated costs will be dictated by the fire department's strategic plan and its implementation. As new goals and objectives are established, the fire department will be able to effectively project future costs.^{36c, 2002}

Problems, Issues and Opportunities Associated with Costs

As a public service entity, the Fire Department is not profit driven or user fee dependent, funding is primarily through County revenue and State subsidy. However, with both governments experiencing revenue shortfalls, the Fire Department will be exploring alternative funding sources at the Federal and private sector levels.^{36, 2002} Collected tax revenues – primarily from real property taxes – fall short of covering the costs of providing the service expected by the community.^{91, 2002} Further study into funds made available through Homeland Security monies and other sources should be researched.

Compare Visitor and Resident Impact

Due to the diverse services and the varying demographics, the Fire Department is currently unable to provide a comparison of residents to visitor usage.

However, some districts reflect a higher visitor usage due to higher concentration and of visitors (e.g. resort areas of South Kohala). The visitor and resident impacts are similar for the most part and only vary with frequency depending upon seasonal travel, fluctuations, and high use areas.

One obvious disparity is fire protection in structural fire safety services. This definitely impacts residents to a higher degree. However, with a significant growth of "time share" type occupancies, that may have an impact on this issue. Finally, as the database system is developed, a usage profile will be incorporated.^{36c, 2002}

Major Assumptions

Several assumptions are made by the Fire Department including: service needs, costs and population growth. Assumptions of future requirements are based on

measurable statistics and trends. Increases in population, construction, visitor activity and target areas can be identified based on known and planned development projects. (Big Island population increases by approximately 20,000 residents every 10 years, or about 2,500 annually.^{51, 2001}) These relate to infrastructure and resource requirements. Essentially, there will have to be expanded services and resources to meet increase in demand within specific geographical areas.^{36c, 2002}

County of Hawaii – Police, Fire and Emergency Services: Police

Present Capacity and Usage

According to the *General Plan*, an inventory of police facilities, programs and statistics about service calls reveal the present capacity and usage of Hawaii County Police. Each district is served by a **main police station (8)**. There are an additional **4 substations**. (See maps in appendix.) Enhanced 9-1-1 provides residents 24-hour access to the Hawaii County Police Department Dispatch Center. Computer Aided Dispatch allows fire and police to better serve the County. It enhances call taking, dispatching and record management. ^{27, 2001}

At the end of fiscal year 01, Hawaii Police Department had **536 full time positions (395 sworn personnel and 141 civilian personnel)**. There were also **40 part-time school crossing guard positions and 23 Police Officer I non-funded positions**.

A ratio of approximately 2.5 officers per 1,000 residents is maintained. However, due to manpower and budget constraints, Hawaii County Police Department is used to its maximum capacity. In 2001, there were **78,266 calls for service** from the public. This averages to more than 276 calls per officer (patrol or community policing officer). ^{91c, 2002}

**Table 3.32 -- Hawaii County Police Stations
 By Town And District 2001** ^{199,2001}

Name	Location	District
Hilo headquarters	Hilo	S. Hilo
Hilo station	Hilo	S. Hilo
Honokaa station	Honokaa	Hamakua
Kapaau station	Kohala	N. Kohala
Keaau station	Keaau	Puna
Kealakehe station	Kona	Kona
Laupahoehoe station	Laupahoehoe	N. Hilo
Naalehu station	Naalehu	Kau
Waikoloa sub-station	Waikoloa	S. Kohala
Waimea station	Waimea	S. Kohala

Existing Problems, Issues and Opportunities

According to the Police Department, in the vice section, marijuana, cocaine, crystal methamphetamine and heroine continue to be a problem. In the traffic enforcement section, of the 38 traffic fatalities, 12 were alcohol related.

The number of calls for service frequently exceeds the available manpower needed to respond in a timely manner. Additionally, the physical size of the

County of Hawaii often requires officers to travel long distances to arrive at the scene. This increases the time to respond. ^{91c, 2002}

Future and Planned Usage

The Police Department plans to increase the number of personnel to meet the anticipated increase in the calls for service as the population grows. Maintaining the present ratio of officers to residents is desired.

Future and Planned Requirements or Changes

Analysis of county documents and Police Department data indicates that further study of long-range planning and population growth within the districts must be utilized to most strategically and efficiently place facilities and manpower. Advances in emergency services will also impact future requirements.

Anticipated Costs for the Future

There are several retrofits planned for the Police Department: ^{193,2001}

- Air duct removal – \$39,134
- Safety A/C retrofit – \$400,000
- Safety Complex Cellblock – \$352,000
- Kona Police Station A/C Retrofit – \$100,000
- Kealahou Refueling Station – \$150,000
- Island wide Communication Tower Replacement – \$25,763
- Microwave Radio Repeater – \$319,568 + \$100,000 (federal funds)

Some anticipated costs for the future include budget increases to cover increases in police staffing and other costs to provide adequate service – such as fuel, automobile insurance, salary increases, equipment, training. ^{91c, 2002}

Problems, Issues and Opportunities Associated with Costs

As mentioned by the Police Department, collected real property taxes fall short of covering the costs of providing the service expected by the community. ^{91c, 2002}

This is anticipated to be the case in the future. Further study into funds made available through Homeland security monies should be researched.

Compare Visitor and Resident Impact

The Police Department states that the impact of visitors on police services is about the same as that of the resident population. However, the visitor impact is greater on the west side of the Big Island, because the visitor destination areas of Kona and South Kohala. ^{91c, 2002} More definitive data would require further study.

Major Assumptions

Not all policing areas are congruous with planning districts; therefore, some statistics may be unrepresentative of the planning district they represent.

Projected increases in staffing and costs are based on population increases and other anticipated costs. Some costs are beyond the control of the Department. Costs include the cost of fuel, automobile insurance, equipment and negotiated salary increases.^{91, 2002}

County of Hawaii – Visitor Accommodations

Present Capacity and Usage

Tourism became the primary economy for the County in the 1980s. From 1982 to 1990, visitor arrivals grew at an annual average of 5.66%. Decline in 1991 can be attributed to recessions and the Persian Gulf War. In the years since (through 1998), the annual average visitor arrival growth rate was 1.18%.

In accordance with the *County of Hawaii General Plan Revision*, the 2000 total visitors for Hawaii County are projected using series B scenario for growth. Visitor accommodation units are at 9,944 units total. Bed and breakfast units are the fastest growing segment (171 units in 1998). Historically, Hawaii records the lowest visitor unit occupancy rates for the state, however in 1998 it surpassed Kauai.

The principal visitor accommodation destination area is the South Kohala-North Kohala region. As of 2002, the total acreage zoned for resorts is 1,353 acres. The most popular attraction on Hawaii is the Hawaii Volcano National Park. ^{27, 2001}

Below are tables depicting various visitor accommodation information. Each is referenced. They outline the present capacity (total number of units and properties) and usage (occupancy rates) for visitor accommodations in Hawaii County.

Table 3.33 – Existing Inventory in Hawaii County by Type: 2001

Type	Properties	Units
Bed and Breakfast	72	287
Condominium Hotel	29	1956
Hostel	2	21
Hotel	32	7073
Vacation Unit	42	438
Other	8	169
Total	185	9944

Source: 2001 Visitor Plant Inventory

Table 3.34 -- Visitor Accommodations By Nightly Price: 2001 ^{64, 2001}

Type of accommodation	All levels	<\$100	\$101- \$250	\$251- \$500	>\$500
(2001) Hawaii County	9,713	1,946	4,090	2,580	1,097

Source: 2001 Visitor Plant Inventory

Table 3.35 -- Visitor Accommodations, Hawaii County, By Type And District: 2001

Hawaii County	Units	Properties
Total	9944	185
Hilo-Honokaa		
Bed & Breakfast	115	23
Condominium Hotel	70	1
Hostel	17	1
Hotel	1,134,946	6
Vacation Unit	7,012	8
Other	58	1
Total	1,218	40
Kohala-Waimea-Kawaihae		
Bed & Breakfast	21	7
Condominium Hotel	530	7
Hostel	0	0
Hotel	3,427	10
Vacation Unit	3	2
Other	0	0
Total	3,981	26
Kona		
Bed & Breakfast	77	21
Condominium Hotel	1,311	20
Hostel	0	0
Hotel	2,566	2,111
Vacation Unit	395	321
Other	68	3
Total	4,417	76
Naalehu-Kau		
Bed & Breakfast	16	5
Condominium Hotel	45	1
Hostel	0	0
Hotel	0	0
Vacation Unit	0	0
Other	12	1
Total	73	7
Volcano		
Bed & Breakfast	58	16
Condominium Hotel	0	0
Hostel	4	1
Hotel	134	5
Vacation Unit	28	11
Other	31	3
Total	255	36

Source: 2001 Visitor Plant Inventory

Table 3.36 –Hawaii County Hotel Room Occupancy: 2001

	Percent occupied
State total	77.2
Hawaii	72.8
Hilo	64.0
Kona	72.6
Kohala	74.6

Source: State of Hawaii Data Book - 2001

Existing Problems, Issues and Opportunities

There is a need for planned and controlled growth in visitor industry. This includes the renovation of more dated visitor accommodations.

Cruise ships are an opportunity of potential growth (up from 124,000 in 1997 to 184,000 in 1998). Cruise ship visitors expend between \$16,000,000 and \$23,000,000 annually. ^{27, 2001}

Analysis of documents shows that accounting for the number of vacation rentals and bed and breakfast units is difficult. Further study is required to extrapolate this number.

Another problem is that external world events greatly impact the visitor industry and Hawaii's economy. Recent events include terrorism, Japan's economy, and the USA economic recession. All these events have resulted in a drop-off in visitor counts.

Future and Planned Usage

The west side of the island has dominated the visitor market, with trends expecting it to continue. Most developments are planned for the South Kohala and North Kona districts. ^{27, 2001} The addition of 34 properties will add 5,111 units. The completion date for these properties is unknown. The table below is a projection of various visitor variables through the year 2025.

Table 3.37 -- Hawaii Visitor Variables: Actual and Projections to 2025

	<u>2000</u>	<u>2005</u>	<u>2010</u>	<u>2015</u>	<u>2020</u>	<u>2025</u>
Ratio between average daily census and occupied visitor rooms						
State	3.1	3.1	3.2	3.2	3.2	3.2
Hawaii County	3.5	3.5	3.6	3.6	3.6	3.6
Number of occupied visitor rooms						
State	54,256	62,685	68,483	75,197	82,567	90,657
Hawaii County	6,634	7,671	8,417	9,246	10,157	11,156
Share of occupied visitor rooms (%)						
Hawaii County	12.2	12.2	12.3	12.3	12.3	12.3
Minimum hotel occupancy rate when new hotels are needed (%)						
State	75.9	81.7	82.5	82.8	83.0	83.0
Hawaii County	68.7	79.5	82.5	82.5	83.0	83.0
Number of visitor rooms demanded						
State	71,480	76,744	83,010	90,867	90,479	109,226
Hawaii County	9,655	9,655	10,202	11,207	12,237	13,442
Number of Visitor rooms (avg. annual growth rate, %)						
State	0.0	1.4	1.6	1.8	1.8	1.9
Hawaii County	0.0	0.0	1.1	1.9	1.8	1.9

Source: *Population and Economic Projections for the State of Hawaii to 2025*

Future and Planned Requirements or Changes

Table 3.38-- Planned Hotel And Condo Projects, Hawaii County: 2000

Name of project	Type	Units	Status
Four Seasons (Kaupulehu)	Hotel	600	Approved
Kaupulehu Makai Venture	Hotel /Condo	1,500	Project district approved
Mauna Lani Cove (S. Kohala)	Condo	355	SMA pending
Chalon's Mahukona (S. Kohala)	Hotel	240	SMA approved
Regent Kona Coast (Kukio)	Hotel	310	SMA approved
Kukio Beach Resort (N. Kona)	Condo	310	No SMA yet
Punaluu Resort (Kau)	Hotel	100	SMA approved: No progress; Applicant requested time extension
Amanresort (Hamakua)	Hotel	47	Approved development: No progress; Applicant requested time extension
Sobay Hawaii Inc.	Condo	21	In litigation
Kahaluu Beach Partnership	Condo	27	SMA permit approved
Towne Development	Time-share	270	SMA use permit approved

Source: *Visitor Plant Inventory*

Future changes include changes in zoning and utility connections.

Anticipated Costs for the Future

It is difficult to find exact information regarding costs for proposed and existing visitor accommodations. Over \$1 billion of planned construction of resort-residential complexes is to be added. ^{27, 2001}

Problems, Issues and Opportunities Associated with Costs

According to the majority of private visitor accommodations, the number one opportunity to fund future growth is pay-as-you-go by users.

Compare Visitor and Resident Impact

As illustrated in tables found in the Hawaii County Airports Summary, there are a higher percentage of domestic and international visitors to West Hawaii than to Hilo. Hilo consists primarily of Hawaii residents on business trips or Hawaii residents traveling to Hilo for its cultural events.

Major Assumptions

Utilizing Series B scenario, the County's total visitors to the county is projected to grow to 1,890,700 in 2020. ^{27, 2001}

County of Hawaii – Private Transportation

Present Capacity and Usage

The following tables have been taken from the *County of Hawaii Data Book – 2001*:

**Table 3.39 -- Registered Taxicabs, Hawaii County:
 1995 To 2000** ^{142,2001}

Subject	1995	1996	1997	1998	1999	2000
Taxicabs	129	128	157	180	163	175

**Table 3.40 -- Motor Carrier Characteristics, Hawaii County,
 July 2001**

Subject	Number
Passenger carriers (tour operators, no public transit, taxis or school buses)	
Number of carriers	172
Number of vehicles	1,024
Seating capacity	20,635

**Table 3.41 -- Motor Vehicles Registered, Hawaii County:
 1990 To 2000** ^{142,2001}

(Taxable and non-taxable, including military non-resident exempt vehicles. Includes passenger cars, buses, trucks, and motorcycles but excludes trailers and semi-trailers.)

Year	Number
1990	105,584
1991	109,491
1992	107,427
1993	110,890
1994	111,532
1995	111,624
1996	115,627
1997	118,364
1998	121,959
1999	126,039
2000	132,305

**Table 3.42 -- Motor Vehicle Registration, By Type Of Vehicle,
 Hawaii County: 1996 To 2000** ^{142,2001}

(Taxable and non-taxable, including military non-resident exempt vehicles.)

Type of vehicle	1996	1997	1998	1999	2000
All vehicles	120,783	123,522	127,187	131,562	138,616
Motor vehicles	113,375	116,047	119,712	123,615	129,759
Passenger vehicles	88,037	90,271	93,507	96,656	101,761
Buses	235	250	238	238	251
Trucks (vans)	24,961	25,393	25,835	26,584	27,597

**Table 3.43 -- Passenger Vehicles Registered, Hawaii County:
 1990 To 2000** ^{142,2001}

(Taxable and non-taxable, including military non-resident exempt vehicles.
 Excludes ambulances, hearses, buses, trucks, motorcycles, and trailers.)

Year	Number
1990	82,776
1991	84,925
1992	83,262
1993	84,435
1994	84,807
1995	84,475
1996	88,037
1997	90,271
1998	93,507
1999	96,656
2000	101,761

Existing Problems, Issues and Opportunities

Analysis has shown that as privately owned businesses, each business will expand or contract as the market allows or the business will not succeed.

Future and Planned Usage

There are no county documents, aside from the tables above, which address this parameter.

Future and Planned Requirements or Changes

There are no county documents, aside from the tables above, which address this parameter.

Anticipated Costs for the Future

There are no county documents, aside from the tables above, which address this parameter.

Problems, Issues and Opportunities Associated with Costs

There are no county documents, aside from the tables above, which address this parameter.

Compare Visitor and Resident Impact

There are no county documents addressing this parameter. Further research is required to more adequately evaluate this parameter.

Major Assumptions

It is assumed that visitor private transportation options are to rent vehicles, hire taxis or join tours to get around the island. According to vehicle registry tables and population figures, the majority of residents do have vehicles on the island. Although these vehicles are also private transportation, for the purposes of this summary, private transportation is understood to mean commercial private transportation.

County of Hawaii – Energy Systems

Present Capacity and Usage

Petroleum provides up to 75% of the islands energy needs. Hawaii Electric Company (regulated by the State) owns 6 power generation plants in the County. Average annual residential use in 1990 was 6794-Kilowatt hours. That decreased to 6563-kWh in 1999. Residential use accounts for 37% of the power sold and may include visitor use.

Puna Geothermal Venture's geothermal power plant at Kapoho Sub zone on the East Rift Zone has been online since April 1993. It currently produces 30 megawatts of power energy, but has been approved to provide up to 60 megawatts. The 30 megawatts account for about 25% of the electricity for the County of Hawaii. This displaces almost 110 million gallons of fuel oil and reduces carbon dioxide and other emissions.

Solar power accounts for 30-35% of power demand. It is accumulated in 2 fashions- solar heat collection and solar light energy to electrical power via photovoltaic cells.

Hydroelectric power accounts for only 5% of the County's energy. It is not foreseen as increasing due to reliance on stream flows and lack of storage for water. Wailuku River Hydroelectric facility has the capacity to supply 11 megawatts of power. Apollo Energy has the capacity to provide 7 megawatts of supplemental wind energy.

Wind energy is a clean form of energy, producing no emissions or chemical waste. However, wind energy generation farms at Kahua Ranch, Lalamilo Wind Farm and Kamaoa Wind Farm prove inconsistent.

Gas is widely available and a major source of energy. Utilization is either by tank refill or underground pipelines.

Biomass conversion generates about 34% of the County's electrical energy. Bagasse, sugar cane byproduct, is the primary source used. Biomass can also be processed into ethyl alcohol. Alcohol fuel is adaptable for hydrocarbon combustion systems, which account for 58% of the County's energy demand.^{27, 2001}

Below are tables illustrating Hawaiian Electric Company, Inc.'s subsidiary Hawaii Electric Light Company energy production and services. Each table is referenced.

**Table 3.44 -- Electric Utility Power Production By Resource
 Hawaii County, 1999 And 2000**

RESOURCE	1999		2000	
	NET KWH/YR	% OF TOTAL	NET KWH/YR	% OF TOTAL
HELCO Power				
HELCO Diesel	240,486,350	23.7	263,611,660	25.2
HELCO Steam	398,844,000	39.3	369,728,420	35.3
HELCO Hydropower	18,843,470	1.9	15,113,760	1.4
HELCO Wind	3,794,550	0.4	2,649,300	0.3
Total HELCO Resources	661,968,370	65.3	651,103,140	62.2
Purchase Power				
Total Coal (Hilo Coast Power Co.)	115,806,093	11.4	62,593,653	6.0
Total Naphtha (Hamakua Energy Partners)	0	0.0	39,836,806	3.8
Total Geothermal	196,001,249	19.3	250,194,036	23.9
Total Purchase Hydro	28,222,813	2.8	30,653,392	2.8
Total Wind	11,611,591	1.2	13,228,723	1.3
Total Purchased Power	351,641,746	34.7	396,506,610	37.8
Total Energy Delivered to System	1,013,610,116	100.0	1,047,609,750	100.0

Table 3.45 -- HELCO Production by Source ^{27,2001}

Source	Megawatts Produced
Medium sulfur fuel oil fired steam generators	69
Internal combustion diesel engine generators	38
Combustion turbine units	43.3
Firm Power	150.3
Hydro generation	3.35
Wind generation	2.28
Non Firm Power	5.63
Total	155.93

HELCO's first IRP called for installation of CT-4 and CT-5, 20 MW combustion turbines at Keahole in 1995. Later, in 1997, these were to be connected to a steam turbine generator that would produce an additional 18 MW. HELCO would

also consider installing a 10 MW battery storage unit as contingency for delays in installing the Keahole generators. None of the units planned in IRP-93 were installed due to permitting delays on the Keahole CT's and HELCO's decision not to deploy the battery storage unit. HELCO intended to install Keahole CT-4 and CT-5 in December 1998. It is not clear when HELCO will be permitted to install additional units at Keahole.

Encogen, a non-utility generator, has installed a 62 MW DTCC cogeneration facility near Haina, Hawaii. The plant was constructed and in operation in 2000. HELCO needs to gain additional approvals from regulatory authorities are needed to proceed with CT-4 and CT-5 in parallel with the Encogen contract.

HELCO is the only utility in the state that currently operates on its own renewable resources. HELCO's sales of 894,110 Megawatts in 1997 ranked third of the state's four utilities, according to the County of Hawaii general plan revision.
27,2001

There are two levels of transmission voltages to transfer power between areas on the Big Island. The main transmission voltage is 69kV. HELCO has four 69kV cross-island transmission lines. One line is the northern line connecting the Kanoiehua substation to West Hawaii via the Waimea substation along highway 19 following the Hamakua coastline. Two lines connect the Kaumana substation to the Keamuku substation along the Saddle Road. The fourth is the southern line connecting the Kanoiehua substation to West Hawaii via the Kealia substation along Highway 11 through the Puna and Kau Districts. The other transmission voltage is 13.8kV that includes three tie lines in Hilo connecting the Shipman and Kanoiehua power plants. HELCO uses 34.5kV as a sub transmission voltage and three lines are used to service the Puna, Kau and North Kohala areas.

The existing distribution system consists of several different voltage levels: 2.4kV, 4.16kV, 7.2kV, 12.47kV and 13.8kV. The distribution system basically consists of overhead pole lines and underground systems. Because of the vastness of the Big Island, the majority of the distribution system consists of overhead pole lines. Underground systems have been used more extensively in West Hawaii in the newer subdivisions and developments. HELCO currently operates major switching stations (used to transfer the flow of power between different transmission circuits) at critical locations around the island. These transmission switching stations provide greater system flexibility and increase system reliability in supplying power to the various distribution substations and eventually, to customers. Distribution substations, which transform voltages to distribution voltages, are also located island-wide in proximity to communities and other developments.

The Big Island has a potential to use more alternative energy in the form of geothermal, hydro, wind, solar thermal and photovoltaic systems. These sources

have been included in HELCO's Intergraded Resource Planning (IRP) process. The goal of integrated resource planning is the identification of the resources or the mix of resources for meeting near and long term consumer energy needs in an efficient and reliable manner at the lowest reasonable cost including the need and timing of any new generation and new cross-island transmission lines. As identified in the IRP process, HELCO is planning to expand its generation facilities at Keahole, North Kona. The added generation at Keahole will improve the system voltage level in West Hawaii, improve system reliability and allow for the retirement of older generators in East and West Hawaii. Because of the planned addition at Keahole, additional cross-island transmission lines can be deferred.

**Table 3.46 -- Electric Company Customers - Hawaii County:
 1996 To 2000**

Region	1996	1997	1998	1999	2000
Residential Customers	49,860	50,590	51,277	52,277	53,263
Residential Customers by Service Area					
Hilo – North Hilo District to Kau District	26,051	26,460	26,730	27,106	27,519
Kona – Kau District to North Kona District	14,561	14,733	15,035	15,516	15,985
Waimea – South Kohala District to North Hilo District	9,248	9,397	9,512	9,655	9,759
All Customers	59,349	60,220	61,228	62,478	63,778

Table 3.47 -- Electric Utility, Hawaii County: 1997 To 2000

Subject	1997	1998	1999	2000
Customers, Dec. 31:				
Residential	50,590	51,277	52,277	53,263
General loads	9,001	9,372	9,654	9,982
Commercial cooking and heating	484	438	396	373
Large power service	69	67	65	63
Street lighting	76	74	86	97
Power sold (1,000 kWh):				
Residential	331,214	335,171	343,085	355,420
General loads	286,133	298,995	308,493	330,462
Commercial cooking and heating	31,845	28,071	25,964	26,009
Large power service	240,496	236,775	234,889	238,327
Street lighting	3,717	3,835	3,879	3,956
Average annual use (kWh/customer):				
Residential	6,547	6,536	6,563	6,673
Average rate (dollars per kWh):				
Residential	0.19758	0.18683	0.18624	0.21621
General	0.18948	0.17842	0.18006	0.20803
Commercial cooking and heating	0.17675	0.16684	0.16385	0.19098
Large power service	0.14385	0.13692	0.13738	0.16588
Revenues (\$1,000):				
Total	160,315	153,722	156,636	190,891
Residential	65,208	62,620	63,895	76,846

Existing Problems, Issues and Opportunities

As mentioned by the General Plan, long-range planning and further study is needed to:

- Establish an Office of Energy Coordinators (This office would coordinate and provide information, organize transportation programs, assist businesses in energy-related ventures, fund information-gathering programs, monitor energy departments, recommend changes to County's energy program and analyze developments to energy balance.),
- Establish a geothermal system capable of producing power that follows changing demand during the day in needed,
- Examine and recommend changes to lower the power rate on Hawaii (among the highest in the nation due to small market and sparse population), and

- Attain energy self-sufficiency to minimize its dependence upon fossil fuels.
27, 2001

Future and Planned Usage

According to the County of Hawaii General Revised Plan, HELCO has successfully maximized available generation by careful scheduling of generation unit overhauls and maintenance. HELCO deferred planned unit retirements, purchased increased power from Puna Geothermal Venture and HCPC, and obtained load management contract to reduce the evening peak by 7 MW.

HELCO's long-term plans include the eventual conversion of distribution circuits to 12.47kV where necessary. Therefore, any new distribution improvement or line extension will be designed for 12.47kV. 27, 2001

HELCO's efforts to continue to meet electricity demand were aided by the slowdown in the Big Island's economy and reduced growth of electricity demand. HELCO continued to see an air permit for its Keahole units. Should this and other issues be favorably resolved, HELCO estimated that the delay on the Keahole units could exceed a year from the expected service date of December.

One goal is to establish the county of Hawaii as a demo for development and use of natural energy resources. Natural energy sources include:

- Solar power is still being researched for industrial, commercial and residential applications.
- Ocean Thermal Energy Conversion research is underway at the Natural Energy Laboratory of Hawaii. Currently there are plans to construct a 1-megawatt facility. 27, 2001

Future and Planned Requirements or Changes

As maintained by the General Plan, the County encourages:

- Development of alternate energy resources,
- Expansion of energy research,
- Development and use of agricultural products and byproducts as sources of fuel,
- Educate the public on new energy technologies,
- Strive to ensure sufficient energy for current and future populations,
- Seek funding from government and private sources,
- Coordinate governmental and private research and development,
- Ensure a balance between alternative energy resources and preservation of natural environment,
- Encourage research of developing power at lower costs to consumers, minimize impacts to the environment,
- Support net-metering and other incentives,
- Encourage energy saving design in building construction, and
- Encourage solar water heating through tax credit programs. 27, 2001

According to the County of Hawaii general revised plan, HELCO has sought a West Hawaii site since before 1988. Although studies have identified a number of potential sites to meet HELCO's stated need to locate new generation on the side of the island where of the new load growth will occur, HELCO encountered major obstacles in attempting to locate generation at sites recommended by the study. HELCO asserts that the new power plant will minimize pollution.

Recently, in 1999, Hawaii County Council approved HELCO's request to rezone the Puna Power Plant parcel from agricultural to industrial. Additionally they amended the State land use boundary designation, according to the County of Hawaii general revised plan. ^{27, 2001}

Anticipated Costs for the Future

There has been no documentation for anticipated costs for the future.

Problems, Issues and Opportunities associated with Costs

Energy costs will ultimately be passed on to the consumers.

Compare Visitor Impact with Resident Impact

As growth occurs on the west side, the need for a power station will increase. The growth is not distinguished between residential and visitors, although this is a highly concentrated area for visitors.

Major Assumptions

Although, due to HELCO's inability to resolve permitting and other issues, construction had not started on generation units at Kaehole that HELCO had assumed would be in place in late 1998 as a basis for their IRP. HELCO forecasts, peak electricity demand and sales through 2018 in IRP-98.

County of Hawaii – Sewer Systems

Present Capacity and Usage

Data regarding private sewage systems was difficult to separate from public sewage. All information is included in the public sewage summaries and visitor related area summaries.

Approximately 77% of Hawaii's homeowners have cesspools for sewage disposal. There are also several privately operated sewer systems. ^{27,2001}

Existing Problems, Issues and Opportunities

There are problems with cesspools leaking into the water supply. ^{27,2001}

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Coastal Water Quality

Present Capacity and Usage

There is not enough data on this topic to adequately summarize coastal water quality at the county level. While there have been studies at specific beaches, they cannot be generalized to the regional, county or state level.

Existing Problems, Issues and Opportunities

Generally, coastal water quality is affected by polluted runoff from streams. However, little is known about the pollutant loads of individual streams. Further study is being conducted to rectify this problem.

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Marine Ecosystem Health

Present Capacity and Usage

There is not enough data on this topic to adequately summarize marine ecosystem health at the county level. Studies of various marine environments have been conducted, but the results should not be generalized for an entire region, county or state.

Existing Problems, Issues and Opportunities

Generally, marine ecosystem health is affected by polluted runoff from streams. However, little is known about the pollutant loads of individual streams. Further study is being conducted to rectify this problem.

Concerns about over fishing, fish collecting and particularly, encroachment of development on the shoreline. This development and its associated grading and grubbing can impact the health of marine ecosystems by adversely affecting the water quality and delicate coastal features such as anchaline ponds, coral reefs and other coastal and oceanic resources. Development near the shoreline also affects public access to the beaches. These concerns are not easily quantifiable and need further research. ^{27,2001}

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Forestry / Green Space

Present Capacity and Usage

In addition to being part of the scenic and natural resources of Hawaii, forests are the first protection for the watershed, and ultimately water quality. The tables below outline the current acreage for forests in Hawaii County and the types. There are many uses for forests, some of which agricultural/forest production as outlined in the Acres of Commercial Forestland table.

Table 3.48 -- Forest Acreage, Hawaii County: 1999 ^{239,2001}

Subject	Acres
Forest reserve land (State owned)	427,220
Commercial (federal, military, state and misc.)	800,000
Noncommercial (unproductive/nonproductive)	344,000
Planted forest	
Total standing	43,620
Natural area reserves	
Number of areas	8
Acreage	82,535

Source: *County of Hawaii Data Book - 2001*

Table 3.49 -- Island of Hawaii Natural Reserves

Reserve	Acres	Environment
Puu O Umi	10,142	Montane bogs – dry coastal shrubland
Mauna Kea Ice Age	3,894	Alpine aeolian desert
Laupahoehoe	7,894	Lowland to montane wet forests
Waiakea	640	Wet montane forest
Puu Makaala	12,106	Montane wet forests and montane wet grassland
Kahauale	16,726	Montane to lowland wet to mesic forests
Manuka	25,550	Subalpine shrublands and forests, mesic to wet montane forests and lowland mesic and dry forests and anchialine pools
Kipahoehoe	5,583	Lowland dry grassland and forests
Total	82,535	

Table 3.50 -- Acres of Commercial Forestland, 1970 ^{112, 2000}

Ownership	Island of Hawai'i	All Other Islands	Total
State			
Hawaiian Homes	6,300	27,700	34,000
Other State	278,000	99,400	377,400
Federal	-	11,800	11,800
Private corporate	140,500	142,900	283,400
Private non-corporate	126,500	68,600	195,100
Total	551,300	350,400	901,700

Source: *Forest Inventory Information Needs Assessment for the State of Hawaii with Emphasis on the Island of Maui*

At least 24,000 acres are cultivated specifically for eucalyptus production, with thousands more planned. ^{27, 2001}

Existing Problems, Issues and Opportunities

The United States Geological Survey states that the potential for adverse impacts from forest roads exist in areas where steep slopes, erodible soils, or where forest roads are located near water. Forest roads cause more erosion than any other forestry activity. Locating, constructing, and maintaining roads to minimize soil movement and pollution of streams can prevent most of this erosion. ^{123, 2001} These activities adversely affect the watershed that directly impacts the water quality.

According to the “Watershed Protection and Management Program,” many of the dry and mesic lowland plants are rare; their habitat largely displaced by agriculture and other development. Scientists estimate that less than 10% of the native Hawaiian lowland ecosystems survive today.

Natural area managers are working to protect rare and native plants and animals within their critical habitats, and remove threats to their existence. In many parts, non-native weed control helps keep aggressive introduced plants from replacing native trees. Protective fencing around rare plants is sometimes the only way to save them from feral pigs and other domestic animal threats. Seeds and other material are collected from the reserve's rare plants and sent to botanical gardens that specialize in propagation of native Hawaiian plants that border on extinction.

Other concerns, as mentioned through public input, are loss of open space and impacts on recreational areas and scenic resources. These concerns are not readily quantifiable, but need to be mentioned.

Future and Planned Usage

Restoration of Hawaii's dry forests will require active management, both to control nonnative species and to reintroduce key native species. ^{125, 2000}

State Division of Forestry and Wildlife study in 1981 identified about 80,000 acres of former agriculture as ideal for forest plantation. An additional 100,000 acres were identified for longer rotation forest plantations. ^{27, 2001 123, 2001}

Future and Planned Requirements or Changes

Although it is unrealistic to expect that all non-point source pollution can be eliminated, best management practices, as directed by the Watershed Protection Program, can be used to minimize the impact of forestry practices on water quality. These practices must be reasonable, achievable and cost effective.

- To maintain the integrity of stream courses;
- To reduce the volume of surface runoff originating from an area of forest management disturbance and running directly into surface water;
- To minimize the movement of pollutants i.e. pesticides, nutrients, petroleum products, etc. and sediment to surface and ground water;
- To stabilize exposed mineral soil areas through natural or artificial re-vegetation means. ^{123, 2001}

A well-planned access system is a sound method of reducing erosion and sedimentation in areas requiring frequent or temporary access as stated by the Watershed Protection Program. Proper location and construction of roads will provide for safety, longer operating periods, lower maintenance and operating costs, and minimal impacts to water quality. ^{123, 2001}

Anticipated Costs for the Future

There were no costs mentioned in the referenced documents.

Problems, Issues and Opportunities Associated with Costs

As cited in the Watershed Protection Program, temporary and permanent access roads are necessary components of all management programs. They are also one of the most costly investments made in forests. ^{123, 2001}

Compare Visitor and Resident Impact

No reference was made to differentiating visitor impact from resident impact.

Major Assumptions

See Hawaii State Forestry Summary for major assumptions regarding forests.

County of Hawaii – Air Quality

Present Capacity and Usage

According to the *General Plan*, the Island of Hawaii is globally recognized for the clarity of air at the summits of Mauna Kea and Mauna Loa. There is minimal locally generated pollution. Some sources include open burning, sprayed agricultural chemicals, transportation, fixed combustion sources and emissions. Wind patterns can create localized concentrations of pollution from vehicles and volcanoes. ^{27, 2001}

According to the American Lung Association, Kilauea on the Big Island of Hawaii is one of the most active volcanoes in the world. Part of this activity is the production and release of gases that react in the air to form volcanic fog, or vog. One of the gases released by Kilauea is sulfur dioxide (SO₂). While the amount released varies, Kilauea typically releases about 1,000 metric tons of SO₂ each day. The SO₂ reacts with other chemicals in the air to form both liquid and solid particulate pollution. The particles scatter light, making the air appear hazy. ^{117, 2002}

Vog is released at a rate of about 385 tons per day during eruptive pauses and 2,000 tons during active eruptions. Vog contains sulfur, silicon, sodium and chlorine, with lesser amounts of potassium, calcium, magnesium, aluminum, titanium and iron. Sulfur, in the form of sulfuric dioxide, oxidizes in the presences of sunlight and water to form sulfuric acid or acid rain. It is believed that during non-eruptive phases, the effect of acid rain is localized. ^{27, 2001}

Kilauea also produces tons of lava every day. When the lava flows into the ocean, the intense heat evaporates the water, vaporizing salts at the same time. As the water vapor cools, the salts recombine and hydrogen chloride is formed. This reacts with water to form droplets of hydrochloric acid. The droplets scatter light forming a haze we call laze.

The following is a list of monitoring stations and what chemical compounds they monitor for around Hawaii:

- **Kona:** This station is located on the grounds of the Konawaena High School. This special purpose site was established in April 1997 to monitor vog in the Kona area. The pollutants sampled at this site are SO₂ and PM10. The 1-in-6 day sampling for PM10 at this site was discontinued on June 11, 2000.
- **Hilo:** Established in March 1995, this station is located on the grounds of the Adult Rehabilitation Center of Hilo to monitor vog. The pollutants sampled are SO₂ and PM10.
- **Honokaa:** Located at Honokaa High and Intermediate School, this station was established in August 1997 on the upwind side of the island to

- monitor vog. The pollutants sampled at this site are SO₂ and PM₁₀. This site was discontinued on August 1, 2000.
- **Puna:** This station is located in a residential-agricultural area near Nanawale Estates. It is approximately 1.4 miles northwest of the Puna Geothermal Venture power plant. The station was established in August 1993 and monitors for H₂S.
 - **Puna East:** Located in the Leilani Estates residential subdivision in Puna, it is approximately 3 miles south-southwest of the Puna Geothermal Venture power plant. Established in 1992, this station monitors for H₂S. ^{67, 2000}

Existing Problems, Issues and Opportunities

Vog is moved away from Kilauea by wind. Wind direction determines which part of Hawaii will be affected. When the prevailing, northeasterly trade winds are blowing, vog collects on the Kona side of the Big Island before being blown out to sea. When southerly (Kona) winds are blowing, vog affects the Hilo side of the Big Island and may impact islands farther up the chain. ^{117, 2002}

Future and Planned Usage

This parameter is not applicable to this environmental feature.

Future and Planned Requirements or Changes

Planned changes include:

- Definition of the most ecologically balanced use of the land between residents and visitors possible while retaining the quality of life and sustainable and viable natural resources;
- Control of pollution through recycling in agriculture, industrial and municipal levels;
- Reinforce of established standards to maintain the quality of the environment and establish air and water quality monitoring stations.
- Support programs preventing invasive species establishment; and
- Require golf courses to limit leaching of nutrients, implementation of management measures through conditional land use permitting and review grading and grubbing ordinances to address erosion and runoff. ^{27, 2001}

Anticipated Costs for the Future

There were no costs directly associated with the proposed changes or requirements.

Problems, Issues and Opportunities Associated with Costs

As there were no direct costs associated with future or planned usage, changes or requirements, there should be no issues.

Compare Visitor and Resident Impact

This parameter is not applicable to this environmental feature. The largest detrimental contributor to air quality is of natural origin.

Major Assumptions

This parameter is not applicable to this environmental feature. Until Kilauea ceases erupting, it will continue to create vog (volcanic fog) and laze (lava related haze).

County of Hawaii – Beach Erosion

Present Capacity and Usage

There is not enough data on this topic to adequately summarize beach erosion at the county level. Studies at specific beaches has been conducted, however, the results for one beach cannot be generalized for all beaches within the region, island or state.

Existing Problems, Issues and Opportunities

There is no single problem applicable to all county beaches. Each beach has its own set of environmental and anthropogenic factors that give it unique characteristics.

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Invasive Species

Present Capacity and Usage

Table 3.51 -- Big Island Invasive Species Committee Target Species

Species Common Name	Source
German Ivy	South America, South Europe
Fountain grass	Africa
Silk oak	Australia
Clidemia	Tropical America
Jasmine	N/A
Rubber vine	Central Africa, India and Asia
Plume poppy	South America
Fireweed	Africa
Cat's claw creeper	Asia
Coqui	Caribbean

Source: *Big Island Invasive Species Committee*

According to the *Big Island Invasive Species Committee*, a total of 8,920 acres on the Big Island were surveyed from the air for miconia. On the ground, all mature and near mature trees (172 plants) were destroyed and seed production stopped on Kona sites, while 2,284 acres were surveyed and 7,389 plants were destroyed on Hilo and Puna sites. A total of 661 acres in core areas were revisited, and a total of 19,438 immature plants and 635 trees were killed. Meanwhile, stewardship project volunteers killed 227 trees and 5,841 immature plants, and the Miconia Hotline received 132 calls, none for new areas. ^{205, 2000}

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Other Natural / Scenic Resources

Present Capacity and Usage

There native species, riparian / wetlands and trails are summarized as other natural resources. There is not enough data regarding scenic resources to adequately summarize scenic resources at the county level. Data uncovered regarding scenic resources has been outdated (1970s-1980s), subjective in nature and not specific to Hawaii. Further study is required for an objective quantitative scenic resource evaluation.

Native Species / Extinction Issues

While native species and extinction issues are serious issues, there is not enough information at the county level to make an adequate evaluation.

Riparian / Wetlands

Riparian / wetlands water quality are issues that are currently being worked on. However, present capacity and usage are not measurements conducive to evaluating

Existing Problems, Issues and Opportunities

There is inadequate data to evaluate some of Hawaii's precious environmental resources. Continued research is required.

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Puna – Water Quality and Quantity

Present Capacity and Usage

The *County of Hawaii General Plan Revision*, states that the Olaa-Mt. View water system consists of eleven service areas and extends along the Volcano Road from the former Puna Sugar Company mill to the Olaa Reservation Lots and along the Keaau-Pahoia Road to the vicinity of Kaloli Drive. Water for this system is supplied by three deep wells. Two of the wells are located at the former Puna Sugar Co. mill site and the third is near Olaa, between Keaau and Kurtistown. The average consumption of this system is about 0.82 million gallons per day. Olaa Well C, the primary source for this system, has a maximum pump capacity of 2.0 mgd. Olaa Wells A and B have capacities of 1.6 mgd and 0.72 mgd, respectively.

The Pahoia 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. The present average consumption is 0.40 million gallons per day. The total amount of water available in the area of the Pahoia wells is very high. All evidence indicates that the Pahoia wells can obtain water of excellent quality, insofar as salinity is concerned, in amounts limited only by the capacity of the pumps. ^{27, 2001}

Existing Problems, Issues and Opportunities

The Glenwood and Volcano areas are presently not serviced by any public water system. Many of these areas still depend on roof catchments systems.

Future and Planned Usage

According to the County of Hawaii General Plan Revision, 2001, the following lists future projects for the area:

- Continue to improve inadequate water system facilities.
- Water source investigation and exploration should be continued in order to provide service for anticipated needs.
- Investigate additional groundwater sources in the Olaa area.
- Investigate alternative means to finance the extension of water systems to subdivisions that rely on catchments. ^{27, 2001}

Future and Planned Requirements or Changes

According to the County of Hawaii General Plan Revision, 2001, the State Department of Land and Natural Resources, Engineering Division also has the capacity to explore and develop new ground water sources. The County has in the past depended upon this agency, formally known as the Division of Water and Land Development, for source development. The development of new

sources requires the cooperation between State and County agencies in the delivery of municipal water systems.

The exploration for new water sources will continue. It is anticipated that these new water sources and systems will further influence land development. ^{27, 2001}

Anticipated Costs for the Future

Exact figures for Puna district were not available. General figures are available at the county level.

Problems, Issues and Opportunities Associated with Costs

As mentioned in the County of Hawaii General Plan Revision, 2001, one solution to improve systems presently served by only surface sources is to install a well in these systems, use the surface sources when available, and use the pump when the surface sources are deficient. This would minimize operational costs and upgrade systems so they are more dependable. Another solution is to construct large storage reservoirs. These, however, require high initial capital expenditures. ^{27, 2001}

Compare Visitor and Resident Impact

No information was available to distinguish between visitor and residential impacts on water in Puna.

Major Assumptions

See County of Hawaii Water Summary for information.

County of Hawaii – Puna – Sewage

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, many small towns the largest of which are Keaau and Pahoa characterize the Puna district. At present, most residents in the Puna district are served by individual on-site wastewater disposal systems. The use of cesspools and individual household aerobic treatment units will probably be continued until increased population distribution and densities make it economically feasible to install municipal sewerage systems.

Existing Problems, Issues and Opportunities

Residences near the coastal areas of Puna see a higher rate of on-site disposal system failure because of the shallow groundwater table. The close proximity of the groundwater reduces the efficiency of on-site disposal systems because there is less filtration that can occur before the effluent reaches the groundwater. This reduced efficiency will ultimately affect the quality of near shore waters.

Future and Planned Usage

The following information is referenced to the *County of Hawaii General Plan Revision*.

Proposed future courses of action for the Puna area include:

- The use of cesspools shall be discontinued in the coastal areas where cesspools do not function satisfactorily;
- Individual household aerobic treatment units approved by the State Health Department and the County of Hawaii should be utilized in coastal areas;
- Future municipal sewage collection systems for the Puna area would then naturally commence with service to the lower coastal areas; and
- Coordination should occur with W.H. Shipman Ltd. in the planning and development of a sewerage system for the Keaau area. ^{27, 2001}

Future and Planned Requirements or Changes

See County of Hawaii Sewage Summary for information.

Anticipated Costs for the Future

See County of Hawaii Sewage Summary for capital improvement projects.

Problems, Issues and Opportunities Associated with Costs

Little information was uncovered regarding issues with costs for sewage in Puna.

Compare Visitor and Resident Impact

No information distinguishing visitor impact from resident impact was uncovered.

Major Assumptions

N/A

County of Hawaii – Puna – Solid Waste Disposal

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, the District of Puna has no landfills, but operates solid waste transfer stations, which are located in Pahoa, Kalapana, Volcano, Glenwood and Keaau. ^{27, 2001}

See table 3.09 – Quantities of Solid Waste from Convenience Centers for Year 2000 in the County of Hawaii Solid Waste Disposal Summary for tonnage of solid waste collected at each transfer center.

Existing Problems, Issues and Opportunities

See County of Hawaii Solid Waste Summary for information.

Future and Planned Usage

See County of Hawaii Solid Waste Summary for information.

Future and Planned Requirements or Changes

See County of Hawaii Solid Waste Summary for information.

Anticipated Costs for the Future

See County of Hawaii Solid Waste Summary for information.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Solid Waste Summary for information.

Compare Visitor and Resident Impact

See County of Hawaii Solid Waste Summary for information.

Major Assumptions

See County of Hawaii Solid Waste Summary for information.

County of Hawaii – Puna – Storm Water

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, the climate of the Puna District varies considerably from the rocky shoreline to the rain forest areas in the upper elevation. Rainfall amounts are generally heavy and most of the district receives over 100 inches per year.

The district is subject to heavy rainfall and there is record of severe flooding. Historically, flooding along the Belt Highway and the highway from Keaau to Pahoia had been the most prominent problems of the district. However, highway improvements have done much to alleviate the flooding on the roadways.

The entire coastline is susceptible to tsunami impacts and hurricane storm surge inundation. However, much of the coastline is undeveloped and/or has high cliffs. This renders most developed areas outside of the inundation zone and not subject to damage. On November 29, 1975, an earthquake measuring 7.2 on the Richter Scale centered approximately three miles off shore of Halape generated a tsunami that killed two people and resulted in \$1,400,000 of property damage. The total damage of the earthquake and tsunami amounted to approximately \$4,100,000. ^{27, 2001}

Existing Problems, Issues and Opportunities

The following information is from the *County of Hawaii General Plan Revision*. Currently, the lack of development and the extremely permeable soils have helped to minimize major flooding and damage to life and property. However, as the amount of development increases within the district, flood problems will also increase. Furthermore, the conversion of land historically planted in sugar to other crops may increase runoff. In this regard, Soil and Water Conservation District conservation programs can help lessen the potential problem.

Some of the flood hazard areas for the Puna district are difficult to delineate due to the lack of defined drainage ways. Recorded flood damage has mainly been caused by surface sheet flows that are likely to occur anywhere when heavy storms strike. Examples of this are found in Fern Forest, Eden Rock, Fern Acres, Orchidland, and Hawaiian Paradise Park. In addition to these subdivisions, flooding occurs in certain areas of Pahoia. Other areas, such as Hawaiian Acres, may be more defined. The flooding below Mt. View may be the result of diversion of the Mt. View watershed into some of the substandard subdivisions. ^{27, 2001}

Future and Planned Usage

Systems that incorporate diversion channels to intercept sheet flows and main channels to transport the flows away or through the area have been proposed for

the communities of Keaau and Pahoia. Along the Keaau-Pahoia Road, the State Department of Transportation (DOT) has installed culverts to facilitate the movement of water and minimize overtopping of the road in certain sections. In addition, the DOT plans to replace those culverts that are ineffective or inadequate.

Drainage systems incorporating the use of diversion channels to collect and transport surface flows safely through the area are also proposed for Mt. View. A portion of this system has been constructed.

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision* the following proposed changes for the Puna District include:

- As development increases within the district, the drainage systems designed for the existing village areas shall be implemented;
- Conduct an update of the County of Hawaii *Drainage Master Plan* and the *Mountain View Drainage Study* and provide improvements as recommended by the updates;
- Seek assistance to develop a comprehensive flood study for the subdivisions between and along Highways 11 and 130; and
- Ensure that purchasers of homes and other real property are fully informed of hazards from lava flows and other volcanic emissions. ^{27, 2001}

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

Visitors and residents have little impact on the predominantly natural forces behind flooding.

Major Assumptions

N/A

County of Hawaii – Puna – Roads

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision* the 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 Keaau to Kalapana-Kaimu; the Kapoho Road (Highway 132), from Pahoa to Kapoho; and the Puna Coast Road (Highway 137), linking Kapoho and Kalapana-Kaimu. The latter road is basically a [one-lane] narrow, paved cinder road. Recent upgrades have greatly improved Highway 130 from Keaau to Kalapana and Highway 11 from Hilo to Volcano. However, the majority of the roads throughout the district are inadequate by present standards. As the only two primary routes serving the district, Highway 130 and Highway 11 are congested during the workweek for Hilo-bound traffic as the population in the district continues to grow. The recently completed Keaau By-Pass Highway re-directs Hilo- and Pahoa-bound traffic around the town of Keaau. This avoids the congested intersection of Volcano Highway-Keaau-Pahoa Road.

Many sections of the roads in this district have drainage systems that do not meet present standards or have sharp curves and grades without adequate sight distance. In several communities, buildings directly abut or encroach onto rights-of-way.

Most private roads in large subdivisions are cinder-surfaced and deficient in layout and construction. During the development of these large, substandard subdivisions in the 1950s and 1960s, limited attention was given to proper roadway base construction and drainage. There is also a network of private old plantation roads throughout the area.^{27, 2001}

Existing Problems, Issues and Opportunities

According to the *County of Hawaii General Plan Revision*, many sections of the roads in this district have drainage systems that do not meet present standards or have sharp curves and grades without adequate sight distance. In several communities, buildings directly abut or encroach onto rights-of-way.

Future and Planned Usage

The following information is according to the *County of Hawaii General Plan Revision*.

- Explore the possibility of developing a mid-level roadway to be located makai of Highway 130, beginning at Hawaiian Beaches Subdivision and extending through Hawaiian Paradise Park Subdivision with its eventual connection to Railroad Avenue in South Hilo. Consider the establishment of a bikeway along the same alignment.

- Consider, in conjunction with community associations and the property owners, the use of a variety of mechanisms to provide infrastructure in non-conforming subdivisions, beginning with the major roads providing access into the more densely populated subdivisions.^{27, 2001}

Future and Planned Requirements or Changes

Explore the possibility of developing a mid-level roadway to be located makai of Highway 130, beginning at Hawaiian Beaches Subdivision and extending through Hawaiian Paradise Park Subdivision with its eventual connection to Railroad Avenue in South Hilo. Consider the establishment of a bikeway along the same alignment.

Anticipated Costs for the Future

See County of Hawaii or State of Hawaii Roads Summaries for information.

Problems, Issues and Opportunities Associated with Costs

According to the *County of Hawaii General Plan Revision*, roadway systems in Hawaii County are generally financed through Federal, State, and County programs. Recent funding limitations are reducing the availability of such monies. Consequently, additional sources will have to be sought to implement the needed improvements.^{27, 2001}

Compare Visitor and Resident Impact

N/A

Major Assumptions

See County of Hawaii or State of Hawaii Roads Summaries for information.

County of Hawaii – Puna – Airports

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, except for small private landing strips developed to serve the former sugar plantations, there are no airfields in Puna. There are several small private aircraft landing strips developed by the former sugar industry for use by "crop-dusting" single engine aircraft. ^{27, 2001}

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Puna – Harbors

Present Capacity and Usage

There are no commercial boat harbors in Puna district. ^{27, 2001}

A boat launching ramp facility is presently provided adjacent to the park at Pohoiki Bay. There is no mention of the capacity or usage of the small boat facility. ^{27, 2001}

Existing Problems, Issues and Opportunities

Although crowding was not documented, parking for cars and boats, restrooms, and play areas are needed at the Pohoiki Bay facility. It is unknown as to whether this is due to the boating facility or other amenities the park offers. ^{27, 2001}

Future and Planned Usage

According to the *County of Hawaii General Plan Revision*, the County has purchased twenty-two acres of land on the Mauka-side of Isaac Hale Beach Park for the construction of additional car and boat parking areas, playgrounds, and picnic and bathroom facilities to supplement the heavily used small boat launching facilities at Pohoiki. ^{27, 2001}

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision*, there are plans to provide another small boat launching facility at Kapoho. ^{27, 2001}

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

See County Harbor Summary or State Harbor Summary.

Major Assumptions

N/A

County of Hawaii – Puna – Parks

Present Capacity and Usage

County

As stated by the *County of Hawaii General Plan Revision*, recreation programs are centered around team sports for young people. Below is an inventory of the facilities available:

- Mountain View and Kurtistown parks located at Hawaiian Beaches subdivision are provided with a multi-purpose sports field;
- Herbert Shipman Park in Keaau provides tennis courts and ball fields.
- Pahoa Neighborhood Facility has a 50-meter Olympic-size swimming pool. The neighborhood center is heavily used for community meetings and events; educational, cultural, and senior citizens programs; health and welfare programs; and indoor recreational activities;
- Keaau, Mountain View, and Pahoa Schools have ball fields.
- Department of Education maintains gymnasiums at Pahoa and Keaau, covered and outdoor basketball courts at Mountain View, and tennis courts and ball fields at Pahoa;
- The Isaac Hale Beach Park offers picnicking, camping, fishing, surfing, and swimming when the ocean is calm.
- The new Ahalanui Park features a naturally-occurring warm spring (Mauna Kea Pond) and a grassed area with scattered ornamental and coconut trees;
- Glenwood Park located along the Volcano Highway, adequately serves travelers as a picnic and rest stop; and
- Approximately 60,000 acres of the 229,176-acre Hawaii Volcanoes National Park is located within the Puna District.

Close proximity to Hilo, means many of the parks in Puna are heavily used by Hilo residents for picnicking, camping, swimming, surfing, and fishing.

In 1993, the County purchased approximately six acres of land situated 2,000 feet to the northeast of Isaac Hale Beach Park in an effort to replace park land destroyed by 1990 lava flows. Ahalanui Park features a naturally occurring warm spring (Mauna Kea Pond) and a grassed area with scattered ornamental and coconut trees. ^{27, 2001}

State

There are also State owned parks noted in the *General Plan*. MacKenzie State Recreation Area between Pohoiki and Opihikao at the edge of the Malama-Ki Forest Reserve offers fishing, picnicking and tent camping. The State's undeveloped Nanawale Park site (78.3 acres) is adjacent to Honolulu Landing, along the Puna Coastal Road between Kapoho and Hawaiian Shores Subdivision. Lava Tree State Monument (17.0 acres) features lava trees and

large volcanic earth cracks and has a footpath, picnic facilities, parking area, and restrooms. The park is landscaped, maintained and has adequate facilities for present use. An area adjacent has been reserved for expansion.^{27, 2001}

Federal

As noted in the *General Plan* is the approximately 60,000 acres of the 229,176-acre Hawaii Volcanoes National Park located within the Puna District. The facilities of the park for passive and active recreation are readily accessible.^{27, 2001}

Existing Problems, Issues and Opportunities

Parks in the Puna district are inadequate in serving the needs of the residents and social and cultural activities are limited. Problems mentioned in the *General Plan* include:

- Cool and rainy weather requires that there be extensive covered and indoor recreational areas;
- Improvements are needed to the parking facilities at Herbert Shipman Park in Keaau;
- Drainage problems exist at Keaau, Mountain View, and Pahoia Schools Parks;
- Isaac Hale Beach Park currently has inadequate facilities. Cars, boats, and boat trailers occupy areas within the park that could be used for recreational opportunities; and
- Kaimu Beach Park's famous black sand beach and adjacent coconut grove, covered by lava flows from Puu Oo Crater, Kilauea Volcano in 1990. Less than a mile away, Harry K. Brown Park, at one time the Puna district's most popular beach park, was inundated in the same eruption.^{27, 2001}

Future and Planned Usage

Some of the proposed changes in the *General Plan* are:

- An additional area adjacent Lava Tree State Monument Park has been reserved for future expansion;
- The Isaac Hale Beach Park is being expanded. The expansion of this park has been initiated by the County with the purchase of an adjacent 22 acres of land mauka of the existing park to be developed with additional parking areas, playgrounds, boat parking area, picnic facilities, and restrooms; and
- The new Ahalanui Park has proposed improvements which include the construction of a 54-stall parking lot, renovation of existing structures to accommodate a caretaker's cottage and community center, the construction of restrooms, access roadway and infrastructure improvements.^{27, 2001}

Future and Planned Requirements or Changes

The *General Plan* proposes the following future changes for the Puna District:

- Encourage the State to establish a park reserve on State-owned land east of Kaimu;
- Recommend the establishment of beach reserves at Kehena Beach and Opihikao (west of Opihikao junction);
- Recommend that the State expand the MacKenzie State Recreation Area;
- Develop the expanded Isaac Hale Beach Park recreation area by providing trail access to Keahialaka Spring and Pond and Mahinaakaaka Heiau;
- Develop the Kapoho Tide pools as a marine park;
- Establish a small scenic park overlooking Kapoho;
- Develop recreational areas along the coast between Hilo and Kapoho, including areas at Papai, Haena (Keaau), Kaloli Point, Keonepoko Nui, Honolulu Landing, and Nanawale;
- As the population increases and need arises, neighborhood parks in large subdivisions between Keaau and Pahoia should be provided and improved;
- Establish small scenic viewpoints along the Puna Road to overlook the rift zone and Kaueleau, Keekee and the 1955 flows; and
- Explore means to maximize the use of the Pahoia Neighborhood Facility site to serve the recreational needs of the lower Puna area. ^{27, 2001}

Anticipated Costs for the Future

See County of Hawaii Park Summaries for total funds spent for cultural and recreational programs. A current breakdown into districts was not available.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

See State of Hawaii and County of Hawaii Park Summaries for information.

Major Assumptions

See State of Hawaii and County of Hawaii Park Summaries for information.

County of Hawaii – Puna – Police, Fire and Emergency Services

Present Capacity and Usage

The following information is provided by the *County of Hawaii General Revision Plan*:

Fire and EMS

Pahoa has a fire and EMS operation servicing Pahoa-Paradise Park and Kalapana-Kapoho areas. Keaau has a regular 24-hour fire/EMS facility. Hawaiian Beaches, Hawaiian Paradise Parks, Hawaiian Acres, Fern Acres, Fern Forest, Waa Waa subdivisions and Volcano Village have 24-hour volunteer facilities. ^{27, 2001}

Police

Puna police station headquarters is housed in the Keaau public office complex. A district substation is located in Pahoa. ^{27, 2001}

Existing Problems, Issues and Opportunities

See County of Hawaii Police, Fire and EMS Summaries for details.

Future and Planned Usage

See County of Hawaii Police, Fire and EMS Summaries for details.

Future and Planned Requirements or Changes

Further study and review of 24-hour fire and EMS for the entire district should be conducted, and expansion of the public office facilities should be considered in accord with district needs. Police services and facilities should be expanded to adequately meet the needs of the district. ^{27, 2001}

Anticipated Costs for the Future

See County of Hawaii Police, Fire and EMS Summaries for details.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Police, Fire and EMS Summaries for details.

Compare Visitor and Resident Impact

See County of Hawaii Police, Fire and EMS Summaries for details.

Major Assumptions

See County of Hawaii Police, Fire and EMS Summaries for details.

County of Hawaii – Puna – Visitor Accommodations

Present Capacity and Usage

There are a total of 255 units and 36 properties located in the Volcano area.

The population in Puna is expected to grow at a rapid rate, as mentioned in the *County of Hawaii General Revision Plan*. This is due to an expanding agriculture and possible geothermal industry. There are a few visitor attractions, such as Hawaii Volcanoes National Park and the Painted Church. There are only one hotel and a handful of visitor accommodations in the form of bed and breakfast's.
27,2001

Existing Problems, Issues and Opportunities

In accordance to the *General Plan*, there is a lack of infrastructure for resorts, the terrain is structurally unsound and the area is prone to tsunamis. 27,2001

Future and Planned Usage

The *Plan* includes consideration of more bed and breakfast developments. 27,2001

Future and Planned Requirements or Changes

See Hawaii County Visitor Accommodations for information.

Anticipated Costs for the Future

See Hawaii County Visitor Accommodations for information.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

There is minimal visitor impact to the Puna district as stated by the *General Plan*.
27,2001

Major Assumptions

See Hawaii County Visitor Accommodations for information.

County of Hawaii – Puna – Private Transportation

Present Capacity and Usage

There was no breakdown of private transportation to the district level. See County of Hawaii Private Transportation Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Puna – Energy Systems

Present Capacity and Usage

There was no breakdown of energy systems to the district level. See County of Hawaii Energy System Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Puna – Sewer Systems

Present Capacity and Usage

There was no breakdown of private sewer systems to the district level. See County of Hawaii Sewage Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Puna – Coastal Water Quality

Present Capacity and Usage

There was little information regarding coastal water quality at the district level. See County of Hawaii Coastal Water Quality Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Puna – Marine Ecosystem Health

Present Capacity and Usage

There was little information regarding marine ecosystem health at the district level. See County of Hawaii Marine Ecosystem Health Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Puna – Forestry / Green Space

Present Capacity and Usage

There was little information regarding forestry at the district level. See State and County of Hawaii Forestry Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Puna – Air Quality

Present Capacity and Usage

There was little information regarding air quality at the district level. See County of Hawaii Air Quality Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Puna – Beach Erosion

Present Capacity and Usage

There was little information regarding beach erosion at the district level. See State of Hawaii Beach Erosion Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Puna – Invasive Species

Present Capacity and Usage

There was little information regarding invasive species at the district level. See State and County of Hawaii Invasive Species Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Puna – Other Natural Scenic Resources

Present Capacity and Usage

There was little information regarding various other natural and scenic resources at the district level. This includes native species and extinction issues and riparian / wetlands. See State and County of Hawaii Other Natural and Scenic Resources Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Hilo – Water Quality and Quantity

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, the Hilo Water System extends as far as Alae Point to the north, Panaewa Agricultural Park to the south, Keaukaha to the east, and Kaumana and Waiakea Uka to the west. The Hilo Water System is supplied with water from both surface and groundwater sources. The sources are:

- Olaa Flume Source: This spring source flow capacity ranges from a low of less than 1.0 mgd to a high of about 11.0 mgd depending on climatic conditions.
- Panaewa Well: Water from this source is pumped from the basal aquifer with three pumps, one, with a 2.2 mgd capacity and two each with a capacity of 3.1 mgd.
- Piihonua Well: This source has a capacity of 3.0 mgd. From this location, water may be pumped up to higher elevations during dry weather conditions. Water from this source is pumped from the basal aquifer with two pumps; both with a maximum pumping capacity of 2,100 gallons per minute or 3.0 mgd.

These three sources supply Hilo, which presently consumes an average of approximately 6.0 mgd. When the surface sources are low, more water is used from the Panaewa and Piihonua Wells.

The Papaikou water system serves Papaikou Village, Puueopaku, Paukaa and Kalaoa. This system is served by two perched water sources, Kaieie and Papaikou intakes and a well source located just above Papaikou Village. Kaieie is the most dependable surface source while the Papaikou intake source is inconsistent. The present average consumption is about 0.23 mgd.

Pepeekeo is served by a deep well. Present consumption is about 0.16 mgd.

The Honomu system, dedicated to the County by the former Pepeekeo Sugar Co., has an average daily consumption of 0.06 mgd. This system obtains its water supply from Kolekole Stream above Akaka Falls.

The Wailea-Hakalau system is a low capacity system comprised of one well and one storage tank together with connecting lines and limited distribution facilities. Currently, 95 customers consume about 0.028 mgd. ^{27, 2001}

Existing Problems, Issues and Opportunities

See County of Hawaii Water Summary for details. Data at the district level would require further study.

Future and Planned Usage

According to the *County of Hawaii General Plan Revision*, the following lists the planned

- Continue to implement water system maintenance and improvement programs in order to provide the city with a dependable and consistently safe drinking water supply.
- Investigate groundwater sources in the upper Waiakea Uka, Kaieie Mauka, Kulaimano, Saddle Road, and Honomu areas.
- Further investigate future ground water resources.
- Replace existing surface sources with groundwater sources to meet State Department of Health standards. ^{27, 2001}

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision*, the State Department of Land and Natural Resources, Engineering Division also has the capacity to explore and develop new ground water sources. The County has in the past depended upon this agency, formally known as the Division of Water and Land Development, for source development. The development of new sources requires the cooperation between State and County agencies in the delivery of municipal water systems.

The exploration for new water sources will continue. It is anticipated that these new water sources and systems will further influence land development. ^{27, 2001}

Anticipated Costs for the Future

The following major capital improvement projects were under construction, in various stages of contract award, or, in the planning and design phases during the fiscal year (1999-2000) in SOUTH HILO:

Department of Water Supply new office space

Bids were opened for the renovation work at the existing Waiakea Office Plaza. This renovation work consists of demolition work of the interior and installing new partitions to create new office space for Administration, Fiscal and Engineering Division of the Department. (Estimated Cost: \$810,000)

Kaumana Drive Pipeline Replacement, Phase 2

The pipeline replacement is along Kaumana Drive from Hokulani Street to Ainako Avenue. This project will replace an older 5-inch galvanized iron waterline with new 8-inch ductile iron pipeline. The completion of this project will also provide for improved flow and fire protection. (Estimated Cost: \$884,000)

Mohouli Street Extension 12-inch waterline

This water improvement project will be done in conjunction with the County of Hawaii road extension project. The completion of this project will provide the department with system flexibility in transmitting water to parts of our Hilo City Water System. (Estimated Cost: \$800,000)

Piihonua-Kukuau 1.0-MG Reservoir and Transmission Line

A new million-gallon reservoir and a 16-inch transmission waterline will improve the storage and flow capacities of the Piihonua-Kukuau water system. This system serves portions of Kaumana, the entire Sunrise Estates subdivision, the University of Hawaii-Hilo, and portions of the Waiakea Homesteads areas in South Hilo. (Estimated Cost: \$3,000,000)

Kaieie Mauka Exploratory Well

A well will be construction at the 1140-foot elevation to provide a source of potable water to replaced the surface water source, which is presently servicing the Kaieie Mauka water system. The well, once developed in to a production well, will be a reliable source of water during periods of low rainfall, which often results in diminished flows from the present surface water source. (Estimated Cost: \$800,000)

Saddle Road Well “A” Production Well

According to the Count of Hawaii 1999 – 2000 Annual Report, the existing well at the 1906-foot elevation will be outfitted with a deep well pumping unit and appurtenances. The completion of this project will provide a source of potable water to replace the present surface water source. (Estimated cost: \$1,200,000)
51, 2000

Problems, Issues and Opportunities Associated with Costs

In the *County of Hawaii General Plan Revision*, it is stated that one solution to improve systems presently served by only surface sources is to install a well in these systems, use the surface sources when available, and use the pump when the surface sources are deficient. This would minimize operational costs and upgrade systems so they are more dependable. Another solution is to construct large storage reservoirs. These, however, require high initial capital expenditures.^{27, 2001}

Compare Visitor and Resident Impact

There was no information available for distinguishing between residential and visitor use for water in South Hilo.

Major Assumptions

See County of Hawaii Introduction for population and visitor projections and County of Hawaii Water Summary.

County of Hawaii – South Hilo – Sewage

Present Capacity and Usage

According to the *General Plan*, Hilo is designated as an urban sewerage planning area. The County of Hawaii owns, operates, and maintains a sewerage system located on the Puna side of the Hilo International Airport. At present, the system consists of **5.0 million gallons per day (mgd) secondary sewage treatment plant** with an ocean outfall effluent disposal and a collection system of sewage pump stations, force mains, and gravity lines.

The existing municipal wastewater treatment facility in Pepeekeo has a design capacity of **500,000 gallons per day**. The Papaikou-Paukaa sewerage system consists of a **0.35 mgd secondary wastewater treatment plant**, collection and transmission lines, and an outfall to convey effluent to the shoreline for discharge. ^{27,2001}

Existing Problems, Issues and Opportunities

According to the *General Plan*, expansion of the existing sewer lines and upgrades are needed. Other issues can be found in the County of Hawaii Sewage Summary. ^{27,2001}

Future and Planned Usage

The *County of Hawaii General Plan Revision*, states that the proposed future courses of action for the South Hilo area include:

- Encourage the State Department of Health to monitor the wastewater received to provide sufficient base line data regarding the need for any future extension or expansion of wastewater collection systems;
- Expand the existing sewer collection system to include all densely populated areas in and around Hilo;
- Construct a new treatment plant to eventually provide either advanced primary or secondary treatment to incoming sewage flows; and
- Upgrade and/or rehabilitate aging sewer pump stations and collector sewers. ^{27, 2001}

Future and Planned Requirements or Changes

See County of Hawaii Sewage Summary for list of capital improvement projects.

Anticipated Costs for the Future

See County of Hawaii Sewage Summary for list of capital improvement projects.

Problems, Issues and Opportunities Associated with Costs

No information was uncovered regarding problems with costs associated with future changes in South Hilo.

Compare Visitor and Resident Impact

No information was uncovered regarding distinguishing between resident impact and visitor impact on sewage in South Hilo.

Major Assumptions

N/A

County of Hawaii – South Hilo – Solid Waste Disposal

Present Capacity and Usage

Landfill

The County of Hawaii operates the East Hawaii landfill waste disposal system at the former dumpsite in Hilo.

The impending closure of the Hilo landfill will cause substantial problems unless a suitable East Hawaii site is found. A cost analysis showed that it was less expensive to build a new landfill than retrofit the Hilo site to be compliant with current EPA and State pollution regulations. If an East Hawaii alternative site cannot be found, the island's only landfill will be at Puuanahulu.

Transfer Stations

According to the *County of Hawaii General Plan Revision*, transfer station sites supplementing the landfill system have been built in Hilo, Papaikou and Honomu. ^{27, 2001}

See table 3.09 – Quantities of Solid Waste from Convenience Centers for Year 2000 in the County of Hawaii Solid Waste Disposal Summary for tonnage of solid waste collected at each transfer center.

Existing Problems, Issues and Opportunities

See County of Hawaii Solid Waste Summary for information.

Future and Planned Usage

New transfer stations have been planned for Kaumana and Pepeekeo areas. ^{27, 2001}

Future and Planned Requirements or Changes

See County of Hawaii Solid Waste Summary for information.

Anticipated Costs for the Future

No actual costs were documented for the new transfer stations. See County of Hawaii Solid Waste Summary for information.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Solid Waste Summary for information.

Compare Visitor and Resident Impact

See County of Hawaii Solid Waste Summary for information.

Major Assumptions

See County of Hawaii Solid Waste Summary for information.

County of Hawaii – South Hilo – Storm Water

Present Capacity and Usage

The *County of Hawaii General Plan Revision* states that the South Hilo district can be separated into two watershed study areas using the Wailuku River as a dividing line. To the north of the river, the coastline has abrupt cliffs 30 to 80 feet high that are broken by deep stream channels. Usable land area has a ground slope of six to twelve percent. Above 4,000-foot elevation, the stream channels diminish in number and depth and have all but disappeared above 7,000-foot elevation. Flooding problems in this area are primarily caused by local water runoff from former sugar cane fields situated above the communities.

South of the Wailuku River is a relatively flat plain of less than one percent slope that extends towards Highway 11. Above Highway 11, the slope increases approximately six to twelve percent. Stream channels are poorly defined and disappear at elevations above 2,500 feet. ^{27, 2001}

Waiakea

Until recently, the existing drainage system was the result of uncoordinated development. Lacking a comprehensive plan, property owners have constructed and installed drainage facilities to protect their own interests. In many instances, these facilities have seriously concentrated flows and aggravated situations downstream. Many proposals of the *Hilo Drainage and Flood Control Report* have been completed for the Waiakea area with methods to alleviate the flooding problems.

Kaumana-Ainako-Wailuku River

According to the *County of Hawaii General Plan Revision*, Kaumana's drainage system consists of roadside ditches, culverts, and narrow channels. Except for the Ainako Avenue area, all of upper Kaumana's storm water runoff is discharged either through the Waipahoehoe or the Alenaio Streams. The Chong Street Diversion No. 3 and the Wailuku-Alenaio Diversion No. 4 along Akolea Road reduce flooding in the lower areas and the Ainako Avenue sections.

The drainage system in the Ainako-Wailuku River area is comprised of box culverts that pass the discharge of the Ainako River across Kokea, Koula, and Kapaa Streets. The residential areas bordering the Wailuku River have a system of collection ditches. Except during very intense storms, there are few problems in the area. ^{27, 2001}

Hilo Urban Area

Between tsunamis and runoff from higher elevations, the commercial district has displayed amazing recuperative abilities. Prior to the completion of the Waiolama Canal in 1924 and the Ponahawai Storm Drain System in 1926, this

area was a virtual "sea" during heavy rain. The construction of the canal and the storm drain system has since provided some degree of protection for the area.

The Alenaio Stream Flood Control Project, completed in 1998, begins just below Kapiolani Street and ends below Kilauea Avenue with an earthen levee leading into the Waiolama Canal. The project consists of three floodwalls, a 1,790-foot rectangular concrete-lined channel, a 200-foot concrete entrance transition, and an 830-foot earthen levee. The project also included the reconstruction of four bridges located at Kapiolani, Ululani, Kinoole Streets, and Kilauea Avenue. The Alenaio Flood Control project mitigated much of the flooding that occurred in the Alenaio flood plain.

Except for the northern section of the business district, downtown Hilo falls within the Wailoa River basin and within the area tributary to the Alenaio Stream. The State Department of Transportation as indicated that there are periodic shifts of beach material along the Hilo bay front shoreline. In addition, occasional storm events will close the roads at bay front due to storm surge. A study detailing the level of storm surge and the periodic shifts of beach material is needed before a solution can be developed.^{27, 2001}

Paukaa, Papaikou, Pepeekeo, Honomu, Hakalau

As stated in the *County of Hawaii General Plan Revision*, these communities have no serious flood problems although Honomu and Papaikou have experienced minor flooding. These result from runoff from the areas above the communities.^{27, 2001}

Existing Problems, Issues and Opportunities

Waiakea

The *County of Hawaii General Plan Revision* also states that most of the culverts in upper Waiakea are inadequate. Roadside ditches, though small in cross-sectional area, are aided by the highly porous ground and therefore are effective even during heavy storms. One of the most serious problems faced by County maintenance crews is the frequent washout of cinder-gravel shoulders along road pavements. Another problem is the accumulation of vegetation growth and debris in waterways, which causes overflow.

The Waiakea Stream Preliminary Investigation report prepared by Natural Resources Conservation Service in November 1999 identified the channel constrictions at the Hoaka, Kupulau, and Kawaiiani bridges as a major factor in the flooding of the Waiakea Stream Watershed. Several recommendations in the report suggests an increase in the level of maintenance for the Waiakea stream channel, reconstruction of the three bridges to handle the 100-year flood, installation of a flood levee above the properties along Kupulau Road, and Stream channel improvements to manage the volume of a 100-year flood.

In the lower Waiakea area, storm damage is minimal due to the effectiveness of the Wailoa and Waiakea-Uka Flood Control Projects. The Waiakea coastal area is subject to tsunami and hurricane storm surge inundation and has suffered considerable loss to life and property from tsunami activity. ^{27, 2001}

Future and Planned Usage

Kaumana-Ainako-Wailuku River

The Wailuku-Alenaio Watershed Reinvestigation report prepared by Natural Resources Conservation Service in December 1999 identified a new flood diversion alternative for the watershed. The alternative will control storm water in Waipahoehoe and Kaluiki Streams and could provide 100-year flood protection to communities on the south side of Kaumana Drive in the vicinity of Akolea Road and Chong Street. The County has requested the Natural Resources Conservation Service's assistance to further plan and implement the new alternative.

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision*, proposed changes for the South Hilo District include:

- Update and implement the *Hilo Drainage and Flood Control Report* by Wilson, Okamoto and Assoc., Ltd., January, 1967;
- Update and implement the *Hilo Area Comprehensive Study for Flood Damage Reduction*;
- Implement the proposals of the *Final Report and Environmental Impact Study of Alenaio Stream*. Continue the studies for the upper Alenaio Stream, the upper Wailuku River and its tributaries, the upper Waiakea Stream and Palai Stream;
- Update and implement the Hawaii County *Drainage Master Plan* for the Honomu, Pepeekeo, Papaikou, and Paukaa areas. In addition, proper soil conservation measures shall be applied to reduce the amount of surface water and sediment runoff;
- Assess the possibility of implementing the recommendations of the NCRS's *Waiakea Stream Preliminary Investigation* and the *Wailuku-Alenaio Watershed Reinvestigation* reports; and
- Encourage a study of storm surge and the annual change in shoreline beach movement as a solution to the closing of the bay front highway during storm events. ^{27, 2001}

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

Visitors and residents have little impact on the predominantly natural forces behind flooding.

Major Assumptions

N/A

County of Hawaii – South Hilo – Roads

Present Capacity and Usage

The Hawaii Belt Highway (Highway 19) is the primary traffic artery serving the district outside of Hilo. Portions of the old Mamalahoa Highway serve scattered residential areas such as Pepeekeo and Honomu. Several narrow roadways cross-connecting the Hawaii Belt Highway and the old Mamalahoa Highway serve upper homestead areas. There is also an intricate system of private, former plantation roads.

Hilo is a terminal point for the island-circling Hawaii Belt Highway. Augmenting the Hawaii Belt Highway is the trans-island Saddle Road. The Saddle Road route within the city follows major thoroughfares that are congested, narrow, and/or winding. Planning and design is currently underway to improve and partially realign Highway 200 (Saddle Road) between Kaumana in East Hawaii and its connection to the Queen Kaahumanu Highway just south of Waikoloa in West Hawaii. The extension of Puainako Street in Hilo to connect with Highway 200 is currently in its planning stages and will ultimately provide the final link in a much improved and safer trans-island connector between East and West Hawaii.

Existing Problems, Issues and Opportunities

The *County of Hawaii General Plan Revision*, states that Hilo's internal circulation system provides arterial and collector streets to handle traffic moving from one part of the city to another. However, except for Komohana Street below the mauka residential sections, the majority of the traffic flow in Hilo is forced through the downtown area because of the lack of arterial connections. High traffic volume is also generated around the Hilo High and Hilo Intermediate School complexes during peak traffic hours. Kawailani and Puainako Streets also experience high traffic volumes during peak traffic hours as students arrive at the various public schools located nearby. The Keaukaha area is served by a single main road, Kalaniana'ole Avenue that is vulnerable to the threat of tsunamis in this low-lying area. A portion of this road has been recently widened and improved. However, the unimproved portion remains inadequate to accommodate the existing uses in the area.

The majority of the roads throughout the district do not meet present standards. Many sections of the roads have sharp curves and grades with relatively short sight distance. There are many streets with a maximum 40-foot right-of-way that is below present standard, and many more that do not have designed pedestrian areas, or that drain poorly and lack curbs, gutters or swales. In many instances, there is no major surface drainage system to handle the increased runoff brought about as new lands are opened for construction development. ^{27, 2001}

Future and Planned Usage

As referenced by the *County of Hawaii General Plan Revision*, the following lists the future and planned projects for the area:

- Portions of the old Mamalahoa Highway, especially those serving Pepeekeo and Honomu, should be improved to provide a secondary north-south route along the Hamakua coast.
- Major east-west collector roads between the old Mamalahoa Highway and the Belt Highway and those serving upper homestead areas should be widened and improved.
- A realignment of Highway 200 (Saddle Road) from the Forest Reserve boundary on the south side of Kaumana Drive and along the north side of Puainako Street, intersecting the present Puainako alignment at Kinoole Street and continuing to the intersection of Kanoelehua Avenue should be constructed. Limited access control is recommended with intersections at the major cross arterials serving the various areas of the city.
- Construct the proposed improvements and extension of Highway 200 (Saddle Road) from Kaumana Drive to the Queen Kaahumanu Highway in South Kohala.
- Widen and provide curb, gutter and sidewalk improvements along Kilauea Avenue from Haihai Street to Ponahawai Street.
- Widen and provide curb, gutter and sidewalk improvements along Kinoole Street from Haihai Street to Olona Street.
- An extension of Puainako Street east of Kanoelehua should be the main route from the airport terminal for direct access to the business district.
- Widen and improve Kekuanaoa Street from Kanoelehua Avenue to Kilauea Avenue.
- Plan for the eventual closure of the Bayfront Highway and the relocation of the existing Highway 19-Pauahi Street intersection to an area in the vicinity of Ponahawai Street, in coordination with the State.
- Ainako Street should extend across Kaumana Drive to meet the Mohouli extension to provide one of the major mauka cross-city connections.
- Improve Akolea Road between Piihonua and Kaumana Drive and construct its extension to the upper reaches of Ainaola Drive to provide a cross-city connection between Upper Wailuku and Waiakea-Uka.
- Improve Waianuenue Avenue and Kaumana Drive along their entire alignments, including the acquisition of additional rights-of-way as needed.

27, 2001

Future and Planned Requirements or Changes

See County of Hawaii Roads Summary for details.

Anticipated Costs for the Future

See County of Hawaii Roads Summary for details.

Problems, Issues and Opportunities Associated with Costs

The *County of Hawaii General Plan Revision* also states that roadway systems in Hawaii County are generally financed through Federal, State, and County programs. Recent funding limitations are reducing the availability of such monies. Consequently, additional sources will have to be sought to implement the needed improvements. ^{27, 2001}

Compare Visitor and Resident Impact

There is no distinguishable impact between residents and visitors.

Major Assumptions

See County of Hawaii Roads Summary for assumptions and Introduction for population and visitor projections.

County of Hawaii – South Hilo – Airports

Present Capacity and Usage

Hilo International Airport, formerly known as General Lyman Field, is 1,391 acres about two miles east of Hilo. The primary runway, 08-26, is 9,800 feet long, is used for air carrier operations and is capable of accommodating Boeing 747 aircraft. To accommodate maximum-rated cargo payloads to the West Coast would require a runway length of up to 12,000 feet. However, until a major cargo facility is constructed at Hilo International Airport, extension of the existing runway will not be needed. ^{27, 2001} Runway 3-21 is 5,600 feet long and is used for general aviation operations. The passenger terminal, including commuter facilities, is served by an access roadway from Kekuaaoa Avenue. General aviation facilities are served by the terminal access roadway. A parking apron for transient military aircraft is provided at the western edge of the runway. ^{37,2001}

The *County of Hawaii General Plan Revision*, states the terminal at Hilo is an overseas facility. Overseas flights through Hilo International Airport are important to agriculture in East Hawaii. Overseas passenger carriers underutilize the facility as illustrated by the table below.

Table 3.23 -- PASSENGERS, CARGO, AND MAIL, HILO INTERNATIONAL AIRPORT: 1990 TO 1998 ^{142,2001}

Year	Passengers		Cargo (tons)		Mail (tons)
	Enplaned	Deplaned	Enplaned	Deplaned	Total
OVER-SEAS					
1990	-	-	177	83	-
1991	-	-	218	117	-
1992	-	167	215	33	2
1993	86	86	-	-	-
1994	-	-	-	-	-
1995	-	-	50	-	15
1996	-	-	158	19	-
1997	-	-	-	-	-
1998	-	-	-	-	-
INTRA-STATE					
1990	721,104	739,506	14,247	10,887	2,911
1991	709,223	730,588	14,359	10,505	2,921
1992	773,327	800,320	14,228	10,580	3,117
1993	785,043	802,227	15,044	10,322	3,147
1994	790,172	813,449	15,518	9,501	3,287

Year	Passengers		Cargo (tons)		Mail (tons)
	Enplaned	Deplaned	Enplaned	Deplaned	Total
1995	803,417	824,298	15,121	9,206	3,249
1996	795,216	827,527	15,363	10,092	3,891
1997	819,946	849,368	15,774	11,966	3,519
1998	770,659	788,835	11,285	9,357	3,456

The *State of Hawaii Airport Activity Statistics Calendar Year 2001* references the following information regarding passengers, cargo, mail and operations:

Table 3.24 -- Hilo FY 2001 ^{212,2001}

Count	% Change
1,568,165 passengers	-2.6% change
23,301 tons cargo	14% change
3,728 tons mail	0% change
109,373 operations	-7% change

Existing Problems, Issues and Opportunities

According to the *County of Hawaii General Plan Revision*, there may be an increase in demand for airstrips and helipads stemming from the growth of the visitor industry. The State, in coordination with the County and the affected communities, has been developing a master plan for the facility to assess current and future demand as well as specific recommended improvements.

Hilo International Airport serves inter-island and occasional overseas air traffic. The airport facilities are currently underutilized. Proximity of Hilo's airport and harbor may be utilized to the County's advantage. Both transportation facilities are surrounded by or near State-owned lands that could be used for support services and facilities.

Hilo is fourth in the amount of cargo handled through both its airport and harbor. There is an opportunity for the development of a centralized cargo distribution center within Hilo that could alleviate congested conditions on Oahu. The distribution center could serve neighbor islands by distributing and marshalling cargo both from and to the mainland. ^{27, 2001}

Future and Planned Usage

See Future and Planned Requirements or Changes.

Future and Planned Requirements or Changes

The *County of Hawaii General Plan Revision*, states that planned changes include:

- Analysis of future land uses in the vicinity of the Hilo International Airport should have an adequate open space buffer and/or be compatible with the anticipated aircraft noise exposure levels for that vicinity.
- Construction of an Agricultural Processing and Packing Center at the old Hilo Airport, the planning of which shall be coordinated with future development plans for Hilo Harbor.
- Construction of a centralized air cargo distribution complex at the Hilo International Airport. ^{27, 2001}

Anticipated Costs for the Future

See State of Hawaii Airports Summary for information.

Problems, Issues and Opportunities Associated with Costs

See State of Hawaii Airports Summary for information.

Compare Visitor and Resident Impact

See State of Hawaii Airports Summary for information.

Major Assumptions

As mentioned in the *Final Statewide Airport System Plan*, from 1995 to 2020, inter-island passengers using Hilo International Airport are forecast to increase at an average annual rate of 3%. Total aircraft operations at Hilo airport are forecast to increase 39%, from 91,055 in 1992 to 126,300 operations by 2020. Air carrier operations are expected to dominate, followed by commuter/air taxi operations. Air taxi operations are primarily helicopter operations with flights to the volcano area. ^{127,1998}

County of Hawaii – South Hilo – Harbors

Present Capacity and Usage

One of two deep-draft harbors on the island is located at Hilo. The present harbor has a 35-foot deep draft and three commercial piers. *The County of Hawaii General Plan Revision*, references the following information regarding the present capacity and use of this area. Additional data regarding capacity and usage may be found in the tables in the County of Hawaii Harbor Summary.

Table 3.29 – Hilo Harbor Passengers and Cargo Fiscal Year 2000

Passengers	88,074
Tons of Cargo	1,494,156

Existing Problems, Issues and Opportunities

While improvements continue to be made, both harbor terminals lack adequate docking and support facilities. ^{27, 2001}

The *County of Hawaii General Plan Revision*, states that Hilo Harbor is one of two major, deep draft harbor facilities on the island. There is limited loading or back-up space. There also is limited land area for the expansion of harbor-oriented industrial uses. The number of cruise ship passengers visiting Hilo has increased dramatically during the 1990's and there is a need to improve the accommodations for these passengers at the harbor. There is a recognized need for expansion opportunities for Hilo Harbor and the need to accommodate increased cargo and passenger volumes. In addition to specifying recommended cargo yard acreages, berthing requirements and roadway improvements, the plan also recommends the construction of a passenger terminal facility at Pier 5 to accommodate the growth of cruise ship arrivals.

Within Hilo Harbor, Radio Bay has limited facilities for small boats. The State Department of Transportation also maintains small boat facilities at the mouth of the Wailoa River. ^{27, 2001}

Future and Planned Usage

It is anticipated that the use of Hilo Harbor will expand substantially. ^{27, 2001} As stated in the *State Airports, Harbors, and Highways*, the future projects for the area will facilitate the rapid, safe and economical movement of people and goods into, within, and out of the state by providing and operating transportation facilities and supporting services. ^{37, 2001}

Future and Planned Requirements or Changes

The *County of Hawaii General Plan Revision*, states that future requirements in the area will encourage development of a small boat harbor for the area. Under the guidance of the Federal government, the State Department of Health should enforce and strengthen present pollution regulations. The State Department of Transportation should continue to improve facilities at Hilo Harbor to meet increased shipping activities and cruise ship passenger arrivals.^{27, 2001}

Anticipated Costs for the Future

The *State Airports, Harbors, and Highways* references information regarding the future costs for this area:

Hilo Harbor

Paving of additional storage area \$1.2 million.

Demolition of existing sugar storage facilities near Pier 2 \$1.2 million.

Special maintenance projects \$441,570.

Fairly stable from CIP/maintenance aspect; increasing security costs.^{37, 2001}

Problems, Issues and Opportunities Associated with Costs

As a result of the economic recession, funding is an issue. Research into Homeland Security funding for security problems around harbors may yield some monies.

Compare Visitor and Resident Impact

See County of Hawaii Harbors Summary.

Major Assumptions

According to the *State Airports, Harbors, and Highways*, the overseas container volume is projected to top 1,338,000 TEUs in the year 2020. The 2020 projections for general cargo total 3,919,800 short tons.^{37, 2001}

County of Hawaii – South Hilo – Parks

Present Capacity and Usage

County

The *County of Hawaii General Plan Revision*, states that South Hilo, as the major urban center in the County, has a diversity of recreational facilities. Within the city, there are eight neighborhood parks. All parks are between 3.0 and 7.7 acres in size and five of them have playfields. Nine schoolyards provide additional playfields. These parks are not used to their optimum capacity.

Hilo also has 17 gymnasiums: two at University of Hawaii at Hilo, three with the Department of Education, nine under County jurisdiction, and three privately owned and maintained. A gymnasium at Waiakea High School is presently under construction.

Outside of urban Hilo, there is a County community park in Kaiwiki; a gymnasium in Wainaku; a playfield in Hakalau; a gymnasium and playfield in both Honomu and Papaikou; and a community center and playfield in Kulaimano. The County and the Department of Education jointly administer public use of facilities. Public use is generally limited to after school hours.

Regional recreational facilities located in Hilo serve South Hilo and neighboring districts. There are three swimming pools, two owned by the County and the other administered by the Department of Education. Hoolulu Complex (56 acres) is the major regional recreational center. There is an auditorium with a seating capacity of 2,800 that is used for special events. A large stadium (Wong) for sports events, a swimming pool, outdoor tennis courts, a covered tennis stadium (utilized for cultural events, car shows and other events), and a tri-baseball field are also located in the park.

The Hilo Armory is utilized for county programs, and organized sport events. It also houses various county agencies.

Five miles south of Hilo, the County maintains the Panaewa Recreation Complex located on a 173-acre parcel. The complex includes the Rainforest Zoo and the Equestrian Center, consisting of a racetrack, rodeo arena, and other equestrian facilities. The County also maintains the Hilo Drag Strip (70.66 acres) located east of Railroad Avenue. There is a three-fourth mile racetrack, spectator area and other support facilities. Also, near the drag strip is a County-operated skeet and trap range.

There are eight developed beaches with about 3,000 linear feet of shoreline in Hilo. These are the Hilo Bayfront Beach, Mokuola (Coconut Island), Reed's Bay, Onekahakaha Beach Park, Leleiwi Beach Park, James Kealoha Beach Park, Carlsmith, and Richardson Ocean Park Beaches. Lihikai (Onekahakaha) has a

small sand beach with shallow water and is especially good for children. There is a two-mile stretch of coastline from Lehia Beach Park through Lihikai (Onekahakaha) that can be developed for recreation. The Reed's Bay area and Kuhio Bay (Baker's Beach) have sand beaches with potential for more intensive recreational use.

The County has two general use oceanfront parks: Liliuokalani Gardens (19 acres), currently undergoing extensive renovation and modification to improve accessibility, and Bayfront-Mooheau Park (20.9 acres). Near the mouth of the Wailoa River is the Wailoa River State Recreation Area. This includes a pond maintained as a public fishing area. These parks provide scenic landscaped open space and are used for picnicking, pleasure walking, quiet relaxation, and fishing. Large pavilions at Wailoa River State Recreation Area are frequently used for community meetings and banquets. Mooheau Park has a bandstand that is used for community gatherings and events.

Steep cliffs make the coastal waters of the northern portion of the South Hilo district inaccessible except at the mouths of a few large gulches. North of Hilo are two beach parks located at the mouths of gulches. Honolii Beach Park (2.77 acres) is used by surfers. Kolekole Gulch Park at Wailea is used mainly for picnicking and camping with limited swimming in the stream.

The County's 4.9-acre parks at Kaumana Caves and the Wailuku River State Park (16.3 acres) in Hilo and Akaka Falls State Park (65.4 acres) in Honomu have outstanding natural features. The State maintains a scenic viewpoint at Alealea Point and the County has a scenic viewpoint at Onomea Lookout Point.
27, 2001

State

According to the *County of Hawaii General Plan Revision*, the three forest reserves in South Hilo offer limited wilderness recreation, primarily hunting and camping. The Waiakea Arboretum is used as a demonstration area for visitors.

There are three facilities for small boats in Hilo. One is located at the mouth of the Wailoa River and is used by fishing craft and other powerboats. A launching ramp is provided. The others are moorages with minimal facilities in Reed's Bay and Radio Bay used by sailboats.
27, 2001

Private

Information from the *County of Hawaii General Plan Revision* states there are three privately owned museums provide educational resources to the community. The Pacific Tsunami Museum memorializes those who have lost their lives in tsunamis. Hawaii Shima Japanese Immigrant Museum chronicles the solicitation of Japanese nationals to work the sugar plantations and illustrates their strong traditional cultural heritage and entrepreneurial spirit in braving adversities. The Lyman House and Memorial Museum strives to promote awareness and instill

community pride by presenting programs and exhibits relating to the cultural, artistic, religious, and historical heritage of Hawaii. ^{27, 2001}

Existing Problems, Issues and Opportunities

As stated in the *County of Hawaii General Plan Revision*, long-range planning by the Parks Department has accommodated population growth in Hilo. However, lack of foresight in development stages leaves many problems as listed below.

- In many of the parks, there are drainage problems,
- Lack of lights does not allow evening use of playfields,
- Lack of playground equipment, inadequate landscaping, and the lack of benches and adequate shelters have restricted the use of some parks,
- Some residential areas do not have easy access to neighborhood parks, and newer communities lack recreational areas altogether,
- Although adequate for sports, the acoustics and seating at the Hoolulu Complex are poor for entertainment,
- Parking is currently inadequate Wong Stadium for large events,
- Most beach areas in the district have little depth due to coastal roads or residential lots,
- Parking is often a problem and vehicles occupy valuable recreation area, and
- Noise from the nearby highway, however, often interferes with the use of the bandstand at Mooheau Park. ^{27, 2001}

Future and Planned Usage

The *County of Hawaii General Plan Revision*, states that a new football/soccer field and parking area will be developed on lands located to the west of the Hoolulu Complex on Manono Street. The County is currently working with the owners of these lands to secure the site for its expansion plans. ^{27, 2001}

Future and Planned Requirements or Changes

The *County of Hawaii General Plan Revision*, has information regarding are the planned changes for the future, which are listed below:

- Maintain Clem Akina Park, Gilbert Carvalho Park, Keikiland Playground and Wainaku Camp 2 Field as community recreation centers,
- Improve Kalakaua Park as an open space amenity and the focal point of the Kalakaua Park Heritage Area,
- Provide shaded areas with benches at Keikiland, Villa Franca,
- Encourage the development of a park along both sides of the Wailuku River in the central business district of Hilo and provide major viewpoints with pedestrian walkways and benches,
- Community and/or neighborhood recreational areas should be provided in areas such as Piihonua, upper Ponahawai, Kaumana-Ainako, upper Kaumana, Haihai, and upper Waiakea,
- Develop urban commercial areas with landscaped parks for passive recreation,

- Expand the depth of coastal recreation areas. Park areas should be connected with trails to increase public access,
- Develop the coastal area between Lehia and Lihikai for recreational use,
- Develop Reed's Bay for more intensive water-oriented recreation,
- Encourage the State to develop a small boat harbor and additional moorage facilities,
- Develop Kuhio Bay and the Baker's Beach area as a public recreational facility,
- Encourage the implementation of the "Environmental and Urban Design Proposals, East Hawaii Project, City of Hilo," and the "Downtown Hilo Redevelopment Plan" for the Kaiko'o and Bayfront areas. This includes the deepening of Waiolama Canal, the development of the proposed Waiolama River State Park, the elimination of Bayfront Highway and the widening and realigning of Kamehameha Avenue, and the establishment of botanical gardens,
- Provide trail and access systems to recreational areas,
- Develop a center/complex for major cultural, educational and recreational activities, and
- Return Kaumana Caves County Park, a natural resource recreation area, to the jurisdiction of the State. ^{27, 2001}

Anticipated Costs for the Future

See State of Hawaii and Hawaii County Parks Summaries for total monies funding cultural and recreational projects. District breakdown was not available.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

See State of Hawaii and Hawaii County Parks Summaries for information.

Major Assumptions

See State of Hawaii and Hawaii County Parks Summaries for information.

County of Hawaii – South Hilo – Police, Fire and Emergency Services

Present Capacity and Usage

Fire and EMS

County of Hawaii's Fire Administration is located in the County Building in South Hilo. There are four 24-hour substations within the city at Central, Waiakea, Kaumana, and Kawaiiani. Central Fire Station is a full-time fire and EMS operation. Waiakea Fire Station is a fire, EMS and rescue operation. Kawaiiani Fire Station is a fire/EMS operation. Kaumana Fire Station is a fire, EMS and Hazardous Materials operation. A 24-hour on-call volunteer facility is located in Pepeekeo. Communities outside Hilo are about two minutes per mile away from service.

Police

The *County of Hawaii General Plan Revision*, states that the combined police headquarters for Hilo and the County is located in the Hilo Public Safety Building on Kapiolani Street. The Hawaii Community Correctional Center is operated by the State Department of Social Services, has a capacity of 24. The State's Kulani Correctional Facility has a capacity of 90. As a minimum-security facility, it has no perimeter walls or fences and is primarily a rehabilitation center. Also located in the Hawaii Public Safety Complex is the Civil Defense office.^{27, 2001}

Existing Problems, Issues and Opportunities

Parking is inadequate at the Waiakea and Kawaiiani fire stations. Access problems exist at the Central, Kaumana and Kawaiiani stations. See County of Hawaii Police, Fire and EMS Summary for details. Data at the district level would require further study.

Future and Planned Usage

Plans are being formulated for a centralized fire/rescue/hazardous materials training facility. See County of Hawaii Police, Fire and EMS Summary for details.

Future and Planned Requirements or Changes

See County of Hawaii Police, Fire and EMS Summaries for details.

Anticipated Costs for the Future

See County of Hawaii Police, Fire and EMS Summaries for details.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Police, Fire and EMS Summaries for details.

Compare Visitor and Resident Impact

See County of Hawaii Police, Fire and EMS Summaries for details.

Major Assumptions

See County of Hawaii Police, Fire and EMS Summaries for details.

County of Hawaii – South Hilo – Visitor Accommodations

Present Capacity and Usage

There are 1218 units within 40 properties located in the Hilo –Honokaa area with a 64% occupancy rate, according to the 2001 Visitor Plant Inventory.

According to the *County of Hawaii General Plan Revision*, Hilo has the lowest occupancy rate for visitor related areas in the state. Tourism in Hilo has been on the decline since the 1970's. Most visitors are business and local tourists drawn in by special events, such as sports or cultural events. While tourism from cruise ships has been on the increase, overall tourism is expected to remain the same. There are 136 acres zoned for resorts. ^{27,2001}

Existing Problems, Issues and Opportunities

The *General Plan* cites the following as problems:

- Cruise ship tourism is declining.
- The anticipated overseas visitors through Hilo Airport have not materialized, perhaps due to the expansion of the Kona airport. ^{27,2001}

Future and Planned Usage

No new unit accommodations are mentioned in the *General Plan*; however, there are plans of renovating existing units. Continued usage is expected. ^{27,2001}

Future and Planned Requirements or Changes

See Hawaii County Visitor Accommodations for information.

Anticipated Costs for the Future

See Hawaii County Visitor Accommodations for information.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

There are more local tourists in South Hilo on business than there are out-of-state tourists. ^{27,2001}

Major Assumptions

See Hawaii County Visitor Accommodations for information.

County of Hawaii – South Hilo – Private Transportation

Present Capacity and Usage

There was no breakdown of private transportation to the district level. See County of Hawaii Private Transportation Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Hilo – Energy Systems

Present Capacity and Usage

There was no breakdown of energy systems to the district level. See County of Hawaii Energy System Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Hilo – Sewer Systems

Present Capacity and Usage

There was no breakdown of private sewer systems to the district level. See County of Hawaii Sewage Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Hilo – Coastal Water Quality

Present Capacity and Usage

There was little information regarding coastal water quality at the district level. See County of Hawaii Coastal Water Quality Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Hilo – Marine Ecosystem Health

Present Capacity and Usage

There was little information regarding marine ecosystem health at the district level. See County of Hawaii Marine Ecosystem Health Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Hilo – Forestry / Green Space

Present Capacity and Usage

There was little information regarding forestry at the district level. See State and County of Hawaii Forestry Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Hilo – Air Quality

Present Capacity and Usage

There was little information regarding air quality at the district level. See County of Hawaii Air Quality Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Hilo – Beach Erosion

Present Capacity and Usage

There was little information regarding beach erosion at the district level. See State of Hawaii Beach Erosion Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Hilo – Invasive Species

Present Capacity and Usage

There was little information regarding invasive species at the district level. See State and County of Hawaii Invasive Species Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Hilo – Other Natural Scenic Resources

Present Capacity and Usage

There was little information regarding various other natural and scenic resources at the district level. This includes native species and extinction issues and riparian / wetlands. See State and County of Hawaii Other Natural and Scenic Resources Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Hilo – Water Quality and Quantity

Present Capacity and Usage

The *County of Hawaii General Plan Revision*, states that the domestic water is available in the built-up areas of the North Hilo district. The private and public systems provide a wide range of levels of service.

The Laupahoehoe system obtains its water from high level springs in Manowaiopae and Kuwaikahi Gulches and two deep wells with Well No. 1 outfitted with a 0.14 mgd pumping unit and Well No. 2 with a 0.43 mgd pumping unit. None of the spring sources are dependable during dry weather. The present average daily consumption is 0.11 mgd.

The Ookala system is currently being serviced by the Ookala Well. ^{27, 2001}

Existing Problems, Issues and Opportunities

See County of Hawaii Water Summary for information.

Future and Planned Usage

According to the *County of Hawaii General Plan Revision*, the following lists future projects for the area:

- Coordinate plans for new systems with the relocation program for plantation camps.
- Replace old, substandard, or deteriorating lines and storage facilities.
- Develop a standby well for the Ookala system. ^{27, 2001}

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision*, the State Department of Land and Natural Resources, Engineering Division also has the capacity to explore and develop new ground water sources. The County has in the past depended upon this agency, formally known as the Division of Water and Land Development, for source development. The development of new sources requires the cooperation between State and County agencies in the delivery of municipal water systems. It is anticipated that these new water sources and systems will further influence land development. ^{27, 2001}

Anticipated Costs for the Future

According to the *County of Hawaii: 1999 - 2000 Annual Report*, the following major capital improvement projects were under construction, were in various stages of contract award, or, were in the planning and design phases during the fiscal year (1999-2000) in NORTH HILO:

Ninole Exploratory Well – A well will be construction in the Ninole area to replace the present surface water source. The well, once fully developed into a production well, will be the source of potable water for the Ninole Water System. (Estimated Cost: \$500,000) ^{51, 2000}

Problems, Issues and Opportunities Associated with Costs

As mentioned in the *County of Hawaii General Plan Revision*, one solution to improve systems presently served by only surface sources is to install a well in these systems, use the surface sources when available, and use the pump when the surface sources are deficient. This would minimize operational costs and upgrade systems so they are more dependable. Another solution is to construct large storage reservoirs. These, however, require high initial capital expenditures. ^{27, 2001}

Compare Visitor and Resident Impact

No data was uncovered distinguishing residential use form visitor use for water in North Hilo.

Major Assumptions

See County of Hawaii Water Summary for information.

County of Hawaii – North Hilo – Sewage

Present Capacity and Usage

According to the *General Plan*, towns along the coast of the North Hilo district are small plantation towns characterized by populations of less than one thousand. For some of these towns, the population is expected to decline. At present, most residents are served by individual on-site wastewater disposal systems. The only exception is Kapehu Camp, which has been provided with a soil purification wastewater treatment system. ^{27, 2001}

Existing Problems, Issues and Opportunities

In general, municipal sewerage systems for the small towns such as those seen in North Hilo are not economically feasible. According to the local Environmental Health Department, there are no apparent problems currently. ^{27, 2001}

Future and Planned Usage

As stated in the *County of Hawaii General Plan Revision*, the North Hilo district intends to continue operation of the existing sewerage system at Kapehu. ^{27, 2001}

Future and Planned Requirements or Changes

A list of capital improvement projects is listed in the County of Hawaii Sewage Summary.

Anticipated Costs for the Future

A list of capital improvement projects is listed in the County of Hawaii Sewage Summary.

Problems, Issues and Opportunities Associated with Costs

There was no documentation of issue with costs associated with future projects in North Hilo.

Compare Visitor and Resident Impact

No information was uncovered regarding distinguishing between resident impact and visitor impact on sewage in North Hilo.

Major Assumptions

N/A

County of Hawaii – North Hilo – Solid Waste Disposal

Present Capacity and Usage

The *County of Hawaii General Plan Revision* states that the District of North Hilo operates one solid waste transfer station, which is located in Laupahoehoe. Prior to construction of the transfer station solid waste was disposal of via an open dump, which emptied into the ocean. ^{27, 2001}

See table 3.09 – Quantities of Solid Waste from Convenience Centers for Year 2000 in the County of Hawaii Solid Waste Disposal Summary for tonnage of solid waste collected at each transfer center.

Existing Problems, Issues and Opportunities

See County of Hawaii Solid Waste Summary for information.

Future and Planned Usage

See County of Hawaii Solid Waste Summary for information.

Future and Planned Requirements or Changes

See County of Hawaii Solid Waste Summary for information.

Anticipated Costs for the Future

See County of Hawaii Solid Waste Summary for information.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Solid Waste Summary for information.

Compare Visitor and Resident Impact

See County of Hawaii Solid Waste Summary for information.

Major Assumptions

See County of Hawaii Solid Waste Summary for information.

County of Hawaii – North Hilo – Storm Water

Present Capacity and Usage

As stated in the *County of Hawaii General Plan Revision*, an average ground slope of approximately 10 per cent, and numerous deep intermittent and perennial streams characterizes the North Hilo District.

Aside from storm water runoff from former cane lands, there is little record of flooding in urban areas. Each community is in close proximity to one or more gulches that carry flows from the upper watershed areas. The key to flood control within the district is to collect and divert surface runoff to the gulches. In addition, soil conservation practices are highly recommended.

The community of Ookala has not experienced heavy flooding although there are minor problems due to surface waters from the former cane fields above the town. There is also no record of any flooding within the community of Ninole. The existing flood control system provided by the plantation is adequate.

The community of Papaaloa has not experienced any serious flooding problems. With the projected expansion of the community, there will be a need to provide flood protection for the North Hilo district is characterized by high sea cliffs, most of which rise 300 feet above the sea. Except for the Laupahoehoe Point area, development is not subject to tsunami or hurricane storm surge damage.^{27, 2001}

Existing Problems, Issues and Opportunities

The flood hazard areas are extremely difficult to delineate. High intensity storms can produce localized flooding in almost any area. The community of Laupahoehoe has not experienced any extreme flood flows. However, there will be a need to supply flood protection for the community since Laupahoehoe School, which is located just to the south of the urban center, has experienced some flooding. Water flows from the former cane fields, when the natural vegetation does not form a complete cover.^{27, 2001}

Future and Planned Usage

See County of Hawaii for Storm Water Summary information. Details at the district level require further study.

Future and Planned Requirements or Changes

The County of Hawaii General Plan Revision, states that the following is the only proposed change for the North Hilo District: updated and implemented the Hawaii County *Drainage Master Plan* for the Ookala and Laupahoehoe-Papaaloa areas to alleviate problems of runoff from higher elevations.^{27, 2001}

Anticipated Costs for the Future

See County of Hawaii for Storm Water Summary information.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

Visitors and residents have little impact on the predominantly natural forces behind flooding.

Major Assumptions

N/A

County of Hawaii – North Hilo – Roads

Present Capacity and Usage

The *County of Hawaii General Plan Revision*, states that the primary traffic circulation system through the district is the Hawaii Belt Highway (Highway 19). A secondary system also parallel to the shoreline is the existing Mamalahoa Highway, the major link between Hilo and Honokaa before the Hawaii Belt Highway to Honokaa was completed in 1960.

The only means of access to the many small towns within this district is via the Hawaii Belt Highway, which has many sharp curves and grades with relatively short sight distance. Several bridges along this highway are narrow. Landslides also occur along certain portions of this roadway during heavy rainfall.

In addition to the roads paralleling the seacoast, many mauka-makai roads connect the lowlands to the upper homestead and agricultural belt. Many of these roads are maintained by the County but were also maintained by the now-defunct sugar companies. Continued maintenance of these former plantation roadways is a concern that the County and the affected residents along these roadways must strive to resolve. ^{27, 2001}

Existing Problems, Issues and Opportunities

Some of the biggest problems with the existing highway system in this area are its aging bridges. Many of these bridges were built originally for rail usage and later converted to highway traffic, while others were built for maximum sized trucks considerably smaller than what is commonly in use today. Significant challenges for these bridges exist in the area have federally mandated seismic retrofitting and lead based paint abatement, especially for the aged large steel truss structures.

Future and Planned Usage

According to the *County of Hawaii General Plan Revision*, the following lists future projects for the area:

- Restore and maintain existing homestead roads.
- Encourage the State Department of Transportation to improve those portions of the Hawaii Belt Highway at Maulua, Laupahoehoe and Kaawalii Gulches.
- Encourage the State Department of Transportation to realign that portion of the Hawaii Belt Highway at Kapehu Camp.
- Encourage the State to install additional passing lanes at various sections along Highway 19. ^{27, 2001}

Future and Planned Requirements or Changes

See County of Hawaii for Road Summary information.

Anticipated Costs for the Future

See County of Hawaii for Road Summary information.

Problems, Issues and Opportunities Associated with Costs

The *County of Hawaii General Plan Revision* also states that the roadway systems in Hawaii County are generally financed through Federal, State, and County programs. Recent funding limitations are reducing the availability of such monies. Consequently, additional sources will have to be sought to implement the needed improvements.^{27, 2001}

Compare Visitor and Resident Impact

N/A

Major Assumptions

See County of Hawaii for Road Summary assumptions.

County of Hawaii – North Hilo – Airports

Present Capacity and Usage

The *County of Hawaii General Plan Revision*, states that there are no air or harbor terminals in this district. ^{27, 2001}

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Hilo – Harbors

Present Capacity and Usage

There are no harbor terminals in this district. The only small boat ramp on the Hamakua Coast is located within the Laupahoehoe Point Beach Park.

Existing Problems, Issues and Opportunities

The *County of Hawaii General Plan Revision*, states that although the boat ramp was improved through a joint effort of the County of Hawaii and the U. S. Army Corps of Engineers, it is inadequately protected from damage due to storm surges. Without further improvements, the ramp will continue to be hazardous for users of the facility. ^{27, 2001}

Future and Planned Requirements or Change

According to the *County of Hawaii General Plan Revision*, the planned requirements or change will include the continued improvement of the small boat ramp at Laupahoehoe, extend the offshore protective structure, and provide for adequate parking. ^{27, 2001}

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

This facility is under County jurisdiction and has not been accepted by the State Boating Division, principally due to its inadequate protection. Opportunities for funding are extremely limited. ^{27, 2001}

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Hilo – Parks

Present Capacity and Usage

The *County of Hawaii General Plan Revision* divides parks and recreation facilities into two categories based on ownership of the properties. Descriptions of the facilities are in the following two paragraphs.

County

Recreational facilities in the North Hilo district are somewhat limited. The population of the area is small and scattered. The community at Ookala has a gymnasium and ball field that was previously owned by the sugar plantation but are now owned and maintained by the County. The Papaaloa community has a county gymnasium, community center, ball field, and tennis courts. In Laupahoehoe, community groups use the former Court House as a meeting place. The community also uses the Laupahoehoe School complex, with a 6-acre playfield, a gymnasium, two tennis courts and a County swimming pool. There is an old gymnasium at Laupahoehoe Peninsula used primarily by area residents for various functions.

State

Two parks are located adjacent to the mouths of the larger gulches. Waikaumalo Park at Honohina is 3.4 acres in size and offers stream swimming and picnicking. Facilities include a playfield, a boat ramp, four picnic shelters and a large pavilion. Camping, picnicking and fishing are featured activities in this scenic location. A joint effort undertaken by the U.S. Army Corps of Engineers and the County provided the community with a new breakwater and boat-launching ramp.
27, 2001

Existing Problems, Issues and Opportunities

Basic issues cited by the *General Plan* include:

- No public transportation, which presents problems for minors to commute between settlements and recreation areas.
- Bad roads conditions.
- The water at Waikaumalo Park, and Laupahoehoe Point Beach Park has been determined unsafe for swimming. 27, 2001

Future and Planned Usage

See State of Hawaii and County of Hawaii Park Summaries for information.

Future and Planned Requirements or Changes

The *General Plan* calls for long-range planning and further study in the future. Some of currently planned projects include:

- Developing 24 acres in the Laupahoehoe Point Beach Park area to serve as a regional recreation area;

- Improve the boat launching facilities at Laupahoehoe Peninsula by extending the Army Corps of Engineers' breakwater; and
- The only planned change in the North Hilo District at this time is the implementation of the Laupahoehoe Point Beach Park master plan. ^{27, 2001}

Anticipated Costs for the Future

See State of Hawaii and County of Hawaii Park Summaries for total funds for cultural and recreational projects.

Problems, Issues and Opportunities Associated with Costs

An opportunity afforded to the County, as mentioned in the *General Plan*, is a cooperative agreement with the U.S. Army Corps of Engineers. The joint effort undertaken by the U.S. Army Corps of Engineers and the County provided the community with a new breakwater and boat-launching ramp. ^{27, 2001}

Compare Visitor and Resident Impact

According to the *General Plan*, there is little visitor impact on the parks in this district. ^{27, 2001}

Major Assumptions

See State of Hawaii and County of Hawaii Park Summaries for information.

County of Hawaii – North Hilo – Police, Fire, EMS

Present Capacity and Usage

Fire and EMS

The *County of Hawaii General Plan Revision*, states that protective service facilities are located at Laupahoehoe. Fire protection consists of regular 24-hour fire/EMS service supplemented by on-call volunteers.^{27, 2001}

Police

The *County of Hawaii General Plan Revision* also states that police services are available.^{27, 2001} See County of Hawaii Police Summary for more information.

Existing Problems, Issues and Opportunities

See County of Hawaii Police, Fire and EMS Summaries for details.

Future and Planned Usage

See County of Hawaii Police, Fire and EMS Summaries for details.

Future and Planned Requirements or Changes

As mentioned in the *County of Hawaii General Plan Revision*, Police, Fire and EMS service facilities will be improved to meet future needs.^{27, 2001}

Anticipated Costs for the Future

See County of Hawaii Police, Fire and EMS Summaries for details.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Police, Fire and EMS Summaries for details.

Compare Visitor and Resident Impact

See County of Hawaii Police, Fire and EMS Summaries for details.

Major Assumptions

See County of Hawaii Police, Fire and EMS Summaries for details.

County of Hawaii – North Hilo – Visitor Accommodations

Present Capacity and Usage

There are no major visitor accommodations according to the *County of Hawaii General Plan Revision*, and that is not expected to change. ^{27,2001}

See County of Hawaii and South Hilo Visitor Accommodation Summaries for capacity and usage statistics.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

No development is currently planned, except to encourage small visitor related facilities near visitor attractions. ^{27,2001}

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

There is very little visitor impact to this area. ^{27,2001}

Major Assumptions

See Hawaii County Visitor Accommodations for information.

County of Hawaii – North Hilo – Private Transportation

Present Capacity and Usage

There was no breakdown of private transportation to the district level. See County of Hawaii Private Transportation Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Hilo – Energy Systems

Present Capacity and Usage

There was no breakdown of energy systems to the district level. See County of Hawaii Energy System Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Hilo – Sewer Systems

Present Capacity and Usage

There was no breakdown of private sewer systems to the district level. See County of Hawaii Sewage Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Hilo – Coastal Water Quality

Present Capacity and Usage

There was little information regarding coastal water quality at the district level. See County of Hawaii Coastal Water Quality Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Hilo – Marine Ecosystem Health

Present Capacity and Usage

There was little information regarding marine ecosystem health at the district level. See County of Hawaii Marine Ecosystem Health Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Hilo – Forestry / Green Space

Present Capacity and Usage

There was little information regarding forestry at the district level. See State and County of Hawaii Forestry Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Hilo – Air Quality

Present Capacity and Usage

There was little information regarding air quality at the district level. See County of Hawaii Air Quality Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Hilo – Beach Erosion

Present Capacity and Usage

There was little information regarding beach erosion at the district level. See State of Hawaii Beach Erosion Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Hilo – Invasive Species

Present Capacity and Usage

There was little information regarding invasive species at the district level. See State and County of Hawaii Invasive Species Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Hilo – Other Natural Scenic Resources

Present Capacity and Usage

There was little information regarding various other natural and scenic resources at the district level. This includes native species and extinction issues and riparian / wetlands. See State and County of Hawaii Other Natural and Scenic Resources Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Hamakua – Water Quality and Quantity

Present Capacity and Usage

As stated in the *County of Hawaii General Revision*, the service area of the Hamakua Water System extends from Ahualoa to Pohakea. Except for the town of Honokaa, the major portion of the system serves a scattered and dispersed population in the Ahualoa, Kalopa, Kaapahu, Pohakea, Paauhau and Paauilo Homesteads. The Hamakua system obtains its water from the high level streams in the Kohala Mountains and the Haina deep well. Over fifty-five percent of the 0.63 mgd used by the Hamakua system is used in Honokaa.

The Paauilo system, although presently connected to the Hamakua system, has an additional source. The capacity of the Paauilo deep well is 0.43 mgd and the service area extends from Paauilo Village to Kaa. The present average daily consumption is 0.10 mgd. ^{27, 2001}

Existing Problems, Issues and Opportunities

See County of Hawaii Water Summary for information.

Future and Planned Usage

The *County of Hawaii General Plan Revision*, lists the following as future projects:

- Extend the water line from Kukaiau to Keehia.
- Extend Honokaa system toward Kukuihaele.
- Replace inadequate mains.
- Improve existing storage, transmission and distribution facilities.
- Replace old, sub-standard, or deteriorating lines and storage facilities.
- Investigate groundwater sources in the Honokaa and Kukuihaele areas. ^{27, 2001}

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision*, the State Department of Land and Natural Resources, Engineering Division also has the capacity to explore and develop new ground water sources. The County has in the past depended upon this agency, formally known as the Division of Water and Land Development, for source development. The development of new sources requires the cooperation between State and County agencies in the delivery of municipal water systems.

The exploration for new water sources will continue. It is anticipated that these new water sources and systems will further influence land development. ^{27, 2001}

Anticipated Costs for the Future

According to the *County of Hawaii: 1999 - 2000 Annual Report*, the following major capital improvement projects were under construction, were in various stages of contract award, or, were in the planning and design phases during the fiscal year (1999-2000) in HAMAKUA:

Pohakea Water System Improvements Phases 1 and 2

Two new booster-pump stations, two new 100,000-gallon concrete reservoirs, and transmission waterlines to replace the existing water system facilities in the area, which are outdated. (Estimated Cost: \$1,400,000)^{51, 2000}

As mentioned in the County of Hawaii General Plan Revision, 2001, one solution to improve systems presently served by only surface sources is to install a well in these systems, use the surface sources when available, and use the pump when the surface sources are deficient. This would minimize operational costs and upgrade systems so they are more dependable. Another solution is to construct large storage reservoirs. These, however, require high initial capital expenditures.^{27, 2001}

Problems, Issues and Opportunities Associated with Costs

Surface water sources require significant more treatment including chlorination. Construction of well systems in lieu of surface water systems will be of added benefit with regards to maintaining low levels of treatment requirements.

Compare Visitor and Resident Impact

N/A

Major Assumptions

See County of Hawaii Introduction for population projections and County of Hawaii Water Summary for assumptions.

County of Hawaii – Hamakua – Sewage

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, many small communities, largest of which are Honokaa and Paauilo, characterize the Hamakua district. There is no public sewage system. Further study is required to obtain usable data. ^{27, 2001}

Existing Problems, Issues and Opportunities

According to the *County of Hawaii General Plan Revision*, there are no public sanitary sewer systems in the Hamakua area. Oxidation ponds serve the towns of Honokaa, Paauilo, Paauhau and Haina and are presently adequate. Oxidation ponds act as a settling pond so bacteria can break down sewage as the liquid filters through the earth. ^{27, 2001}

Future and Planned Usage

Further study is required to investigate alternatives to eliminate the need for oxidation ponds. ^{27, 2001}

Future and Planned Requirements or Changes

A list of capital improvement projects is listed in the County of Hawaii Sewage Summary.

Anticipated Costs for the Future

A list of capital improvement projects is listed in the County of Hawaii Sewage Summary.

Problems, Issues and Opportunities Associated with Costs

The *County of Hawaii General Plan Revision*, municipal sewage systems for the smaller towns are not economically feasible. ^{27, 2001}

Compare Visitor and Resident Impact

No information was uncovered regarding distinguishing between resident impact and visitor impact on sewage in Hamakua.

Major Assumptions

N/A

County of Hawaii – Hamakua – Solid Waste Disposal

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, solid waste transfer stations are located at Honokaa and Paauilo. The solid waste disposal site located at Haina has been replaced with a solid waste transfer station. ^{27, 2001}

See table 3.09 – Quantities of Solid Waste from Convenience Centers for Year 2000 in the County of Hawaii Solid Waste Disposal Summary for tonnage of solid waste collected at each transfer center.

Existing Problems, Issues and Opportunities

See County of Hawaii Solid Waste Summary for information.

Future and Planned Usage

See County of Hawaii Solid Waste Summary for information.

Future and Planned Requirements or Changes

The *County of Hawaii General Plan Revision*, mentions that another transfer station has been planned for Kukuihaele. ^{27, 2001}

Anticipated Costs for the Future

No actual costs were documented for the new transfer station. See County of Hawaii Solid Waste Summary for information.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Solid Waste Summary for information.

Compare Visitor and Resident Impact

See County of Hawaii Solid Waste Summary for information.

Major Assumptions

See County of Hawaii Solid Waste Summary for information.

County of Hawaii – Hamakua – Storm Water

Present Capacity and Usage

As stated in the *County of Hawaii General Plan Revision*, the Hamakua District can be divided into two major watersheds. The northern watershed, which affects the Waipio Valley area, extends upward into the Kohala Mountains. The second watershed extends to the peak of Mauna Kea and affects the communities of Kukuihaele, Honokaa, Paauhau, Paauilo, and Kukaiau.

The majority of the flood damage in the Hamakua district affects former cane fields, roads, ditches, and bridges. The state and county most directly feel the fiscal impact from the damage. ^{27, 2001}

Existing Problems, Issues and Opportunities

According to the *County of Hawaii General Plan Revision*, existing problems and potential solutions for the Hamakua district include:

- Streams originating above and flowing through Honokaa have caused flooding in the town. The existing culverts within the town do not have adequate capacity to handle volume flows.
- The communities of Paauhau and Kukaiau have not been subjected to any high flood flows in the past. The only recommended flood prevention measures would be the construction of diversion channels above the communities to divert water from former sugar cane fields and into the surrounding gulches.
- Occasional flooding along the Hawaii Belt Road between Ahualoa and Waimea occurs when rainwater comes down from the pastures and overtops the road. Although there are no mitigation measures planned at this time, road improvements have alleviated some of the flooding and improved sheet flow.
- Localized drainage problems exist within the limits of Paauilo. The problems are caused by allowing surface waters to collect from large areas within the town and flow down narrow roadways. This could be prevented if the water was intercepted and diverted to the gulches for disposal.
- The only areas that are subject to tsunami and hurricane storm surge inundation within the Hamakua district are Waipio Valley and three other uninhabited valleys to the north. Damage in Waipio Valley has been primarily to crops caused by periodic stream meandering, overflow, and stream blockages. Requested solutions and subsequent studies of the problem have found approaches to be economically unfeasible. ^{27, 2001}

Future and Planned Usage

See County of Hawaii for Storm Water Summary information.

Future and Planned Requirements or Changes

As mentioned in the County of Hawaii General Plan Revision, proposed changes for the Hamakua area include:

- Update and implement the Hawaii County "Drainage Master Plan" for the Waipio-Kukuihaele, Honokaa-Paauhau, and Paauilo-Kukaiiau areas;
- Support the use of natural channels and proper soil conservation practices to manage flood control and drainage problems;
- Implement the proper flood control measures and soil conservation practices to minimize sheet flow, flooding, and sediment runoff from agricultural and forest reserve land;
- The Waipio Valley area shall be retained for limited recreational and agricultural activities due to its high susceptibility to flooding and tsunami inundation; and
- Encourage the State to develop mitigation measures for the occasional flooding along the Hawaii Belt Road between Ahualoa and Waimea. ^{27,}
2001

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

Visitors and residents have little impact on the predominantly natural forces behind flooding.

Major Assumptions

N/A

County of Hawaii – Hamakua – Roads

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, the Hawaii Belt Highway is the primary traffic artery connecting Hamakua to the Hilo and Kohala districts. Realignment and widening of the secondary road through Honokaa and its continuation to Waipio Valley is complete. In addition to the roads mentioned, there are several homestead roads mauka of the Hawaii Belt Highway serving the Paauilo, Pohakea, Kaapahu, Kalopa, Kaa, and Ahualoa Homestead lands. These roads, however, are narrow and in poor condition. There is also a network of private former plantation roads. ^{27, 2001}

Existing Problems, Issues and Opportunities

As stated in the *County of Hawaii General Plan Revision*, the pattern of circulation in Honokaa is overly dependent upon Mamane Street, the only roadway providing access through the town. There is a lack of parallel loop circulation routes and most of the local traffic is on Mamane Street or sub-streets that branch off the main street. However, because of the sloping topography and the watercourses dividing Honokaa into separate areas, it is difficult to develop loop circulation systems without constructing a number of bridges.

Some of the biggest problems with the existing highway system in this area are its aging bridges. Many of these bridges were built originally for rail usage and later converted to highway traffic, while others were built for maximum sized trucks considerably smaller than what is commonly in use today. Significant challenges for these bridges exist in the area of federally mandated seismic retrofitting and lead-based paint abatement, especially for the aged large steel truss structures. ^{27, 2001}

Future and Planned Usage

As mentioned in the *County of Hawaii General Plan Revision*, the County wants to encourage the State to install additional passing lanes along Highway 19 at appropriate locations. Provide for an industrial traffic connection leading from the former sugar mill to Highway 19, separating this traffic from local traffic movement on Mamane Street. Encourage the State to construct a scenic highway from the Waipio Valley lookout extending mauka to connect to Mud Lane at the entrance of Waimea. Improve County maintained roads and encourage the improvement of non-county owned roads by the State of Hawaii or private landowner.

Consider alternatives in the management of Pakalana Street, such as its conveyance to the State Department of Education or its conversion to a one-way traffic pattern. Provide a cross-town connection to Plumeria Street by extending Kamani Street. Provide a mauka-makai connection from the Kamani Street extension to Mamane Street on the Hilo side of the elderly housing. Eliminate the Milo Street extension on the Waipio side of Pakalana Street.^{27, 2001}

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

See County of Hawaii Roads Summary.

Problems, Issues and Opportunities Associated with Costs

As stated in the *County of Hawaii General Plan Revision*, roadway systems in Hawaii County are generally financed through Federal, State, and County programs. Recent funding limitations are reducing the availability of such monies. Consequently, additional sources will have to be sought to implement the needed improvements.^{27, 2001}

Compare Visitor and Resident Impact

N/A

Major Assumptions

Assumptions for population and visitor projections can be found in the County of Hawaii Introduction.

County of Hawaii – Hamakua – Airports

Present Capacity and Usage

The *County of Hawaii General Plan Revision* states that there are no air terminals in this district. ^{27, 2001}

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Hamakua – Harbors

Present Capacity and Usage

There are no harbor terminals in this district. The only small boat ramp on the Hamakua Coast is located within the Laupahoehoe Point Beach Park.

Existing Problems, Issues and Opportunities

The *County of Hawaii General Plan Revision*, states that although the boat ramp was improved through a joint effort of the County of Hawaii and the U. S. Army Corps of Engineers, it is inadequately protected from damage due to storm surges. Without further improvements, the ramp will continue to be hazardous for users of the facility. ^{27, 2001}

Future and Planned Requirements or Changes

According the *County of Hawaii General Plan Revision*, the County plans to continue to improve the small boat ramp at Laupahoehoe, extend the offshore protective structure, and provide for adequate parking. ^{27, 2001}

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Parks Summary regarding funding.

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Hamakua – Parks

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, combined recreational facilities, which were made available by the former sugar company, the schools and the County, adequately serve the communities of the Hamakua district. The sugar company previously provided neighborhood playground and playfield facilities in Haina and Paauhau. The County now owns the ball field in Haina and the ball field and gym at Paauilo Park. The Paauilo community also uses the five-acre school playfield.

In Honokaa, the school grounds serve as a district park administered by the Department of Education. Other facilities include a 4.5-acre playfield, a swimming pool owned and maintained by the County, and a National Guard gym. Honokaa has a large County-developed park with two ball fields, a football/track field, and a gymnasium facility. The County also owns a rodeo arena mauka of the Hawaii Belt Highway.

Two wild land State parks provide facilities for hiking, picnicking, camping and hunting. Cabins are available for overnight use. Mauna Kea State Recreation Area located in the saddle between Mauna Kea and Mauna Loa is 20 acres in size. The park provides a hiking trail to the summit of Mauna Kea. During the winter months, the summit of Mauna Kea provides opportunities for skiing and other snow sports. Kalopa State Recreation Area (100 acres) is located in a native Ohia forested area five miles southeast of Honokaa.

The County maintains a scenic lookout area above Waipio Valley that has a shelter and facilities for picnicking. There is a State hiking trail into the adjoining valleys, including Waimanu Valley.^{27, 2001}

Existing Problems, Issues and Opportunities

A community center was built by the County at Paauilo Park, unfortunately has an inadequately lighted field and gym. See County of Hawaii Park Summary for information. Details at the district level require further study.

Future and Planned Usage

The following future usages were listed in the *County of Hawaii General Plan Revision*:

Future usage for the Hamakua area include:

- Development of Waipio and Waimanu Valleys as natural and wilderness areas. Encourage the State to provide small recreation sites on the edge of Waipio Valley; and
- Develop a general use park in the Kaao-Ahualoa section of the Hamakua Forest Reserve.^{27, 2001}

Future and Planned Requirements or Changes

The following future changes were listed in the *County of Hawaii General Plan Revision*:

Planned changes for the Hamakua area include:

- Construction of multipurpose rooms adjacent to the gymnasium in Honokaa Park to accommodate community meetings and functions; and
- Encourage the State to develop a scenic park on the Kohala side of Hiilawe Falls in conjunction with the development of the scenic highway.^{27, 2001}

Anticipated Costs for the Future

See County of Hawaii Park Summary for total funds spent on cultural and recreational projects.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

Residents extensively utilize the park facilities. A small percentage of park visitors are tourists.^{27, 2001}

Major Assumptions

See County of Hawaii Park Summary for information.

County of Hawaii – Hamakua – Police, Fire and Emergency Services

Present Capacity and Usage

The following was taken from the County of Hawaii General Revision Plan:

Fire and EMS

The Hamakua fire facility is located in Honokaa and provides 24-hour fire/EMS service. A volunteer station is located in Paauilo. ^{27, 2001}

Police

Hamakua police headquarters is located within the government office center in Honokaa. ^{27, 2001}

Existing Problems, Issues and Opportunities

See County of Hawaii Police, Fire and EMS Summaries for details.

Future and Planned Usage

See County of Hawaii Police, Fire and EMS Summaries for details.

Future and Planned Requirements or Changes

According to the *County of Hawaii General Revision Plan*, plans to improve service facilities to meet needs are being made. ^{27, 2001}

Anticipated Costs for the Future

See County of Hawaii Police, Fire and EMS Summaries for details.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Police, Fire and EMS Summaries for details.

Compare Visitor and Resident Impact

See County of Hawaii Police, Fire and EMS Summaries for details.

Major Assumptions

See County of Hawaii Police, Fire and EMS Summaries for details.

County of Hawaii – Hamakua – Visitor Accommodations

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, Hamakua is growing, despite the decline of sugar operations. Hamakua has only a handful of bed and breakfast accommodations, due to the fact that there aren't any visitor attractions in this area. There are 42 acres of resort zoning in 2000. ^{27, 2001}

Existing Problems, Issues and Opportunities

As stated in the *County of Hawaii General Plan Revision*, geographically, valleys are not conducive to visitor oriented facilities or accommodations. ^{27, 2001}

Future and Planned Usage

The *County of Hawaii General Plan Revision*, states that future plans include encouraging family/small operation hotels and retreat/resort developments. ^{27, 2001}

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

According to the *County of Hawaii General Plan Revision*, there is very little visitor impact to this area, unless native hardwood forests are to be developed as a tourist attraction. ^{27, 2001}

Major Assumptions

N/A

County of Hawaii – Hamakua – Private Transportation

Present Capacity and Usage

There was no breakdown of private transportation to the district level. See County of Hawaii Private Transportation Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Hamakua – Energy Systems

Present Capacity and Usage

There was no breakdown of energy systems to the district level. See County of Hawaii Energy System Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Hamakua – Sewer Systems

Present Capacity and Usage

There was no breakdown of private sewer systems to the district level. See County of Hawaii Sewage Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Hamakua – Coastal Water Quality

Present Capacity and Usage

There was little information regarding coastal water quality at the district level. See County of Hawaii Coastal Water Quality Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Hamakua – Marine Ecosystem Health

Present Capacity and Usage

There was little information regarding marine ecosystem health at the district level. See County of Hawaii Marine Ecosystem Health Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Hamakua – Forestry / Green Space

Present Capacity and Usage

There was little information regarding forestry at the district level. See State and County of Hawaii Forestry Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Hamakua – Air Quality

Present Capacity and Usage

There was little information regarding air quality at the district level. See County of Hawaii Air Quality Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Hamakua – Beach Erosion

Present Capacity and Usage

There was little information regarding beach erosion at the district level. See State of Hawaii Beach Erosion Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Hamakua – Invasive Species

Present Capacity and Usage

There was little information regarding invasive species at the district level. See State and County of Hawaii Invasive Species Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Hamakua – Other Natural Scenic Resources

Present Capacity and Usage

There was little information regarding various other natural and scenic resources at the district level. This includes native species and extinction issues and riparian / wetlands. See State and County of Hawaii Other Natural and Scenic Resources Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kohala – Water Quality and Quantity

Present Capacity and Usage

The *County of Hawaii General Plan Revision*, states that the North Kohala District obtains water primarily from two wells and a spring. The Hawi Wells No. 1 and 2 serve the following areas: Kaauhuhu, Hawi-Kokoiki, Kynnersley-Kapaau, and Halaula. The average consumption for this system is 0.30 mgd. The Makapala-Keokea water system source is from the Murphy Tunnel owned by Chalon International of Hawaii. Present consumption is 0.0281 mgd.^{27, 2001}

Existing Problems, Issues and Opportunities

See County of Hawaii Water for information.

Future and Planned Usage

According to the *County of Hawaii General Plan Revision*, the following lists future projects for the area:

- Pursue a ground water source for the Makapala-Keokea water system,
- Explore further sources for future needs,
- Improve and replace inadequate distribution mains and storage facilities, and
- Encourage efforts to improve the Kohala ditch system and its use for agricultural purposes.^{27, 2001}

Future and Planned Requirements or Changes

As stated in the *County of Hawaii General Plan Revision*, the State Department of Land and Natural Resources, Engineering Division also has the capacity to explore and develop new ground water sources. The County has in the past depended upon this agency, formally known as the Division of Water and Land Development, for source development. The development of new sources requires the cooperation between State and County agencies in the delivery of municipal water systems. It is anticipated that these new water sources and systems will further influence land development.^{27, 2001}

Anticipated Costs for the Future

According to the *County of Hawaii: 1999 - 2000 Annual Report*, the following major capital improvement projects were under construction, were in various stages of contract award, or, were in the planning and design phases during the fiscal year (1999-2000) in North Kohala.

For North Kohala Water System Improvements, a contract was awarded for the replacement of older pipelines within various areas of our North Kohala Water

System. The completion of this project will improve flow and pressure conditions in addition to providing for fire protection. (Estimated Cost: \$1,800,000)^{51, 2000}

Problems, Issues and Opportunities Associated with Costs

In reference to the *County of Hawaii General Plan Revision*, one solution to improve systems presently served by only surface sources is to install a well in these systems, use the surface sources when available, and use the pump when the surface sources are deficient. This would minimize operational costs and upgrade systems so they are more dependable. Another solution is to construct large storage reservoirs. These, however, require high initial capital expenditures.^{27, 2001}

Compare Resident Impact with Visitor Impact

No information was uncovered distinguishing visitor from residential use for water in North Kohala.

Major Assumptions

See County of Hawaii Water for information.

County of Hawaii – North Kohala – Sewage

Present Capacity and Usage

The North Kohala district is characterized by many small communities with populations under one thousand. The district is served by individual on-site wastewater disposal systems. According to the *County of Hawaii General Plan*, there are no plans at this time of constructing a municipal wastewater collection and treatment system.

The *County of Hawaii General Plan*, states that current individual wastewater disposal systems in the North Kohala area appear to be functioning adequately. Considering the density and distribution of the housing units and the relatively small anticipated population growth, individual household waste disposal units will continue to be utilized unless restricted by the Department of Health. ^{27, 2001}

Existing Problems, Issues and Opportunities

There is no municipal sewage system in place. Individuals are responsible for their own wastewater disposal. It is not cost effective to establish a municipal system at this time.

Future and Planned Usage

See County of Hawaii Sewage Summary for information.

Future and Planned Requirements or Changes

A list of capital improvement projects is listed in the County of Hawaii Sewage Summary.

Anticipated Costs for the Future

A list of capital improvement projects is listed in the County of Hawaii Sewage Summary.

Problems, Issues and Opportunities Associated with Costs

No documentation was uncovered regarding issues with costs of future projects in North Kohala.

Compare Visitor and Resident Impact

No information was uncovered regarding distinguishing between resident impact and visitor impact on sewage in North Kohala.

Major Assumptions

N/A

County of Hawaii – North Kohala – Solid Waste Disposal

Present Capacity and Usage

The *County of Hawaii General Plan Revision*, states that the district of North Kohala operates a solid waste transfer station located in Kaauhuhu. The solid waste transfer station replaced the refuse disposal site at the old quarry in Kaauhuhu. ^{27, 2001}

See table 3.09 – Quantities of Solid Waste from Convenience Centers for Year 2000 in the County of Hawaii Solid Waste Disposal Summary for tonnage of solid waste collected at each transfer center.

Existing Problems, Issues and Opportunities

See County of Hawaii Solid Waste Summary for information.

Future and Planned Usage

The *County of Hawaii General Plan Revision* identifies that a new solid waste transfer station is planned for Halaula. ^{27, 2001}

Future and Planned Requirements or Changes

See County of Hawaii Solid Waste Summary for information.

Anticipated Costs for the Future

No actual cost was documented for the new transfer station. See County of Hawaii Solid Waste Summary for information.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Solid Waste Summary for information.

Compare Visitor and Resident Impact

See County of Hawaii Solid Waste Summary for information.

Major Assumptions

See County of Hawaii Solid Waste Summary for information.

County of Hawaii – North Kohala – Storm Water

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, the North Kohala district is subject to occasional heavy rainfall that creates runoff. Streams collect water from the upper watershed and convey most flows safely through the urban centers. Although the gulches are generally smaller than those on the Hamakua coast, they have adequate capacity to handle storm flows.

The North Kohala district has recorded runup from tsunami and hurricane storm surge activity. Areas subject to inundation include Pololu Valley, Upolu Point Airport, and the Mahukona Harbor areas. ^{27, 2001}

Existing Problems, Issues and Opportunities

According to the *County of Hawaii General Plan Revision*, there is no record of any flood damage to structures, other than damage to highway culverts. There are areas, however, which are subject to flooding problems. These include the town of Hawi, which has experienced surface sheet flows concentrating along the highway within the town, the highway and road culverts at Lipoa Gulch, and Halelua and Pueka gulches.

The community of Kapaau has problems similar to those of Hawi. The existing highway culverts are inadequate to handle peak flood flows, which have caused minor flooding problems in the past. On each side of the highway, the Makapala area is relatively flat and is susceptible to flooding by the Niulii and Waikani Streams.

The solution to the flood control and drainage problems of this district lies in the practice of proper soil conservation in agricultural lands and forest areas to help reduce and retard surface water and sediment runoff. In addition, improvements could be made to the natural channels to increase their capacity. ^{27, 2001}

Future and Planned Usage

See County of Hawaii for Storm Water Summary information.

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision*, the following is the only proposed change for the North Kohala area: update and implement the Hawaii County *Drainage Master Plan* for the Hawi and Honomakau-Kapaau areas. ^{27, 2001}

Anticipated Costs for the Future

See County of Hawaii for Storm Water Summary information.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Resident Impact with Visitor Impact

Visitors and residents have little impact on the predominantly natural forces behind flooding.

Major Assumptions

N/A

County of Hawaii – North Kohala – Roads

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, there are two roads leading into North Kohala, the Kohala Mountain Road and the Akoni Pule Highway. The mountain route to Kohala has sharp vertical and horizontal curves and grades with relatively short [sighting] sight distance. The urban areas of this district are scattered along the main road between Hawi and Niulii, a distance of nearly seven miles. There is also an intricate system of former plantation roads.
^{27, 2001}

Existing Problems, Issues and Opportunities

The area is mountainous and requires good sighting distances for roads. ^{27, 2001}

Future and Planned Usage

The *County of Hawaii General Plan Revision*, promotes the following future and planned usages:

- Encourage the improvement of the Kohala Mountain Road.
- Encourage the improvement of that portion of the Akoni Pule Highway between the towns of Hawi to Niulii.
- Improve mauka-makai county maintained homestead roads and encourage improvement of the non-county owned roads by the State of Hawaii or private subdivisions. ^{27, 2001}

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

See County of Hawaii Roads for information.

Problems, Issues and Opportunities Associated with Costs

The *County of Hawaii General Plan Revision*, states that the roadway systems in Hawaii County are generally financed through Federal, State, and County programs. Recent funding limitations are reducing the availability of such monies. Consequently, additional sources will have to be sought to implement the needed improvements. ^{27, 2001}

Compare Visitor and Resident Impact

See County of Hawaii Roads for information.

Major Assumptions

See County of Hawaii Roads for information.

County of Hawaii – North Kohala – Airports

Present Capacity and Usage

According to the Airports Division, Upolu Airport is in northern Hawaii. It is the only air transportation facility in the district. This general aviation airport has a single runway (without taxiways) and two aircraft parking areas to the south. The eastern parking area supports passenger terminal operations and the western parking area provides tie down facilities for general aviation aircraft. The airport has no control tower, aircraft rescue, fire fighting or air cargo facilities.^{37,2001 27, 2001} There is no data available for Upolu Airport regarding passengers, mail, or cargo.

According to the *Final State Airport System Plan*, this airport is forecast to serve a combination of commuter/air taxi, general aviation and military operations. The airport will continue to serve a stable, rural community in the long term with no scheduled air passenger activity anticipated.^{127, 1998}

Existing Problems, Issues and Opportunities

According to the *County of Hawaii General Plan Revision*, there may be an increase in demand for airstrips and helipads stemming from the growth of the visitor industry. The State, in coordination with the County and the affected communities, has been developing master plans for each of the four airport facilities to assess current and future demand as well as specific recommended improvements.^{27, 2001}

Future and Planned Usage

The State prepared the Upolu Airport Master Plan in 1999 to forecast aviation demand at the facility to the Year 2020 and to evaluate the need for additional facility improvements. Based on forecast demand, no extension of the existing runway or expansion of terminal facilities will be required through 2020. However, it recommends the acquisition of lands adjacent to the airport for future runway and terminal expansion. The widening of the airport's existing 1.8 mile access road to a two-lane, paved road is also recommended.^{27, 2001}

No significant improvements are planned. However, if demand increases, plans include a parallel taxiway south of the runway and moving terminal facilities away from the runway to provide clearance and additional aircraft parking.^{37,2001}

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision*:

- Retain Upolu airfield for general aviation use.
- The State should provide improvements to runway and terminal facilities at Upolu Airport, including the improvement of the airport's access road from the Akoni Pule Highway.^{27, 2001}

Anticipated Costs for the Future

See State and County Airport Summaries for information. Details at the district level require further study.

Problems, Issues and Opportunities Associated with Costs

See State and County Airport Summaries for information. Details at the district level require further study.

Compare Visitor and Resident Impact

See State and County Airport Summaries for information. Details at the district level require further study.

Major Assumptions

According to the *Final State Airport System Plan*, facility development assumptions for SASP: Compliance, air demand, and safety issues will drive capital projects over the long term. ^{127, 1998}

County of Hawaii – North Kohala – Harbors

Present Capacity and Usage

According to the *County of Hawaii General Revised Plan*, there is only the Mahukona Beach Park harbor. ^{27, 2001}

Existing Problems, Issues and Opportunities

The harbor has no docking or mooring facilities. ^{27, 2001}

Future and Planned Usage

Improvements planned are for the restroom facilities. ^{27, 2001}

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii -- North Kohala – Parks

Present Capacity and Usage

County

According to the *County of Hawaii General Plan Revision*, parks in the North Kohala district consist of two school grounds and four County parks. The Halaula Middle Annex for Kohala High and Intermediate Schools, formerly the Halaula Elementary School, has a 5-acre playfield, playground, and basketball court used by residents in the area. Kohala High School has a gym, playground, track, and a 4.5-acre playfield.

Kamehameha Park in Kapaau is a major district park with an area of 18.4 acres. Facilities include a grandstand, lighted playfield, lighted tennis courts, a swimming pool, and a large gymnasium/community center complex.

The windward coast of the district contains Keokea Beach Park at Niulii. The park with an area of 7.1 acres and two pavilions, is the only developed beach area. On the leeward side of the district are two County beach parks Kapaa and Mahukona. Kapaa Beach Park has a total area of 28.3 acres, however only a small portion has been developed. Mahukona Beach Park, popular for fishing and swimming has a total area of less than three acres and is located close to the harbor. The Pololu Valley lookout at Niulii provides scenic views and a hiking trail from the lookout into the valley.

State

The State manages three historical parks within the district: Lapakahi State Historical Park, Kamehameha I Birthsite State Monument, and the Mookini Heiau State Monument. ^{27, 2001}

Existing Problems, Issues and Opportunities

The *County of Hawaii General Plan Revision* identifies several problems and issues faced by North Kohala district. These include:

- Kamehameha Park in Kapaau is not large enough to accommodate major events;
- The Pololu Valley lookout has limited parking area;
- Scattered settlement in the North Kohala district makes it challenging for residents to get to recreation areas;
- Swimming is limited at Keokea Beach Park due to ocean conditions;
- While the County maintains Mahukona Harbor's launching derrick, the harbor lacks docking and mooring facilities for small boats; and
- Parking is inadequate at some of the beach parks. ^{27, 2001}

There are also opportunities. In 1993, the Hawaii County Council approved the 240-unit Mahukona Resort development with the understanding that the

developer would provide various improvements to both Mahukona and Kapaa Beach Parks. These improvements included facilities for active recreational uses and improvements to the existing access roadway, pavilion and restroom facilities. Improvements to Kapaa Beach Park include accommodations for camping and passive recreational uses and the construction of restrooms and additional parking.

Future and Planned Usage

According to the *County of Hawaii General Plan Revision*, aside from a planned community park to serve the Kahei area, more long-range planning and further study must be conducted.

Future and Planned Requirements or Changes

Planned changes for the North Kohala district, as acknowledged by the *General Plan*, include:

- Expansion of the facilities at Kapaa Beach Park;
- Development at the Lapakahi complex as a historic park;
- Expand the small boat harbor facilities at Mahukona Harbor;
- Expand the multi-use recreation areas at Mahukona and Kapaa Beach Parks;
- State dedication of approximately 12 acres of land surrounding Mahukona Beach Park to the County for the expansion of the park; and
- Development of the Upolu Point area for recreation, including access to fishing areas.^{27, 2001}

Anticipated Costs for the Future

See State of Hawaii and County of Hawaii Park Summary for cultural and recreational budget.

Problems, Issues and Opportunities Associated with Costs

The *County of Hawaii General Plan Revision*, analysis of county documents reveals that it is beneficial to the County to pursue all development projects as opportunities to expand or improve park and other infrastructure facilities and equipment.

Compare Visitor and Resident Impact

See State of Hawaii and County of Hawaii Park Summary for information.

Major Assumptions

See State of Hawaii and County of Hawaii Park Summary for information.

County of Hawaii – North Kohala – Police, Fire and Emergency Services

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, there is the following:

Fire and EMS

Kapaau has a **full-time fire/EMS operation supplemented by 15 volunteers.**
27, 2001

Police

In Kapaau, the police station adjoins the court building.^{27, 2001} See County of Hawaii Police Summary for more information.

Existing Problems, Issues and Opportunities

See County of Hawaii Police, Fire and EMS Summaries for details.

Future and Planned Usage

See County of Hawaii Police, Fire and EMS Summaries for details.

Future and Planned Requirements or Changes

See County of Hawaii Police, Fire and EMS Summaries for details.

Anticipated Costs for the Future

See County of Hawaii Police, Fire and EMS Summaries for details.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Police, Fire and EMS Summaries for details.

Compare Visitor and Resident Impact

See County of Hawaii Police, Fire and EMS Summaries for details.

Major Assumptions

See County of Hawaii Police, Fire and EMS Summaries for details.

County of Hawaii – North Kohala – Visitor Accommodations

Present Capacity and Usage

See County of Hawaii and South Kohala Visitor Accommodation Summaries for capacity and usage data.

According to the *County of Hawaii General Plan Revision*, North Kohala has grown dramatically due to the resort activity along the South Kohala coast. Diverse agriculture and tourism support the economy. The tourists consist primarily of local travelers. The district is a bedroom community to the people working at South Kohala resorts. ^{27,2001}

Existing Problems, Issues and Opportunities

According to the *County of Hawaii General Plan Revision*, there are efforts to preserve the rural, agricultural character of the area. The area is noted for a rural country charm and a quiet lifestyle. ^{27,2001}

Future and Planned Usage

As stated by the *General Plan*, there are several natural and historical features conducive to tourism development. Lots of history resides here and several worthwhile attractions, such as Lapakahi State Park, where visitors can do a self-guided walking tour; the King Kamehameha statue at Kapaau and his birthplace near the Molokini Luakini Heiau at Upolu Point; and the lush Pololu Valley at the end of the road past Kapaau town that has trails leading down to the beach. Another main attraction is the Kohala Mountain Kayak Company, which runs the Big Island's most unusual eco/cultural adventure: a kayak ride through the upcountry irrigation ditch of the old Kohala Sugar Company. ^{27,2001}

Future and Planned Requirements or Changes

The *General Plan* includes encouraging bed and breakfast development, along with small retreat/resort development that is consistent with the rural character of the district. ^{27,2001}

Anticipated Costs for the Future

See Hawaii County Visitor Accommodations for information.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

See Hawaii County Visitor Accommodations for information.

Major Assumptions

See Introduction to Hawaii County for major assumptions.

County of Hawaii – North Kohala – Private Transportation

Present Capacity and Usage

There was no breakdown of private transportation to the district level. See County of Hawaii Private Transportation Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kohala – Energy Systems

Present Capacity and Usage

There was no breakdown of energy systems to the district level. See County of Hawaii Energy System Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kohala – Sewer Systems

Present Capacity and Usage

There was no breakdown of private sewer systems to the district level. See County of Hawaii Sewage Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kohala – Coastal Water Quality

Present Capacity and Usage

There was little information regarding coastal water quality at the district level. See County of Hawaii Coastal Water Quality Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kohala – Marine Ecosystem Health

Present Capacity and Usage

There was little information regarding marine ecosystem health at the district level. See County of Hawaii Marine Ecosystem Health Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kohala – Forestry / Green Space

Present Capacity and Usage

There was little information regarding forestry at the district level. See State and County of Hawaii Forestry Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kohala – Air Quality

Present Capacity and Usage

There was little information regarding air quality at the district level. See County of Hawaii Air Quality Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kohala – Beach Erosion

Present Capacity and Usage

There was little information regarding beach erosion at the district level. See State of Hawaii Beach Erosion Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kohala – Invasive Species

Present Capacity and Usage

There was little information regarding invasive species at the district level. See State and County of Hawaii Invasive Species Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kohala – Other Natural Scenic Resources

Present Capacity and Usage

There was little information regarding various other natural and scenic resources at the district level. This includes native species and extinction issues and riparian / wetlands. See State and County of Hawaii Other Natural and Scenic Resources Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kohala – Water Quality and Quantity

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, the Waimea system primarily services the Waimea and Puukapu area. The source feeding the Waimea System is the Waikoloa and the Kohakohau Streams. Flow from the streams varies greatly with the weather. During extended drought periods, the supply is not sufficient to meet demands. Presently, the system has five reservoirs with a total capacity of 162.5 million gallons.

The Lalamilo system obtains its water from six deep wells at the 1,200-foot elevation. The area of service for the Lalamilo system extends from Kawaihae to Mauna Lani.

The Waikoloa Development Company has developed its own water system to serve the needs of Waikoloa Village and the Waikoloa Beach Resort. The water system is to be kept in private ownership. ^{27, 2001}

Existing Problems, Issues and Opportunities

See County of Hawaii Water Summary and South Kohala Visitor Related Area for information.

Future and Planned Usage

According to the *County of Hawaii General Plan Revision*, the following lists future projects for the area:

- Seek alternative sources of water for the Lalamilo system.
- Improve and replace inadequate distribution mains and steel tanks.
- Further efforts should be made to develop adequate quantities and acceptable quality of basal ground water at appropriately placed sites mauka of the shoreline.
- Continue to seek additional groundwater sources for the Waimea System
- Encourage expansion of sources and storage capacity for both the agricultural and domestic water systems. ^{27, 2001}

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision*, the State Department of Land and Natural Resources, Engineering Division also has the capacity to explore and develop new ground water sources. The County has in the past depended upon this agency, formally known as the Division of Water and Land Development, for source development. The development of new sources requires the cooperation between State and County agencies in the delivery of

municipal water systems. It is anticipated that these new water sources and systems will further influence land development. ^{27, 2001}

Anticipated Costs for the Future

According to the *County of Hawaii: 1999 - 2000 Annual Report*, the following major capital improvement projects were under construction, were in various stages of contract award, or, were in the planning and design phases during the fiscal year (1999-2000) in South Kohala.

Kawaihae Road Waterline Replacement Project: This project consists of the replacement of an older section of 6-inch pipeline with new 12-inch waterline. The completion of this project will improve flows for domestic and fire needs. (Estimated Cost: \$1,400,000)

Waimea Baseyard Improvements: The improvements include the construction of a new Operations center building to house the Waimea Baseyard's personnel and equipment. The building will provide expanded space for equipment storage, personnel offices and conference rooms, and a customer service facility. Another base yard improvement is a fuel filling station for the Department's use. (Estimated Cost: \$750,000) ^{51, 2000}

Problems, Issues and Opportunities Associated with Costs

As mentioned in the *County of Hawaii General Plan Revision*, one solution to improve systems presently served by only surface sources is to install a well in these systems, use the surface sources when available, and use the pump when the surface sources are deficient. This would minimize operational costs and upgrade systems so they are more dependable. Another solution is to construct large storage reservoirs. These, however, require high initial capital expenditures. ^{27, 2001}

Compare Visitor and Resident Impact

No information distinguishing visitor use from residential use was uncovered.

Major Assumptions

See County of Hawaii Introduction for population and visitor projections. See County of Hawaii Water Summary for assumptions.

County of Hawaii – South Kohala – Sewage

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, most residences in the Waimea area are now being served by cesspools. Parker Ranch has constructed a limited collection system and treatment plant to service its development needs.

Existing sewerage systems within the Kawaihae-Puako area consists mainly of domestic sewage disposal via cesspools and individual wastewater systems. However, resort developments operate their own private treatment facilities. ^{27, 2001}

Existing Problems, Issues and Opportunities

As the population is expected to increase, a municipal sewerage system should be made available. Cesspool problems are generally located along the Puako residential lots where the groundwater table is near the surface.

Future and Planned Usage

See County of Hawaii Sewage Summary for information.

Future and Planned Requirements or Changes

The County of Hawaii General Plan Revision provides the following information: Proposed changes for the South Kohala area includes:

- A municipal wastewater collection and treatment system should be designed and constructed with sufficient capacity to accommodate the current and ultimate growth for the Waimea area;
- Options for water reclamation and/or subsurface disposal should be considered; and
- A municipal wastewater collection system should be designed and constructed for the Puako beach lot area. The system would route wastewater to the existing resort wastewater treatment facilities for treatment and disposal. ^{27, 2001}

Anticipated Costs for the Future

Costs associated with a new municipal wastewater systems for the Waimea and Puako Beach areas. A list of capital improvement projects is listed in the County of Hawaii Sewage Summary.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Sewage Summary for information. Details at the district level require further study.

Compare Visitor and Resident Impact

No information was uncovered regarding distinguishing between resident impact and visitor impact on sewage in South Kohala.

Major Assumptions

N/A

County of Hawaii – South Kohala – Solid Waste Disposal

Present Capacity and Usage

The *County of Hawaii General Plan Revision* provided the following information:

Landfill: The West Hawaii landfill is located in and operating in Puuanahulu.

Transfer Station: The South Kohala District operates two solid waste transfer stations, which are located at Waimea and Puako. Prior to the construction of the transfer stations the solid waste deposited on site at the Waimea and Puako locations. ^{27, 2001}

See table 3.09 – Quantities of Solid Waste from Convenience Centers for Year 2000 in the County of Hawaii Solid Waste Disposal Summary for tonnage of solid waste collected at each transfer center.

Existing Problems, Issues and Opportunities

See County of Hawaii Solid Waste Summary for information.

Future and Planned Usage

According to the *County of Hawaii General Plan Revision* a solid waste transfer site or alternative means of refuse collection should be established for Waikoloa area. ^{27, 2001}

Future and Planned Requirements or Changes

See County of Hawaii Solid Waste Summary for information.

Anticipated Costs for the Future

No costs were documented for the new transfer station. See County of Hawaii Solid Waste Summary for information.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Solid Waste Summary for information.

Compare Visitor and Resident Impact

See County of Hawaii Solid Waste Summary for information.

Major Assumptions

See County of Hawaii Solid Waste Summary for information.

County of Hawaii – South Kohala – Storm Water

Present Capacity and Usage

According to information from the *County of Hawaii General Plan Revision*, the South Kohala district can be divided into two separate watershed areas. The Waimea Village watershed extends into the Kohala Mountains. Heavy rainfall occurs in these mountains and several intermittent streams flow through the Waimea area. Upon reaching the Waimea plains, these streams turn to the west and flow toward Kawaihae across the extremely permeable lava flows of Mauna Kea. The Waikoloa stream has caused flooding within the town of Waimea during high intensity storms when waters overflow due to sharp stream bends and generally inadequate flow-carrying capacities. In addition, there is some flooding concern around the area abutting the Kawaihae road.

The second watershed area above the Kawaihae to Anaehoomalu shoreline extends from the coast to the peaks of Mauna Kea to Mauna Loa. The area is semi-arid with few well-defined channels and infrequent stream flows.

In 1997, construction was completed on the Parker Ranch drainage improvements. The improvements diverted the Kamuela and Lanimaumau Streams toward open pasturelands. Flooding has done substantial damage to the residential subdivision at the Mauna Kea Beach Resort. To mitigate the flooding, the developer has constructed flood control measures off site and the State Department of Transportation intends to install three sets of new culverts on site. The State Department of Transportation also intends to realign and replace Waiaka Road. ^{27, 2001}

Existing Problems, Issues and Opportunities

According to information from the *County of Hawaii General Plan Revision*, high intensity storms have caused flooding along the Queen Kaahumanu Highway from Kawaihae to Puako, and at Puako. These storms are very infrequent and tend to create flash floods. High flows have been experienced in the Hapuna Beach and Spencer Beach Park areas due to the flash floods. The Puako Beach lots have also been subject to flooding. During the evening of September 8, 1996, heavy rains generated a flash flood along Auwaiakeakua Stream. The floodwaters overtopped the existing drainage ways causing damage to private properties, particularly the Fairway Terrace Condominium at Waikoloa Village, County roads and drainage facilities.

An added threat to the coastal areas results from fire that leaves the upper slope areas with limited ground cover and thus more susceptible to flooding. The entire coastline of this district from Kawaihae southward is subject to tsunami and storm surge wave inundation. Runup has been recorded in Kawaihae and Puako. ^{27, 2001}

Future and Planned Usage

See County of Hawaii for Storm Water Summary information.

Future and Planned Requirements or Changes

The *County of Hawaii General Plan Revision* provides the following information for proposed future courses of action for the South Kohala area:

- Update and implement the Hawaii County *Drainage Master Plan* for the Kawaihae, Hapuna Bay-Puako, Pauoa Bay-Honokaope Bay, and Waimea areas; and
- Conduct a flood study for the Auwaiakeakua Stream. ^{27, 2001}

Anticipated Costs for the Future

See County of Hawaii for Storm Water Summary information.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

Visitors and residents have little impact on the predominantly natural forces behind flooding.

Major Assumptions

N/A

County of Hawaii – South Kohala – Roads

Present Capacity and Usage

According to information from the *County of Hawaii General Plan Revision*, recent improvements on Mamalahoa Highway have significantly improved traffic flow through Waimea town. Studies are on going regarding construction of a new bypass highway around Waimea and a new road from Waimea to Kawaihae. Preliminary designs indicate that the proposed connection with the Mamalahoa Highway will be located approximately 8 miles south of its current intersection. ^{27,2001}

Existing Problems, Issues and Opportunities

See County of Hawaii Roads Summary for information.

Future and Planned Usage

According to information from the *County of Hawaii General Plan Revision*:

- Improve existing homestead roads;
- Relieve traffic congestion through Waimea town, implement construction of
 - Parker Ranch’s connector road from Kamamalu Street to Mamalahoa Highway;
 - The County’s extension of this road, between Mamalahoa Highway and Kawaihae Road; and
- However, the narrow and winding sections of Mamalahoa Highway from Waimea to Kona still require improvements. ^{27, 2001}

Future and Planned Requirements or Changes

The *County of Hawaii General Plan Revision* includes the following changes:

- Construct, at a minimum, one other paved two-lane access road out of the Ke Kumu Housing area onto Paniolo Drive.
- Extend Paniolo Drive in Waikoloa north to intersect with the Kawaihae Road and the proposed Waimea-Kawaihae Road.
- Provide traffic signals at the Waikoloa Road-Paniolo Drive intersection.
- Construction of a Waimea by-pass road from Mud Lane to Mamalahoa Highway on the Kona side of Waimea.
- Construction of connector roads from the Waimea Bypass Road to the Mamalahoa Highway.
- Construction of a new Waimea to Kawaihae road from Mamalahoa Highway to the Queen Kaahumanu Highway.
- Widening of Queen Kaahumanu Highway as the need arises.
- Construction of these transportation segments will be needed to accommodate the anticipated expansions of resort areas along the coast, commuter traffic from Hamakua and Waimea and the transportation of goods to and from the Kawaihae Harbor. ^{27,2001}

Anticipated Costs for the Future

See County of Hawaii Roads Summary and Appendix: County of Hawaii – Capital Projects Fund for information.

Problems, Issues and Opportunities Associated with Costs

According to information from the *County of Hawaii General Plan Revision*, Roadway systems in Hawaii County are generally financed through Federal, State, and County programs, as noted by the *General Plan*. Recent funding limitations are reducing the availability of such monies. Consequently, additional sources will have to be sought to implement the needed improvements. ^{27, 2001}

Compare Visitor and Resident Impact

See County of Hawaii Roads Summary for information.

Major Assumptions

See County of Hawaii Roads Summary for information.

County of Hawaii – South Kohala – Airports

Present Capacity and Usage

Statistics regarding passengers, cargo and mail for Waimea-Kohala Airport can be found in the County of Hawaii Airport Summary.

According to the Airports Division, Waimea-Kohala Airport is 90 acres one mile south of the town of Kamuela. It has a single runway, no taxiways and an aircraft parking apron to the west. The apron serves as the passenger terminal and general aviation facilities. No fueling or traffic control facilities are provided. Aircraft rescue and fire fighting share space in the airport maintenance facility.
37,2001

According to the *County of Hawaii General Plan Revision* the Waimea-Kohala Airport, provides commuter air service, air cargo and air ambulance service to the residents of North and South Kohala, and Hamakua. Users include the military, private aircraft owners and flight training schools. While use of the facility by current users is expected to increase during the study period, commercial inter-island and overseas flights will remain at the international airports in Hilo and Kona. 27,2001

Existing Problems, Issues and Opportunities

Currently, Waimea-Kohala airport is underutilized. Demand will change the services needed. 27,2001

See State and County Airport Summaries for information.

Future and Planned Usage

The Waimea-Kohala airport is underutilized, but its use may increase with resort development in South Kohala. Modest enlargements for fixed-wing and helicopter hangars are being considered. 37,2001 Various improvements and upgrades to the runway and terminal facilities would improve operating efficiencies and increase aircraft load capacity should the demand arise. 27,2001

Future and Planned Requirements or Changes

According to information from the *County of Hawaii General Plan Revision*, the State Department of Transportation should continue to provide improvements to terminal and runway facilities at the Waimea-Kohala airport. The State prepared the *Waimea-Kohala Airport Master Plan* in 1999. In general, the airport master plan recommends various improvements and upgrades to the runway and terminal facilities to improve operating efficiencies and increase aircraft load capacity. 27,2001

Anticipated Costs for the Future

No costs were uncovered documenting future changes for Waimea-Kohala Airport.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

See County Airports Summaries for information.

County of Hawaii – South Kohala – Harbors

Present Capacity and Usage

The following information is referenced from the *State Office of Planning – Airports, Harbors and Highways Division*:

Table 3.30 – Kawaihae Harbor Passengers and Cargo for Fiscal Year 2000^{37, 2001}

Passengers	
Tons of Cargo	643,802

According to the *County of Hawaii General Plan Revision* major transportation, terminals in the County of Hawaii consist of harbors and airports. There are two deep draft harbors on the island, one at Hilo and another at Kawaihae. While improvements continue to be made, both harbor terminals lack adequate docking and support facilities. It is anticipated that the use of both deep draft harbors will expand substantially. Cargo volume at Kawaihae Harbor has increased significantly as the population and development in West Hawaii continues to grow. The Hawaii Commercial Harbors 2020 Master Plan was developed by the State in 1998 to guide the development, maintenance and enhancement of the island's harbor systems to ensure its efficient, safe, accessible and economical operations.^{27, 2001}

The perimeter breakwater of the Kawaihae Small Boat Harbor is now complete. The present small boat harbor has moorings for 40 boats and a pier with 3-point (Tahitian-style) moorings that can accommodate six boats.

Existing Problems, Issues and Opportunities

According to the *County of Hawaii General Plan Revision* there is a deep draft port and small boat harbor at Kawaihae, both of which are being further improved. Kawaihae Harbor has two commercial piers with approximately 14 acres of cargo handling and storage areas, with room for expansion as needed. Although a new perimeter breakwater was constructed at the southern end of the harbor by the Army Corps of Engineers, there is insufficient parallel docking space at the present facility. The State Department of Transportation has plans to increase small boat capacity when funding can be appropriated. The Hawaii Commercial Harbors 2020 Master Plan identifies the need for additional cargo yard space to accommodate inter-island and overseas cargo as well as the construction of a passenger terminal at Pier 4.^{27, 2001}

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision* the State Department of Transportation should continue to improve harbor facilities at Kawaihae to

meet increased shipping activities and cruise ship passenger arrivals. Continue to support the Department of Land and Natural Resources in its plans to develop a small boat harbor at Kawaihae.^{27, 2001}

Anticipated Costs for the Future

The following information was provided by the *State Airports, Harbors and Highways Division*:

Kawaihae Harbor^{37, 2001}

- Paving of an additional barge terminal area \$3 million.
- Special maintenance projects \$41,000.

Problems, Issues and Opportunities Associated with Costs

See State of Hawaii Harbors Summary and Appendix: DOT CIP.

Compare Visitor and Resident Impact

See County of Hawaii Harbors Summary and State of Hawaii Harbors Summary.

Major Assumptions

N/A

County of Hawaii – South Kohala – Parks

Present Capacity and Usage

County

The *County of Hawaii General Plan Revision* states that recreation areas in the South Kohala district are limited. The recreational facilities for South Kohala are as follows:

- The Waimea community center is at the former courthouse in Waimea. The facility is operated by Hawaii County which also operates senior citizen center;
- The Waimea Elementary and Intermediate School has a playground which is operated by the County after school hours; and
- Waimea Park (10.5 acres) is the district's recreation center with a community center, playfields and facilities for spectators, tennis courts, restrooms, and an attractive playground for young children. One playfield and the tennis courts are provided with lights for night activities. This park is often a rest and picnic stop for travelers. ^{27, 2001}

State

The *General Plan Revision* goes on to inventory State parks and facilities as well. Hapuna Beach State Recreation Area and Samuel M. Spencer Beach Park are the major developed areas. These recreation areas are a part to the white sand beaches that stretch along the coast of South Kohala.

Federal

The National Park Service manages the Puukohola Heiau National Historic Site overlooking Samuel M. Spencer Beach Park. ^{27, 2001} According to the *National Park Service*, Puukokola Heiau National Historic Site had 54,745 visits in the year 2001. It has a total gross area of 86.24 acres, from which, 60.95 is Federal land and 25.29 is non-Federal land. ^{136, 2002}

Existing Problems, Issues and Opportunities

Existing problems, as described by the *General Plan Revision*, for the Parks in the South Kohala District include:

- Both Hapuna Beach and Samuel M. Spencer Parks receive intensive use. The facilities need to be maintained or overuse will destroy the natural beauty; and
- The County's Waimea Park is not provided with clearly marked parking stalls and the restroom facilities are inadequate. ^{27, 2001}

Future and Planned Usage

The *General Plan* sets up guidelines for development of parks around Waimea. A concern regarding the amount of development planned for the Waimea area is a long range Master Plan should be implemented to direct decision makers as to

areas where parks would be most beneficial to the community. Also a community park adjacent to the Waikoloa School is currently being developed.

- Develop parking areas for Waimea Park.
- Develop additional recreational facilities in Waimea, including an approximate 30-acre regional park on land to be donated by Parker Ranch.
- Expansion of outdoor recreational areas around Waimea School.
- Develop trail systems linking residential areas to Waimea's urban center.
- Development of Waimea Trails & Greenways and Waimea Nature Park (Ulu Laau).
- Support the passive use of Church Row Park.
- Improve picnic and camping facilities at Samuel M. Spencer Beach Park.
- Acquire and develop additional public shoreline recreation areas.
- Establishment of neighborhood parks.
- Ensure public use of and access to beach areas. ^{27, 2001}

Future and Planned Requirements or Changes

Proposed future changes for the South Kohala District mentioned by the *General Plan* includes:

- Encourage the full implementation of the Hapuna Beach State Park Master Plan including Wailea Bay Area;
- Improve picnic and camping facilities at Samuel M. Spencer Beach Park;
- Acquire and develop additional public shoreline recreation areas;
- Encourage the establishment of neighborhood parks.
- Develop recreational facilities in Waikoloa, including an enclosed community center/sports complex;
- Develop trail systems linking residential areas to Waimea's urban center; and
- Support the passive use of Church Row Park. ^{27, 2001}

Anticipated Costs for the Future

See State of Hawaii and County of Hawaii Park Summaries for cultural and recreational budget.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

The Puukokola Heiau National Historic Site had 54,745 visits in the year 2001.^{136, 2002} It is unknown what percentage of these visits are by tourists or residents.

See State of Hawaii and County of Hawaii Park Summaries for information.

Major Assumptions

The 2002 and 2003 forecast for the Puukohola Heiau National Historic Site is 58,217 and 59,539 visitors respectively. The increase between 2001 and 2002 is approximately 6.3 percent. ^{136, 2002}

See State of Hawaii and County of Hawaii Park Summaries for information.

County of Hawaii – South Kohala – Police, Fire and Emergency Services

Present Capacity and Usage

Fire and EMS

According to the *County of Hawaii General Plan Revision* a 24-hour fire/EMS facility is located in Waimea, with an eight hour one-man facility located at Kawaihae. South Kohala is a full-time fire/EMS/Hazardous Materials and Aero Medical operation. Waikoloa is a full-time fire/EMS operation. 24-hour, on-call volunteer facilities are located in Waikoloa Village, Kona Village Resort and Kohala Ranch Subdivision.

Police

Police service is available from a public office complex shared with the Court and State government agencies located in Waimea. South Kohala District substation is located in Kalahuipuaa.^{27, 2001}

Existing Problems, Issues and Opportunities

See County of Hawaii Police, Fire and EMS Summaries for details.

Future and Planned Usage

See County of Hawaii Police, Fire and EMS Summaries for details.

Future and Planned Requirements or Changes

See County of Hawaii Police, Fire and EMS Summaries for details.

Anticipated Costs for the Future

See County of Hawaii Police, Fire and EMS Summaries for details.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Police, Fire and EMS Summaries for details.

Compare Visitor and Resident Impact

As stated in the County of Hawaii section of the *Hawaii Tourism Product Assessment*, visitor impact on police, fire and rescue resources is greater on the west side of the Big Island, because of the visitor destination areas of South Kohala.^{91, 2002} Geographically, according to the Department of Fire, there are more incidents (no specification as to what type) on the west side of Hawaii. However, there is no comparison available between visitors and residents available.

Major Assumptions

See County of Hawaii Police, Fire and EMS Summaries for details.

County of Hawaii – South Kohala – Visitor Accommodations

Present Capacity and Usage

There are 3981 visitor accommodation units within 26 properties with a 74.6% occupancy rate, according to the 2001 Visitor Plant Inventory.

The economic activities in South Kohala are tourism, diversified agriculture, educational institutions, and research and development associated with the astronomy sector.

The South Kohala coast is a world premier resort destination. Other attractions that lure tourists are the environment, fishing, golfing, and the beaches. The potential for tourism growth is becoming a major economic force for the island.

There are currently 360 acres of land zoned for resort use. There are many different types of accommodations for different types of visitors, from luxury resorts to small lodges. ^{27,2001}

Existing Problems, Issues and Opportunities

This area benefits greatly from direct overseas flights into Kona International Airport.

Future and Planned Usage

Many current resorts have further development plans; thus the visitor industry has potential for expansion.

Future and Planned Requirements or Changes

Improve access, sewer, and water systems in the areas of high density.

Anticipated Costs for the Future

Majority of money spent to recruit visitors and money spent by visitors.

Problems, Issues and Opportunities Associated with Costs

Private industry costs reflected in pricing.

Compare Visitor and Resident Impact

See Hawaii County Visitor Accommodation Summary for information.

Major Assumptions

Barring unforeseen incidents (September 11, 2001), the visitor industry continues to expand.

County of Hawaii – South Kohala Visitor Related Area

213,1990

Introduction

The Mauna Lani Cove, Mauna Lani Resort, South Kohala Summary is based on the Mauna Lani Cove, Mauna Lani Resort Environmental Impact Statement. The Statement, required by law, is for Mauna Lani Resort, Incorporated and their proposal for a water-oriented residential marina on an 88-acre waterfront parcel. The statement is not intended to be an all-inclusive inventory of existing infrastructure or environmental features for the proposed development, but to be indicative of the infrastructure and features that can be found in South Kohala.

As noted in the EIS, at time of publication (October 1990) there was no South Kohala regional plan. A West Hawaii Regional Plan was used in addition to the North Kohala Community Development Plan, Kona Regional Plan and Waimea Design Plan.

Terrestrial Water Quality and Quantity

Excavation of the marina will impact groundwater in the following ways:

- Bring the seawater shoreline into the perimeter of the marina causing salinity of groundwater in the near vicinity to increase via seawater intrusion;
- This brings seawater inland 2000 feet;
- Act as focal point for groundwater discharge; and
- Volume of “new” water contributes to marina’s flushing;
- A tendency toward vertical stratification; nutrient load of influent groundwater may cause a biologic response.

Summary of anticipated effects based on computer simulations of the impact of groundwater on the marina’s water quality include:

1. The marina project will not change the quantity of groundwater flow; it will simply redirect into the marina itself.
2. All groundwater intercepted by the 2,000-foot wide marina will discharge into it. A portion of the flow for up to 1500 feet to either side of the marina will also empty into it. Total discharge will be in the range of 2.5 to 5.9 MGD. In contrast to the existing linearly distributed discharge along the shoreline, all of this flow will move out the marina’s entrance.
3. Seawater intrusion is principal source of groundwater contamination. Excavation of the marina will bring this contaminating source 2,000 feet inland. Groundwater salinity immediately inland of the excavation and to either side of it will be increased.
4. The salinity increase will be a localized effect, confined to the several thousand feet surrounding the marina’s perimeter. The only existing wells in this area of influence are saltwater wells at the Mauna Lani Bay Hotel.

Mauna Lani's nearest golf course irrigation well is 6,000 feet away. The effect of increased salinity will not extend that far.

While salinity intrusion resulting from the marina excavation is not a desirable effect, it will be limited to the near vicinity of the project and is not expected to compromise existing or future uses of the brackish water resource. No mitigation measures are needed.

The current source of water for South Kohala is the Lalamilo water system. Mauna Lani Resort's allocation from this source is 0.95 millions of gallons per day from wells A, B and C. Once well D is operational, Mauna Lani Resort's allocation from this well will be 1.30 millions of gallons per day. The anticipated demand for potable water for the Cove development is 0.26 millions of gallons per day. The Resort currently uses 0.80 millions of gallons per day. The anticipated need for the Cove will not significantly impact existing or planned water supply.

Sewage

There are no public sewage treatment facilities in South Kohala. Most Kohala coastal resorts are served by privately operated wastewater treatment plants and underground collection systems. Mauna Lani has an existing wastewater treatment plant. Users pay for operating and maintenance costs. Treated effluent is used for tree nursery irrigation only currently.

The existing plant has the capacity to treat 0.76 millions of gallons per day and can be expanded to handle 2.1 millions of gallons per day. Current usage is 0.29 millions of gallons per day. The Cove will add an estimated 0.03 millions of gallons per day. A pump at the Landing will be for resident and transient boat use. This will add an estimated 0.02 millions of gallons per day. Given the expanded capacity of the plant, the development plans will not tax the plant capacity.

Solid Waste

Solid waste information is outdated.

Storm Water

There are no streams or drainage ways crossing the property. Average rainfall for the area is 9 inches annually. The terrain and permeability of the surface preclude significant surface runoff.

Roads

Access to the development will be through the main resort road off Queen Kaahumanu Highway. Access within the resort is owned and maintained by Mauna Lani Resort.

Peak morning hours for traffic are from 0615 – 0715; afternoon peak hours are from 1530-1630. Traffic operates at a level of service C for left turns currently. Plans have been made to improve left turn storage lanes. There are also three alternatives to improving traffic level of service once the resort is at capacity.

Airports

The majority of the resort's visitors will transit through Keahole Airport. They are not expected to significantly impact the service or facilities.

Harbors

There is a need for this project as illustrated by the number and availability of moorings for small boats in West Hawaii. As of 1990, there were 310 applications for mooring, 93% of those were for moorings in West Hawaii. So there is a need for small boat moorings in West Hawaii.

Development of the Cove requires access in the form of shallow channels for waterways and moorings. The channel proposed is 150 feet wide and 625 feet long. The existing shoreline is to remain in place.

Analyses foresee that Kawaihae commercial facilities are adequate to accommodate long-term water transportation needs for West Hawaii. A small boat harbor at Kawaihae would alleviate some of the demand for small boat mooring space in West Hawaii.

The Cove will add 75 private moorings attached to houselots, and 110 slips. At least 10 would be for transient public boats, and another 10 for commercial fishing or charter operations. The lack of parking around the moorings remains an issue. The plan is for Cove employees to assist with boat launching and retrieval, and parking the vehicle.

Parks

There are several recreational facilities and opportunities in Kohala and North Kona. An area of concern is small boat harbors.

Shoreline access will be restored upon completion of the development. The area is a popular site for shore fishing and surfing. Impact upon these activities is nature dependent (height and direction of swell, wind speed and direction and season). The surf sites will remain accessible by water.

Police, Fire and Emergency Services

Police service is located at Waimea. The station is new and expandable. The Resort contracts security for the resort, its streets and facilities.

Fire protection is also in Waimea. Emergency medical services are located at the Kohala Coast fire station.

The development may increase the potential for criminal activity and fire protection and services. However, based on previous Mauna Lani developments, this development is not expected to increase the county police manpower requirements. Close proximity of the fire station and adherence to fire codes, should not increase fire manpower requirements. The Cove dock will be equipped with fire fighting and emergency response equipment and trained personnel.

Visitor Accommodations

This development is not a substantial addition to the visitor accommodations for the area, but more a private boat harbor with residential area.

Private Transportation

There was no mention of impact on private transportation on the area.

Energy Systems

Hawaii Electric Light Company provides generation capacity of 150 megawatts with a peak demand of 132 megawatts. The Resort has an electrical system of underground ducts and hand holes.

Electrical facilities need to be extended to the development. There is no estimate for energy usage needed for the development, so no analysis is possible to determine whether Hawaii Electric Light Company capacity is sufficient.

Coastal Water Quality

Salinity for the development area is low due to groundwater flowing into the area. Development will increase the flow of groundwater to flush the harbor and increase circulation. The water chemistry of the area to be impacted is typical of natural conditions along the West Hawaii coastline.

To assure that the proposed project does not adversely affect the coastal water quality and marine ecosystem health, the following measures will be taken during construction and operation of the proposed Cove:

- All construction conducted in compliance with Ocean Monitoring Program
- Offshore excavation limited to summer months to avoid potential impacts on humpback whales
- Siltation curtain used to contain sediment plumes
- Measures to minimize chances of propagation of significant shockwaves during blasting
- Access channel through the beach opened after all interior excavation work completed

- Harbor master and dock workers to be employed to assist in launching boats, maintaining docks and facilities and assist in enforcement of Cove rules and regulations
- Fuel dock to be equipped with oil containment booms
- Cove to be cleaned on regular basis
- Coastal/anchialine ponds to be cleaned and not filled or altered
- Special dye tablets in toilets of all incoming and resident boats to be used to monitor and regulate use
- Sewage pump-out stations and restrooms to be provided
- Trash receptacles on docks and around shoreline to be provided
- Resort-wide civil defense/tsunami warning system to be extended to Cove area

Marine Ecosystem Health

Living corals are scarce on the shallow reef terrace with total cover ranging from 5 to 28%. The number of coral species is also low. *Porites lobata* and *Pocillopora meandrina* are the only corals that appeared on all shallow transects. Both species are capable of assuming growth forms that are most resistant to the concussive force of waves. Beyond the edge of the reef drop-off, total coral cover increases to 49 to 86%. Species increase to 3 to 7.

Sea urchins are the major species of motile invertebrate benthic organism in the area. The reef surface not inhabited by coral colonies is covered with short mixed-species algal turf. A total of 67 species of fish were observed in transects.

The shoreline area contains several anchialine and old fishponds: five major ponds with surface areas of 3,000+ square feet and several smaller ponds. The ponds are in various stages of senescence with some exhibiting anaerobic conditions due to infilling by windblown sand, vegetation and detritus. The biota of the two ponds that could be affected by the proposed project was similar in that no native or exotic fish were observed.

Improvements to the shoreline include:

- Trails on a greenbelt;
- And interpretive center and
- Existing anchialine pools in poor condition will be restored, in addition to interpretive signs added.

Impacts are expected to the anchialine ponds from development, increased foot traffic, and chemicals from landscaping and the harbor. No filling or alteration of the ponds is proposed. Debris and organic material will be removed from the ponds and retained in a natural condition thereafter. Ponds will be integrated into an educational interpretive center. Precautions would be taken as needed to prevent increased and accelerated sediment loading during excavation and dredging activities.

Forestry / Green Space

There was no mention of forest in the EIS.

A green space / trail way is proposed to add to the development.

Air Quality

Air quality is good, as there are no large stationary emission sources in the vicinity. The principle source is Kilauea volcano. During eruptive phases, and when the trades are blowing, vog builds up creating a hazy atmosphere. Even under these conditions, air quality is within federal standards.

Short-term air quality problems will be controlled with twice daily water spraying to minimize fugitive dust. Increased motor vehicle traffic to the area will not significantly impact the air quality. Other measures planned to reduce emissions are solar water heating and cooling, heat pumps, waste heat recovery and other energy efficient measures.

Beach Erosion

Public access to the shoreline will remain uninterrupted and improved by installation of 2 mauka-makai public access routes.

Although shoreline improvements are proposed, there is no discussion of beach erosion, its occurrence, impediment or acceleration.

Invasive Species

The vegetation of the project site is dominated largely by introduced species such as Kiawe and Buffel grass. Fifteen species of exotic birds were surveyed, others are suspected. Feral mammals include Goats, Small Indian Mongoose.

Development is not expected to significantly affect the bird or mammal species found within the project area.

Other Natural / Scenic Resources

The area is dominated by water filled open space to the makai side and lava/scrub vegetation interrupted by resorts to the mauka side. The makai view will be altered for the proposed harbor and residential development. Extensive landscaping and architectural style designed to blend the building with the natural environment of the area.

Native Species

Nineteen of the inventoried plants are native. Sixteen are indigenous and 3 are endemic (found only in Hawaii). None of the plants are threatened or endangered, however, one species is a candidate. Relocation of the species will occur, along with incorporation of it into the landscape.

No native birds were recorded during the March 1989 faunal inventory. The only potential endemic resident species that might occur is the Short-eared Owl or Pueo and possibly the endangered Hawaiian hoary bat. Migratory birds were sighted. Improvements to the shoreline anticipate improved environment for some bird species.

Three species of marine animals occurring in the area have been declared threatened or endangered: the green sea turtle, hawksbill turtle, and the humpback whale. Green sea turtles were observed in the marine area. No hawksbill turtles were observed. Populations of the humpback whale were noted offshore. However, humpback whale behavior is poorly understood and minimally quantified. The proposed water development is not anticipated to provide habitat for threatened or endangered marine species.

A broad shoreline park area and landscaped planting area near the anchialine ponds will be created. The pololei fern will be relocated and incorporated into the landscape planting that will utilize native dry land and strand material. Natural landscape elements, including endemic species, would be used in landscaping plans for the Cove and houselots, particularly along the coastline.

County of Hawaii – South Kohala – Private Transportation

Present Capacity and Usage

There was no breakdown of private transportation to the district level. See County of Hawaii Private Transportation Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kohala – Energy Systems

Present Capacity and Usage

There was no breakdown of energy systems to the district level. See County of Hawaii Energy System Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kohala – Sewer Systems

Present Capacity and Usage

There was no breakdown of private sewer systems to the district level. See County of Hawaii Sewage Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kohala – Coastal Water Quality

Present Capacity and Usage

There was little information regarding coastal water quality at the district level. See County of Hawaii Coastal Water Quality Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kohala – Marine Ecosystem Health

Present Capacity and Usage

There was little information regarding marine ecosystem health at the district level. See County of Hawaii Marine Ecosystem Health Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kohala – Forestry / Green Space

Present Capacity and Usage

There was little information regarding forestry at the district level. See State and County of Hawaii Forestry Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kohala– Air Quality

Present Capacity and Usage

There was little information regarding air quality at the district level. See County of Hawaii Air Quality Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kohala – Beach Erosion

Present Capacity and Usage

There was little information regarding beach erosion at the district level. See State of Hawaii Beach Erosion Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kohala – Invasive Species

Present Capacity and Usage

There was little information regarding invasive species at the district level. See State and County of Hawaii Invasive Species Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kohala – Other Natural Scenic Resources

Present Capacity and Usage

There was little information regarding various other natural and scenic resources at the district level. This includes native species and extinction issues and riparian / wetlands. See State and County of Hawaii Other Natural and Scenic Resources Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kona – Water Quality and Quantity

Present Capacity and Usage

The *County of Hawaii General Plan Revision*, states that the Kona system can be divided into the North Kona and South Kona systems. Although the two systems are connected, the line dividing the two systems runs along the Honalo ahupuaa. These systems are interconnected to transport water from one system to the other. This is done only during emergencies and on a very limited basis.

Four wells and one shaft at Kahaluu and one well each at Holualoa, Keahuolu, Kalaoa, Honokohau and Hualalai supply the North Kona system. The Kahaluu wells provide the bulk of the water for the North Kona system with a total capacity of 14.9 mgd. The estimated safety capacity based on the largest pump on standby, however, is 12.9 mgd. The present average water usage is about 8.5 mgd.

From the Kahaluu wells, the water is pumped to Mamalahoa Highway and fed by gravity to the lower areas. The upper service area extends from Kealakehe School in the north to Kaawaloa in the south where it connects to the South Kona system. The average water consumption in the upper area is approximately 1.85 million gallons per day.

The lower service area is fed by gravity from Kahaluu Reservoir. The system extends from Keahole Airport to Keauhou Bay. The average consumption is 3.564 million gallons per day. The lower area can be roughly divided into three sections: 1) Keahole Airport to Kailua (Casa De Emdeko); 2) Casa De Emdeko to Kahaluu Bay; and 3) the Keauhou Bay area.

The Keahole to Kailua area is fed mainly from a line along Kuakini Highway. The present demand is 1.767 million gallons per day. The second section along Alii Drive presently delivers 0.9153 million gallons per day. The present water demand for the Keauhou area is 0.882 million gallons per day.

The four deep wells at Kahaluu and the Holualoa Wells service the upper service area along Mamalahoa Highway from Honalo to Waiaha. Demand in the area averages 0.6 mgd. The Keahuolu and Honokohau wells supply water along Mamalahoa Highway from Waiaha to Kalaoa and along Palani Road from Mamalahoa Highway to Kealakehe. Demand in these areas average 0.8 mgd. The Hualalai and Kalaoa wells supplement the subdivisions in Kaloko, Kalaoa and Kona Palisades with an additional 0.4 mgd.

The Kahaluu Shaft services the lower service area along the Queen Kaahumanu Highway from Keauhou to the Kona International Airport at Keahole. Demand in

this area averages 5.7 million gallons per day, the highest consumption rate in Kona. ^{27, 2001}

Existing Problems, Issues and Opportunities

According to the *County of Hawaii General Plan Revision*, the following lists future projects for the area:

- Continue to pursue groundwater source investigation, exploration and development in areas that would provide for anticipated growth and an efficient and economic system operation.
- Continue to evaluate growth conditions to coordinate improvements as required to the existing water system in accordance with the North Kona Water System Master Plan.
- Explore and develop a well in Waiaha.
- Continue to pursue groundwater source investigation, exploration and development in areas that would provide for anticipated growth and an efficient and economic system operation.
- Continue to evaluate growth conditions to coordinate improvements as required to the existing water system in accordance with the South Kona Water System Master Plan. ^{27, 2001}

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision*, the State Department of Land and Natural Resources, Engineering Division also has the capacity to explore and develop new ground water sources. The County has in the past depended upon this agency, formally known as the Division of Water and Land Development, for source development. The development of new sources requires the cooperation between State and County agencies in the delivery of municipal water systems. It is anticipated that these new water sources and systems will further influence land development. ^{27, 2001}

Anticipated Costs for the Future

See County of Hawaii Water Summary for general costs.

Problems, Issues and Opportunities Associated with Costs

As mentioned in the *County of Hawaii General Plan Revision*, one solution to improve systems presently served by only surface sources is to install a well in these systems, use the surface sources when available, and use the pump when the surface sources are deficient. This would minimize operational costs and upgrade systems so they are more dependable. Another solution is to construct large storage reservoirs. These, however, require high initial capital expenditures. ^{27, 2001}

Compare Visitor and Resident Impact

No distinguishing between residential use and visitor use of water was uncovered.

Major Assumptions

See County of Hawaii Water Summary for information.

County of Hawaii – North Kona – Sewage

Present Capacity and Usage

Private

The *County of Hawaii General Plan* states that the majority of residences in the North Kona area are serviced by individual on-site wastewater disposal. Housing and businesses developed in unsewered areas rely on individual wastewater systems for sewage disposal. ^{27, 2001}

Public

According to the *County of Hawaii General Plan*, the North Kona district has several community sized wastewater treatment facilities. The communities of Kailua and Kealakehe are being serviced by the Kealakehe Sewage Treatment Plant, which has a design capacity of 5.31 mgd.

The Keauhou area sewerage system is a 1.8 mgd secondary sewage treatment plant at Heeia to serve the Keauhou-Kona resort community. This sewage treatment facility is projected to eventually handle 3.6 mgd when the final increment is completed. It should be noted that Keauhou Community Services Inc., a subsidiary of Kamehameha Investment Corp, privately owns this facility.

The basic concepts of the North Kona regional wastewater management system are described in detail in "The Facility Plan for the Kailua-Kona Sewage System, Phase IV (Northern Zone), April 1981" and "Area wide Wastewater Management Plan for North Kona, December 1976 (w/1981 Supplement). ^{27, 2001}

Existing Problems, Issues and Opportunities

The soil below most on-site wastewater systems consists of lava strata. Because of the lava's permeable nature, some of the untreated wastewater effluent is flowing towards the groundwater and adjacent coastal waters. If great precaution is not exercised, both groundwater supply and coastal waters could become contaminated.

Future and Planned Usage

Planned changes for the North Kona district as outlined in the *County of Hawaii General Plan*, include:

- Construct a new wastewater treatment plant at Kealakehe near Honokohau, provide sewage pumping station, force mains and interceptor sewers to handle existing and proposed wastewater flows;
- Expand the existing sewer collection system; and
- Upgrade the Kealakehe Wastewater Treatment Plant to produce tertiary (R-1) quality effluent. ^{27, 2001}

Future and Planned Requirements or Changes

A list of capital improvement projects is listed in the County of Hawaii Sewage Summary.

Anticipated Costs for the Future

A list of capital improvement projects is listed in the County of Hawaii Sewage Summary.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Sewage Summary for information.

Compare Visitor and Resident Impact

No information was uncovered regarding distinguishing between resident impact and visitor impact on sewage in North Kona.

Major Assumptions

N/A

County of Hawaii – North Kona – Solid Waste Disposal

Present Capacity and Usage

According to the *County of Hawaii General Revision Plan*:

NORTH AND SOUTH KONA:

Transfer Stations

North and South Kona operate four transfer stations, which are located at Kailua, Keauhou, Napoopoo, Waiea and Milolii. Prior to the construction of the transfer stations open pit dumping was utilized at the Keauhou, Kailua, Waiea and Keei locations.

Landfills

The landfill at Kealakehe has been closed. A new landfill is now in operation at Puuanahulu. In accordance with State Department of Health and Environmental Protection Agency Regulations, the Kailua Landfill continues to be monitored.^{27, 2001}

See table 3.09 – Quantities of Solid Waste from Convenience Centers for Year 2000 in the County of Hawaii Solid Waste Disposal Summary for tonnage of solid waste collected at each transfer center.

Existing Problems, Issues and Opportunities

See County of Hawaii Solid Waste Summary for information.

Future and Planned Usage

See County of Hawaii Solid Waste Summary for information.

Future and Planned Requirements or Changes

See County of Hawaii Solid Waste Summary for information.

Anticipated Costs for the Future

See County of Hawaii Solid Waste Summary for information.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Solid Waste Summary for information.

Compare Visitor and Resident Impact

See County of Hawaii Solid Waste Summary for information.

Major Assumptions

See County of Hawaii Solid Waste Summary for information.

County of Hawaii – North Kona – Storm Water

Present Capacity and Usage

As stated in the *County of Hawaii General Plan Revision*, the North Kona district can be divided into two watershed areas. The first is the area north of Keahole Point and the summit of Hualalai, which has very low rainfall and runoff. Rainfall for this area ranges between 20 and 40 inches per year. The soils are extremely permeable and there is no record of hazardous flooding.

The second area extends southward from Keahole Point and contains most of the urban development. The area is subject to increasing hazards from floodwater damage as land is more intensively utilized and is characterized by dry vegetative growth along the coastal areas and thick tropical vegetation in the upper forest reserves. The ground slope is steep, averaging approximately 15 percent.^{27, 2001}

Existing Problems, Issues and Opportunities

The *County of Hawaii General Plan Revision* states that the steep slopes, shallow soils, frequent high intensity rains, and the lack of well-defined drainage ways make many areas in the North Kona district susceptible to flooding and overland flows.

Flash floods, primarily from overflows of the Keopu/Hienaloli, Waiaha, Kaumalumu and the Holualoa/Horseshoe Bend drainageways, have been identified by the Natural Resources Conservation Service's *North Kona Flood Plain Management Study*.

Floodwater and sediment damage occurs along the entire coffee belt with the Kainaliu, Holualoa and Kailua village areas experiencing the heaviest damage.

The entire coastline of the North Kona district is subject to inundation by tsunamis. Kailua and Keauhou have recorded runup and damage from tsunami activity in the past. In addition, the coastline has also been subject to damage from storm waves.^{27, 2001}

Future and Planned Usage

See County of Hawaii for Storm Water Summary information.

Future and Planned Requirements or Changes

Proposed future action for the North Kona District, as stated in the County of Hawaii General Plan Revision, include:

- Drainage systems for the Keopu/Hienaloli, Waiaha, Kaumalumu and the Holualoa/Horseshoe Bend drainageways shall be studied and remapped to determine the actions necessary to mitigate negative impacts;

- Establish and maintain appropriate vegetative cover in high rainfall, sediment and debris producing areas;
- Encourage the mapping of the floodways in North Kona to develop more effective flood control programs;
- Encourage the use of natural drainageways as greenways in the development of the region; and
- Maintain and re-establish forest cover in mauka areas to improve the capacity of the ground to absorb heavy rainfall. ^{27, 2001}

Anticipated Costs for the Future

See County of Hawaii for Storm Water Summary information.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

Visitors and residents have little impact on the predominantly natural forces behind flooding.

Major Assumptions

N/A

County of Hawaii – North Kona – Roads

Present Capacity and Usage

As stated in the *County of Hawaii General Plan Revision*, the major traffic arteries serving the North Kona district are the Hawaii Belt Highway connecting Kona with South Kohala and Kau, the Queen Kaahumanu Highway, the Kuakini Highway connecting Kailua with the mauka Keauhou area, and Alii Drive serving the shoreline areas between Kailua and Keauhou. The latter of these systems is the only access to areas along the shoreline between Kailua and Keauhou. Mauka-makai access between Mamalahoa Highway and Queen Kaahumanu Highway is provided by Kaiminani, Hina Lani and Palani roads.

The Hawaii County Council adopted the Keahole to Kailua Development Plan in 1991. This development plan encompasses an area from the Kau ahupuaa near Kona International Airport at Keahole to the Keahuolu ahupuaa in Kailua-Kona, with the Mamalahoa Highway as the mauka boundary of the study area. The overall goal of the plan was to develop a mixed residential, commercial, industrial, resort and recreational community to meet the growing needs of the Kona region. In 1997, the Department developed the Keahole to Kailua Development Plan-Revised Roadway Plan Implementation Strategy. This plan identified schematic roadway corridors necessary to accommodate future traffic volumes upon full build-out of the study area. Recommended roadway improvements, among others, include widening of the Queen Kaahumanu and Mamalahoa Highways and the construction of a mid-level roadway and mauka-makai connectors between the Queen Kaahumanu and Mamalahoa Highways.

Currently in its design stage, the proposed Kahului-Keauhou Parkway (formerly known as the Alii Highway) will provide another north-south arterial between its northern connection to the Queen Kaahumanu Highway at Kahului ahupuaa and its southern terminus at the Alii Drive-Kamehameha III Road intersection in Keauhou.

There is also a network of private subdivision roads with steep grades and limited sight distance. ^{27, 2001}

Existing Problems, Issues and Opportunities

Issues to be noted are based on public concerns over safety and flow of traffic during pau hana traffic. Congestion may be due to hotel worker pau hana traffic. There are also safety concerns about entrance / exits to resorts and Queen Kaahumanu Highway.

Future and Planned Usage

According to the *County of Hawaii General Plan Revision*, the planned changes for this area include:

- Develop a roadway network circulation plan in cooperation with the State Department of Transportation and affected communities. Upon adoption of the plan, the plan recommendations shall be incorporated on the zone district maps.
- Encourage the State to widen Queen Kaahumanu Highway as necessary to accommodate increases in traffic flows, in particular between Kona International Airport at Keahole and Kailua-Kona.
- Widen Palani Road between the proposed Keanalehu (Waena) Drive and the Queen Kaahumanu Highway or construct the proposed Palani Bypass Highway.
- Encourage the State to extend Kealakehe Parkway mauka to connect with the Mamalahoa Highway.
- Construct the following north-south collector roadways from Palani Drive and extending north to the proposed University Drive: 1) Ane Keohokalole Highway (Mid-level Road); 2) Keanalehu (Waena Drive); and 3) Kealakaa Street.
- Construct the proposed University Drive between the Mamalahoa and Queen Kaahumanu Highways.
- Widen Hina Lani Drive to four lanes between the Queen Kaahumanu Highway and the proposed Ane Keohokalole Highway.
- Construct the proposed Shore Drive from the Old Kona Airport Park to the Kealakehe Drive intersection.
- Construct the Kahului-Keauhou Parkway (Alii Highway) from Queen Kaahumanu Highway to Keauhou.
- Construct a scenic road from Keauhou above the Kealakekua cliffs to Napoopoo.
- Provide vertical connectors from Alii Drive to Kuakini Highway.
- Improve that portion of the Mamalahoa Highway extending from the North Kona to the Kau Districts.
- Support the installation of suitable bikeways and/or jogging paths.
- Develop a roadway circulation plan for the area between Palani Road and Kamehameha III Road, in cooperation with the State Department of Transportation, Federal Highway Administration, and the affected communities.
- Extend Lako Street to connect to Alii Drive.
- Work with the State and the adjacent landowners in establishing the old railroad right-of-way as a pedestrian and bicycle right-of-way.^{27, 2001}

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

See County of Hawaii Roads Summary for details.

Problems, Issues and Opportunities Associated with Costs

The *County of Hawaii General Plan Revision* also states that the roadway systems in Hawaii County are generally financed through Federal, State, and County programs. Recent funding limitations are reducing the availability of such monies. Consequently, additional sources will have to be sought to implement the needed improvements.^{27, 2001}

Compare Visitor and Resident Impact

N/A

Major Assumptions

See County of Hawaii Roads Summary for details.

County of Hawaii – North Kona – Airports

Present Capacity and Usage

Kona International Airport at Keahole occupies 3,450 acres about seven miles northwest of Kailua-Kona. The airport accommodates domestic overseas, international, inter-island, commuter/air taxi, and general aviation activities. It has an 11,000-foot runway and a complex of facilities at the eastern edge of the airfield for arriving and departing passengers, air cargo and mail, airport support, and general aviation operations. (See the table below for these statistics.) An additional complex is used primarily for general maintenance and storage. General aviation, cargo, and related facilities are located to the south of the passenger terminals and the access roadway. ^{37,2001} Oversea flights at the Kona International Airport at Keahole will continue to increase with the growth of resort areas in Kona and Kohala. Direct flights from the mainland to Keahole began in 1985; direct flights from Japan began in 1996, and the number of inter-island flights has increased. There are two domestic flights per day and seven international flights per week. ^{27, 2001}

Kona International Airport at Keahole is one of two principal entry points for visitors to the Big Island. In 1994, the airport runway was extended from 6,500 to 11,000 feet in length to accommodate aircraft as large as the Boeing 747.

The *County of Hawaii General Plan Revision* gives information regarding the capacity and usage of airports in this area. Additional information regarding aircraft operations for Keahole Airport can be found in the County of Hawaii Airports Summary. No actual data regarding capacity was found for the Kona International Airport at Keahole.

Table 3.22 -- Kona International Airport at Keahole Statistics
Fiscal Year 2001 ^{212,2001}

Count	% Change
2,780,813 passengers	0.2%change
22,505 tons cargo	-2% change
6,545 tons mail	7% change
101,617 operations	14% change

Source: *State of Hawaii Airport Activity Statistics Calendar Year 2001*

Existing Problems, Issues and Opportunities

As stated in the *County of Hawaii General Plan Revision*, there may be an increase in demand for airstrips and helipads stemming from the growth of the visitor industry. The State, in coordination with the County and the affected communities, has been developing a master plan for the airport facility to assess current and future demand as well as specific recommended improvements. Problems documented include:

- Passenger and aircraft operations projections show continued increases in traffic resulting in demand for additional terminal and airfield facilities;
- Lack of passenger accommodations results in congestion in the terminal area;
- Overseas flights directly to the Kona airport will result in the need for new or adapted terminal and/or airfield facility;
- Revenue enhancement through concession and permit fee development has not been actively promoted;
- Concession spaces are not maximized to capture customer demand;
- Cargo facilities operate at or near capacity; and
- Hawaii agriculture would benefit from additional cargo capacity for export of Hawaii products. ^{27, 2001}

The *Final Statewide Airport System Plan* states that the Kona airport does not effectively project the image of local culture. Additional demand has been demonstrated for direct service from the mainland U.S. and international points to Neighbor Islands although these destinations are not yet prepared to accept current demand. Hawaii residents expect and deserve a user-friendly air travel experience both for holiday and business purposes. An active public-private partnership is required to ensure full cooperation among airport stakeholders. Effective working relationships need to be established and actively nurtured with community and interest group representatives. A need exists to ensure a user-friendly environment for airport system tenants. The allocation of space within and among the airport must be adjusted in order to maximize efficiency. Ground transportation facilities do not optimize use of land curb space. There is a need to enhance marketing of Made-in-Hawaii products at the airports. There is minimal feeling of “sense of place” or awareness of Hawaiian culture at the airports. Displays presenting Hawaiian culture and history to visitors are either placed in inadequate space or are not sufficiently prominent to attract attention. ^{127, 1998}

Future and Planned Usage

According to the *General Plan*, expansion of the visitor industry in West Hawaii, the airport has and will continue to experience growth in passenger arrivals, aircraft operations and cargo/mail activities. Annual passenger volume is anticipated to increase by 51 percent to approximately 3.5 million in 2015.

The master plan details land use, terminal improvements, access and circulation, and supporting infrastructure needs to accommodate future facility needs. Some of the improvements include an expanded air cargo facility and new overseas terminal, flight kitchen, postal facility and general aviation facilities.

Future land uses in the vicinity of the Kona International Airport at Keahole should be compatible with the anticipated aircraft noise exposure levels for that vicinity. ^{27, 2001}

Future and Planned Requirements or Changes

Information given in the *Final Statewide Airport System Plan* states that facility requirements for Kona International Airport during the planning period 1998 through 2020 are:

Terminal Area Complex

Currently, a single terminal complex services overseas and inter-island operations. A new overseas terminal (OST) will be required to handle up to 1,699,000 overseas passengers annually by the year 2020. The estimated growth terminal building required to meet the expected growth is 250,000 square feet with a minimum of three departure gates. Inter-island terminal facilities will require approximately 110,000 square feet of terminal space to meet the projected requirements. This will not require an increase in gross area, but rather small improvements within existing areas and the reassignment of gates from overseas usage to inter-island use.

Expansion of General Aviation, cargo and air tours facilities and a new heliport are proposed at the southern end of the airport. The GA area will require and additional ten aircraft parking spaces for a total of 42 aircraft parking spaces as well as more hangar space. Expansion of air cargo facilities is not proposed until 2005, since available buildings are not fully utilized. A heliport is proposed, as there are currently no formal heliport facilities. The proposed heliport on approximately 19 acres will be located in area east of the cargo facilities.

Airfield and Support Facilities

Presently, Kona International Airport operates with a single 11,000-foot long by 150-foot wide runway. The capacity of this runway configuration and its associated taxiways has been evaluated and deemed adequate for the projected demand.

Holding bay and meteorological facilities upgrades are needed to accommodate projected growth. The size and strength of the existing holding bays along taxiway A south will be upgraded to accommodate up to two wide body jets. An upgrade of meteorological facilities is proposed to give operators improved weather information. The minimum upgrade recommended is an Automatic Weather Observation Station.

Airport Support and Infrastructure

A new wastewater treatment plant is needed to provide necessary capacity for existing and future demand. The new facility will be a lagoon type plant treating an average daily flow of 0.13 mgd with a peak of 1.25 mgd. The treated effluent will be used for landscape irrigation purposed to reduce potable water consumption.

New fuel facilities and a flight kitchen will be required to accommodate growing overseas traffic. A fuel farm is proposed northeast of the terminal area. A

smaller-capacity fuel storage area is also proposed adjacent to the general aviation area. Construction of a new Air Traffic Control Tower (ATCT) will be required to correct safety issues due to obsolete facility and future airport development. Initial recommendations site the new ATCT located on the terminal/landside of the airport due to the soil stability of the area. The new ATCT will serve the airport in its future, expanded capacity.

New Overseas Terminal (OST): An OST is required to handle existing deficiencies and projected increases in overseas domestic and international flights. Components of the OST include: new terminal, apron, and loading bridges; infrastructure upgrades to civil, electrical and communications; parking; and, relocation of facilities to increase efficient use of the airport. The eleven projects associated with this program will require five years to complete, starting in FY 1998 and ending in FY 2002.

Wastewater Treatment Plant (WWTP): The expected number of travelers will exceed the capacity of the existing WWTP. A new facility will require two years to complete, starting in FY 1998 and ending in FY 1999.

Remaining Programs: The remaining eight programs involve airfield and terminal improvements, construction of new facilities and upgrades of existing ones, safety compliance studies, and improvement sot airport access.^{127, 1998}

Anticipated Costs for the Future

According to the *Hawaii Tourism Product Assessment*, international customs and immigration processing costs are being funded temporarily by Japan Airlines.^{91, 1999}

As mentioned in the *Final Statewide Airport System Plan*, the Statewide Kona International Airport has two major programs that represent over 70% or \$70.350 million of the total \$101.312 million CIP dollars. These programs are a New Overseas Terminal, \$54.070 million, and Wastewater Treatment Plant, \$16.280 million.^{127, 1998}

Problems, Issues and Opportunities Associated with Costs

See State Airports Summary for information.

Compare Visitor and Resident Impact

No information was uncovered regarding residential or visitor impact on the Kona International Airport at Keahole.

Major Assumptions

The *Final Statewide Airport System Plan* mentions that it is projected that overseas flights per day and seven international flights will continue to increase at this airport, but remain below the inter-island passenger levels.

Total aircraft operations at Kona International Airport at Keahole are forecast to increase from 63,989 in 1992 to 91,900 operations by 2020, an overall increase of 44 percent. Air carrier operations represent the majority of the expected operations, followed by commuter/air taxi operations. Approximately 45 percent of the commuter/air taxi operations are projected to be helicopters. ^{127, 1998}

County of Hawaii – North Kona – Harbors

Present Capacity and Usage

In the *County of Hawaii General Plan Revision*, it is stated that aside from the small boat harbors at Kailua, Keauhou, and Honokohau, there are no shipping terminals in the district. Improvements to Honokohau small boat harbor have been made incrementally. Cruise ships visiting Kailua-Kona currently anchor about one-third mile offshore of Kailua Bay and shuttle their passengers to Kailua-Kona Wharf. A visitor information booth is the only visitor-related accommodation provided at the wharf. ^{27, 2001}

Existing Problems, Issues and Opportunities

Facilities are inadequate at the Keauhou and Honokohau boating facilities. ^{27, 2001}

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision*, future projects in the area include encouraging the State to renovate the Kailua-Kona Wharf or to seek alternative facilities to accommodate the cruise ship industry. ^{27, 2001}

The *Hawaii Tourism Product Assessment* mentions the development of a cruise ship berth at Kona. ^{91, 1999}

Anticipated Costs for the Future

As mentioned in the *County of Hawaii General Plan Revision*, anticipated costs in this area include Funding for a \$3.5 million refurbishment of the Kailua-Kona Wharf was approved by the 2000 State Legislature with construction anticipated to be completed before the end of 2003. ^{27, 2001}

Problems, Issues and Opportunities Associated with Costs

The small boat harbor facilities are operated by DLNR and as such are limited in funding opportunities.

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kona – Parks

Present Capacity and Usage

County

According to the *County of Hawaii General Plan Revision*, nine County parks serve approximately 27,400 residents. Hale Halawai (3.2 acres) provides a meeting place and a picnic area for the community. Kailua Playground (0.7 acre) is presently used by Kailua residents for tennis and basketball. Hill Crest Subdivision Park is too small for competitive team sports and has inadequate parking. Harold H. Higashihara Park is too small for competitive team sports, although its tennis and outdoor basketball courts and newly constructed playground are well utilized. Holualoa school yard (1.0 acre) is used for organized sports. Holualoa School and the Kona Imin Center in Holualoa serve as community centers for meetings, social gatherings, and recreational purposes.

Newly completed Kealakehe High School offers facilities that are open to the public during non-school hours. It currently has a gymnasium, two general use playfields, four tennis courts and outdoor basketball courts. Playfields accommodates baseball, football, soccer, and track activities. Construction is in progress to provide dugouts, bleachers and other improvements to these playfields.

Kailua Park (Old Kona Airport) consists of 34 acres and provides lighted fields for baseball, softball, and football. New baseball and soccer fields were recently constructed. There are four lighted tennis courts. The old terminal building houses restrooms, offices, and a meeting place. A multipurpose gymnasium was completed in 1993 and a 50-meter Olympic-size swimming pool was completed in 1999.

The County has three developed beach parks in North Kona. They include Laaloa Bay Beach Park located along Alii Drive south of Kailua-Kona; Pahoeheo Beach Park located north of the White Sands Beach; Kahaluu Beach Park along Alii Drive in close proximity to the hotels at Keauhou. Due to Kahaluu Beach Park being accessed by hotel guests and residents it receives intensive use. The park also has a unique and readily accessible coral garden with an abundance of marine life. ^{27, 2001}

State

The Old Kona Airport State Recreation Area is the only developed State park. Activities at this 84-acre coastal park include picnicking, sunbathing, fishing, wading, tide pooling, and surfing. Facilities include a special events pavilion and a jogging path.

Kekaha Kai State Park (formerly known as Kona Coast State Park) is a 1,700-acre park and wildlife sanctuary situated along the coast between the ahupuaa of

Kukio to the north and Kaulana to the south. Facilities at the park are minimal with portable toilets and a graded, unpaved access road and parking area at Mahaiula. Most of the limited facilities within the park, such as an activity center, Park Ambassador's residence, picnic facilities, restrooms and a dry botanical. Awakee will remain a wilderness area and Maniniowali will be an intermediate level activity area adjacent to the resort and residential developments of Kaupulehu and Kukio.

Federal

As stated in the *National Park Service Statistical Abstract 2001*, the Kaloko-Honokohau National Historic Park had 54,000 visits in the year 2001. It has a gross area of 1,160.91 acres, of which, 615.90 acres is Federal land and 545.01 is non-Federal land. ^{136, 2002}

Existing Problems, Issues and Opportunities

According to the *County of Hawaii General Plan Revision*, using the ratio of 5.0 acres of recreation area for every 1,000 people, the district of North Kona should now have a minimum of 137 acres. Unfortunately, North Kona has significantly less area for community recreation. Other problems pointed out in the General Plan are:

- The distance from Hale Halawai to mauka areas is a problem for many residents in the district;
- Hale Halawai provides a meeting place for the community, however, the acoustics are poor and parking is inadequate;
- Kailua Playground's limited area has restricted active team sports;
- Hill Crest Subdivision Park is too small for competitive team sports and has inadequate parking;
- Harold H. Higashihara Park is small for competitive team sports; and
- Kahaluu Beach Park is usually overcrowded. ^{27, 2001}

Future and Planned Usage

The *County of Hawaii General Plan Revision* mentions a conceptual plan for Kekaha Kai State Park was developed in 1998, and will provide low intensity use of the park to preserve the unique natural, cultural and recreational resources of the area. Access roads and parking areas will be provided at both the northern and southern ends of the park near Kua and Mahaiula Bays. ^{27, 2001}

Future and Planned Requirements or Changes

Proposed changes, as noted by the *County of Hawaii General Plan Revision*, for the North Kona District include:

- Encourage the development of community and district recreational facilities;
- Encourage the development of Alii Drive within the Kailua Village area as a pedestrian mall with open space areas for passive recreation;
- Improve facilities at Laaloa Bay Beach Park and Kahaluu Beach Park;

- Implement the development of the Kailua Park (Old Kona Airport) as a major regional or district park;
- Encourage the development of a major multi-purpose regional recreational and sports complex;
- Acquire, and/or encourage the development of additional public shoreline recreation areas;
- Establish public access to and the development of shoreline regions along the North Kona Coast in areas such as Keawaiki, Kiholo Bay, Kaupulehu, Kukio and Kapapa Bays, Kua Bay, Kahoiawa, Makalawena, and Honokohau;
- Encourage the state to continue with the establishment of Kekaha Kai State Park reaching into Mahaiula, Awakee, and Maniniowali Ahupuaa;
- Protect the marine life at Kahaluu Bay;
- Protect the Opaehala, Kaloko, and Honokohau (Aimakapa) Ponds as natural areas;
- Encourage the development of historic trails;
- Encourage the acquisition and establishment of the summit area of Hualalai as a wilderness park; and
- Increase mauka parklands. ^{27, 2001}

Anticipated Costs for the Future

See State of Hawaii and County of Hawaii Park Summary for cultural and recreational budget.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

See State of Hawaii and County of Hawaii Park Summary for information.

Major Assumptions

The *National Park Service Statistical Abstract 2001* forecasts the number of recreation visits for the Kaloko-Honokohau National Historic Park will be at or below the 2002 forecast of 51,379 and below the 52,084 forecast for the year 2003. ^{136, 2002}

See State of Hawaii and County of Hawaii Park Summary for additional information.

County of Hawaii – North Kona – Police, Fire and Emergency Services

Present Capacity and Usage

The County of Hawaii treated Police, Fire and EMS for North and South Kona as a single unit, regardless of how the rest of the infrastructure was divided into two discreet districts. This report reflects the same treatment. Notes in South Kona Police, Fire and EMS will read “See North Kona Police, Fire and EMS.”

Fire and EMS

The *County of Hawaii General Plan Revision* mentions a 24-hour fire facility is located in Kailua-Kona with fire, EMS and rescue capabilities. A full-time fire and EMS operation is located at Keauhou, and within the Captain Cook public office center, is a full-time fire and EMS operation. Twenty four-hour, on-call volunteer services are located in Kalaoa Mauka, Milolii Village and Kona Paradise Subdivision. There is also a proposed fire station in a subdivision at Kaupulehu.
27, 2001

Police

The *County of Hawaii General Plan Revision*, also states the main police facility is located in Kealakehe. Substations are located in Captain Cook, Kailua-Kona and Keauhou.
27, 2001

Existing Problems, Issues and Opportunities

See County of Hawaii Police, Fire and EMS Summaries for details.

Future and Planned Usage

See County of Hawaii Police, Fire and EMS Summaries for details.

Future and Planned Requirements or Changes

See County of Hawaii Police, Fire and EMS Summaries for details.

Anticipated Costs for the Future

See County of Hawaii Police, Fire and EMS Summaries for details.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Police, Fire and EMS Summaries for details.

Compare Visitor and Resident Impact

As stated in the *Hawaii Tourism Product Assessment*, visitor impact is greater on the west side of the Big Island, because of visitor destination areas at Kona and South Kohala.
91, 2002

Major Assumptions

See County of Hawaii Police, Fire and EMS Summaries for details.

County of Hawaii – North Kona – Visitor Accommodations

Present Capacity and Usage

There are 4417 visitor accommodation units within 76 properties with a 72.6% occupancy rate for all of Kona, according to the *2001 Visitor Plant Inventory*.

As stated in the *County of Hawaii General Plan Revision*, the population growth in North Kona continues to rise due to the expansion of the tourism industry. The tourism industry and associated services is expected to keep a moderate growth rate. One of the facilities and services available to visitors is the Honokohau Harbor, known for world-class big game fishing. North Kona supports a multitude of hotels and bed and breakfast's.

There are currently 740 acres zoned for resort land, some of which will be condominiums. North Kona has the largest inventory of visitor units on the island (4,399).^{27,2001}

Existing Problems, Issues and Opportunities

See problems regarding North Kona Harbors at Hawaii County Visitor Accommodations.

According to the *County of Hawaii General Plan Revision*, one issue is discouragement of strip development resorts along Alii Drive.^{27,2001}

Future and Planned Usage

The *County of Hawaii General Plan Revision*, states plans are to extend resort zoning into South Kohala as one visitor area.^{27,2001}

Future and Planned Requirements or Changes

It is stated in the *County of Hawaii General Plan Revision*; renovations for older hotels/resorts are needed. Improved roads, sewer, and water in high-density areas should also be considered.^{27,2001}

Anticipated Costs for the Future

See Hawaii County Visitor Accommodations for information.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

See Hawaii County Visitor Accommodations for information.

Major Assumptions

See Hawaii County Visitor Accommodations for information.

County of Hawaii – North Kona – Visitor Related Area

Introduction

The North Kona Visitor Related Area is based upon the Kohanaiki Mauka Environmental Impact Statement. The Statement, required by law, is for the Kamaaina Eight Partners proposal for a commercial/light industrial subdivision encompassing a 70-acre site. The statement is not intended to be an all-inclusive inventory of existing infrastructure or environmental features for the proposed development, but to be indicative of the infrastructure and features that can be found in North Kona.^{214,1991}

Terrestrial Water Quality and Quantity

The North Kona potable water system is supplied by five deep wells and one incline shaft at Kahaluu and Holualoa, as well as from Waiaha Stream. The majority of water is currently provided by the Kahaluu wells. Additional wells are in the drilling and test stages at Kahaluu and Kaloa. Present [1991] output capacity is 9 to 11 MGD.

Potable water use on the site is expected to be approximately 166,000 gallons per day upon full occupancy. This development will induce a net increase of use of water use. The county has committed 18,000 gal/day of potable water to the site.

The planned water system for the project that includes two wells (0.3 million gallon concrete reservoir with appropriate pumps, etc., located within the development at about 325-foot level and the second 0.3 million gallon concrete reservoir at 570 feet) are anticipated to provide sufficient water quantity and pressure for fire protection purposes within the commercial/light industrial subdivision.

A 0.3 million gallon, 17-foot high, 61-foot diameter, reservoir tank is to be constructed at about the 325 foot elevation. 12-inch ductile iron water lines located along Palani Road and within Queen Kaahumanu Highway right-of-way will aid in providing water to the site. This water main is part of the North Kona Water System that serves the area from Keahole Airport to Kealahou to the south. Lateral lines would be run into the project site with stub-outs to individual parcels.

At build-out potable water needs are estimated by the County Department of Water Supply to total 166,000 gpd. An agreement is being pursued with the County for joint development of a water source in the Hualalai area, mauka of the property, off Mamalahoa Highway.

Sewage

Wastewater disposal will be accomplished through leach fields and septic tanks until the development is connected to County wastewater systems.

Wastewater generated from activities on the proposed project at build-out is estimated to range between 24,640 gpd to 40,250 gpd, based on 35 gallons per person per day (using an employee range of 704 to 1,150). Analysis of residential cesspools and agricultural activities in the area shows no increase in chemicals to the brackish lens of groundwater. It is assumed that the minimal sanitary waste generated by the development would have little or no impact on it as well.

Initially wastewater treatment and disposal would be handled by individual wastewater systems for each lot, consisting of a septic tank and leach fields. Future treatment and disposal would be via a joint County/State planned treatment plant to be located in the Keauhou area south of Kailua-Kona.

Solid Waste

There are 28 solid waste transfer stations chutes in 21 areas in the County. Refuse generated in the vicinity of the proposed project is transferred to the active landfill site at Kealakehe. This landfill is nearing capacity. The County has recently selected a new landfill site located about 15 miles north of the airport at Puuwaawaa. When this site is developed, the Kealakehe landfill would be closed and would function only as a solid waste transfer station.

Solid waste anticipated to be generated from the activities on the proposed project at build-out is estimated to range from 4,928 to 8,050 pounds per person per day.

Storm Water

This project area is a low rainfall area averaging less than 10 inches annually. There are no naturally occurring or well-defined drainage ways or drainage outlets on-site and surface water run-off is virtually nonexistent.

Surface water run-off will be directed to treatment facilities and disposed of through dry wells. These wells promote all rainfall presently falling on the subject property returning as local recharge to the brackish basal lens. Drainage system would be included as part of the internal infrastructure serving the development.

Roads

If development of the project continues as forecast, the highway may need to be widened to four lanes. Access to site: turnoff from Queen Kaahumanu Highway, within the highway right-of-way.

It is recommended that the proposed intersection of the project access road with Queen Kaahumanu Highway be fully channelized with left-turn storage lanes for safety and to maximize roadway capacity at each approach.

Deceleration and acceleration lanes are also recommended. As future traffic volumes meet signal warrants, the intersection of the project access road and the highway should be signalized.

Primary roadway within site: 60-foot wide right-of-way in compliance with County subdivision ordinance for commercial and industrial subdivisions to include two 12-foot wide lanes of two-inch thick asphalt concrete pavement over a 4-inch thick aggregate base and 6-inch thick sub-base. A paved swale, 18 feet wide, is to be provided on each side of the traffic lanes.

Airports

There was no mention of airports in the EIS.

Harbors

There was no mention of harbors in the EIS.

Parks

There are five public parks in the area of the proposed project: Old Kona Airport Park, Spencer Beach Park, Hapuna State Beach Park, Waikoloa Beach Resort at Anaehoomalu Bay and Wauaaloli Beach Park adjacent to Natural Energy Laboratory.

Acquisition of 615.9 ocean front acres is being completed by the US National Park Service for development of the Kaloko-Honokohau National Historic Park.

Police, Fire and Emergency Services

Police and fire protection for the area are described in the Kohanaiki Resort Community Final Environmental Impact Statement. The proposed project is not expected to affect these services. Fire protection water is provided by new reservoirs to be constructed. Private security contractors may be hired for the resort area.

Visitor Accommodations

Data from the County of Hawaii and North Kona Visitor Accommodation Summaries is more current.

Private Transportation

It is expected that no significant traffic impact on Queen Kaahumanu Highway will occur because of the proposed project, including the scenario of a 1999 fully occupied project site. The results of the analysis indicate that the two lanes of

Queen Kaahumanu Highway will be operating at congested levels even without the proposed project.

Energy Systems

Electrical power to the development facilities would be drawn from the existing Hawaii Electric Light Company (HELCO) overhead transmission lines located along the highway. Sufficient HELCO generating capacity exists to serve the planned facilities: 8-10 watts per square foot for light industrial uses and 12 watts per square foot for commercial uses with a total power requirement for the proposed subdivision to be approximately 9,500 kilowatts.

An electrical substation for conditioning the power to the site could be constructed either on- or off-site possibly in conjunction with other planned developments in the immediate area.

Sewer Systems

Initially, the development would be served by individual septic tanks and leach fields. Following completion of a joint County/State planned West Hawaii wastewater treatment and disposal plant, the proposed project would be connected to that system at the developer's expense.

Coastal Water Quality

The hydrology report done for the project indicates no impact to coastal waters from residential cesspools and agricultural activities, suggesting negligible adverse impacts to coastal waters would occur in association with the proposed project.

Marine Ecosystems Health

See Coastal Water Quality.

Forestry

There was no mention of forests in the EIS.

Air Quality

There are no State or County air quality monitoring stations in the vicinity of the project site. It is presumed that the air quality of the area is good due to present lack of urbanization and low level of vehicular traffic. No significant impacts are expected to the climate or meteorology of the property site or area. Neither is significant impacts expected for long-term air quality. Short-term air quality construction impacts would be minimized by dust control measures (frequent watering) during construction period.

Beach Erosion

There was no mention of beach erosion in the EIS.

Invasive Species

The environment, barren lava beds, is not conducive to vegetation. Few trees were recorded during the inventory. All plants are locally common to the area. No faunal study was conducted on the site, although it is assumed that alien birds, goats, mongoose, rats, mice and cats frequent the area.

Natural / Scenic Resources

The present visual/scenery characteristics are primarily barren lava flows with sparse vegetation. This will change to proposed commercial/light industrial subdivision.

Although the project site appears to be without cultural features, subsurface lava tubes whose entrances are located outside the property boundaries are present. It is likely that heavy grading equipment will break through the thin lava crust, thereby exposing the tubes.

Native Species

No endangered animal or plant species in project site. Only a floral inventory was conducted due to the barrenness of the area. The only viable ecosystem niche is the lava tubes. No mitigating measures were recommended.

County of Hawaii – North Kona – Private Transportation

Present Capacity and Usage

There was no breakdown of private transportation to the district level. See County of Hawaii Private Transportation Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kona – Energy Systems

Present Capacity and Usage

There was no breakdown of energy systems to the district level. See County of Hawaii Energy System Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kona – Sewer Systems

Present Capacity and Usage

There was no breakdown of private sewer systems to the district level. See County of Hawaii Sewage Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kona – Coastal Water Quality

Present Capacity and Usage

There was little information regarding coastal water quality at the district level. See County of Hawaii Coastal Water Quality Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kona – Marine Ecosystem Health

Present Capacity and Usage

There was little information regarding marine ecosystem health at the district level. See County of Hawaii Marine Ecosystem Health Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kona – Forestry / Green Space

Present Capacity and Usage

There was little information regarding forestry at the district level. See State and County of Hawaii Forestry Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kona – Air Quality

Present Capacity and Usage

There was little information regarding air quality at the district level. See County of Hawaii Air Quality Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kona – Beach Erosion

Present Capacity and Usage

There was little information regarding beach erosion at the district level. See State of Hawaii Beach Erosion Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kona – Invasive Species

Present Capacity and Usage

There was little information regarding invasive species at the district level. See State and County of Hawaii Invasive Species Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – North Kona – Other Natural Scenic Resources

Present Capacity and Usage

There was little information regarding various other natural and scenic resources at the district level. This includes native species and extinction issues and riparian / wetlands. See State and County of Hawaii Other Natural and Scenic Resources Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona – Water Quality and Quantity

Present Capacity and Usage

The *County of Hawaii General Plan Revision*, states that the Kona system can be divided into the North Kona and South Kona systems. Although the two systems are connected, the line dividing the two systems runs along the Honalo ahupuaa. These systems are interconnected to transport water from one system to the other. This is done only during emergencies and on a very limited basis.

Four wells and one shaft at Kahaluu and one well each at Holualoa, Keahuolu, Kalaoa, Honokohau and Hualalai supply the North Kona system. The Kahaluu wells provide the bulk of the water for the North Kona system with a total capacity of 14.9 mgd. The estimated safety capacity based on the largest pump on standby, however, is 12.9 mgd. The present average water usage is about 8.5 mgd.

From the Kahaluu wells, the water is pumped to Mamalahoa Highway and fed by gravity to the lower areas. The upper service area extends from Kealakehe School in the north to Kaawaloa in the south where it connects to the South Kona system. The average water consumption in the upper area is approximately 1.85 million gallons per day.

The lower service area is fed by gravity from Kahaluu Reservoir. The system extends from Keahole Airport to Keauhou Bay. The average consumption is 3.564 million gallons per day. The lower area can be roughly divided into three sections: 1) Keahole Airport to Kailua (Casa De Emdeko); 2) Casa De Emdeko to Kahaluu Bay; and 3) the Keauhou Bay area.

The Keahole to Kailua area is fed mainly from a line along Kuakini Highway. The present demand is 1.767 million gallons per day. The second section along Alii Drive presently delivers 0.9153 million gallons per day. The present water demand for the Keauhou area is 0.882 million gallons per day.

The four deep wells at Kahaluu and the Holualoa Wells service the upper service area along Mamalahoa Highway from Honalo to Waiaha. Demand in the area averages 0.6 mgd. The Keahuolu and Honokohau wells supply water along Mamalahoa Highway from Waiaha to Kalaoa and along Palani Road from Mamalahoa Highway to Kealakehe. Demand in these areas average 0.8 mgd. The Hualalai and Kalaoa wells supplement the subdivisions in Kaloko, Kalaoa and Kona Palisades with an additional 0.4 mgd.

The Kahaluu Shaft services the lower service area along the Queen Kaahumanu Highway from Keauhou to the Kona International Airport at Keahole. Demand in

this area averages 5.7 million gallons per day, the highest consumption rate in Kona.

The South Kona system is supplied by three wells at Keei and a well at Halekii, with a total capacity of 5.0 mgd and a safe capacity of 3.0 mgd. The average usage is 0.97 mgd. This system serves the area from Honalo to the Hookena Beach Road junction. ^{27, 2001}

Existing Problems, Issues and Opportunities

See County of Hawaii Water Summary for information.

Future and Planned Usage

According to the *County of Hawaii General Plan Revision*, the following lists future projects for the area:

- Continue to pursue groundwater source investigation, exploration and development in areas that would provide for anticipated growth and an efficient and economic system operation.
- Continue to evaluate growth conditions to coordinate improvements as required to the existing water system in accordance with the North Kona Water System Master Plan. Explore and develop a well in Waiaha. ^{27, 2001}

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision*, the State Department of Land and Natural Resources, Engineering Division also has the capacity to explore and develop new ground water sources. The County has in the past depended upon this agency, formally known as the Division of Water and Land Development, for source development. The development of new sources requires the cooperation between State and County agencies in the delivery of municipal water systems. It is anticipated that these new water sources and systems will further influence land development. ^{27, 2001}

Anticipated Costs for the Future

See County of Hawaii Water Summary for general costs.

Problems, Issues and Opportunities Associated with Costs

As mentioned in the *County of Hawaii General Plan Revision*, one solution to improve systems presently served by only surface sources is to install a well in these systems, use the surface sources when available, and use the pump when the surface sources are deficient. This would minimize operational costs and upgrade systems so they are more dependable. Another solution is to construct large storage reservoirs. These, however, require high initial capital expenditures. ^{27, 2001}

Compare Visitor and Resident Impact

N/A

Major Assumptions

See County of Hawaii Water Summary for assumptions.

County of Hawaii – South Kona – Sewage

Present Capacity and Usage

As stated in *County of Hawaii General Plan*, cesspools and individual wastewater systems are the primary on-site treatment systems in the South Kona area. Several small on-site package plants are utilized by a hospital, a park, and shopping centers. The treated effluent from the packaged plants is discharged into seepage pits or injection wells. ^{27, 2001}

Existing Problems, Issues and Opportunities

See County of Hawaii Sewage Summary for information.

Future and Planned Usage

See County of Hawaii Sewage Summary for information.

Future and Planned Requirements or Changes

Proposed future changes for the South Kona area according to the *County of Hawaii General Plan*, include:

- Continue to work with the Departments of Health and Land and Natural Resources to preserve the Class AA water quality of Kealakekua Bay.
- Continue the current methods of wastewater disposal in unsewered areas in compliance with State and County requirements. This includes individual wastewater systems in low-density developments and private wastewater treatment plants in high-density developments. ^{27, 2001}

Anticipated Costs for the Future

A list of capital improvement projects is listed in the County of Hawaii Sewage Summary.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Sewage Summary for information.

Compare Visitor and Resident Impact

No information was uncovered regarding distinguishing between resident impact and visitor impact on sewage in South Kona.

Major Assumptions

N/A

County of Hawaii – South Kona – Solid Waste Disposal

Present Capacity and Usage

See County of Hawaii and North Kona Solid Waste Summaries for information. Separation of data into discreet district would require further study.

See table 3.09 – Quantities of Solid Waste from Convenience Centers for Year 2000 in the County of Hawaii Solid Waste Disposal Summary for tonnage of solid waste collected at each transfer center.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Change

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona – Storm Water

Present Capacity and Usage

As stated in the *County of Hawaii General Plan Revision*, the South Kona District is geologically young and therefore has few well-defined drainage ways. Overland and stream flows are rare and can only be detected when the rainfall intensity exceeds the rate of infiltration. The district is subject to sudden high intensity rainstorms that can strike anywhere and cause localized flooding. Flood prone areas have been identified by the Natural Resources Conservation Service's *South Kona Flood Hazard Analyses*.^{27, 2001}

Existing Problems, Issues and Opportunities

The following issues were discussed in the *County of Hawaii General Plan Revision*. Coffee and other agricultural lands are subject to erosional damage and roads and culverts are sometimes damaged by high flows and sediment deposition. The Sunset Coffee Mill Flood Prevention Project has provided substantial relief in the Napoopoo area.

There are also records of minor flooding from Kiilae, South Keokea, Honaunau and Wailapa Streams. In general, an area within 150 feet of the stream channels can be considered subject to flooding. Other areas with records of minor flooding include the areas along the Belt Highway in the area of the 1950 lava flows and at Hookena Road.

The entire shoreline is subject to inundation due to high seas and swells caused by hurricanes and distant storms. Coastal areas have received damage to roads, harbor facilities and oceanfront buildings. The shoreline areas are also subject to tsunami activity. This includes the coastline from Napoopoo to Honaunau and the Milolii village area. Tsunami runup has been recorded in two locations along the South Kona shoreline, in Milolii and Hookena.^{27, 2001}

Future and Planned Usage

See County of Hawaii for Storm Water Summary information.

Future and Planned Requirements or Changes

The County of Hawaii General Plan Revision listed the following as proposed future action for the South Kona District:

- Update and implement The *South Kona Flood Hazard Analyses* for the Kealakekua, Napoopoo and Honaunau areas;
- Establish and maintain appropriate vegetative cover in high rainfall, sediment and debris producing areas;
- Encourage the use of natural drainageways as greenways in the development of the region; and

- Maintain and re-establish forest cover in mauka areas to improve the capacity of the ground to absorb heavy rainfall. ^{27, 2001}

Anticipated Costs for the Future

See County of Hawaii for Storm Water Summary information.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

Visitors and residents have little impact on the predominantly natural forces behind flooding.

Major Assumptions

N/A

County of Hawaii – South Kona – Roads

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, the major highway systems on the island are the Hawaii Belt Highway and the Mamalahoa Highway, which combined, link the major towns of all districts except North Kohala. This corridor has aspects of natural beauty that have often been overlooked. To alleviate the problem of distance between east and west Hawaii, a project planned by the Federal, State and County governments would improve the commute along the narrow and winding Saddle Road (Highway 200), the only paved road serving the astronomical observatories on Mauna Kea and Mauna Loa and the Pohakuloa Training Area. This project will upgrade and modernize the Saddle Road to Federal highway design standards and address conflicts in its shared use by the general public and the military. Once completed, the one-way commute time between East and West Hawaii could be reduced by twenty to thirty minutes.

With the cooperation of various State and County agencies and citizen advisory committees, the Long Range Land Transportation Plan for the Island of Hawaii was developed in 1998 to identify the major land transportation improvement needs to support the projected growth of the County to the Year 2020. Various State and County roadway systems located throughout the island were identified for improvement, including the reconstruction of Saddle Road (Highway 200) and the widening of Queen Kaahumanu Highway (Highway 19) to four lanes between Waikoloa Road and Kona International Airport at Keahole.

The Mamalahoa Highway is the only arterial roadway currently serving all of the South Kona District. Many portions of this roadway are narrow and winding. Lands mauka and makai of this roadway are served by private and County-owned collector roadways; many are in poor condition.

Plans are underway for the construction of the new Mamalahoa Highway Bypass Road, which will extend the proposed Kahului-Keauhou Parkway from its terminus at Keauhou, North Kona south to the intersection of Mamalahoa Highway and Napoopoo Road in Captain Cook, South Kona, a distance of approximately five miles. Upon its completion, the combined Alii Highway and Mamalahoa Highway Bypass Road will provide a new north-south alignment from Kailua-Kona to Kealakekua, relieving traffic congestion along the existing Mamalahoa Highway between the communities of Honalo and Captain Cook. The bypass road is being constructed by the developers of the proposed 730-unit Hokulia agricultural subdivision as a requirement of the project's approval by the Hawaii County Council. ^{27, 2001}

Existing Problems, Issues and Opportunities

A problem for the entire island is the need for improved access from the east to west side of Hawaii. Plans to improve Saddle Road would impact the South Kona area. Department of Defense funds may be utilized to improve this access, as access to Pohakuloa Training area is of interest to them.

Future and Planned Usage

The *County of Hawaii General Plan Revision* lists the following as future objectives to improve traffic in South Kona.

- Construct a scenic road from Keauhou above the Kealakekua cliffs to Napoopoo.
- Develop a roadway network circulation plan for South Kona in cooperation with the State Department of Transportation and affected communities. Upon adoption of the plan by the County, the recommendations shall be incorporated on the zone district maps.
- Construct the Mamalahoa Bypass Highway between Keauhou and Captain Cook as a Scenic Corridor, with limited access.
- Improve that portion of the Mamalahoa Highway extending from the North Kona to the Kau Districts.
- Support the installation of suitable bikeways and/or jogging paths.
- Establish a Heritage Corridor on Old Mamalahoa Highway between Hualalai and Honaunau.
- Improve substandard, rural roads. ^{27, 2001}

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

See County of Hawaii Roads Summary.

Problems, Issues and Opportunities Associated with Costs

As stated in the *County of Hawaii General Plan Revision*, roadway systems in Hawaii County are generally financed through Federal, State, and County programs. Recent funding limitations are reducing the availability of such monies. Consequently, additional sources will have to be sought to implement the needed improvements. ^{27, 2001}

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona – Airports

Present Capacity and Usage

As mentioned in the *County of Hawaii General Plan Revision*, except for small private landing strips developed to serve the former sugar plantations, there are no airfields in South Kona. ^{27, 2001}

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona – Harbors

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, there are no shipping terminals and no mention of small boat facilities in the district. ^{27,2001}

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona – Parks

Present Capacity and Usage

County

Recreation areas in the South Kona District are limited, as stated by the *County of Hawaii General Plan Revision*. The recreational facilities for South Kona are as follows:

- The Arthur C. Greenwell Park provides tennis and basketball courts, a newly developed playground, and a lighted playfield;
- Multipurpose facilities at Sgt. Rodney J.T. Yano Memorial Hall are utilized by the County, individuals, and community organizations;
- Kona Scenic Park is a neighborhood park that has a baseball/football field, outdoor courts, and a restroom;
- The Konawaena School in Kealahou has a swimming pool (County-owned and maintained), a gymnasium, baseball and football fields, four tennis courts, and an eight lane all-weather track;
- The schoolyards at Hookena and Honaunau Schools are available for community use. However, the playground and restrooms are available only during school hours. Hookena School has lighted basketball and volleyball courts and a small playfield;
- There are four developed beach parks and two beach park reserves in the district. The County beach parks are small and have limited facilities. Milolii Beach Park (1.2 acres), on the old school grounds, has very limited facilities for camping, picnicking, fishing, and swimming. Hookena Beach Park (3.4 acres) is about 60 feet wide and 600 feet long with outstanding scenic qualities;
- The Puuhonua O Honaunau National Historic Park at Honaunau Bay consists of 182 acres and provides opportunities for fishing, swimming, and picnicking. There are also interpretive trails to significant historic sites. Tide pools are easily accessible and the offshore waters are excellent for snorkeling and diving;
- The State's Napoopoo Beach Park is located south of the Hikiau Heiau; and
- Kealahou Bay State Underwater Park provides opportunities for snorkeling, scuba diving, and glass bottom viewing to observe the marine life in this underwater habitat.^{27, 2001}

State

State owned parks inventoried are:

- An undeveloped beach reserve is located at Manini Point (5.6 acres) on the southern shore of Kealahou Bay;
- At the southeast shore of Kealahou Bay is the Hikiau Heiau State Monument (0.8 acres). It has been incorporated into the presently undeveloped Kealahou Bay State Historical Park; and

- The State's Napoopoo Beach Park is located adjacent and to the south of the Hikiau Heiau. ^{27, 2002}

Federal

The only federal park is Puuhonua O Honaunau National Historic Park at Honaunau Bay. It consists of 182 acres and provides opportunities for fishing, swimming, and picnicking. There are also interpretive trails to significant historic sites. Tide pools are easily accessible and the offshore waters are excellent for snorkeling and diving. ^{27, 2002}

Existing Problems, Issues and Opportunities

The communities in North Kona without recreation areas utilize the Konawaena School facilities.

Future and Planned Usage

Analysis of county documents predicts an increase in usage of South Kona parks. These increases will necessitate the requirements and changes listed in the next section.

Future and Planned Requirements or Changes

The *General Plan* proposed future changes for the South Kona District include:

- Develop recreational facilities in existing communities;
- Establish, in cooperation with the State Department of Education, additional recreational facilities at Konawaena, Honaunau, and Hookena Schools;
- Development of a district recreation center with the cooperation of public and private agencies;
- Development of the coastal area for public recreational use;
- Development of Honomalino Bay as a beach reserve,
- Development of a historic park at Kealakekua Bay and protect historic sites and scenic aspects of the area. Provide a conservation buffer around Kealakekua Bay;
- Development of beach park reserves as natural areas and the improvement of existing beach parks;
- Encourage the further development of Honaunau Bay as a historic park and a beach reserve with recreational opportunities;
- Development of Palemano Point and Hookena areas for public recreational opportunities; and
- Develop and provide cultural facilities and programs. ^{27, 2002}

Anticipated Costs for the Future

See State of Hawaii and County of Hawaii Park Summaries for information.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

See State of Hawaii and County of Hawaii Park Summaries for information.

Major Assumptions

See State of Hawaii and County of Hawaii Park Summaries for information.

County of Hawaii – South Kona – Police, Fire and Emergency Services

Present Capacity and Usage

All data for South Kona Police, Fire and Emergency Services was combined with North Kona Police, Fire and Emergency Services. Please see County of Hawaii Police and Fire Summaries and North Kona Police, Fire and Emergency Services Summary.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona – Visitor Accommodations

Present Capacity and Usage

Data for visitor units is combined and reported in the County of Hawaii and North Kona Visitor Accommodations Summaries.

After analysis of various county documents, it has been concluded that there are limited visitor accommodations in South Kona, which include some bed and breakfast's, one lodge, and one hotel.

Existing Problems, Issues and Opportunities

See Hawaii County Visitor Accommodations for information.

Future and Planned Usage

Various county documents indicated that future developments should blend with the character of the district. The community plans to encourage more bed and breakfast's or small hotel.

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

One opportunity is to require developers to make basic improvements for development.

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona – Private Transportation

Present Capacity and Usage

There was no breakdown of private transportation to the district level. See County of Hawaii Private Transportation Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona – Energy Systems

Present Capacity and Usage

There was no breakdown of energy systems to the district level. See County of Hawaii Energy System Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona – Sewer Systems

Present Capacity and Usage

There was no breakdown of private sewer systems to the district level. See County of Hawaii Sewage Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona – Coastal Water Quality

Present Capacity and Usage

There was little information regarding coastal water quality at the district level. See County of Hawaii Coastal Water Quality Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona – Marine Ecosystem Health

Present Capacity and Usage

There was little information regarding marine ecosystem health at the district level. See County of Hawaii Marine Ecosystem Health Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona– Forestry / Green Space

Present Capacity and Usage

There was little information regarding forestry at the district level. See State and County of Hawaii Forestry Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona– Air Quality

Present Capacity and Usage

There was little information regarding air quality at the district level. See County of Hawaii Air Quality Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona – Beach Erosion

Present Capacity and Usage

There was little information regarding beach erosion at the district level. See State of Hawaii Beach Erosion Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona – Invasive Species

Present Capacity and Usage

There was little information regarding invasive species at the district level. See State and County of Hawaii Invasive Species Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – South Kona – Other Natural and Scenic Resources

Present Capacity and Usage

There was little information regarding various other natural and scenic resources at the district level. This includes native species and extinction issues and riparian / wetlands. See State and County of Hawaii Other Natural and Scenic Resources Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Kau – Water Quality and Quantity

Present Capacity and Usage

As stated in the *County of Hawaii General Revision*, the water source for the Pahala area is Alili Tunnel and a deep well source. The present average consumption of the Pahala system is 0.23 mgd.

The sources supplying Waiohinu, Naalehu and South Point are Haao Springs, Mountain House Tunnel Spring and a deep well in Naalehu. The water from the Mountain House Tunnel is piped to Haao Spring and distributed to South Point, Waiohinu, and Naalehu on separate lines. The Department of Water Supply has a license with the State that allows the department to obtain water from the Mountain House Tunnel.

The Waiohinu system receives its water supply from an 8-inch line from Haao Springs. Presently, the average consumption is 0.12 mgd.

The Naalehu system receives its water supply from the Waiohinu system. The former sugar plantation has dedicated the system within Naalehu Village to the County. The Naalehu deep well with a capacity of 0.54 mgd supplements the system. The average water consumption is 0.08 mgd.

The present average consumption on the South Point system is 75,730 gallons per day.

The Kau area has several large subdivisions still dependent on individual roof catchments. ^{27, 2001}

Existing Problems, Issues and Opportunities

See County of Hawaii Water summary for information.

Future and Planned Usage

The *County of Hawaii General Revision*, lists the following as future projects to pursue in the future:

- Provide additional water system improvements for the currently serviced areas of Naalehu, Waiohinu, and Pahala.
- Pursue groundwater source investigation, exploration and well development at Ocean View, Pahala, and Waiohinu.
- Continue to evaluate growth conditions to coordinate improvements as required to the existing water system.
- Investigate alternative means to finance the extension of water systems to subdivisions that rely on catchments. ^{27, 2001}

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision*, the State Department of Land and Natural Resources, Engineering Division also has the capacity to explore and develop new ground water sources. The County has in the past depended upon this agency, formally known as the Division of Water and Land Development, for source development. The development of new sources requires the cooperation between State and County agencies in the delivery of municipal water systems.

The exploration for new water sources will continue. It is anticipated that these new water sources and systems will further influence land development. ^{27, 2001}

Anticipated Costs for the Future

According to the *County of Hawaii: 1999 - 2000 Annual Report*, the following major capital improvement projects were under construction, were in various stages of contract award, or, were in the planning and design phases during the fiscal year (1999-2000) in KA'U:

Pahala Exploratory Well No. 2

Planning, design, land acquisition and permitting requirements were in progress for this fiscal year. This exploratory drilling is the first phase. Subsequent phase is for the outfitting of this well into a production source. The completion of both phases will provide for a backup source for our Pahala Water System. (Estimated Cost: \$1,000,000) ^{51, 2000}

Problems, Issues and Opportunities Associated with Costs

As mentioned in the *County of Hawaii General Plan Revision*, one solution to improve systems presently served by only surface sources is to install a well in these systems, use the surface sources when available, and use the pump when the surface sources are deficient. This would minimize operational costs and upgrade systems so they are more dependable. Another solution is to construct large storage reservoirs. These, however, require high initial capital expenditures. ^{27, 2001}

Compare Visitor and Resident Impact

There was no information distinguishing visitor use from residential use uncovered.

Major Assumptions

See County of Hawaii Water Summary for Assumptions.

County of Hawaii – Kau – Sewage

Present Capacity and Usage

As mentioned in the *County of Hawaii General Plan Revision*, many small communities characterize the Kau district, the largest of which are Naalehu and Ocean View. The County has no sewerage system in the Kau district. A private system exists for the Punaluu Resort development at Punaluu. Most residents are served by individual waste disposal systems. The cesspools and septic systems presently in use in the Ka'u area function adequately. ^{27, 2001}

Existing Problems, Issues and Opportunities

While there is a private sewage system in operation, most homeowners have individual wastewater disposal systems. ^{27, 2001} Relying on the adequacy of these systems is reactive.

Future and Planned Usage

As stated in the *County of Hawaii General Plan Revision*, considering the low density and wide distribution of housing units and the relatively small population growth anticipated, individual treatment units will continue to be utilized. The County will work closely with landowners to insure development of adequate sewerage treatment facilities. ^{27, 2001}

Future and Planned Requirements or Changes

A list of capital improvement projects is listed in the County of Hawaii Sewage Summary.

Anticipated Costs for the Future

A list of capital improvement projects is listed in the County of Hawaii Sewage Summary.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Sewage Summary for information.

Compare Visitor and Resident Impact

No information was uncovered regarding distinguishing between resident impact and visitor impact on sewage in Kau.

Major Assumptions

N/A

County of Hawaii – Kau – Solid Waste Disposal

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, the District of Kau operates two solid waste transfer stations, which are located at Waiohinu and Pahala. Prior to the construction of the transfer stations the solid waste was disposed of on-site at those locations. The Pahala operation consisted of 'open gulch dumping' at a plantation-owned site. ^{27, 2001}

See table 3.09 – Quantities of Solid Waste from Convenience Centers for Year 2000 in the County of Hawaii Solid Waste Disposal Summary for tonnage of solid waste collected at each transfer center.

Existing Problems, Issues and Opportunities

See County of Hawaii Solid Waste Summary for information.

Future and Planned Usage

As mentioned in the *County of Hawaii General Plan Revision*, a solid waste transfer station has been proposed for the Ocean View area. ^{27, 2001}

Future and Planned Requirements or Changes

See County of Hawaii Solid Waste Summary for information.

Anticipated Costs for the Future

No costs were documented for the new transfer station. See County of Hawaii Solid Waste Summary for information.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Solid Waste Summary for information.

Compare Visitor and Resident Impact

See County of Hawaii Solid Waste Summary for information.

Major Assumptions

See County of Hawaii Solid Waste Summary for information.

County of Hawaii – Kau – Storm Water

Present Capacity and Usage

As stated in the *County of Hawaii General Plan Revision*, the Kau district can be divided into three separate storm water regions. The northeastern region is dominated by the Ka'u desert. The average annual rainfall here is approximately 20 inches. There are few defined stream channels, none of which are perennial. The soils are very shallow, covering rough lava flows that are extremely permeable.

The southwestern region that extends westerly from South Point Road is characterized by moderate slopes, extremely permeable soils, and relatively young lava flows. The median annual rainfall varies from less than 20 inches at South Point to 75 inches at the 5,000-foot elevation. There is little evidence of stream flow within this region and no record of damage from flood flows other than the flooding of roads within the Hawaiian Ocean View Estates subdivision.

The central region contains the communities of Pahala, Naalehu, and Waiohinu. There are several streams within the region, none of which are perennial. Flood flows occur when the soils are saturated and rainfall intensity exceeds the rate of infiltration. Storm runoff descends steep slopes behind the communities and causes flooding and deposition of sediment and debris. ^{27, 2001}

Existing Problems, Issues and Opportunities

According to the *County of Hawaii General Plan Revision*, there are three existing flood control measures in this district. The first is a floodwater channel and debris basin in Naalehu was completed in 1965 with additional improvements and modifications completed in 1969 and 1982. The second project is within the town of Pahala and consists of diversion channels in the former sugar cane fields above the town and the improvement of Paauau Stream. The third project is within the town of Waiohinu, and is designed to collect flows from the watershed areas and transport them around Waiohinu for disposal in the rock land area. This project has been implemented, but needs additional improvements.

Although major flooding within the communities has been addressed, flash flooding along the Hawaii Belt Road still occurs. The Piikea, Keaiwa, Paauau, Punaluu, Hilea, Kawaa, and Honuapo streams often exceed the capacity of the existing bridges and culverts and flood the roadway. This temporarily closes the road and effectively cuts off this district from the Puna, Hilo and Kona districts.

The exception is the Piikea ford area where the State Department of Transportation completed the construction of a new Piikea bridge in 1998. In addition to the bridge, improvements to the Piikea ford are proposed with the construction of three large box culverts. At the Paauau stream, there are plans

for the construction of a new bridge. There are also plans for the replacement of the Ninole Bridge located just past Punaluu. A new culvert is proposed in the Kawaa flats region.

The entire coastline of the district is subject to tsunami and high seas activity, as seen from past tsunami activity at the Punaluu and Honuapo Bay areas. ^{27, 2001}

Future and Planned Usage

See County of Hawaii for Storm Water Summary information.

Future and Planned Requirements or Changes

According to the County of Hawaii General Plan Revision, proposed changes for the Kau District include:

- Improve and upgrade existing flood control measures as necessary;
- Continue proper soil conservation measures to complement the existing systems; and
- Investigate potential solutions to prevent the closure of the Hawaii Belt Road due to flooding. ^{27, 2001}

Anticipated Costs for the Future

See County of Hawaii for Storm Water Summary information.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

Visitors and residents have little impact on the predominantly natural forces behind flooding.

Major Assumptions

N/A

County of Hawaii – Kau – Roads

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, the primary highway through the Kau district is the Mamalahoa Highway. Certain portions of this highway system are narrow with sharp vertical and horizontal curves and relatively short sight distance. Flooding also occurs in certain areas. This district also has an intricate system of former plantation and older subdivision roads. The majority of the private roads in the large subdivisions are cinder-surfaced and/or oil-treated and lack adequate maintenance. ^{27, 2001}

Existing Problems, Issues and Opportunities

Problems for Kau roads include improper banking, safety issues, localized flooding of roads, and aging or ill maintained roads, according to the *General Plan*.

Future and Planned Usage

The following future items are listed in the *County of Hawaii General Plan Revision*:

- Continue to improve Mamalahoa Highway, realigning where necessary.
- Install culverts and construct drainage channels and other related improvements.
- Encourage the improvement of substandard subdivision roads.
- Explore alternatives and means to establish an evacuation route through Hawaiian Ocean View Estates Subdivision to Highway 11, in cooperation with the residents of Ocean View. ^{27, 2001}

Future and Planned Requirements or Changes

See Future and Planned Usage for Kau Roads.

Anticipated Costs for the Future

See County of Hawaii Roads Anticipated Costs for the Future section.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Roads Summary.

Compare Visitor and Resident Impact

There is not enough information to distinguish between resident and visitor impacts on Kau roads.

Major Assumptions

See County of Hawaii Introduction for population and visitor projections. See County of Hawaii Roads Summary.

County of Hawaii – Kau - Airports

Present Capacity and Usage

As mentioned in the *County of Hawaii General Plan Revision*, there are no airfields in Kau, with the exception of small private landing strips developed to serve the former sugar plantations. However, there will be need for general aviation facilities should growth within the district demand such facilities. ^{27, 2001}

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

According to the *County of Hawaii General Plan Revision*, future changes include providing general aviation facilities and launching activities as the need arises. ^{27, 2001}

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

As these are private air facilities the DOT is not required to fund or maintain any of these improvements. Currently the DOT is not planning any acquisition programs to acquire such facilities.

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Kau – Harbors

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, there are presently no terminal facilities in Kau. However, there will be need small boat harbor facilities should growth within the district demand such facilities. ^{27, 2001}

Existing Problems, Issues and Opportunities

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Kau – Parks

Present Capacity and Usage

The majority of information for parks in Kau comes from *County of Hawaii General Plan Revision*. Naalehu Park, Waiohinu and Pahala community parks and their schoolyards provide community recreation areas. There is a plantation community center in Pahala and County community centers in Naalehu and Pahala that are used for community and private functions. In addition, there is a County swimming pool at the Kau High School campus in Pahala. Several neighborhood park sites have been reserved in subdivisions in the Kahuku area. The new Kahuku Park is on a four-acre site in Ocean View. The new park will include a ball field, basketball court, playground, pavilion, and restroom facilities.

The Kau district has a lack of beaches with safe swimming areas. The two developed beach parks in Kau, Whittington Beach Park (0.8 acre) in Honuapo Bay and Punaluu Black Sand Beach Park (6.0 acres) are relatively small for the number of visitors.

Other parks in the district include:

- South Point (Ka Lae) - unique scenic landscape, historic sites, and good fishing
- Department of Hawaiian Homes Lands' Kamaoa park - 28.8 acres undeveloped
- Manuka State Wayside - botanical garden, picnicking facilities, rest stop for travelers
- Kilauea State Recreation Area - near the national park boundary, provides one furnished cabin
- Hawaii Volcanoes National Park - 229,176 acres, features geologic phenomena, native Hawaiian species of flora and fauna, and wildlife. Picnic, camping, and hiking trails are located throughout the park. ^{27, 2001}

State

South Point (Ka Lae) offers unique scenic landscape, historic sites, and good fishing. The Department of Hawaiian Homes Lands' Kamaoa park site, consisting of 28.8 acres, is undeveloped.

Manuka State Wayside, a botanical garden with picnicking facilities, serves as a rest stop for travelers. The Kilauea State Recreation Area near the national park boundary in Volcano has one furnished cabin.

There are also forest reserves in the district, but they have poor access and lack facilities. ^{27, 2001}

Federal

The Hawaii Volcanoes National Park consists of 229,176 acres and features geologic phenomena and wildlife. Facilities for picnicking, camping and hiking trails are located throughout the park.^{27, 2001}

Existing Problems, Issues and Opportunities

Whittington Beach Park is scenic and used for picnicking, camping, and a rest stop for travelers however; swimming is hazardous due to rough seas. The black sand beach of Punaluu is an easily accessible swimming area that is heavily used. Unfortunately, the beach is often crowded and parking is inadequate.

Future and Planned Usage

Future usage for the Kau District include:

- Develop parks in Ocean View, commensurate with population growth; and
- Restoration of Ninole Pond as a recreation area.
- Recommend the development of Kaalualu Bay as a remote camping-beach park;
- Encourage the development of a swimming facility in Naalehu;

Future and Planned Requirements or Changes

Planned changes for the Kau District include:

- Encourage the establishment of the Punaluu-Ninole Springs region as a recreation area;
- Encourage the State Department of Hawaiian Homes Lands to develop the South Point area for recreational opportunities;
- Encourage the State Department of Land and Natural Resources to develop wilderness recreation uses of the Kapua-Manuka Forest Reserve;
- Acquire land surrounding Whittington Beach Park to allow for expansion of a parking area.^{27, 2001}

Anticipated Costs for the Future

See State of Hawaii and County of Hawaii Park Summaries for cultural and recreational budget.

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

Some beaches maybe overcrowded due to a high of volume residential and tourist utilization.

Major Assumptions

See State of Hawaii and County of Hawaii Park Summaries for information.

County of Hawaii – Kau – Police, Fire and Emergency Services

Present Capacity and Usage

The following was taken from County of Hawaii General Plan Revision:

Fire and EMS

There is 24-hour fire and EMS operation in Naalehu and a 24-hour facility located in Pahala. Twenty-four hour, on-call volunteer services are provided within Ocean View, Discovery Harbor, Naalehu and Pahala. ^{27, 2001}

Police

As stated in the *County of Hawaii General Plan Revision*, a police station in Naalehu serves the entire Kau district. A substation is located in Ocean View. ^{27, 2001}

Existing Problems, Issues and Opportunities

See County of Hawaii Police, Fire and EMS Summaries for details.

Future and Planned Usage

See County of Hawaii Police, Fire and EMS Summaries for details.

Future and Planned Requirements or Changes

As mentioned in the *County of Hawaii General Plan Revision*, fire protection and emergency medical services for Ocean View, Naalehu and Pahala will continue to be encouraged. Additionally, a joint police-fire facility will be considered. ^{27, 2001}

Anticipated Costs for the Future

See County of Hawaii Police, Fire and EMS Summaries for details.

Problems, Issues and Opportunities Associated with Costs

See County of Hawaii Police, Fire and EMS Summaries for details.

Compare Visitor and Resident Impact

See County of Hawaii Police, Fire and EMS Summaries for details.

Major Assumptions

See County of Hawaii Police, Fire and EMS Summaries for details.

County of Hawaii – Kau – Visitor Accommodations

Present Capacity and Usage

According to the *County of Hawaii General Plan Revision*, the Kau District of the Big Island is one of the quietest locations on the Big Island. There are limited visitor accommodations in the Punaluu and Volcano areas. The area has no large hotels or resorts and does not see much tourism.

The main attractions include South Point, the southernmost location of the United States, and Punaluu Beach, a black sand beach. There are currently 45 acres zoned for resort use. ^{27,2001}

Existing Problems, Issues and Opportunities

Current visitor accommodations are in need of renovation. ^{27,2001}

Future and Planned Usage

Future plans including developments to blend the character of the district along with encouraging bed and breakfast accommodations or small hotel development. ^{27,2001}

Future and Planned Requirements or Changes

Renovation of Punaluu Resort is needed along with planned expansion. ^{27,2001}

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

An opportunity available is to require developers to make basic improvements for developments to the area. ^{27,2001}

Compare Visitor and Resident Impact

There is very little visitor or residential impact to visitor accommodations in this area. ^{27,2001}

Major Assumptions

N/A

County of Hawaii – Kau – Private Transportation

Present Capacity and Usage

There was no breakdown of private transportation to the district level. See County of Hawaii Private Transportation Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Kau - Energy Systems

Present Capacity and Usage

There was no breakdown of energy systems to the district level. See County of Hawaii Energy System Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Kau – Sewer Systems

Present Capacity and Usage

There was no breakdown of private sewer systems to the district level. See County of Hawaii Sewage Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Kau – Coastal Water Quality

Present Capacity and Usage

There was little information regarding coastal water quality at the district level. See County of Hawaii Coastal Water Quality Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Kau – Marine Ecosystem Health

Present Capacity and Usage

There was little information regarding marine ecosystem health at the district level. See County of Hawaii Marine Ecosystem Health Summary for information and Environmental Introduction.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Kau – Forestry / Green Space

Present Capacity and Usage

There was little information regarding forestry at the district level. See State and County of Hawaii Forestry Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Kau – Air Quality

Present Capacity and Usage

There was little information regarding air quality at the district level. See County of Hawaii Air Quality Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Kau – Beach Erosion

Present Capacity and Usage

There was little information regarding beach erosion at the district level. See State of Hawaii Beach Erosion Summary for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Kau – Invasive Species

Present Capacity and Usage

There was little information regarding invasive species at the district level. See State and County of Hawaii Invasive Species Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

County of Hawaii – Kau – Other Natural and Scenic Resources

Present Capacity and Usage

There was little information regarding various other natural and scenic resources at the district level. This includes native species and extinction issues and riparian / wetlands. See State and County of Hawaii Other Natural and Scenic Resources Summaries for information.

Existing Problems, Issues and Opportunities

N/A

Future and Planned Usage

N/A

Future and Planned Requirements or Changes

N/A

Anticipated Costs for the Future

N/A

Problems, Issues and Opportunities Associated with Costs

N/A

Compare Visitor and Resident Impact

N/A

Major Assumptions

N/A

ID	TITLE	DATE	AGENCY
1	Maui Community Plan Update Infrastructure Assessment	September-92	Maui - Department of Planning
2	West Maui Master Plan for Wastewater Collection, Treatment and Disposal	June-90	Maui - Department of Public Works
3	Maui Public Facilities Assessment; Final Report	July-92	Maui - Department of Planning
4	Kauai General Plan	November-00	Kauai - Department of Planning
6	State Land Use District Boundary Review: Oahu	January-92	State - Office of Planning
8	State Land Use District Boundary Review: Executive Summary, Kauai	January-92	State - Office of Planning
9	State Land Use District Boundary Review: Kauai	January-92	State - Office of Planning
10	State Land Use District Boundary Review: Executive Summary: Maui, Molokai, Lanai	January-92	State - Office of Planning
11	State Land Use District Boundary Review: Maui, Molokai, Lanai	January-92	State - Office of Planning
12	State Land Use District Boundary Review: Executive Summary, Hawaii	January-92	State - Office of Planning
13	State Land Use District Boundary Review: Hawaii	January-92	State - Office of Planning
14	DUPLICATE The General Plan of the County of Maui: 1990 Update	June-90	Maui - Department of Planning
15	DUPLICATE The General Plan of the County of Maui: 1990 Update	November-90	Maui - Department of Planning
16	Lahaina Community Plan of the County of Maui	December-83	Maui - Department of Planning
17	Kahoolawe Community Plan of County of Maui	May-95	Maui - Department of Planning
18	Kihei-Makena Community Plan: County of Maui	March-98	Maui - Department of Planning
19	DUPLICATE The General Plan of the County of Maui: 1990 Update	September-90	Maui - Department of Planning
20	Maui County Community Plan Update Program Socio-Economic Forecast Report	July-92	Maui - Department of Planning
21	DUPLICATE - General Plan 1990: County of Maui	January-90	Maui - Department of Planning
22	Maui County Community Plan Update Program Socio-Economic Forecast Report: Final Report	January-94	Maui - Department of Planning
23	DUPLICATE - Kihei-Makena Community Plan: County of Maui	March-98	Maui - Department of Planning
24	DUPLICATE Molokai Community Plan: County of Maui	January-84	Maui - Department of Planning
25	DUPLICATE - Makawao-Pukalani-Kula Community Plan: County of Maui	October-81	Maui - Department of Planning
26	DUPLICATE - Lanai Community Plan: County of Maui	April-83	Maui - Department of Planning
27	County of Hawaii General Plan Revision	December-01	Hawaii - Department of Planning
28	General Plan: City and County of Honolulu	January-92	Honolulu - Department of Planning and Permitting

29	The General Plan of the County of Maui	April-93	Maui - Department of Planning
30	Lanai Community Plan	December-98	Maui - Department of Planning
31	The Updated Wailuku-Kahului Community Plan	December-00	Maui - Department of Planning
32	DUPLICATE Kihei-Makena Community Plan	March-98	Maui - Department of Planning
33	Makawao-Pukalani-Kula Community Plan	July-96	Maui - Department of Planning
34	Paia-Haiku Community Plan	May-95	Maui - Department of Planning
35	West Maui Community Plan	February-96	Maui - Department of Planning
36	Hana Community Plan	July-94	Maui - Department of Planning
37	State Airports, Harbors and Highways	January-01	State - Office of Planning
38	Department of Water Supply: Water Quality Report for 2000	July-01	Maui - Department of Water Supply
39	The County of Hawaii Annual Report 1999-2000	June-00	Hawaii - Department of Planning
40	Department of Water Supply - County of Maui: Annual Report. Fiscal Year Ending June 30,2000.	June-00	Department of Water Supply
42	Statewide Framework for Updating the Hawaii Water Plan	February-00	Commission on Water Resource Management
43	Water Resource Planning	February-00	Commission on Water Resource Management
44	Water Resources on Oahu	January-01	Honolulu - Department of Planning and Permitting
45	Welcome to the Garden Island of Kauai - Access to Kauai County Agencies	January-00	Kauai - Department of Planning
46	Report to the Governor on the Effectiveness of the Capacity Development Strategy	July-01	Hawaii - Department of Planning
47	Water Plan 2020 - Department of Water: County of Kauai	March-01	Kauai - Department of Water Supply
48	Safe Drinking Water Query Results	April-02	Honolulu - Department of Planning and Permitting
49	Maui County: State of Hawaii	January-00	Maui - Department of Planning
50	County of Maui: Fiscal Year 2002 Budget	March-01	Maui - Department of Planning
51	County of Hawaii: 1999 - 2000 Annual Report	September-00	County of Hawaii

52	DEPARTMENT OF PARKS AND RECREATION	November-01	Honolulu - Department of Planning and Permitting
53	Honolulu Police Department 2000 Annual Report	September-00	Honolulu - Department of Planning and Permitting
54	Fiscal Year 2002 Operating Budget-Maui County	July-01	Maui - Department of Water Supply
55	Survey of Cruiseship Passengers in Hawaii-Fall 2000	March-01	State - Office of Planning
56	The Integrated Solid Waste Management Plan	January-91	State - Office of Planning
57	Hawaiian Streams: The Mauka to Makai Connection	April-02	State - Office of Planning
58	REPORT TO THE TWENTY-FIRST LEGISLATURE REGULAR SESSION OF 2002 ON PROGRESS REPORT ON EXPENDITURES AND EFFECTIVENESS OF INVASIVE SPECIES PROGRAMS FOR THE PERIOD JULY 1, 2001 TO OCTOBER 31, 2001	November-01	State - Office of Planning
59	PORT Hawaii Commercial Harbors System HANDBOOK	January-93	State - Office of Planning
61	Annual Report to the Twenty-First Legislature-Regular Session 2002/Hawaii Coastal Zone Management	December-01	State - Office of Planning
62	Hawaii Tourism Authority: 2001 Annual Report to the Hawaii State Legislature	December-01	State - Hawaii Tourism Authority
63	Joint State/County Maui Interim Transportation Plan	January-02	Maui - Department of Public Works
64	The State of Hawaii Data Book 2000: A Statistical Abstract	2001	State - Department of Business, Economic Development and Tourism
65	Long-Range Financial Plan and Solid Waste User Free Study	April-99	Honolulu - Department of Environmental Services
66	Koolaupoko: Sustainable Communities Plan	August-00	Honolulu - Department of Planning and Permitting
67	Annual Summary Hawaii Air Quality Data: 2000	January-00	State - Department of Health
68	Report to Legislature, Progress on the Study, Planning for Sustainable Tourism in Hawaii, January 2002	January-02	State - Department of Business, Economic Development and Tourism
69	DUPLICATE Draft Hawaii Statewide Transportation Plan	March-02	State - Office of Planning

70	Statewide Transportation Improvement Program: Fiscal Years 2002, 2003, and 2004	October-01	State - Office of Planning
71	Alternative Funding Mechanisms for Environmental Programs	January-02	State - Office of Planning
72	Hawaii Trail Analysis: Survey & Risk Management Data Profile	March-01	State - Department of Land and Natural Resources
74	Environmental Report Card 2001	January-01	State - Environmental Council
75	Identification of Rivers and Streams Worthy of Protection	November-01	State - Department of Land and Natural Resources
76	Potential Sources of Permanent Funding; REPORT TO THE TWENTY-FIRST LEGISLATURE REGULAR SESSION OF 2002 ON PROGRESS REPORT ON EXPENDITURES AND EFFECTIVENESS OF INVASIVE SPECIES PROGRAMS FOR THE PERIOD JULY 1, 2001 TO OCTOBER 31, 2001	January-02	State - Office of Planning
77	State Energy Resources Coordinator: Annual Report 2001	January-01	State - Department of Business, Economic Development and Tourism
78	2000 State of Hawaii: Facts and Figures	January-01	State - Department of Business, Economic Development and Tourism
79	150 Years of Aloha: Hawaii State Department of Health 2001 Annual Report	January-01	State - Department of Health
80	2001 Visitor Plant Inventory	April-02	State - Department of Business, Economic Development and Tourism
81	Task Force to Create a Master Plan for Water Quality and Flood Mitigation for Waimanalo	December-01	State - Department of Land and Natural Resources
82	What Could Hawaii Do With Teaming With Wildlife (TWW) Dollars?	January-00	Hawaii - Department of Planning
83	Relating to Watershed Protection	October-01	State - Department of Land and Natural Resources
84	Population and Economic Projections for the State of Hawaii to 2025	February-00	State - Department of Business, Economic Development and Tourism
85	Progress Report on Expenditures and Effectiveness of Invasive Species Programs	November-01	State - Department of Land and Natural Resources

86	Report to the Twenty-First Legislature Relating to Integrated Solid Waste Management	September-01	State - Department of Health
87	Annual Report to the Twenty-First Legislature Regular Session of 2002 Relating to the Forest Stewardship Program	November-01	State - Department of Land and Natural Resources
88	Analysis of Once-Per-Week Refuse Collection	April-99	Honolulu - Department of Environmental Services
89	An Inventory of Non-Native Timber Resources on Hawaii - A Supplement to the 1999 Waiakea and Hamakua Timber Inventory	January-01	State - DLNR Division of Forestry and Wildlife
90	Annual Report: Fiscal Year 1999-2000 - Public Utilities Commission	December-00	State - Public Utilities Commission
91	Hawaii Tourism Product Assessment	June-99	State - Hawaii Tourism Authority
92	Central Oahu Sustainable Communities Plan	February-02	Honolulu - Department of Planning and Permitting
93	East Honolulu Sustainable Communities Plan	April-01	Honolulu - Department of Planning and Permitting
94	Ewa Development Plan	August-97	Honolulu - Department of Planning and Permitting
95	Koolau Loa Sustainable Communities Plan	October-99	Honolulu - Department of Planning and Permitting
96	North Shore Sustainable Communities Plan	July-00	Honolulu - Department of Planning and Permitting
97	Waianae Sustainable Communities Plan	July-00	Honolulu - Department of Planning and Permitting
99	Annual Report to the Twenty-First Legislature 2001 Regular Session on Act 152 SLH 2001 (HB 2835, HD2, SD2, CD1) RELATING TO WATERSHED PROTECTION	October-02	State - DLNR Division of Forestry and Wildlife
100	Upcountry Town Center, Pukulani, Maui, Hawaii, Draft Environmental Impact Statement	April-02	Maui - Department of Planning
101	DRAFT Hawaii Statewide Transportation Plan, State of Hawaii Department of Transportation	March-02	State - Department of Transportation - Highway Division
102	Department of Transportation Annual Report 2000	January-00	State - Department of Transportation
103	Hawaii Coastal Erosion Management Plan (COEMAP)	January-00	State - Department of Land and Natural Resources

104	DRAFT Kailua Bay Advisory Council Master Plan	March-02	Kailua Bay Advisory Council
105	Final Technical Program Report	March-01	Kailua Bay Advisory Council
107	2000 Annual Visitors Research Report	2000	State - Department of Business, Economic Development and Tourism
108	ANNUAL REPORT TO THE TWENTY-FIRST LEGISLATURE REGULAR SESSION OF 2002 ON THE STATUS OF THE ISSUANCE OF INCIDENTAL TAKE LICENSES FOR ENDANGERED, THREATENED, PROPOSED, AND CANDIDATE SPECIES; AND THE CONDITION OF THE ENDANGERED SPECIES TRUST FUND	November-01	State- DLNR Division of Forestry and Wildlife
111	DUPLICATE Annual Summary Hawaii Air Quality Data	January-00	State - Department of Health (DOH)
112	Forest Inventory Information Needs Assessment for the State of Hawaii with Emphasis on the Island of Maui	April-00	USDA Forest Service
113	Observation of Asian Pollution Over Hawaii	March-01	Hawaii Institute of Geophysics and Planetology
114	Indicators of Environmental Quality	January-02	State - Department of Health (DOH)
115	Reply to ASK-AN-EARTH-SCIENTIST	January-01	Hawaii Institute of Geophysics and Planetology
117	Breathing Protection During Volcanic Air Pollution	January-02	American Lung Association
118	Maui Clean Air Coalition	December-98	Maui Clean Air Coalition
119	DUPLICATE WORLD HEALTH ORGANIZATION CITIES AND A HEALTH RESEARCH PROGRAM	March-00	City and County of Honolulu
120	What is baseline Air Quality?	January-00	Climate Monitoring and Diagnostics Laboratory
121	THE STATE OF THE AIR 2001 IN HAWAII	January-02	American Lung Association
122	Environmental Health - Clean Air Branch	January-02	State - Department of Health
123	Watershed Protection and Management Program	October-01	State - DLNR Division of Forestry and Wildlife
124	USGS Geological Survey Programs in Hawaii & the Pacific	November-96	U.S. Geological Survey
125	Rx for Hawaii's Dry Forests: It's Not Limiting Grazing	June-00	Society of American Foresters

126	The Lowland Mesic Forests	March-02	State - DLNR Division of Forestry and Wildlife
127	Final Statewide Airport System Plan	June-98	State - Department of Transportation
128	Hawaii Sea Grant College Program	May-02	County of Hawaii
129	Division of Boating and Ocean Recreation - DBEDT Sustainable Tourism Analysis	May-02	State - Department of Land and Natural Resources
130	Honolulu Fire Department Response to the DBEDT Sustainable Tourism Analysis	May-02	Honolulu - Fire Department
131	State Parks of the Islands	January-02	State - Department of Land and Natural Resources
132	Maui Invasive Species Committee (MISC) Pulling Together Initiative - 2002 Project Proposal	October-02	US Fish and Wildlife - Ecological Division
134	Impact on Alien Plants on Hawaii's Native Biota	May-98	University of Hawaii
135	Annual Report - Department of Public Works & Waste Management - 2000-2001	January-02	Maui - Department of Public Works
136	National Park Service Statistical Abstract 2001	January-02	National Park Service
137	Analysis of Renewable Portfolio Standard Options for Hawaii.	March-01	State - Department of Business, Economic Development and Tourism
139	The Eight Main Hawaiian Island and CRAMP study sites	September-00	Hawaii Institute of Marine Biology
140	Molokai Community Plan 2001	December-01	Maui - Department of Planning
141	Fiscal Year 2001 Budget	May-02	Maui - Department of Public Works
142	County of Hawaii Data Book - 2001	October-01	County of Hawaii
144	Big Island of Hawaii Flora and Fauna	January-01	Hawaii State Vacation Planner
145	Mauna Kea Silversword	January-02	National Wildlife Federation
146	Hawaii's Endangered Species	January-02	Maui - Department of Public Works
147	FY 2003 Budget	March-02	Maui - Department of Planning

148	The Hawaiian Endangered Bird Conservation Program The Hawaiian Endangered Bird Conservation The Hawaiian Endangered Bird Conservation Program Five-Year Program (2001-2005) Five-Year Workplan (2001 – 2005)	October-01	State - Department of Land and Natural Resources
149	Places We Protect - Watershed Partnerships and Preserves	January-02	The Nature Conservancy
150	The Dirty Dozen: America's Least Wanted	January-01	Nature Serve
151	The Hawaiian Ecoregion: A Crucible of Evolution	September-96	Sierra Club, Hawaii Chapter
152	Hawaii's Endangered Species	March-00	Bishop Museum
153	Water for Life: The History and Future of Water on Oahu.	January-02	Honolulu - Board of Water Supply
154	Report to the World Health Organization	March-00	City and County of Honolulu
155	Vision Projects FY2002	March-02	City and County of Honolulu
156	H3: The Island Interstate	August-93	U.S. Department of Transportation
157	Appendix for Hawaii	January-01	Surfrider Foundation
158	Oahu Water Recycling May Expand	August-01	Honolulu Star Bulletin
159	Recycling Water is Smart Thinking	August-01	Honolulu Star Bulletin
160	About Honolulu's Clean Water Program	January-02	City and County of Honolulu
161	Mayor Jeremy Harris' State of the City Address	January-02	Honolulu Advertiser
162	Recreation	January-01	Hawaii State Vacation Planner
163	Oahu in Focus	January-02	Destinations2go.com
164	Department Organization: Emergency Medical Services Division	February-97	Oahu - Department of Emergency Services
165	Finance Division	January-02	Honolulu - Police Department
166	STATE OF THE STATE ADDRESS BY GOVERNOR BENJAMIN J. CAYETANO BEFORE THE JOINT SESSION OF THE TWENTY-FIRST HAWAII STATE LEGISLATURE	January-02	State - Office of the Governor
167	STATE EMERGENCY MEDICAL SERVICES & INJURY PREVENTION SYSTEM	October-01	State - Department of Health (DOH)

168	Chapter Eco-activism	October-00	Surfrider Foundation
169	[Flood Control and Drainage] Flooding and Other Natural Hazards	December-01	County of Hawaii
170	Research Projects	September-01	State - Department of Health (DOH)
171	Addendum to the Integrated Solid Waste Management Plan for the County of Hawaii	May-02	County of Hawaii
172	Atlas of Hawaii	December-98	Juvik and Juvik
173	Place Names of Hawaii	December-76	Pukui, Elbert and Mookini
174	Hawaiian Word Processing Tools: Hawaiian Language Fonts	December-95	Guava Graphics
175	Hawaiian Dictionary: Hawaiian-English English-Hawaiian	December-86	Pukui and Elbert
177	Strategic Plan Update for Hawaii's Environmental Protection Programs	August-01	State - Department of Health
178	Hawaii Marine Life Conservation Districts	January-01	State - Department of Land and Natural Resources
179	Hawaii- Department of Aquatic Resources Agency	January-01	State - Department of Land and Natural Resources
180	Hawaii Stock Management (USDoC-NOAA)	January-01	USDoc-NOAA
181	National Marine Fisheries Honolulu Laboratory	January-01	National Marine Fisheries Service
182	Hawaiian streams: the Mauka to Makai Connection	January-01	State - Department of Land and Natural Resources
183	Alien Species in Hawaiian Streams	January-01	State - Department of Land and Natural Resources
184	Hawaii's Native Stream Animals	January-01	State - Department of Land and Natural Resources
185	Economic Analysis of Critical Habitat Designations for 76 Plants from the Islands of Kauai and Niihau	January-02	US Fish and Wildlife Service
186	Wetlands	January-01	State - Department of Business, Economic Development and Tourism
187	Company; Kawai Nui Marsh ('www.aecos.com/KOOLAU/Kawai_Nui_2.html)	January-01	Aecos, Co.
188	Hawaiian Islands Initiative	January-01	Ducks Unlimited
189	Kawa Stream TMDL Project Stream Assessment Report	January-02	Aecos, Co.
190	Kawa Stream ('www.pixi.com/~isd/KawaStr.html)	January-01	Pixi, Co.

191	County of Maui FY 2003 Budget	December-02	Maui - Mayor's Office
193	Comprehensive Annual Financial Report	June-01	County of Hawaii
194	Executive Supplemental Budget FY 2003	January-02	State of Hawaii - Department of Budget and Finance
195	Coral Reef Assessment and Monitoring Program (CRAMP) - Final Report 1998-99	January-00	Hawaii Institute of Marine Biology
196	Coral Reef Assessment and Monitoring Program (CRAMP) - Final Report 1999-2000	January-01	Hawaii Institute of Marine Biology
197	Fire Department	December-01	Hawaii - Department of Fire Control
198	DUPLICATE Department of Parks and Recreation	December-01	Hawaii - Department of Parks and Recreation
199	Police Department	December-01	Hawaii - Police Department
200	Department of Public Works	December-01	Hawaii - Department of Public Works
201	Department of Water Supply	December-01	Hawaii - Board of Water Supply
202	State of Hawaii 303(d) List of Water Quality Limited Waters - 1998	December-98	State - Department of Health
203	Learning to Live with the Dynamic Hawaiian Shoreline (http://www.soest.hawaii.edu/SEAGRANT/LiveWithTheHawaiianShoreline/index.htm)	April-02	SOEST
204	Hawaii's Most Invasive Horticultural Plants: An Introduction	May-01	State - Department of Land and Natural Resources
205	Big Island Invasive Species Committee	February-00	U.S. Geological Survey
206	Kapalua Mauka	December-01	Maui - Department of Planning
207	DUPLICATE Waikiki Beach Walk	January-02	Honolulu - Department of Planning and Permitting
208	DUPLICATE Ocean Bay Plantation	June-02	Kauai - Department of Planning
209	Voyager Submarines Hawaii Artificial Reef Installation	April-98	Hawaii - Department of Planning
210	Hawaiian Electric Company, Inc. Integrated Resource Plan 1998-2017	January-98	Hawaiian Electric Company
211	Kauai Electric 1997 Integrated Resource Plan	April-97	Kauai Electric
212	The State of Hawaii Airport Activity Statistics Calendar Year 2001	May-01	State - Department of Transportation

213	Final Supplemental Environmental Impact Statement Mauna Lani Cove Mauna Lani Resort South Kohala, Hawaii	October-90	Hawaii - Department of Planning
214	Environmental Impact Statement Kohanaiki Mauka Kohaniki, North Kona, Hawaii	October-91	Hawaii - Department of Planning
215	Final Environmental Impact Statement and Site Selection Study for the New Hanalei Middle School	May-99	Hawaii - Department of Accounting and General Services
216	Supplemental Environmental Impact Statement Kukuiula Bay Resort Kukuiula Planned Community Koloa, Kauai, Hawaii	August-98	Kauai - Department of Planning
217	Final Impact Statement Kauai Electric Lihue Energy Service Center	March-99	Kauai - Department of Planning
218	Ocean Bay Plantation at Hanamaulu; Hanamaulu, Kauai, Hawaii	June-02	Kauai - Department of Planning
219	Waikiki Development Plan Final Impact Statement	November-01	Honolulu - Department of Planning
220	Waikiki Beach Walk Waikiki, Oahu, Hawaii Final Impact Statement	January-02	Honolulu - Department of Planning
221	Final Impact Statement Voyager Submarines Hawaii Artificial Reef Installation	April-98	State - Department of Land and Natural Resources
222	Final Environmental Impact Statement for the Supplemental Waiialua-Haleiwa Wastewater Facility Plan	June-96	Honolulu - Department of Wastewater Management
223	Final Environmental Impact Statement Lanai Airport Master Plan Improvements; Lanai Airport, Lanai, Hawaii	December-90	State - Department of Transportation
224	County of Maui: Kalamaula Landfill Closure Project; Draft Environmental Impact Statement	February-93	Maui - Department of Public Works and Waste Management
225	Kihei Upcountry Maui Highway; Final Environmental Impact Statement	February-02	State - Department of Transportation
226	Kapalua Mauka; Draft Environmental Impact Statement	December-01	Maui - Department of Planning
227	Kona Civic Center Site Selection Study / Final Environmental Impact Statement	August-94	Hawaii - Department of Accounting and General Services
228	Final Environmental Impact Statement for Kohala Water Transmission System North And South Kohala Districts, Island of Hawaii	November-95	Hawaii - Board of Water Supply
229	Hawaii Energy Strategy 2000	December-00	State - Department of Business, Economic Development and Tourism
230	Hanalei Pier Reconstruction Final Environmental Impact Statement	June-90	State - Department of Land and Natural Resources
231	Hanalei Excursion Boat Staging Operations; Hanalei, Kauai; Draft Environmental Impact Statement	October-90	Kauai - Department of Planning
232	Draft Environmental Impact Statement Kapalawai, Kauai, Hawaii; Kapalawai Resort	October-99	Kauai - Department of Planning

233	Draft Environmental Impact Statement Kalamaula Residence Lots- Unit 1; Kalamaula, Molokai, Hawaii	May-95	State Department of Hawaiian Home Lands
234	Upcountry Town Center, Pukulani, Maui, Hawaii; Draft Environmental Impact Statement	April-02	Maui - Department of Planning
235	Manele Golf course and Golf Residential Project, Lanai, Hawaii; Final Environmental Impact Statement	October-91	Maui - Department of Planning
236	Kaupulehu Resort Final Environmental Impact Statement	October-94	Hawaii - Department of Planning
237	Final Environmental Impact Statement Amanresort Waikoekoe and Kanahonua, Hamakua district, Hawaii	February-94	Hawaii - Department of Planning
238	Maniniowali Residential Community North Kona, Hawaii Final Environmental Impact Statement	February-92	Hawaii - Department of Planning
239	DUPLICATE County of Hawaii Data Book	October-01	Hawaii - Department of Research and Development
240	Annual Report Fiscal Year 2000-2001	August-01	County of Hawaii
241	Primary Urban Center Development Plan	May-02	Honolulu - Department of Planning and Permitting
242	The Hawaii State Plan: Recreation	May-91	State - Department of Land and Natural Resources
243	Funds Required for Reconstruction of Park Facilities 2002-2012	January-02	Honolulu - Department of Planning and Permitting
244	World Health Organization Cities and a Health Research Program	May-02	Honolulu - Emergency Services
245	Six-Year CIP and Budget FY 2003-2008	January-02	Honolulu- Department of Budget and Finance
246	DUPLICATE County of Maui Fiscal Year 2003 Budget	September-02	Maui- Mayor's Office
247	Maui County Data Book 2001	June-01	Maui Office of Economic Development
248	Hawaii's Implementation Plan for Polluted Runoff Control	July-00	State - Department of Health
249	Public Comment Draft 2002 List of Impaired Waters in Hawaii Prepared Under Clean Water Act 303d	August-02	State - Department of Health
250	Maui County Department of Fire Control	January-01	Maui - Department of Fire Control
251	Visit Your Parks Park Guide	October-02	Honolulu Advertiser
252	2001 The State of Hawaii Data Book	2002	State - Department of Business, Economic Development and Tourism

253	Transportation Plan for Oahu TOP 2025	April-01	Oahu Metropolitan Planning Organization and its Participating Agencies
254	Commission on Water Resource Management: Learn about the Water Commission-Frequently Asked Questions	January-11	State - Commission on Water Resource Management
255	The County of Hawaii Annual Report 1999-2000	January-01	Hawaii - Department of Public Works
256	The County of Hawaii Annual Report 2000-2001	January-01	Hawaii - Department of Public Works
257	Kauai Invasive Species Committee	January-02	Kauai Invasive Species Committee

ID c	FIRST NAME	LAST NAME	DATE	AGENCY
1	Deanne	Obatake	4/3/2002	Hawai'i Natural Heritage Program
2	Ben	Schlapeck	4/22/2002	State - Office of Planning
3	Fred	Pascua	4/17/2002	State - Office of Planning
4	Craig	Tasaka	4/25/2002	State - Office of Planning
5	Glen	Fukunaga	4/25/2002	State - Department of Health
6	Joan	Esposito	4/25/2002	State - Office of Planning
7	Iris	Ishida	4/23/2002	State - Office of Planning
8	Fred	Pascua	4/23/2002	State - Office of Planning
10	Fred	Pascua	4/17/2002	State - Office of Planning
11	Ron	Michols	4/13/2002	State - Office of Planning
12	Karen	Tanoie	4/13/2002	State - Office of Planning
13	Lisa	N/A	4/13/2002	Hawaii - Department of Planning
14	Eileen	n/a	4/16/2002	State - Office of Planning
15	Cathy	Tam	4/16/2002	State - Office of Planning
16	Chris	Kam	4/17/2002	State - Office of Planning
17	Stan / Shirley	n/a	4/13/2002	State - Office of Planning
18	Jeff	Hull	4/13/2002	State - Office of Planning
19	n/a	n/a	4/17/2002	State - Office of Planning
20	Glenn	Yasui	4/1/2002	State - Office of Planning
22	Steve	Kyono	4/1/2002	State - Office of Planning
23	Richard	Soo	5/3/2002	Oahu -Fire Department
25	Daniel	Quinn	6/4/2002	State - Office of Planning
26	Ian	Birnie	5/7/2002	State - Hawaii Tourism Authority
27	Thomas	Cunningham	5/7/2002	State - Hawaii Tourism Authority
28	Robert	Crowell	5/7/2002	Kauai - Department of Transportation - Harbor Division
29	David	Goode	5/7/2002	Maui - Department of Public Works
30	David	Craddick	5/7/2002	Oahu - Department of Water Supply
31	William	Balfour	4/30/2002	Oahu - Department of Parks and Recreation
32	Linnel	Nishioka	5/7/2002	Commission on Water Resource Management
33	Clifford	Jamile	5/7/2002	Oahu - Department of Water Supply
34	Barry	Kim	4/30/2002	Oahu - Department of Transportation - Harbor Division
35	Lee	Donohue	5/7/2002	Oahu -Police Department
36	Salvatore	Lanzilotti	5/7/2002	Oahu - Department of Emergency Services
37	Attilio	Leonardi	5/7/2002	Oahu - Fire Department
38	Thomas	Phillips	5/7/2002	Police Department
39	Jeffrey	Bearman	5/7/2002	Hawaii - Small Boat Harbors
40	Vaughan	Tyndzik	5/7/2002	Kauai - Small Boat Harbors
41	Charles	Penque	5/7/2002	Maui - Small Boat Harbors
42	Clayton	Ishikawa	5/7/2002	Maui - Department of Fire Control

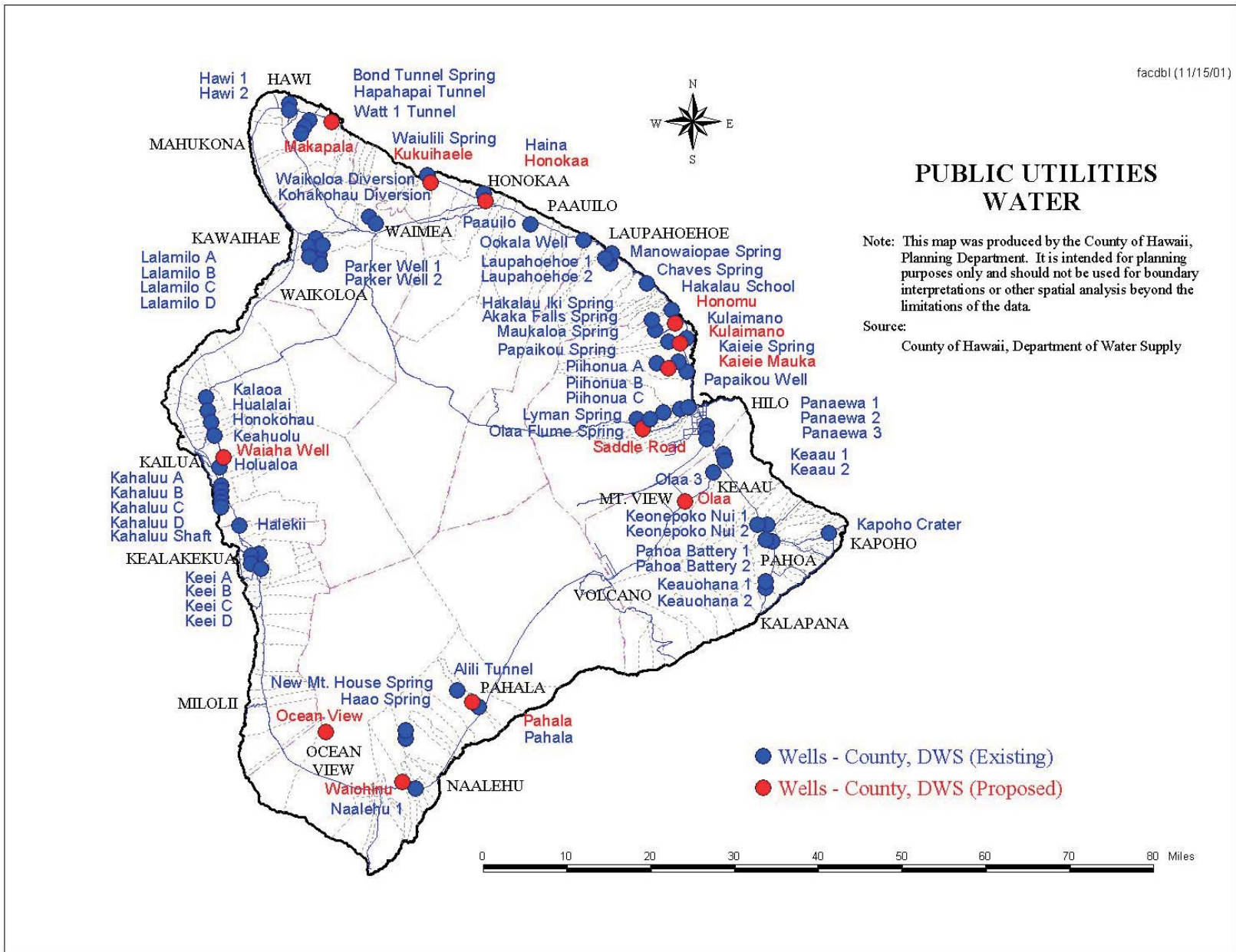
43	Glenn	Yasui	4/30/2002	State - Department of Transportation - Highway Division
44	N/A	N/A	4/30/2002	Hawaii - Board of Water Supply
45	David	Sproat	4/30/2002	Kauai - Department of Fire Control
46	George	Fretias	4/30/2002	Kauai - Department of Fire Control
47	Dely	Sasaki	4/30/2002	State - Department of Health (DOH)
48	Darryl	Oliveira	4/30/2002	Hawaii - Department of Fire Control
50	Curt	Murimoto	5/7/2002	Maui - Department of Emergency Service
51	Mason	Young	5/7/2002	Oahu - Small Boat Harbors
52	Kevin	N/A	5/7/2002	Hawaii - Board of Water Supply
53	Fred	Nunes	5/7/2002	Oahu - Department of Transportation - Harbor Division
54	n/a	n/a	5/7/2002	Oahu - Department of Environmental Services
55	Tim	Houghton	5/7/2002	Division of Environmental Quality
56	Kenneth	Kaneshiro	5/7/2002	Natural Resources Conservation Service
57	Gary	Barbano	5/7/2002	National Park Service
58	Rae	Loui	5/7/2002	Department of Design and Construction
59	n/a	n/a	5/7/2002	Fish and Wildlife - Ecological Division
60	David	Helweg	5/7/2002	U.S. Geological Survey
61	Jill	N/A	5/7/2002	U.S. Geological Survey
62	Lorean	n/a	5/7/2002	U.S. Geological Survey
63	Charlene	N/A	5/7/2002	U.S. Geological Survey
64	Wendy	n/a	5/7/2002	National Marine Fisheries Service
65	Jim	Maskrey	5/13/2002	Hawaiian Electric Company
66	Hans	?	5/10/2002	National Weather Service
68	Pearlyn	Fukuba	5/8/2002	State - Department of Land and Natural Resources
69	Melia	Lane-Kamahele	5/21/2002	National Park Service
70	Sandra	Kirschenbaum	5/16/2002	State - Department of Transportation
71	Jack	Liu	5/20/2002	Division of Environmental Quality
72	Lowell	Chun	5/14/2002	Honolulu - Department of Planning and Permitting
73	Brian	Miskae	5/14/2002	Maui - Department of Planning
74	Tim	Blume	5/14/2002	Kauai Electric
75	Joyce	Mitsunaga	6/4/2002	Department of Parks and Recreation
76	Nancy	Murphy	5/21/2002	Hawaii - Small Boat Harbors
77	Michael	Buck	5/22/2002	State - DLNR Division of Forestry and Wildlife
78	Glenn	Taguchi	6/4/2002	State - DLNR Division of State Parks
79	Gareth	Sakakida	5/10/2002	Hawaii Transportation Association
80	Steven	Levins	5/10/2002	Department of Taxation
81	Linda	Cantorna	5/21/2002	Department of Taxation
82	Carol	Shay	5/21/2002	Maui - Small Boat Harbors
83	Phillip	Ohta	6/5/2002	State - DLNR Division of State Parks
84	Paul Scotty	Paiva	5/2/2002	Fire Department

85	Jerry	Matsuda	5/7/2002	Department of Transportation - Airport Division
86	Bob	Hobdy	6/5/2002	State - DLNR Division of Forestry and Wildlife
87	George	Kuo	4/30/2002	Hawaii - Board of Water Supply
88	Jon	Griffin	6/5/2002	State - DLNR Division of Forestry and Wildlife
90	John	Rooney	6/10/2002	Coastal Geology Group
91	James	Correa	4/30/2002	Police Department
92	Lenay	Lijima	6/26/2002	Department of Health
93	Glenn	Soma	7/2/2002	Oahu - Department of Transportation - Harbor Division
94	Brian	Minaai	5/30/2002	State - Department of Transportation
95	Neil	Reimer	7/5/2002	State of Hawaii - Department of Agriculture
96	Greer	Prince	7/22/2002	Maui - Police Department
97	Glenn	Miyao	7/9/2002	Hawaii - Department of Parks and Recreation
99	Bill	Medeiros	6/30/2002	Maui - Department of Planning
100	Gary	Hashiro	8/20/2002	Hawaiian Electric, Inc.
101	Steve	Alber	8/20/2002	State - Department of Business, Economic Development and Tourism
102	Peter	Boucher	8/1/2002	Hawaii - Department of Public Works
103	Greer	Prince	7/23/2002	Maui Police
104	Shannon	MacElvaney	7/1/2002	Hawaii Natural Heritage

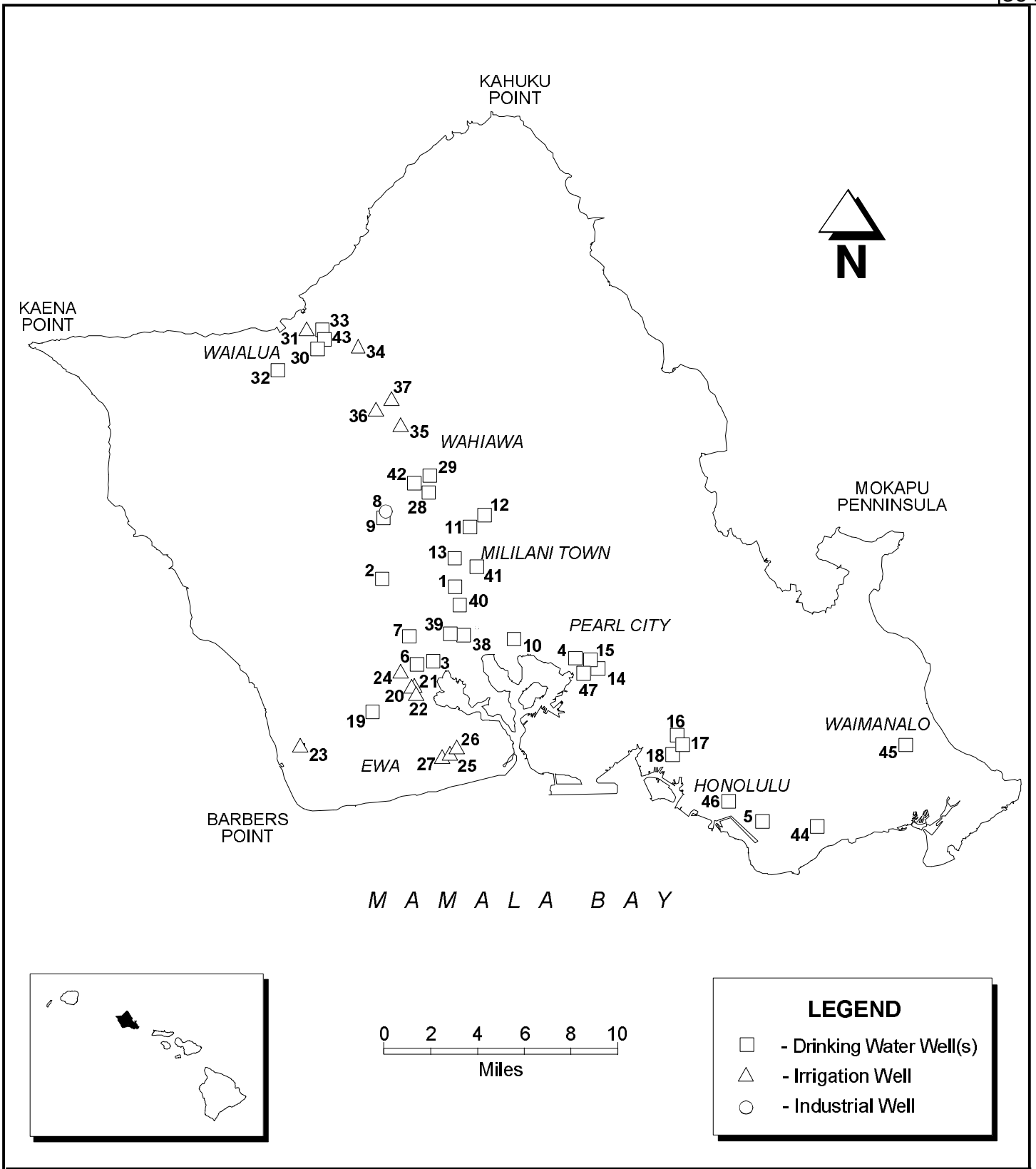
Appendix: County of Hawaii - General Plan Revision Maps 2001

(http://www.co.hawaii.hi.us/general_plan_rev/revision/maps/facilities_state.jpg)

The map below displays wells on Hawaii Island

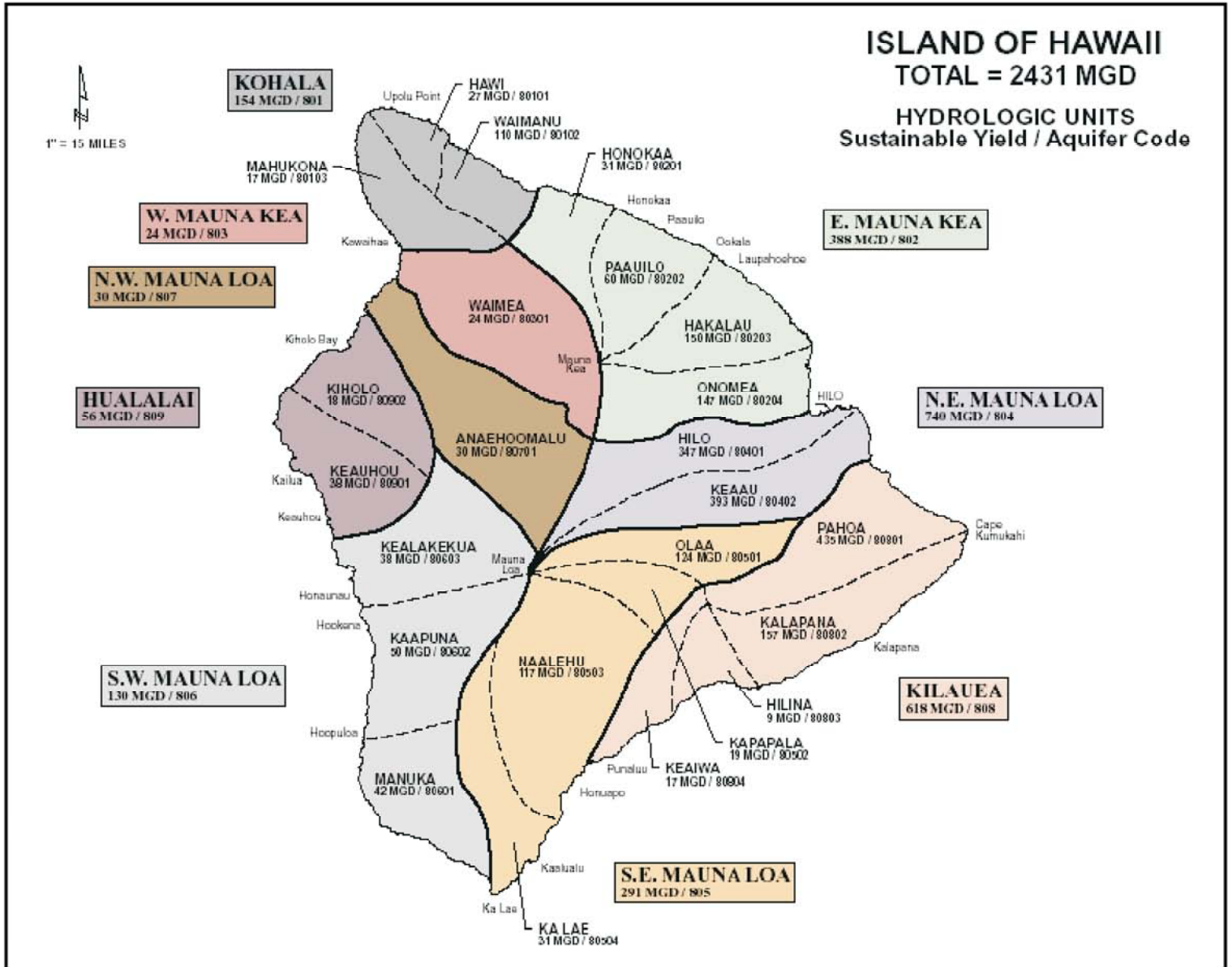


Groundwater Contamination on the Island of Oahu

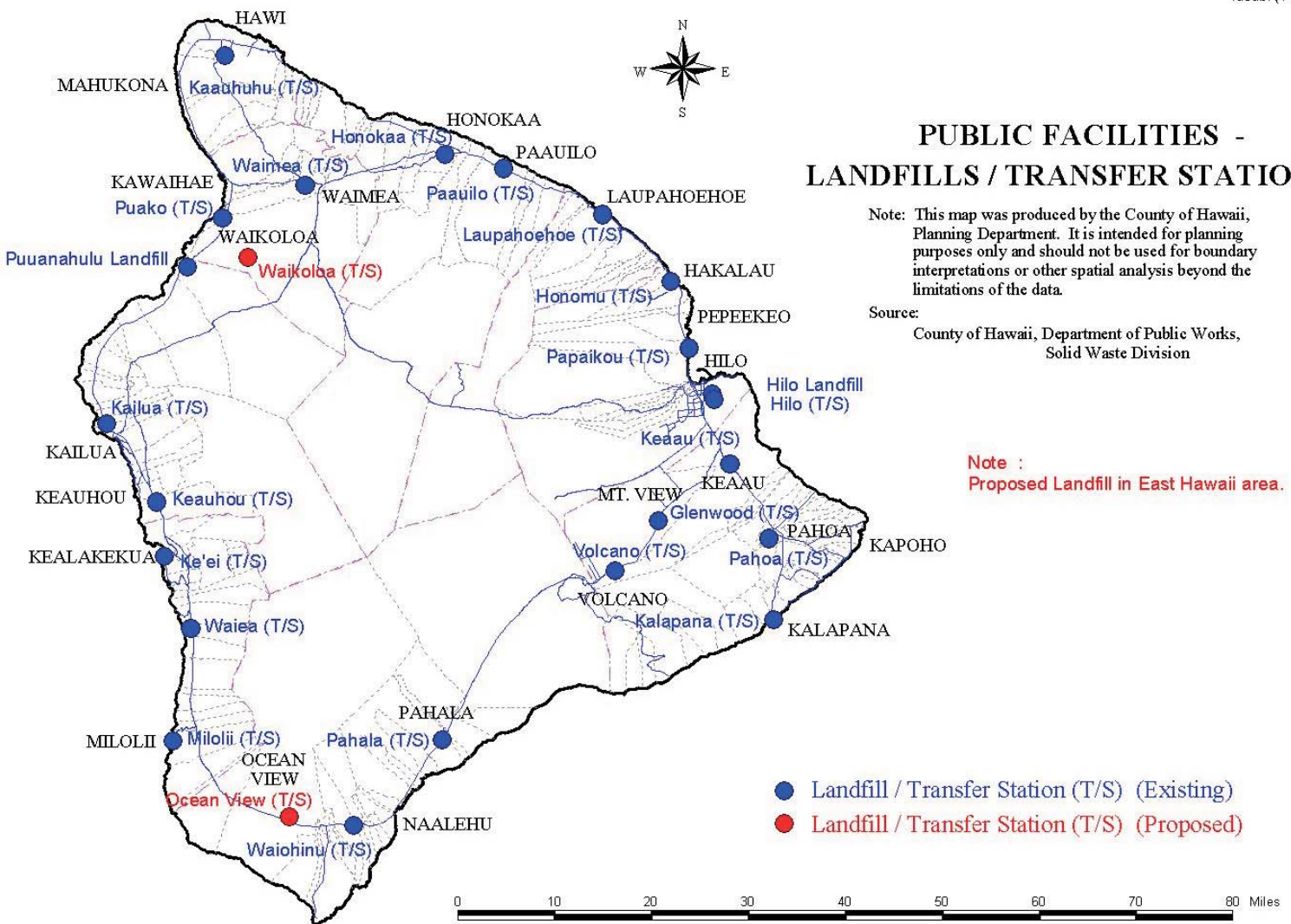


This Map Contains the Latest Confirmed Results From Contaminated Groundwater Wells
See Table for Contaminant Information

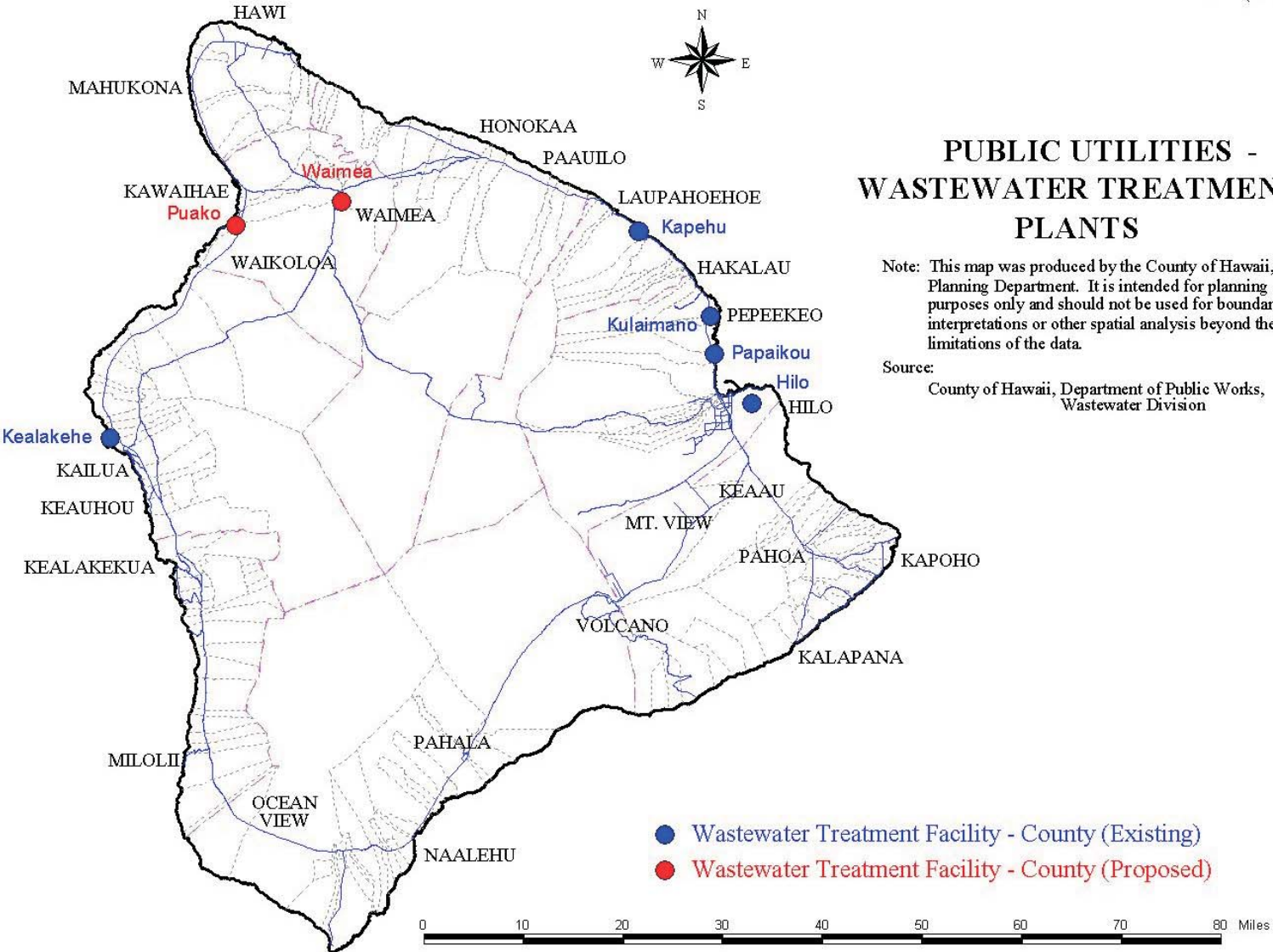
The map below outlines the hydrologic units or aquifers for Hawaii Island, it displays their yeilds and aquifer code.



The map below displays the existing and proposed landfill/transfer stations on Hawaii Island



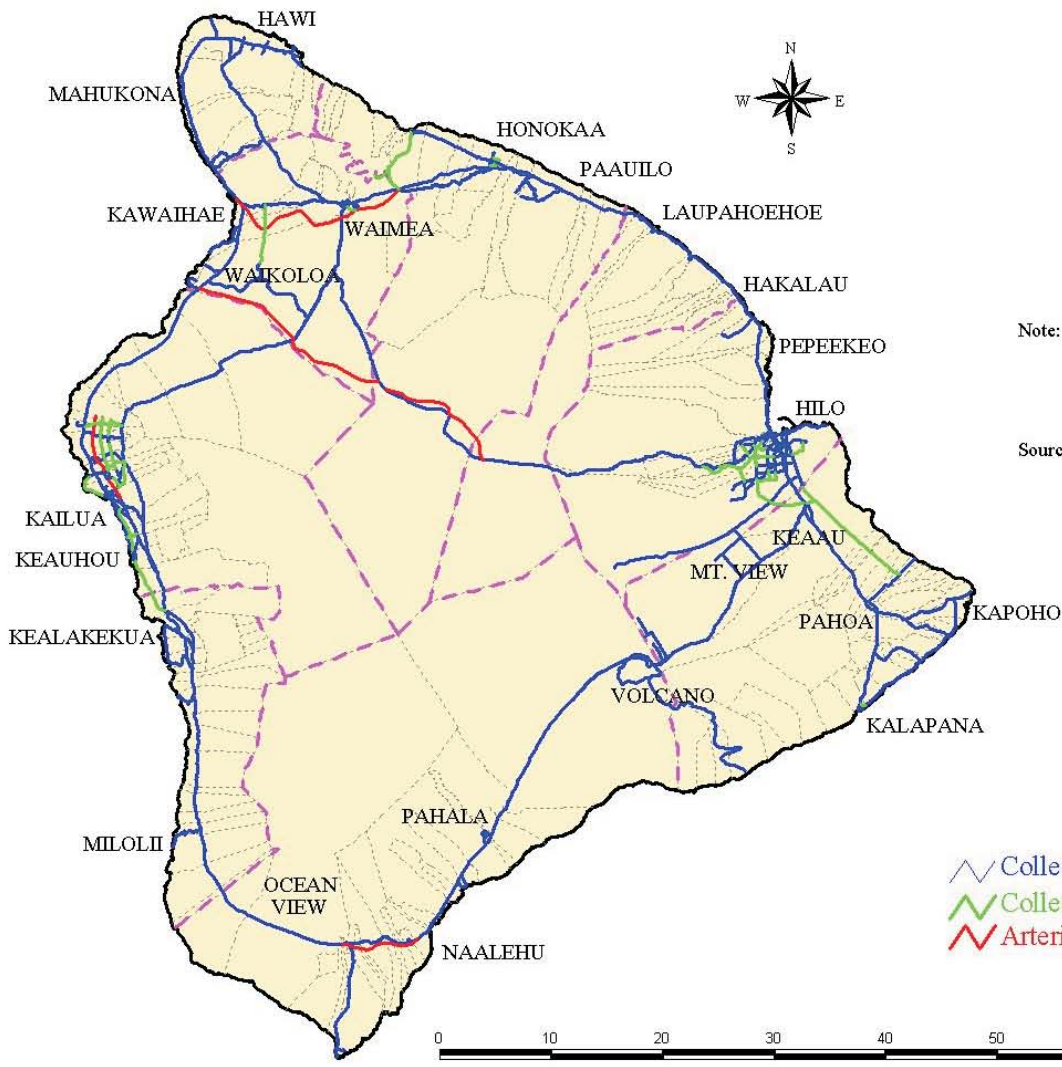
The map below displays Wastewater Treatment plants on Hawaii Island.



facdbl (11/15/0

The map below displays Transportation Roadways on Hawaii Island

roads2.apr (11/15/01)



TRANSPORTATION - ROADWAYS

Note: This map was reproduced by the County of Hawaii, Planning Department. It is intended for planning purposes only and should not be used for boundary interpretations or other spatial analysis beyond the limitations of the data.

Source: County of Hawaii, Department of Public Works, Engineering Division
State of Hawaii, Department of Transportation, Highways Division

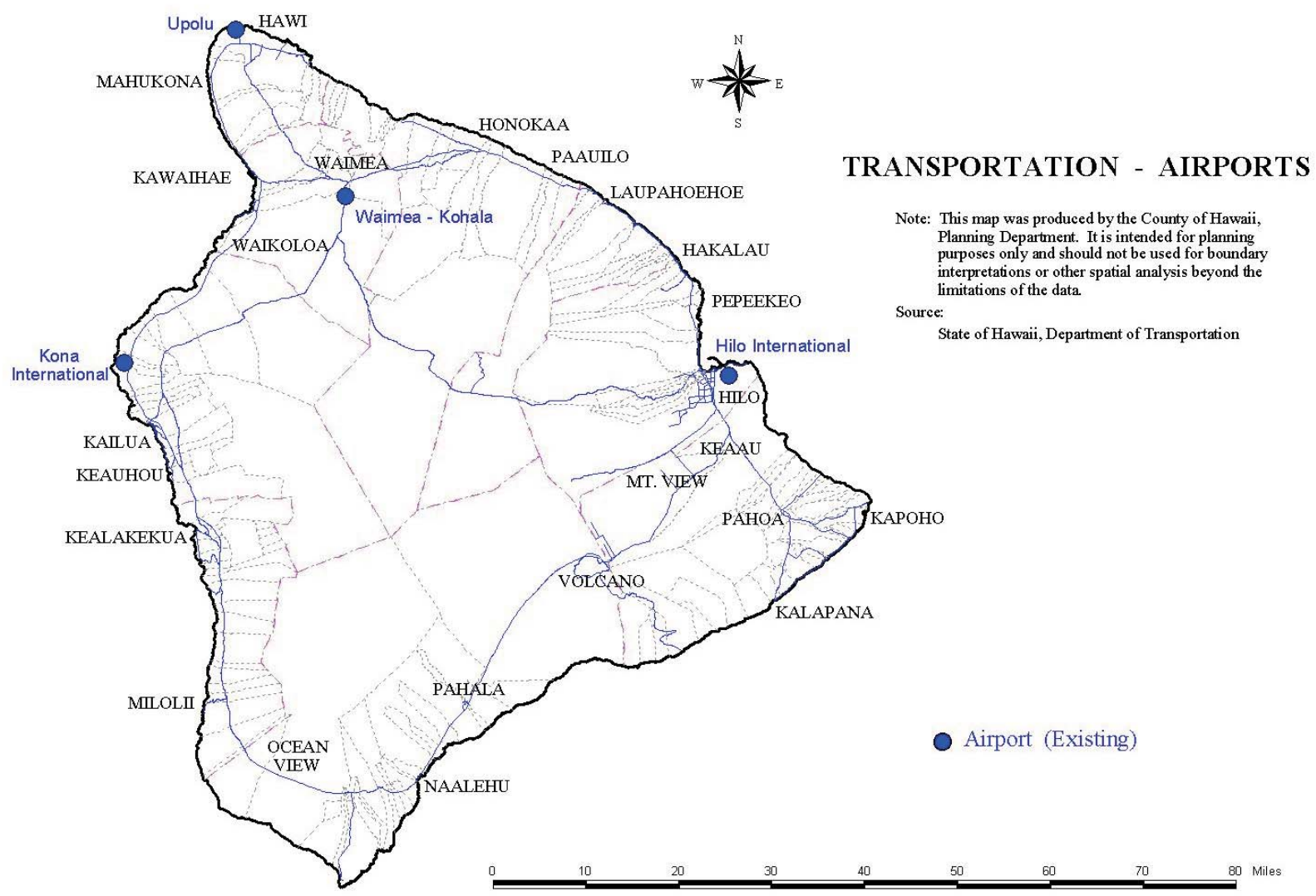
Reference: Okahara & Associates, Inc. - Engineering Consultants (Saddle Road Alignments)

- Collectors/Arterials (Existing)
- Collectors (Proposed)
- Arterials (Proposed)



The map below displays the location of the existing Airports on Hawaii Island.

facdbl (1/15/01)

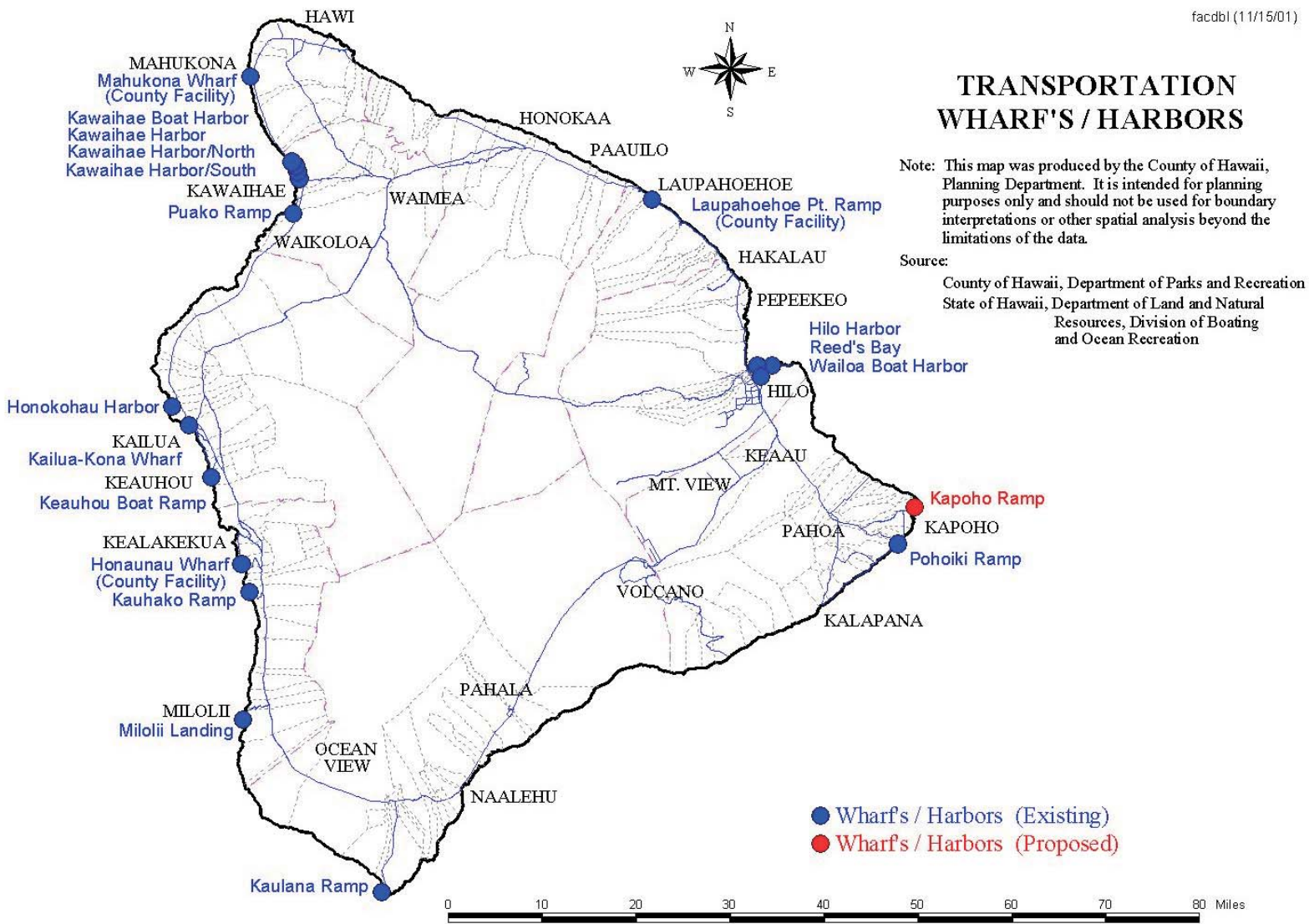


TRANSPORTATION - AIRPORTS

Note: This map was produced by the County of Hawaii, Planning Department. It is intended for planning purposes only and should not be used for boundary interpretations or other spatial analysis beyond the limitations of the data.

Source: State of Hawaii, Department of Transportation

The map below displays the existing Wharfs/Harbors on Hawaii Island



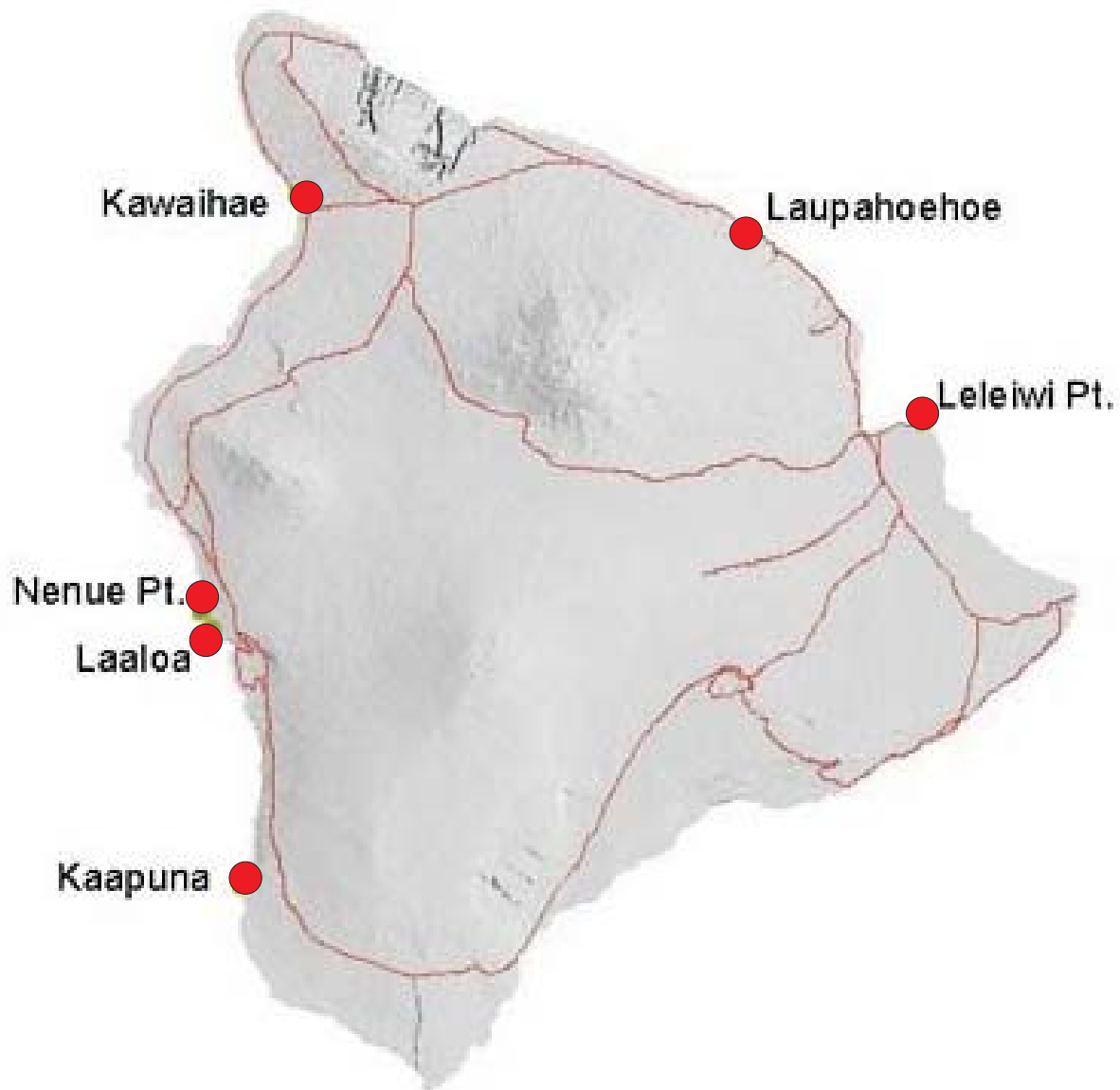
Appendix: County of Hawaii Police Department Annual Report Fiscal Year 2000_2001

([Http://www.hawaiiipolice.com/pdfDocs/annualReport00-01](http://www.hawaiiipolice.com/pdfDocs/annualReport00-01))

The map below displays Police Stations on Hawaii County

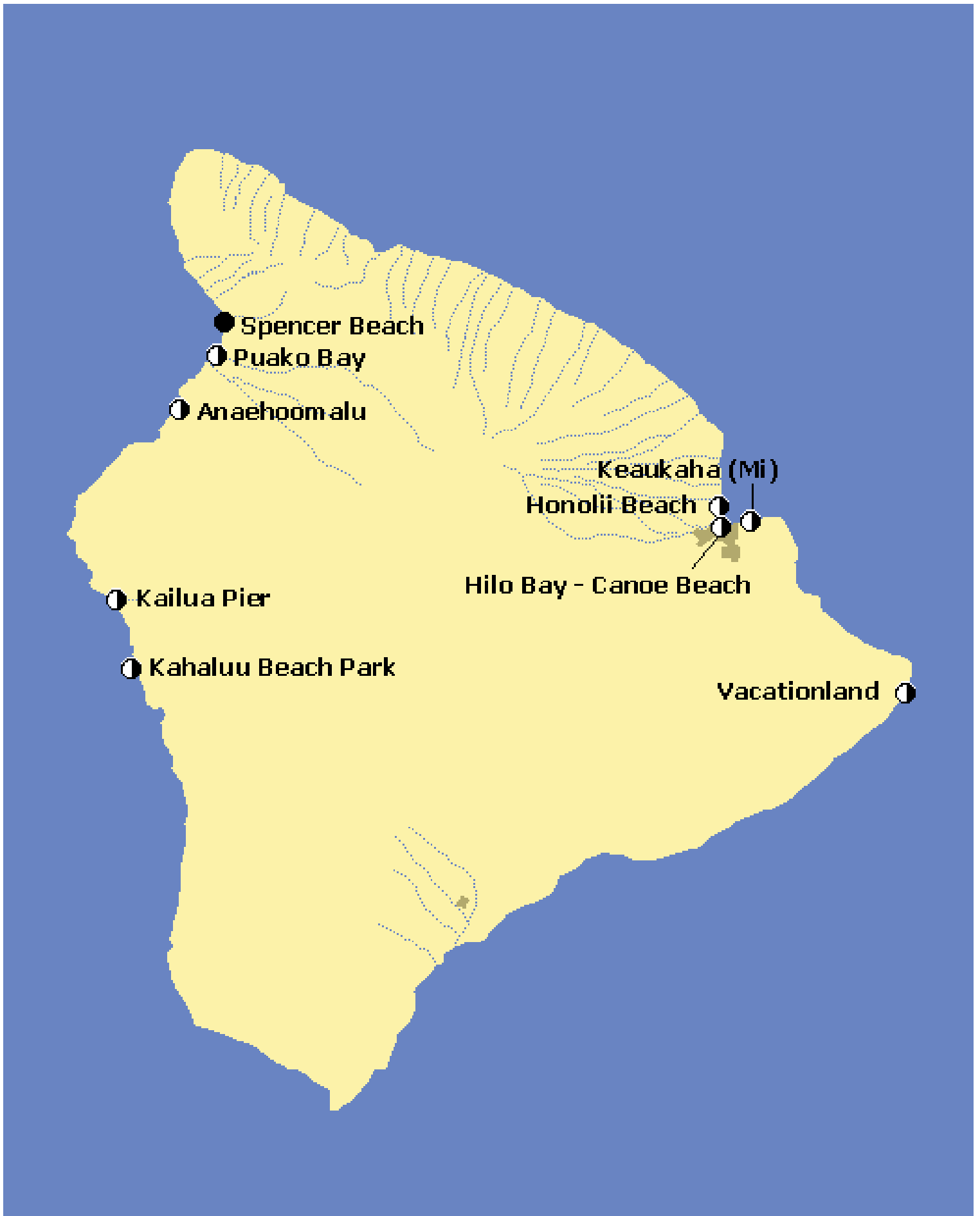


The map below displays the location of the Coral Reef Assessment and Monitoring Sites (CRAMP) on Hawaii Island.

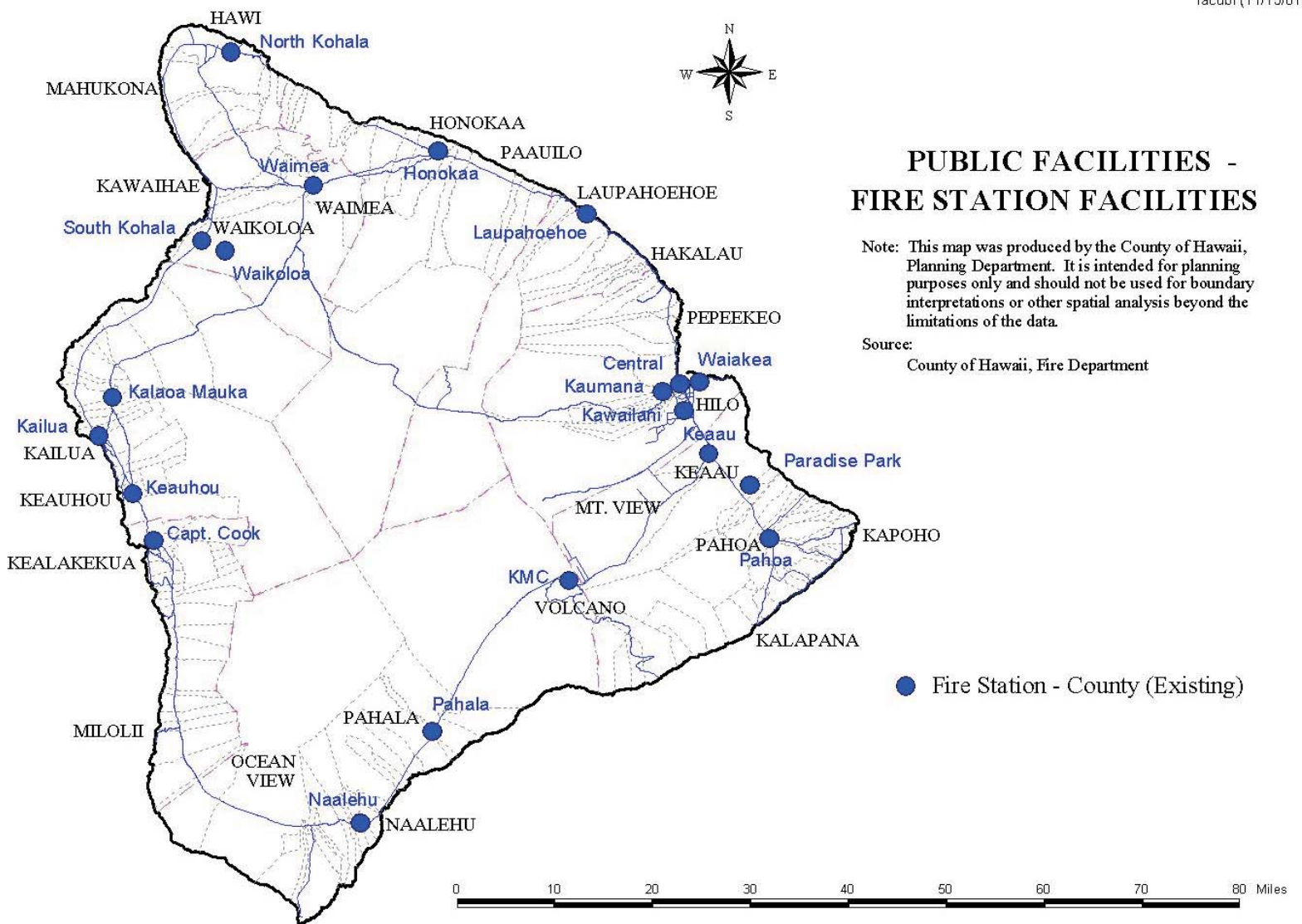


Displayed below is a water Quality Coastal map of Hawaii Island

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The map below displays the existing Fire Stations on Hawaii Island.





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