

MAUNA LOA MAUKA TRAIL SYSTEM

Trail Demand and Economic Analysis



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1. INTRODUCTION

For most visitors and even residents, the upper slopes of Mauna Loa remain a mist-shrouded mystery of forests, lava flows, and ranchlands, often not even visible from the busy coastal areas. As new homes creep up the slopes and the economics of ranching and timbering change, the importance of these lands as a place for managed public access coupled with active preservation and restoration efforts grows.

The Mauna Loa Mauka Trail System (Mauka Trail) is a proposed 186-mile pathway system (71 miles of main trail, 115 miles of connecting and alternate trails) from the Hawai'i Volcanoes National Park, around the southern base of Mauna Loa, and up the western or Kona flank of the Big Island to connection points including the Mauna Kea trail system. The trail is composed of a primary spine route with alternative routes, connector trails, and access routes. The trail will primarily be located on historic jeep trails on public and private properties at approximately 5,000 feet above sea level, along with access and alternative trail routes. Once completed, the trail will be the longest trail system in Hawai'i, and one of the premier trails in the United States and world.

Alta Planning + Design developed this report for The Nature Conservancy to:

1. Identify trail demand and conduct an economic analysis,
2. Define the trail system,
3. Collect available data and study the potential demand for this facility as it relates to visitors and residents,
4. Study comparable trails around Hawaii and the Mainland,
5. Conduct a local survey,
6. Run a trail usage demand model,
7. Analyze the health, safety, property values, environmental, and economic benefits of the project,
8. Analyze potential safety, liability, and related landowner issues, and
9. Develop planning-level costs and a phasing plan for the system.

These issues are addressed in each section of this report.

BACKGROUND

The Big Island has a long history of trails, both for use as a means of local transport and recreation. Early trails such as the Kings Highway, the Old Hawaiian Trail, the Kaukahoku Trail, and others connected local villages primarily followed the coast, while subsequent trails linked the coast to the top of Mauna Loa and other peaks used by the local population and visitors. The trail system on Hawai'i expanded considerably after the creation of the Volcanoes National Park in 1916, which now includes over 10 trails including the Mauna Loa Trail.

At the same time as trails were expanding in the national parks, a network of jeep and cattle trails and roads were being developed from the coastal plains into the Mauna Loa foothills and upper reaches of the mountain, primarily to access ranch lands. A network of jeep roads was also built on private ranches at the upper levels of pastureland, about 5,000 feet above sea level. Private access roads were built from coastal roads up into the upper reaches of these ranches, where they remain today.

The concept of a high elevation trail on Mauna Loa has been widely discussed for several years. In October, 2003, a meeting of interested landowners and representatives of state and federal agencies and conservation groups was held to discuss development of a funding proposal for a Mauka Trail feasibility study. Based on the results of this meeting, the Nature Conservancy (TNC) drafted a proposal to submit to the Hawaii Tourism Authority under their Natural Resources Program. With the support of other partners, TNC agreed to administer the project. Kamehameha Schools agreed to contribute funds to provide a partial match. TNC received notice in December, 2003 that the project was approved and received a notice to proceed in February, 2004.

SETTING

The setting for the Mauka Trail is shown in **Figure 1**. This area consists of a variety of terrains, although the dominant features are the volcanic peaks of Mauna Loa, Hualalai, and Mauna Kea. At 13,679 feet, Mauna Loa is the largest volcanic mass in the world. Slopes in the corridor run up to 30% (300 feet of vertical climb per 1,000 feet) or higher, although the slopes are more moderate in most areas. The climate in the study area ranges from humid tropical conditions in the lower elevations to temperate, even cold temperatures in the higher elevations. Rain is relatively sparse, and there is virtually no ground water in the form of ponds or streams due to the volcanic soil and low rainfall totals.

The vegetation of the area reflects the sharp changes in altitude, ranging from rain forests in the lower elevations to temperate pasture and range lands, large lava flow areas, and semi-desert and alpine areas higher up the slopes. Much of the native vegetation has been impacted by a combination of timbering, cattle, and invasive species.

Lava flows constitute the single most distinctive feature in trail corridor. Major flows in 1859, 1916, 1926, and 1950 not only indicate the historical frequency of major lava flows in the study area, but also reflect the extent of such flows in the study area.

Some unique features of the trail setting are the Southwest Rift Zone, a trackless area of active and historic flows and vents, cones, cracks, and other volcanic features near Mauna Loa. The Hualalai Crater area consists of multiple smaller volcanic peaks with numerous trails and jeep roads and varied terrain. Puu Waawaa is a dramatic volcanic peak rising up to almost 4,000 feet near Puuanahulu. The Ocean View Estates area of Kahuku has a large grid of residential streets laid out on the volcanic slopes leading up to the trail corridor, largely undeveloped.

The trail would be located on a combination of public and private lands. The private lands are predominately ranchlands. These ranches include Yee Hop, McCandless, Kaimalino, Kealia, Pace/Kealekekua, Bishop Estate -Kamehameha Schools, Palani, Hualalai, and Puu Waawaa ranches. These and other ranches are major, functioning cattle and timber producing areas, although depletion of resources, poor access, environmental restrictions, and changes in worldwide economics has impacted their activities. Some of these ranches have provided public access and amenities in the past, such as bed-and-breakfast or rural resort accommodations, although none do currently.

Figure 1: Overview

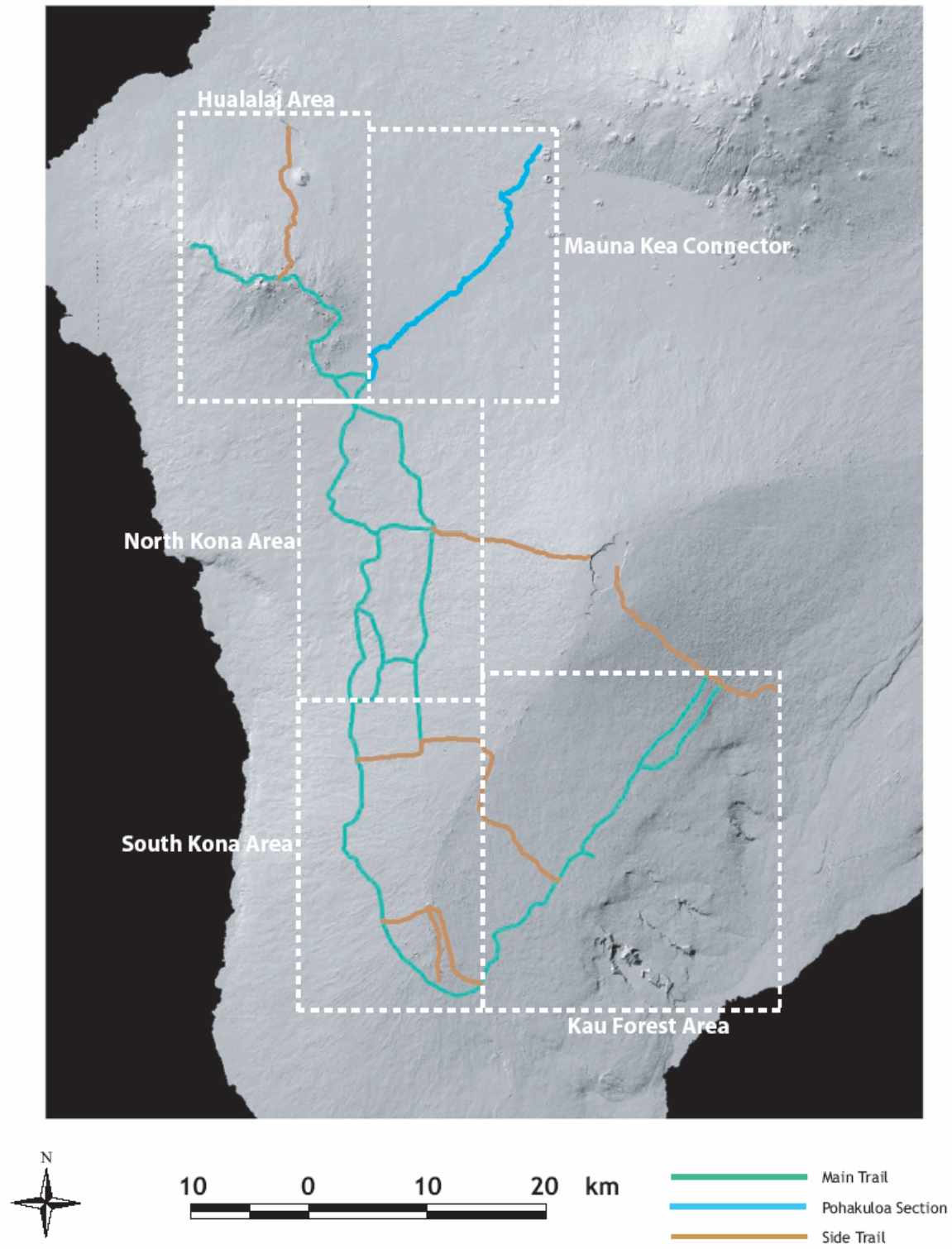


Figure 1: Overview

Most of the private land in the study area is currently zoned agriculture, although there is some residential development at the end of Kaloko Drive and the Ocean Views Estates community. Other than these two areas, the private lands consist of active ranches and there are no current or planned major developments in this area. Water for the ranches is often pumped up to water tanks that dot the countryside, or pumped from the few small waterholes. Numerous rock walls originally built to keep in cattle, some of which run many miles in length, also characterize the area.

Hunting has been a popular activity in the upper slopes for many years, especially wild boar hunting. Hunting access is allowed by some ranches on a permit basis, while hunting groups have secured long-term leases in other areas. Other than occasional hunters and hikers, there is virtually no public activity in the vast stretches of forest and rangeland in the study area.

About 32% of the proposed main and alternate trail would be on public or quasi-public properties, including properties owned by the National Park Service, State of Hawaii, U.S. Army, and the Nature Conservancy. About 40% of the entire 192-mile system, which includes connector routes, would be on public or quasi-public property. Public and quasi-public lands on or near the proposed trail alignments include:

- Honua'ula Forest Reserve (State of Hawaii)
- Kapapala Forest Reserve (State of Hawaii)
- Ka'u Forest Reserve (State of Hawaii)
- Kipahoehoe Natural Area Reserve (State of Hawaii)
- Manuka Natural Area Reserve (State of Hawaii)
- Mauna Loa Forest Reserve (State of Hawaii)
- Mauna Loa Game Reserve (State of Hawaii)
- Pohakuloa Training Area Military Reservation (U.S. Army)
- Pu'uwa'awa'a Wildlife Sanctuary (State of Hawaii)
- Pu'uanahulu Game Management Area (State of Hawaii)
- South Kona Forest Reserve (State of Hawaii)
- Volcanoes National Park (National Park Service)

These areas are managed for a combination of environmental protection, resource management, and to a lesser extent, public access.

2. DESCRIPTION OF PROPOSED TRAIL

Conceptual alignments for the Mauka Trail have been developed, but no final alignment has been selected. The common element to all concepts is a trail alignment utilizing the historic jeep roads at approximately 5,000 feet above sea level, starting at the Volcanoes National Park, stretching around the southern flank of Mauna Loa and then northward on the Kona side of the mountain to the Hualalai Peak area terminating at Kaloko Road. Near this area, two connecting trails would head north—one leading through Puuwaawaa to the Mamalahoa highway, and the other through the Pohakuloa Training Area to the Saddle Road and Mauna Kea foothills (see Figure 1). This concept has many variations and alternatives, including a trail that would encircle Mauna Loa, another cutting across the Southwest Rift Zone, and another climbing up the Kona side of Mauna Loa. One of the objectives of this plan is to identify a trail system that (a) reflects the needs of potential users, land ownership, cost, and other factors, and (b) can be implemented over time in phases.

KEY CORRIDORS

For the purpose of this analysis, the trail has been broken down into corridor segments based on previously developed materials. These areas are:

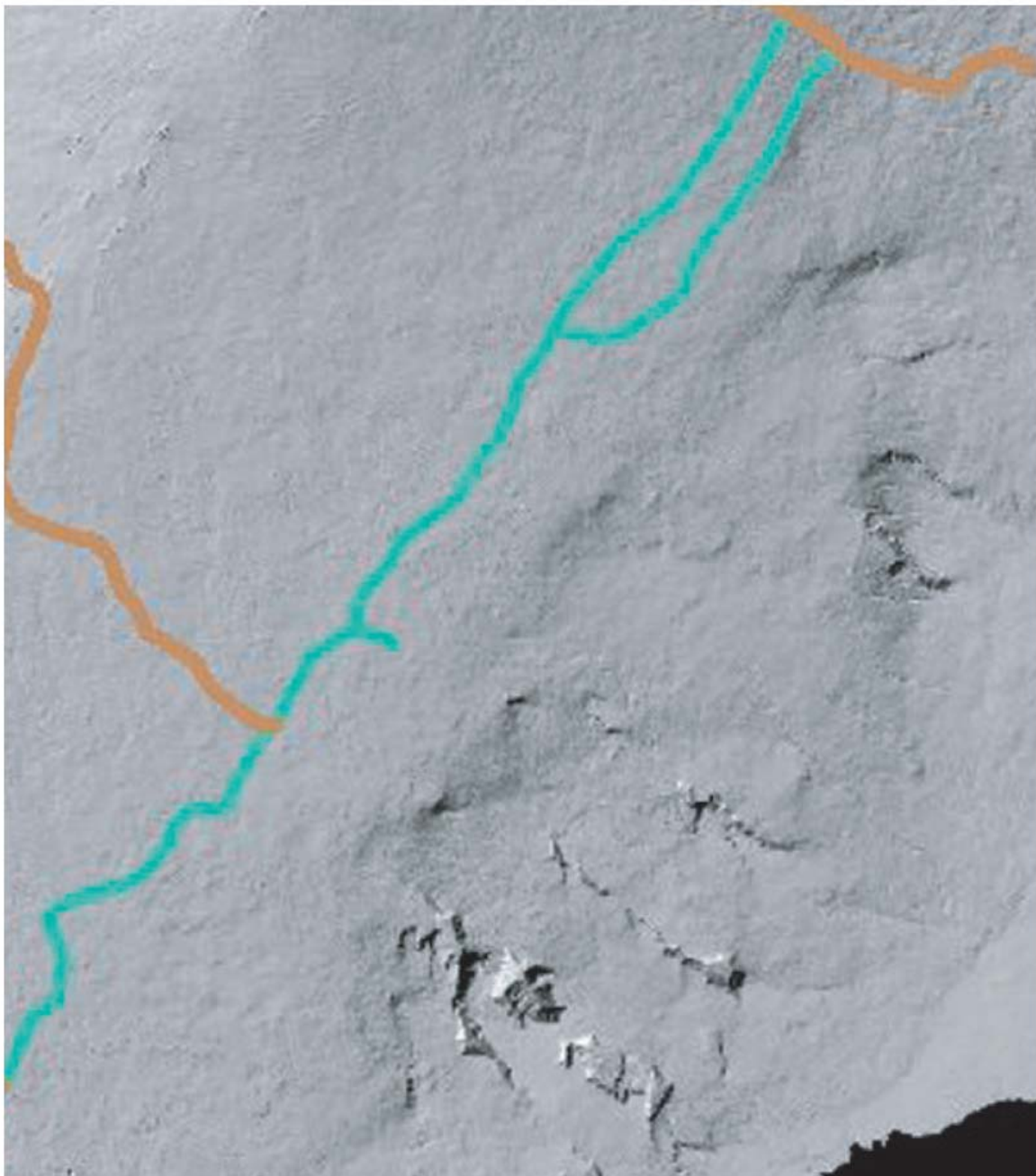
Kau Forest Corridor

This area (see **Figure 2**) lies on the southeast corner of the Island, between the Volcanoes National Park and Ocean View community. It is called the Kau Forest Corridor because the Kau Forest Preserve lies along its entire length. It is characterized by its accessibility to the National Park and local communities, and the largest intact rainforest in the State.

Key Features

Length:	Main Route (21 miles) Connectors (34 miles)
Environment:	Forests, lava fields, open range
Land:	Public (95%) Private (5%)
Elevation:	Main Route (4,300' to 7,400')

Figure 2: Kau Forest Area



-  Main Trail
-  Pohakuloa Section
-  Side Trail

Figure 2: Kau Forest Area

South Kona Corridor

This corridor (see **Figure 3**) lies on the southwest corner of the Island, between the Ocean View Estates Community and a trail junction area directly mauka of Honaunau and Keokea. This area is characterized by numerous private ranches with active cattle ranching and timbering operations, the Nature Conservancy preserve (Kona Hema), and numerous cones, lava fields, and vents. The area has been heavily impacted by cattle and timbering operations, and may have environmental damage.

Key Features

Length:	Main Route (18 miles) Connectors (18 miles)
Environment:	Forests, lava fields, open range
Land:	Private (80%) Public (20%)
Elevation:	Main Route (4,300' to 5,900')

North Kona Corridor

The North Kona Corridor (see **Figure 4**) reaches from a point about 5 miles directly mauka of Honaunau and Keokea, to Puu O Mawae trail junction, near Judd Trail. This area is characterized by relatively intact forest lands interspersed with active cattle and timber operations. It is also the segment of the trail closest to the resort and residential areas of Captain Cook, Kealakekua, and Kailua-Kona. This area also has a large network of jeep roads and therefore greater opportunities for trails.

Key Features

Length:	Main Route (20 miles) Connectors (11 miles) Alternates (6 miles)
Environment:	Forests, lava fields, open range
Land:	Private (100%)
Elevation:	Main Route (4,400' to 6,000')

Hualalai Area

Hualalai is a volcanic peak at 8,271 feet accompanied by numerous cones and volcanic peaks on the northwest slope of Mauna Loa. Its proximity to Kailua-Kona, good access from Kaloko Drive, and interesting slopes, peaks, and cultural sites (such as Umi's Temple) all make this the most active area on the trail corridor (see **Figure 5**). Public access remains limited although hunting and some hiking and mountain biking access exists.

Figure 3: South Kona Area



Figure 3: South Kona Area

Figure 4: North Kona Area



-  Main Trail
-  Pohakuloa Section
-  Side Trail

Figure 4: North Kona Area

Key Features

Length:	Main Route (12 miles) Alternates (31 miles)
Environment:	Forests, lava fields, open range
Land:	Private (90%) Public (10%)
Elevation:	Main Route (3,000' to 8,271')

Mauna Kea Connector Corridor (Pohakuloa Section)

A connection between the Mauna Loa and Mauna Kea trail systems would be accomplished with this corridor (see Figure 6). Mauna Kea already has numerous roads that both encircle and climb the peak. This corridor is characterized by the large flat saddle area between Hualalai and Mauna Loa, and the U.S. Army Military Reservation at Pohakuloa, which is an active target range. While Mauka Trail users could access the Mauna Kea road system at this location, for the purposes of this study the termination point of the Mauka Trail is Highway 200.

Key Features

Length:	Main Route (21 miles)
Environment:	Forests, lava fields, military base
Land:	Private (40%) Public (60%)
Elevation:	Main Route (5,000' to 7,600')

OTHER CORRIDORS

Other corridors have been identified by previous planning efforts but not included as parts of the primary trail at this time. These include:

Mauna Loa Kona Summit Trail (10 miles)

This trail would ascend the Kona side of Mauna Loa from a point along the Mauka Trail, connecting to the National Park Service trails at the summit. This trail would climb almost 8,500 in extremely exposed, dry, and cold conditions, often on very rough lava flows. The National Park Service would need to approve any such new trail, and would be the likely lead in its planning and development.

Mauna Loa Circumference Trail

A trail completely encircling Mauna Loa has been mentioned in some research on this project. Given the mountain's massive size, this trail could be more than 150 miles long and involve many more constraints than the Mauka Trail. The Mauka Trail would constitute more than 70% of this trail when completed. It is recommended that the remaining segments of this trail be considered separately from the Mauka Trail.

Southwest Rift Zone Trail (17 miles)

This trail would cross the Southwest Rift Zone and connect to two portions of the Mauka Trail. A trail currently exists on this corridor, although it is really a series of cairns (stacked rocks) since the entire trail is in one massive lava flow. The corridor is reported to have numerous potentially dangerous cracks, cones, vents, tubes, and other volcanic features, and also climbs up to over 9,000 in elevation. It is recommended that this be retained as a potential alternative trail.

CONNECTOR TRAILS AND ACCESS ROADS

One of the most unique and attractive qualities of the Mauka Trail--its isolation and rural mountain environment-- is also its most challenging element. To say that the Mauka Trail is inaccessible would be a gross understatement, since it is not only inaccessible to the public but literally invisible as well. The topography, vegetation, and climate of Mauna Loa are such that the peak and its slopes are not really visible to people on the coastal areas. Once on the mountain, the ocean and communities below are often not visible as well. The slopes of Mauna Loa are truly isolated from what most people think of when they think of Hawaii, and in fact they can resemble mountain areas in non-tropical areas quite easily.

Access is critical to the future of any trail, especially one located at 5,000 feet above sea level. The typical elevation difference between the trail and Highway 11 is about 3,500 feet. This is a major impediment to all but the most determined hiker or mountain bicyclist, and would exclude anyone not in excellent physical health. Finding access points where vehicles could reach or approach the trail is critical to the trail's feasibility.

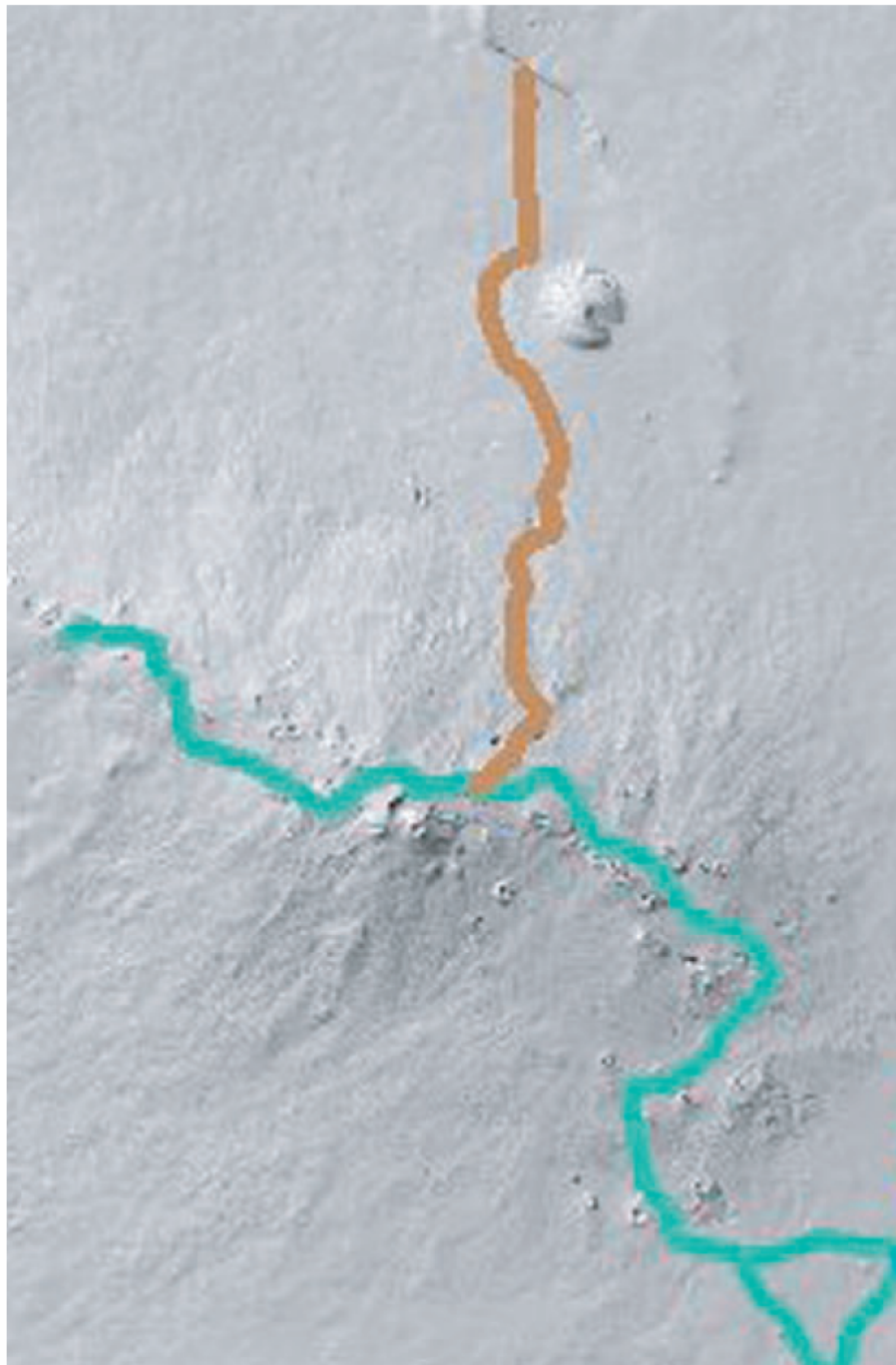
Of the entire 186-mile long trail, there are only three locations where the trail touches or comes close to a paved public road:

- (1) Highway 11, Kau Forest Corridor, about 9 miles west of Volcanoes National Park. No formal trailhead or connection currently exists.
- (2) Kaloko Drive, Hualalai Trail System, about 8 miles east of Kailua-Kona. No formal trailhead or connection currently exists.
- (3) Highway 200, Mauna Kea Connector Trail, about 4 miles southeast of Waikii. No formal trailhead or connection currently exists.

In addition to these locations, numerous private roads also connect up to the trail corridor. Most of these are steep, unpaved jeep roads serving active ranches. Some notable private roads are:

- (1) Ocean Views Estates Roads: These private residential streets provide access to the trail at several locations in this partially developed neighborhood.

Figure 5: Hualalai Area






-  Main Trail
-  Pohakuloa Section
-  Side Trail

Figure 5: Hualalai Area

Figure 6: Mauna Kea Connector



2.5 0 2.5 5 km

-  Main Trail
-  Pohakuloa Section
-  Side Trail

Figure 6: Mauna Kea Connector

- (2) Koa Mill Road: This road climbs to 4,400 feet to an abandoned Koa Mill near Kipahoe Natural Area Reserve. This is part of the private Yee Hop Ranch.
- (3) Koa Road: This road climbs from Captain Cook to over 7,500 feet. This is a private ranch road.
- (4) Judd Trail: This unpaved road climbs from the coast near Holualoa in a direct line to over 5,600 feet near the Hualalai-Mauna Loa shoulder area. This is a private ranch road.
- (5) Puu Alawuawa/Moanuahea Road: This road leaves Highway 190 near the Makalei Golf Course and climbs both to the summit of a small peak (Moanuahea) and to the Puu Waawaa Wildlife Sanctuary at 4,000 feet.
- (6) Puu Waawaa Ranch Roads: There are several paved and unpaved roads leading from Highway 190 near Puuanahulu to the Pu Waawaa Ranch.
- (7) Puu Anahulu Access Road/Kona Highway: This dirt road leaves Highway 111 near Puuanahulu and climbs into the Pohakuloa Military Reservation.

The type and location of access points will greatly determine the phasing and recommended user groups and trail design for each part of the Mauka Trail.

3. DEFINING THE MAUKA TRAIL

As a very long trail of regional and statewide significance that is being developed from scratch, the Mauka Trail has the opportunity to be planned, designed, and operated to reflect the needs, opportunities, and constraints of its environment. Many trails are built as a result of opportunities (available public land) and existing patterns (places where people have always walked or wanted to walk), while others follow an overpowering theme (Appalachia Trail, Ridge Trail, Bay Trail) that dictates the location of a trail and feature (ridgeline, coast line, bay shore, summit, etc.). The Mauka Trail has neither the fortune of being entirely on public land nor an over-powering organizing theme, but it does have many other things going for it including:

1. Proximity to one of the fastest growing tourist destinations in the country,
2. A proven type of location (cooler, mountainous area) in a tropical setting that is attractive to people,
3. Access to the ‘forgotten’ side of Hawaii, from ranch and Koa forest operations to native cultural attractions,
4. Varied and interesting natural features, especially near the Hualalai area,
5. Opportunities for activities such as mountain bicycling, horse back riding, camping, etc., that either do not exist elsewhere on the Island or are in short supply, and
6. Access to one of the most varied and rich ecological and natural habitats in the country, including the largest stand of native forest in the State.

The Mauka Trail is different than other trails in another key respect: since no single public agency is likely to take over its planning and development, it must ‘prove’ its worth and value in order to build agency, political, public, and financial support. This chapter focuses on the potential demand for and benefits from developing the Mauka Trail.

FORM FOLLOWS FUNCTION

In order to understand the potential demand for the Mauka Trail, it is necessary to review all of the potential users groups to determine if and how they might use the trail—given the conceptual alignment, access, and potential related developments.

Trail or recreational facilities must be designed to accommodate a specific user group or range of groups and activities. The final design and operating plans for the Mauka Trail will reflect the optimal range of user groups to meet the objectives of the trail sponsors, while also reflecting the physical, economic, environmental, and other realities. A wide variety of potential user groups could potentially use the trail. Recreational activities include:

Hiking or Walking

- Day Hiking
- Backpacking (multi-day hikes)
- Guided Cultural Studies
- Guided Nature Studies

Overnight Accommodations

- Destination Lodges
- Full Service Lodge-to-Lodge System

- Simple Hut-to-Hut System
- Simple Platform Camping
- Tent Camping

Horseback Riding

- Guided Pack Trains
- Horseback riding

Motorized Vehicles

- All Terrain Vehicles (ATVs)
- Fire, Maintenance, and Service Vehicles
- 4-wheel Drive Tours

Mountain biking

Other

- Hunting
- Special Events (Races, Marathons)

Other than the activity itself, people could enjoy a wide variety of recreational experiences on the trail including:

Recreational Activities

- Archaeological study
- Birding
- Botanical study
- Forestry study
- Geological study
- Guided or Self-Guided Nature Tours
- Historical study
- Nature Photography

Each potential user group and activity is discussed below with a focus specifically on (a) compatibility with the corridor environment and other activities, (b) potential demand and usage patterns, (c) functional, economic, environmental, access, and cost issues, and (d) impacts on trail design and operations.

RECREATIONAL ACTIVITY

User groups may engage in a variety of activities on the Mauka Trail, often accomplishing two, three, or more activities all as part of the same trip. For example, people may be day hiking and bird watching on the same trip. Linear activities such as hiking or mountain bicycling are described in the next section under ‘Mode of Transportation.’ Recreational activities under this section are described briefly below.

Archaeological study

Since there are very limited archaeological sites on or near the Mauka Trail, and those that exist are likely to be protected, this is not likely to be addressed except as part of written text in guidebooks or spoken on guided tours.

Bird Watching/Nature Photography

Bird watching and nature photography may be significant pursuits on the Mauka Trail, which could be encouraged through specific bird watching tours and pamphlets describing the species likely to be found along with their habitat. These activities could be coupled with any of the transportation modes being proposed for the Mauka Trail, and the lodging facilities.

Botanical/Forestry/Geological/Historical Study

These three activities are grouped together because they are similar in many respects. Similar to bird watching, groups or individuals may pursue their interests in botanical, forestry, or geological studies through self-guided or guided tours. Interest in these areas may be increased with the publication of maps and/or informational booklets describing unique areas on or near the trail. Where these resources need to be protected, they may be described in general terms only, or allowed access only with official trail managers present or with permits.

Guided or Self-Guided Nature Tours

These types of activities are described in greater detail under the Mode of Transportation.

MODE OF TRANSPORTATION**Day Hiking**

Day hiking is considered a primary activity on any trail. It is one of the most popular activities on the Island and country, and is frequently combined with other activities such as bird watching. Variations on day hikes include jogging, lodge-to-lodge hiking, guided and self-guided tours, and dog walking. Age groups vary.

Potential user groups:	Local residents, residents, tourists, hotel guests
Preferred design:	Level or moderate grade single-track trail
Environmental impacts:	Minimal except if a new trail is required; off-trail cut-throughs and dogs may impact sensitive environmental areas.
Basic support items:	Drinking water, restrooms
Primary access points:	Near developed residential and hotel areas
Primary access mode:	Most people would drive to trailhead at higher elevations, although hotel guests may take shuttles
Average trip length:	3 miles roundtrip
Activity trends:	Growing popularity related to active and healthy lifestyle

- Conflicts with:** Mountain biking (if on narrow and/or steep trails), horseback riding and pack trains, formal lodging, 4WD and ATVs, races (if on single track), and hunting.
- Required management:** Keep users on trail. Minimize conflicts with other user groups.

Backpacking (Multi-Day Hikes)

Backpacking is a primary activity on longer trails in undeveloped wilderness areas. Most backpackers desire a trail at least 10 miles in length, and in rugged, scenic, and isolated areas. Backpackers typically do not want to hike in to any location that can also be driven to. Activity can be combined with self-guided tours and mountain biking. Age groups tend towards younger people.

- Potential user groups:** Residents, tourists, and hotel guests
- Preferred design:** Level to steep grade single-track trail
- Environmental impacts:** Minimal except if a new trail is required; off-trail cut-throughs, campgrounds, and dogs may impact sensitive environmental areas.
- Basic support items:** Drinking water, restrooms, and campgrounds
- Primary access points:** Access points can be limited, but close to tourist entry points, lower cost accommodations, and shuttle/transit stops preferred
- Primary access mode:** Most people would drive or take transit/shuttles to trailhead at higher elevations
- Average trip length:** 10 miles roundtrip
- Activity trends:** Stable activity dominated by younger tourists
- Conflicts with:** Hikers (if large numbers impact feeling of isolation), mountain biking (if on narrow and/or steep trails), horseback riding and pack trains, formal lodging, 4WD and ATVs, races (if on single track), and hunting.
- Required management:** Permits and user fees required for campgrounds. Pack-in, pack-out requirement. Seasonal fire restrictions. Keep users on trail. Minimize conflicts with other user groups.

Guided and Self-Guided Tours

Guided and self-guided tours appeal to a broad variety of people, from those who enjoy bird watching to those with an interest in geology, history, archaeology, and biology. Self-guided tours can be combined with hiking, mountain bicycling, and backpacking, while guided tours can be combined with hiking, horseback riding, and 4WD vehicles.

A review of tourist services offered in Hawaii indicates that guided hiking tours of areas such as Kilauea Volcano and Haleakala Crater, typically including a van ride to the trail, are popular services. ATV 'Quad Treks', offered in places such as Lanai, are led by a guide with individual ATV operation is by the visitor after some instruction.

Self-guided tours can take two basic forms: (1) shorter trails with interpretive signs and displays, and (2) maps and books that can be used by any user to identify and understand features on the trail. Guided tours typically originate at a major visitor area (hotel or resort area) or at a trailhead. The tours themselves are often given by local park staff, organization volunteers, and in some cases, commercial tour operators.

Potential user groups:	Residents, tourists, hotel guests, cruise ships
Preferred design:	Level to moderate grade trail or road
Environmental impacts:	Minimal except if a new trail is required; off-trail cut-throughs, interpretive exhibits, and increased human activity may impact sensitive environmental areas.
Basic support items:	Drinking water, restrooms, interpretive signs and displays
Primary access points:	Close to major visitor destinations, and major trailheads
Primary access mode:	Most people would drive or take transit/shuttles to trailhead at higher elevations, or take guided tour vehicle from a hotel or resort.
Average trip length:	1 - 5 miles
Activity trends:	Closely follows other guided tour trends
Conflicts with:	For self-guided tours: same as mode of transportation. For guided tours, all other groups would be impacted if the tour used 4WD jeeps. For walking guided tours, hikers (if large tour group numbers), mountain biking, horseback riding and pack trains (if on narrow and/or steep trails), races (if on single track), and hunting
Required management:	Commercial tour operator permits, volunteer coordination, and management of tour operations on limited-capacity trails.

Horseback Riding

Equestrian use of trails either by individuals, groups, or as part of a guided pack train, is a popular activity in many resort areas. This has proven especially popular in the Sierra Nevada and Rocky Mountains, because it combines access to the backcountry with a love of horses, good food and accommodations, adventure, sightseeing, and less physical effort. Horses, just like bicycles, may lend themselves to the Mauka Trail because they can help overcome the tremendous distances and lack of infrastructure in the trail corridor.

Potential user groups:	Visitors, local residents with horses
Preferred design:	Level to moderate grade 4WD road or trail
Environmental impacts:	Depending on the level of use and season, horses can cause significant erosion on a trail. They can also bring in invasive species.
Basic support items:	Non-potable water for the horses; drinking water may be brought in or provided along the trail; outhouses.
Primary access points:	Close to major visitor destinations, and major trailheads. Large parking area and corral required at trailheads.
Primary access mode:	While some people would drive to a trailhead, guided pack train people would likely be shuttled.
Average trip length:	5-10 miles
Activity trends:	Stable activity
Conflicts with:	Depending on level of use and type of trail, separation from hikers and mountain bicyclists may be needed.
Required management:	See Guided Tours.

Motorized Vehicles

Motorized vehicle usage includes private 4WD vehicles, guided tours using 4WD vehicles, private or rented ATVs, and service, maintenance, and fire vehicles. Given the number and variety of other users, impacts to those users, and environmental impacts, no privately operated ATV or 4WD vehicles are recommended for the Mauka Trail. Guided ATV or 4-wheel drive usage may be appropriate for some trail segments, provided they are separated from other users and environmental impacts can be addressed.

4WD vehicles for guided tours offer an opportunity for some groups, especially older people and those with disabilities, an opportunity to visit the trail corridor. Given the impacts of these vehicles on other users, and the fact that these services are most often linked to hotels, it is suggested that this type of service be provided in a limited area close to existing hotels or a new lodge.

Potential user groups:	Residents, tourists, hotel guests, cruise ships
Preferred design:	Level to moderate grade 4WD road
Environmental impacts:	Increased vehicle use and human activity may impact sensitive environmental areas.
Basic support items:	Drinking water, restrooms, interpretive signs and displays

Primary access points:	Close to major visitor destinations, and major trailheads
Primary access mode:	Most people would take a 4WD guided tour vehicle from a hotel or resort.
Average trip length:	5 miles
Activity trends:	Closely follows other guided tour trends
Conflicts with:	Any vehicle usage on 4WD jeep roads would require alternative trails be developed for other users.
Required management:	See Guided Tours.

The existing 4WD jeep road segments of the Mauka Trail should be able to accommodate 4WD fire and emergency vehicles with minor modifications. Segments that need to be used by service vehicles to campgrounds would need to be upgraded, and segments connecting to a new lodge may need to be paved with alternative trails developed. Specialized maintenance equipment may be needed for trails and jeep roads.

Potential user groups:	Rangers, fire, police, maintenance, service personnel
Preferred design:	Level to moderate road
Environmental impacts:	Minimal except for service vehicles, which may have major environmental impacts.
Basic support items:	4WD road for emergency and maintenance vehicles, paved road for service road to lodge, improved dirt road for service access to campgrounds
Primary access points:	Close to existing emergency service stations; accessible from main highways; direct route to lodge.
Activity trends:	Number of service vehicle trips related to size of campgrounds and lodge.
Conflicts with:	Service vehicles will conflict with all other non-motorized users on a road, and also with guided jeep tours.
Required management:	Would need to be coordinated with jeep tour vehicles if they were to share the same roadway.

Mountain Bicycling

Mountain biking has become one of the most popular trail activities in the country, outstripping even hiking in some areas. Mountain biking is as popular with residents as it is with visitors, as seen by its popularity on trails and fire roads around cities and resort areas. Mountain biking is a fast growing sport that has yet to reach its limits, and is often the preferred activity among younger and middle aged adults.

Potential user groups:	Residents, visitors
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Preferred design:	Single track trail with various levels of gradient and difficulty, 4WD roads also acceptable
Environmental impacts:	Depending on level of use, climate, and soil conditions, mountain bikes can cause erosion.
Basic support items:	Directional and trail signage, outhouses, water (optional)
Primary access points:	Multiple major and minor access points with adequate parking.
Primary access mode:	Most people would drive to high elevation access points, although some would ride and others may take a shuttle for visitor areas.
Average trip length:	10-50 miles
Activity trends:	Fast growing activity
Conflicts with:	Depending on level of use, may conflict with hikers, backpackers, motorized vehicles, and horses.
Required management:	Separate trails or limits on access through trailhead parking may be needed; trail repair.

ACCOMMODATIONS

Destination Lodges

Destination lodges or resorts are full service facilities that include guest rooms, common areas, restaurants, and often amenities such as pools and spas. The most likely destination lodge to be located along the Mauka Trail would be a lodge with an eco-tourism, health, and/or spiritual orientation. Age groups are varied.

Potential user groups:	Visitors
Preferred design:	Low impact design possibly with clusters of smaller buildings and a larger common building. Native landscaping and other measures to lessen local impacts.
Environmental impacts:	Any new construction of roads, buildings, and infrastructure will have some environmental impacts that require full analysis.
Basic support items:	Drinking water, electricity, access roads, parking, and sewage.
Primary access points:	Access points can be limited, but decent roads required.
Primary access mode:	Most people would want to drive to site, although it could also be served by shuttles.

Average trip length:	n/a
Activity trends:	Resort and hotel demand has steadily increased since 9-11, and eco-lodges are a fast growing segment of the industry.
Conflicts with:	Some trail uses such as backpacking, where a sense of isolation is important, and access roads will conflict with all non-motorized uses. Incompatible with hunting, ranching, and timber harvesting.
Required management:	Lodge or resort management organization.

Full Service Lodge-to-Lodge System

Lodge-to-lodge hiking is a loose term that can encompass a wide variety of facilities. The 'lodges' can be very primitive tent camps (such as found in places like Costa Rica) or more substantial mini-lodges (such as found in New Zealand and Switzerland) that are located every 10 or so miles along a long distance trail or system of trails, providing overnight accommodations. Each of the lodges would be staffed and provide meals and overnight accommodations for visitors, and may or may not be affiliated with each other.

Potential user groups:	Visitors
Preferred design:	Low impact design possibly with clusters of smaller buildings and a larger common building. Native landscaping and other measures to lessen local impacts.
Environmental impacts:	Any new construction of service roads, buildings, and infrastructure will have some environmental impacts that require full analysis.
Basic support items:	Drinking water, electricity, access roads, parking, sewage.
Primary access points:	Access points can be limited, but decent roads required
Primary access mode:	Typically, these lodges are accessible only by foot, bicycle, or horse, although they may also be accessible by guided tour or shuttle.
Average trip length:	n/a
Activity trends:	This is a relatively rare network of facilities, but where in place they experience high demand.
Conflicts with:	Some trail uses such as backpacking, where a sense of isolation is important, and access roads will conflict with all non-motorized uses. Incompatible with hunting, ranching, and timber harvesting.

Required management: Lodge or resort management organization.

Simple Hut-to-Hut System

Hut-to-hut systems are very similar to lodge-to-lodge systems, except that the type of facility is a simple hut or enclosure with very basic bedding, eating, and restroom facilities. The complex of 'huts' may or may not be staffed; prepared meals may or may not be provided. Typically, there is no electricity nor is there indoor plumbing. Instead of a full staff at each location, there may be a single caretaker. This type of facility may also be compatible with platform tent or tent camping.

Potential user groups: Visitors

Preferred design: Low impact design possibly with individual huts or enclosed sleeping platforms. No larger common building. Native landscaping or no landscaping to lessen local impacts.

Environmental impacts: Any new construction of service roads, buildings, and infrastructure will have some environmental impacts that require full analysis.

Basic support items: Drinking water, access roads, outhouses, trash removal.

Primary access points: Access points can be limited

Primary access mode: Typically, these lodges are accessible only by foot, bicycle, or horse.

Average trip length: n/a

Activity trends: This is a rare network of facilities, but where in place they experience high demand.

Conflicts with: Some trail uses such as backpacking, where a sense of isolation is important, and access roads will conflict with all non-motorized uses. Incompatible with hunting, ranching, and timber harvesting.

Required management: Typically volunteer or organization staff.

Single Platform Camping

Single platform camping is somewhere between a simple hut and tent camping on the ground. Simple platforms with or without a covering are provided that provide some protection from the elements. These facilities provide no electricity or indoor plumbing, and are not staffed.

Potential user groups: Visitors, residents

Preferred design: Low impact design possibly with clusters of smaller platforms.

Environmental impacts:	Any new construction of service roads, platforms, and infrastructure will have some environmental impacts that require full analysis.
Basic support items:	Drinking water, outhouses, trash removal.
Primary access points:	Access points can be limited; trail access only acceptable.
Primary access mode:	Typically, these are accessible by automobile, although some campgrounds are accessible only by foot, bicycle, or horse.
Average trip length:	n/a
Activity trends:	While campgrounds are ubiquitous, tent platforms are relatively rare.
Conflicts with:	Incompatible with hunting, ranching, and timber harvesting.
Required management:	Typically volunteer or organization staff.

Tent Camping

Tent camping is differentiated from backpacking in that many campgrounds are typically accessible by car. People can drive to or near a campground with their vehicle, and bring their equipment and supplies (including water) to the site. Campers may become hunters, hikers, and bicyclists during the day. Campers like to have access to various activities, and tend to be social events often featuring large family or friend gatherings. Age groups are varied, but are skewed towards younger families.

Potential user groups:	Local residents, visitors
Preferred design:	Cluster of camping sites
Environmental impacts:	Minimal except if grading and new roads required; fires will need to be controlled; daily cleanings required; dogs may impact sensitive environmental areas.
Basic support items:	Drinking water, restrooms, tables, fire pits, level areas for tents or RVs
Primary access points:	Access points can be limited, but decent roads preferred
Primary access mode:	Most people would drive to site, although it could also be used by backpackers and other groups.
Average trip length:	n/a
Activity trends:	Stable activity by residents and tourists

- Conflicts with:** Backpackers (if car-accessible and large numbers and vehicles/noise impact feeling of isolation), and hunting.
- Required management:** Permits and user fees required for campgrounds. Seasonal fire restrictions. Minimize conflicts with other user groups.

Special Events

Special events such as races or marathons are occasionally allowed on facilities such as the Mauka Trail. The Dipsea Trail and race in Mill Valley, California, is a good example. However, this is a more common activity in a developed area with good access, staging areas, and capacity. Environmental impacts can be significant due to the amount of cut-throughs and off-trail activity.

- Potential user groups:** Residents, tourists, hotel guests, cruise ships
- Preferred design:** Level to moderate grade trail or road
- Environmental impacts:** Minimal except if a new trail is required; off-trail cut-throughs, interpretive exhibits, and increased human activity may impact sensitive environmental areas.
- Basic support items:** Drinking water, restrooms, interpretive signs and displays
- Primary access points:** Close to major visitor destinations, and major trailheads
- Primary access mode:** Most people would drive or take transit/shuttles to trailhead at higher elevations, or take guided tour vehicle from a hotel or resort.
- Average trip length:** 1 - 5 miles
- Activity trends:** Closely follows other guided tour trends
- Conflicts with:** For self-guided tours: same as mode of transportation. For guided tours, all other groups would be impacted if the tour used 4WD jeeps. For walking guided tours, hikers (if large tour group numbers), mountain biking, horseback riding and pack trains (if on narrow and/or steep trails), races (if on single track), and hunting
- Required management:** Commercial tour operator permits, volunteer coordination, and management of tour operations on limited-capacity trails.

4. PRELIMINARY TRAIL SYSTEM

Based on the assessment of existing conditions, opportunities and constraints on each segment, and the needs of potential user groups, a Preliminary Trail System has been developed for the purpose of assessing potential demand. The recommended activities presented below were based on a variety of factors, including:

1. Existing visitor patterns in nearby areas, based on discussions with the local visitor industry representatives and review of published data on local participation rates.
2. Knowledge of how access to the proposed trail is likely to affect demand and usage.
3. Knowledge of how conflicting uses on the trail is likely to impact each other.
4. Assumed desires to protect the local environment from uses or levels of use that may cause significant environmental damage.
5. Knowledge of how the cost of providing infrastructure, water, and reasonable service and maintenance levels impacts the viability of an activity.
6. A review of trails in similar locations and the range and type of activities offered on those facilities.

Some of these issues may be further addressed in subsequent planning and design studies on this trail, and recommended activities may change at that time.

RECOMMENDED TRAILS, FACILITIES, AND OPERATIONS

<i>Day Hiking:</i>	Three areas are recommended to be developed for day hiking: Hualalai, North Kona, and Kau Forest (Volcanoes National Park). These areas offer good access to major residential and visitor areas, interesting natural features, existing networks of trails and roads, and relatively healthy forests.
<i>Backpacking:</i>	Backpacking would be allowed and managed on the entire trail network, and but encouraged and directed primarily to the Volcanoes National Park access points and Hualalai access points. Permits would be required, and the number of people allowed would be controlled.
<i>Guided/Self-Guided Tours:</i>	Guided and self-guided tours on foot and/or horseback would be provided in the Hualalai and Kau Forest (Volcanoes National Park) areas.
<i>Destination Lodge:</i>	One low-impact destination lodge with an environmental education and health orientation is recommended to be located in the Hualalai or Kau Forest areas, supporting

local activities. These two areas offer a combination of attributes (access, close to visitor areas, healthy and unique physical and ecological features, numerous activities close by) that would be attractive to a destination lodge patron. The lodge could provide up to 50 guest rooms.

Lodge-to-Lodge Hiking:

This is not recommended for the Mauka Trail due to the severe access, environmental, and water constraints.

Hut-to-Hut Hiking:

The temperate climate reduces the need for this type of facility, and severe access, environmental, and water constraints further make this option problematic. It is not recommended as a short to mid-term option, but possibly as a longer-term option. This could be a cached food system similar to the one employed on the New Zealand and Wonderland Trail systems.

Platform Camping:

This is a viable option only if adequate tent sites are not possible on the ground due to unusually rocky or environmentally sensitive conditions. The need to maintain these facilities further reduces their attractiveness.

Tent Camping:

It is recommended that a car-accessible campground on or near the trail be provided in the South Kona area, and possibly in the Hualalai area. It is also recommended that primitive (no water, composting outhouses) campgrounds for up to 20 tents be provided every 20 miles along the length of the trail (6 in all) by available permit. Campgrounds should be located every 10 miles in the Kau Forest, Hualalai, and North Kona areas for backpackers, and every 40 miles elsewhere for mountain bicycles and horses.

Guided Pack Trains:

Commercially operated guided pack trains would be allowed, with limits on the number of trips and users, on the entire trail system. These could be offered in conjunction with ranch-operated services.

Horseback riding:

Horses would be allowed on designated jeep roads, and controlled by the amount of trailhead parking offered.

All Terrain Vehicles (ATVs):

Subject to local approval, ATVs could be allowed in a designated area where impacts could be controlled. No specific area has been identified for this use yet.

Service/Emergency Vehicles:

Jeep roads and trails need to be designed to accommodate service vehicles, which range from dirt motorcycles, trail cats, pick-up trucks, and fire fighting trucks.

- 4-wheel Drive Tours:** A short 4-wheel drive tour may be possible from the destination lodge in the Hualalai area, providing older and disabled people with access to the area.
- Mountain Biking:** A mountain bike-accessible single-track internal trail system should be developed in the Hualalai and Kau Forest areas and also possibly in the North and South Kona Areas. Longer distance trips by mountain bicycle can share jeep roads and trails with other users assuming the usage level remains relatively low.
- Hunting:** No hunting is recommended to be allowed within 1,000 feet of the trail or any campground or lodge. However, hunting may be allowed in surrounding areas associated with ranches or a lodge. Sections of trail may be closed seasonally to allow for hunting if the need exists.
- Special Events:** If a sponsor steps forward, a Mauka Trail mountain bike event would be attractive, especially if it were a one-day endurance event.

Based on this scenario of activities and developments, an estimate of use and evaluation of impacts and benefits can be completed.

5. ESTIMATING DEMAND

There are three basic methods of estimating demand for a trail:

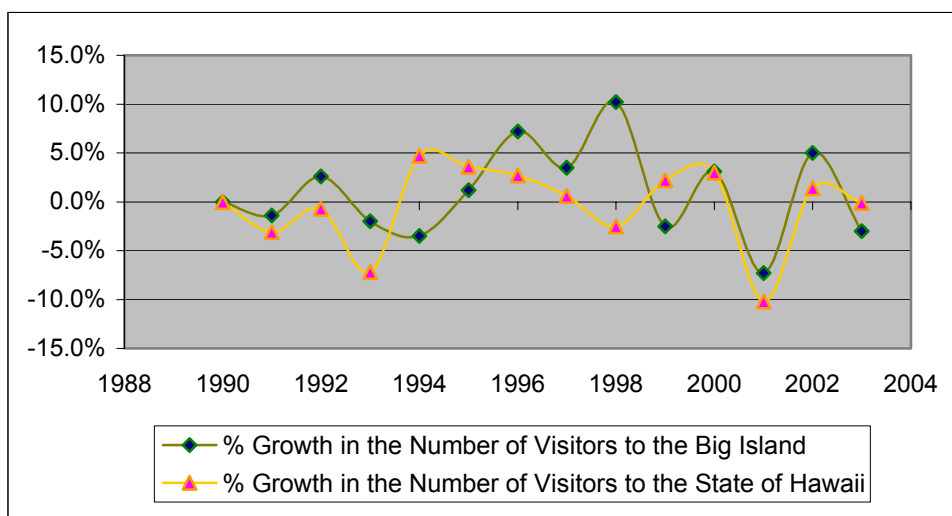
- A. Examine trends in regional visitor activities
- B. Examine trends in activities that could be accommodated on the trail
- C. Study comparable trails and their usage patterns

All three of these approaches are used to develop an estimate of demand for the Mauka Trail, based on the activities and facilities listed previously.

VISITOR TRENDS IN HAWAII

Hawaii remains one of the leading visitor destinations in the United States and world. After 40 years of sustained fast growth, the Islands were impacted by the effects on worldwide travel following September 11, 2001, and only recently have seen visitor stays reach the same levels of pre-2001 (see Figure 7).

Figure 7: Percentage Growth of Arrivals to the State of Hawaii and the Big Island, 1990-2003



Source: The Department of Business, Economic Development and Tourism, 2003

While visitors to Hawaii come from all over the world, the majority are from the United States. About 67% of all visitors, 41% from the West Coast and 26% from the East Coast, come to Hawaii from the United States. Japan, which makes up about 21% of all visitors, is the second most popular country of origin.

While visitor rates for the islands as a whole slowly recover from 9-11, the Big Island has experienced growth that sets it apart from the other islands. This is partially due to the completion of the Kona International Airport, along with numerous resorts and developments along the Kona and Kohala coasts. Perhaps more importantly, the Big Island is attracting

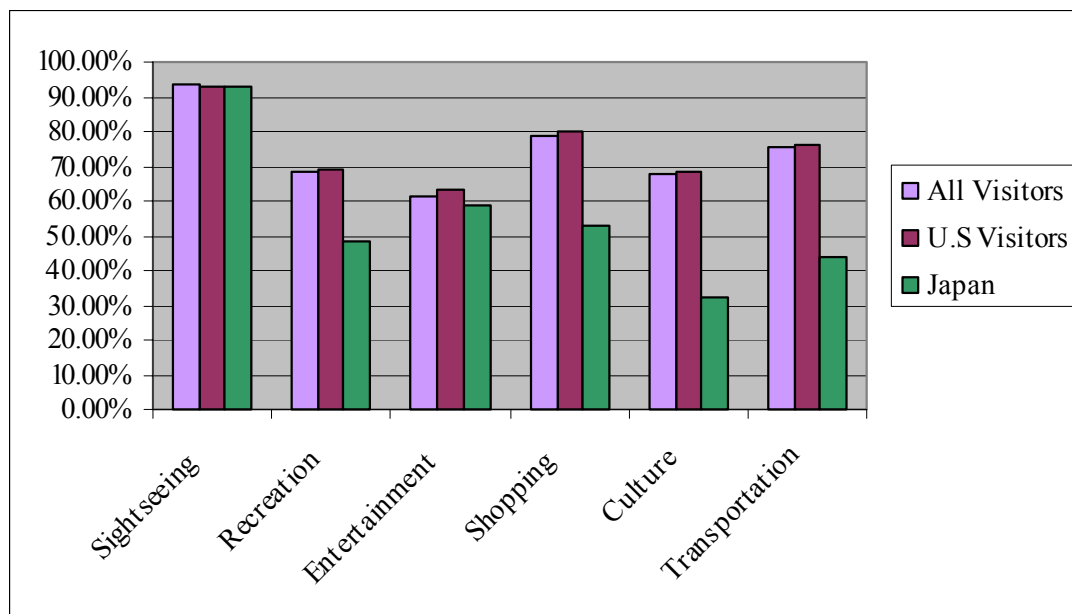
substantial numbers of Mainland retirees and second-home owners. The underlying theme behind all of these changes is that, improved access aside, people are attracted to the Big Island because it offers more room in a rural setting with a slower, more outdoor-oriented lifestyle than the other islands. While the beaches on the Kona and Kohala Coasts may not be the same as those on other islands, none of them can offer the range of outdoor activities to the variety of visitor types and interests as the Big Island. The activities identified on the Mauka Trail fit this profile very well.

VISITOR TRENDS AND TYPES OF ACTIVITIES

Trends in country of origin directly impacts trends in the types of activities that people like to do on their vacations. As can be seen in **Figure 8**, visitors from the Mainland to the Big Island proportionately enjoy more active activities (such as backpacking, hiking, camping, running, jogging, and walking) than Japanese visitors. With visitors from the Mainland increasing as a proportion of visitors, especially on the Big Island, this points to increased demand for active pursuits such as hiking and mountain bicycling.

Coupled with this is the projected increase in the population of the Big Island, which is expected to grow 16% (to 174,000 people) between 2000 and 2010, and 37% by 2020 (County of Hawaii, 2005). As the population grows, so will the demand for facilities such as the Mauka Trail.

Figure 8: Recreational Activity Participation, Hawaii (Big Island) Visitors by Origin, 2003

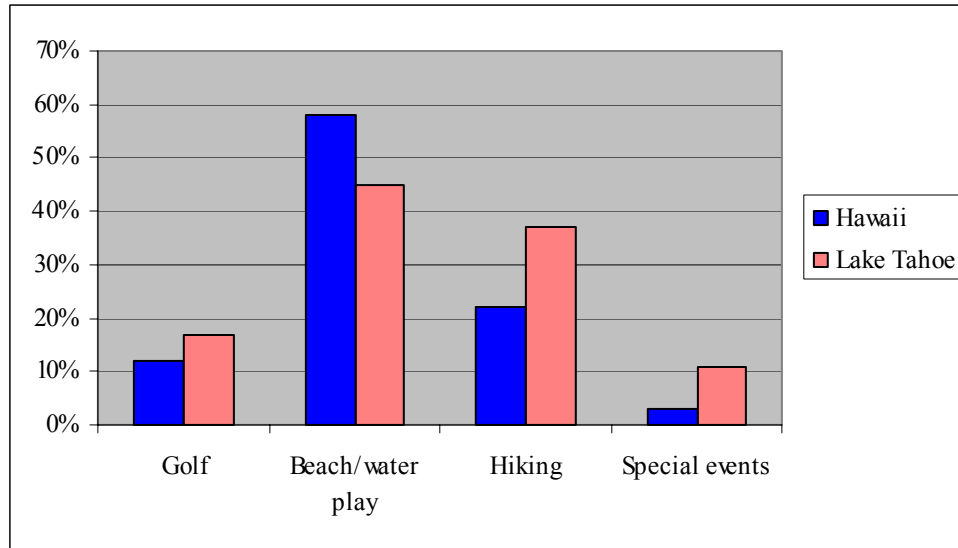


Source: The Department of Business, Economic Development and Tourism, 2003

By way of comparison, activity participation rates from another major visitor destination area were analyzed. The Lake Tahoe region in California and Nevada is one of the most popular leisure destinations in the United States. It is similar to the Big Island in many ways, especially the combination of major hotels, numerous condominiums and rental units, and access to outdoor activities. There are some obvious differences in activities due to physical

factors (swimming in Hawaii, sightseeing by car in Lake Tahoe), but in other respects the activity patterns were similar, as can be seen in Table 1.

Table 1: Comparison of Activity Participation Rates, Hawaii (Big Island) and Lake Tahoe, 2003



Sources: Lake Tahoe Visitors Authority, Summer, 2004, DEBDT 2003

While most activity rates are similar or can be explained by physical differences in the locations, the substantial difference in hiking rates between the two locations may be due to the lack of opportunities on the Big Island versus Lake Tahoe. Lake Tahoe has an extensive network of both paved bike paths and hiking trails, which offer visitors many options to use. The Mauka Trail may serve an important role in addressing this demand in Hawaii.

SUMMARY

Activity Trends

According to the Outdoor Industry Association (Outdoor Recreation Participation for the United States, 2004, 6th Ed.), 146 million Americans over the age of 16 participated in some type of human-powered activity in 2003. Some of the most popular and fast-growing activities are those that could be accommodated on the Mauka Trail, including:

Backpacking	6.2%
Bike riding-single track	17.9%
Bike riding-wide dirt road	17.8%
Car camping	24.1%
Camping-away from car	7.5%
Hiking	32.7%
Trail running	17.1%
Bird watching	7.3%

Of these, it is assumed that the average visitor and resident on the Big Island has roughly the same profile as the average American, and in fact may have higher participation rates considering the weather and environment. Of more interest, 55 million Americans took vacations in 2003 with a human powered activity being their primary trip purpose. Of these,

11.6 million (21%) had hiking, backpacking, or bicycling as their primary trip purpose. While activities like golf and swimming remain popular activities for Americans, linear activities such as trail running are increasingly becoming primary activities for visitors to places like Hawaii.

Overall activity trends, including non-human powered activities, also show walking, hiking, and bicycling to be some of the most popular activities. According to the 1998 Harris Poll, the top ten outdoor leisure activities are:

Gardening	14%
Fishing	9%
Team sports	9%
Walking	7%
Swimming	7%
Golf	6%
Hunting	4%
Bicycling	3%
Camping	3%
Boating	3%

Three and possibly four (hunting) of the top ten most common outdoor leisure activities could be accommodated on or from the Mauka Trail.

Eco-tourism

Eco-tourism is a rapidly growing field in the United States and Hawaii that includes guided tours, lodges, and other facilities and activities. Internationally, eco- and nature tourism have grown from 393 million people in 1988 to 528 million in 1994, spending over \$416 billion dollars (Ecotourism Statistical Fact Sheet, The International Ecotourism Society, 2000).

In its most basic form, eco-tourism has five basic elements: (a) conservation, (b) minimal environmental impact, (c) sustainability, (d) meaningful community involvement, and (e) environmental education. Needless to say, the expression 'eco-tourism' is used by many operators who may or may not truly understand or care about these principles.

According to the World Resources Institute, while tourism generally grows at an annual rate of 4%, nature travel is increasing at an annual rate between 10% and 30%.

A market profile of eco-tourists was constructed by the International Eco tourism Society:

- **Age:** typically 34-54 years old, although age varies with activity and other factors such as cost.
- **Gender:** 50% men, 50% women, however activities vary
- **Education:** 82% were college graduates. A shift in interest in eco tourism from those who have high levels of education to those with less education was also found, indicating an expansion into mainstream markets.
- **Trip Duration:** 50% of eco-tourists preferred trips lasting 8-14 days.
- **Important elements of the trip:**
 1. Wilderness setting
 2. Wildlife viewing
 3. Hiking/trekking

- **Motivations for taking next trip:**
 1. Enjoy scenery/nature
 2. Experiences/places

Eco-Tourism in Hawaii

Eco tourism is a fast growing and important segment of the tourism industry. Eco tourism was identified as one of the main sub-groups of tourism that were important to the State's tourism industry (Strategic Directions for Hawaii's Visitor Industry, Appendix F).

The Hawaii Ecotourism Association actively promotes this type of facility in the Islands. The Association's website lists more than 130 affiliated organizations, businesses, and institutions, along with links to international eco-tourism groups worldwide. The demand from visitors for eco-tourism activities has prompted many adventure companies to promote and offer guided eco-tours. These eco-tours may include hiking, walking, biking, horseback riding, and similar activities in parks and other areas. These activities are often coupled with education on environmental, cultural, historical, and other resources. Due to the increased interest in active vacations especially by Mainland and European visitors, tour operators in Hawaii are capitalizing on the term if not fully complying with all of the connotations. A review of 'eco-tours' advertised in Hawaii includes traditional hotels, helicopter tours, and sailboat rides.

True 'eco-tourism' may be a challenge for many Hawaii and Big Island hotels and tour operators because the activities do not always lend themselves to guided packages originating from hotels and resorts. In order to capitalize on new facilities such as the Mauka Trail, hotels and tour operators will need to adapt to the new types of activities, and develop services and facilities that meet these unique demands. While some user groups such as backpackers may not represent potential hotel and tour operator customers, many others will.

Eco-Lodges

The term eco-lodges, like eco-tours, encompasses a very wide variety of facilities and services. Responsibletravel.com defines an eco-lodge as having the following characteristics:

- A. A written policy regarding the environment and local people.
- B. Contribute to conservation and the local people.
- C. Local resident employment including management positions.
- D. Use services and products from within 25k of the facility.
- E. Low impact wastewater treatment and solar heating.
- F. Information on local cultures and customs available to guests.
- G. Employment of local guides.

A review of how eco-lodges are actually advertised provides perhaps a more realistic indication of what makes them attractive to visitors. These advertisements stress access to the following activities and facilities:

- a. Bird watching tours
- b. Botanical gardens and reserves
- c. Climbing expeditions
- d. Cultural tours
- e. Eco adventure tours (mountain biking, hiking, kayaking, etc.)
- f. History tours

- g. Mountain biking tours
- h. Multi-sport MTB tours

The San Jorge Eco-Lodge in Costa Rica is a prime example of this type of facility. It is essentially a full service resort with most of the traditional amenities (restaurants, pool, sauna, lounges, conference rooms) but with an emphasis on preservation, the environment, local history and culture, and outdoor human powered activities. Typically, an eco-lodge would not have a golf course or tennis courts.

There are currently no eco-lodges per se on the Big Island, although there are some bed and breakfast facilities that advertise themselves as being eco-friendly. Perhaps the most similar type of experience is the Volcano House hotel in the Volcanoes National Park, although this facility does not advertise itself as an eco-lodge or offer extensive eco-tours.

National and international trends suggest that eco-hotels a function of eco tourism are gaining momentum quickly. Travelers are demanding with greater frequency lodging that blends in with the landscape and does not harm the surrounding environment. This type of lodging has been popular in select areas across the world including Puerto Rico, the Bahamas, New Zealand, and the Cook Islands

Jeep Tours

Jeep tours are a way for tourists to explore steep terrain leading to a major geographic feature (such as a mountain peak) that may otherwise be difficult to access. They typically use paved or unpaved roads that are not shared with hikers, horses, or other users. Jeep tours are very popular on Mauna Kea (for which statistics are not available) and at the Haleakala National Park.

Jeep tours are a potential activity on the Mauka Trail, at least on selected segments of the trail. Jeep and ATV tours are popular in Hawaii. ATV 'Quad Treks' are available on the Island of Lanai that use trails and roads similar to the mauka Trail. Four-wheel drive vans are popular services to Mauna Kea, Kilauea Volcano, and Haleakala Crater, costing about \$125/person and including a hike at or near the summits.

Mountain Bicycling

American adults rode single-track trails on bicycles 587 million times in 2003. This high level of mountain biking participation was a key finding of the 6th annual Outdoor Recreation Participation Study conducted by the Leisure Trends Group and presented by the Outdoor Industry Association (OIA), the trade association of the outdoor industry.

The study focuses on comparing participation over time and has been conducted each year since 1998. 4,000 Americans 16 and older are interviewed by telephone about their participation in 21 human powered activities. Mountain biking on single-track (dirt track less than five feet wide) is tallied separately from riding dirt roads.

The study breaks single-track mountain bikers into two groups, "Participants" and "Enthusiasts." "Participants" believe they participated in the activity at least one time during the past year. "Enthusiasts" are those within the top 15 percent of frequency levels. 39.3 million adults - or 17.9 percent of the U.S. adult population - are classified as single-track mountain biking "Participants," indicating they rode single-track at least once during 2003.

For mountain biking on single-track, there are two key findings: 1) The number of "Participants" has remained fairly steady since the study began, ranging from a low of 37.1 million in 1998 to a peak of 46 million in 2001. In 2003, the number of "Participants" was 39.3 million. 2) The number of "Enthusiasts" has grown 150 percent since 1998 - from 2.5 million in 1998 to 7.5 million in 2001. The number of "Enthusiasts" in 2003 declined slightly to 6.6 million.

The study also tallies the total number of "outings" each year. Mountain bikers rode single-track a total of 587 million times in 2003. "Enthusiasts" counted for 77 percent - or 455 million - of those outings. One conclusion is obvious: mountain biking on narrow trails is extremely popular nationwide.

Surveys conducted by the International Mountain Bicycling Association (IMBA) showed that of the 10 million active mountain bicyclists in the United States, locations like Moab, Utah, Lake Tahoe, and Mammoth Mountain were major attractors for a wide variety of factors, the most important of which are (a) variety and difficulty of terrain and (b) the number of trails.

Activities on the Appalachian National Scenic Trail

A detailed study was conducted of users on the Appalachian Trail in 2000 (Use and Users of the Appalachian Trail: A Source Book). Some of the findings of this study have direct relevance on activity trends for the Mauka Trail.

Trip type:

Day hike	36%
Overnight	32%
Whole trail	32% (note: trips may be taken in sections over 1 year)

Average trip length: 71 miles (7.2 days)

Average group size: 3.2 persons

Percent who paid a fee: 12%

Activities (may be more than one activity):

View scenery	82%
Day hiking	62%
Backpacking	57%
Camping	46%
Photography	48%
Picnicking	28%
Nature study	18%

Type of overnight facility or location used:

Shelter (lean-to)	43%
Campground	26%
Camping area near shelter	12%
Hut	10%
Informal camping	9%

Average distance trail user lives from trail: 150 miles

Allow commercial uses (guided tours) on trail? Yes: 38% No: 38% No opinion: 25%

CONCLUSION

Activities and facilities proposed for the Mauka Trail represent some of the fastest growing and largest recreation participation segments in the country. These activities are typically underserved on the Big Island. The Mauka Trail will provide resources for these activities, and will directly increase the number of visitors, length of visitor stays, and total expenditures on the Island. There is also a definite demand for an eco-lodge type facility on or near the Mauka Trail, which would tie in directly with the trail through various guided and individual activities. Tour operators and existing hotels that find ways to integrate their services into the Mauka Trail will also benefit.

6. ANALYSIS OF COMPARABLE TRAILS

There is no directly comparable trail to the Mauka Trail in Hawaii, or for that matter, anywhere in the world. Other trails do offer an important source of understanding for how the Mauka Trail may operate given differences in length, environment, trail type, access, and other factors.

HAWAIIAN TRAILS

Kalalau Trail (Na Pali Coast)

This trail on Kauai within the Na Pali Coast State Park is one of the most popular trails in Hawaii, located along the rugged and isolated Na Pali Coast. While located along the coast, the trail is moderately difficult with numerous steep climbs. The trail is approximately 11 miles long, traverses 5 valleys before ending at Kalalau Beach where it is blocked by sheer, fluted pali (cliffs) Originally built in the 1880s, with portions rebuilt in the 1930s. According to the State parks staff, the trail usage ranges between 60,000 and 70,000 per year and is limited by permit requirements, camping fees, and weather. No drinking water is available on the trail, but camping areas are provided as are a few composting toilets.

Canyon Trail (Waimea Canyon)

This trail leads from Koke'e State Park into Waimea Canyon on Kauai, one of the most spectacular geographic features in the United States. Usage is about 28,000 people per year.

Ala Kahakai National Historic Trail

While this 175-mile coastal trail on the Big Island is not yet constructed, it will be a major comparable trail when completed. Current plans identify several options along the Kona and Kawaihee Coasts, including some sections that may not be trails but be water only connections.

Haleakala National Park

This national park offers a wide variety of trails and facilities, ranging from trails around the Haleakala Crater to trails that plummet to the coast below. The park offers a variety of campgrounds (both car-camping and backpacking) and three cabins. The cabins all need to be reserved months in advance. The cabins have 12 padded bunk beds, a wood stove, a nearby latrine, and cistern water that must be purified. A popular activity is to be driven to the summit in a car, and descend the access road by bicycle. The National Park Service Visitors Report indicated a total of 1.4 million visitors in 2004, including 1,416 overnight backcountry permits.

Kohala Mountain Trails

There are numerous trails in the Kohala Mountain area on the Big Island, including the Awini Trail and the Waipio Valley Trail. These trails are predominately located in State Forest or Natural Reserve areas, although some are on private land.

Hawaii Volcanoes National Park

The Volcanoes National park has over 15 trails within its borders, ranging from a few miles to over 10 miles in length. Major trails include the Pu'u Huluhulu Trail (3 miles), Napau Trail (7 miles), and the Crater Rim Trail (11 miles). While the park does not keep trail usage figures, the 2004 Visitors Report indicated that it had 2.6 million visitors in 2004 including 5,070 overnight backcountry permits.

Puu Laau Road

This dirt and gravel road near Waikii on the Big Island is accessible to hikers, bicyclists, equestrians, and 4-wheel drive vehicles. The road is 8.4 miles (Na' Ala Hele Website, 2005) long and passes through open native dryland forest and critical habitat of the endangered Palila, a Hawaiian honeycreeper found only on the upper slopes of Mauna Kea. The trail also traverses active hunting grounds, and trail users are recommended to wear brightly colored clothing. The trail is shown on the Na Ala Hele Trail & Access System and is located on state land.

OTHER COMPARABLE TRAILS

Wonderland Trail

The Wonderland Trail is located in Mt. Rainier National Park in Washington. The trail was originally built in 1913, is 93 miles long as it encircles the mountain, and has campgrounds that can be used by trail users. The trail traverses a wide variety of landscapes, including 25 named glaciers, and has rapid changes in topography requiring up to 3,500 feet in vertical change. Weather is a major factor on the trail, rapidly changing to sub-zero temperatures without warning. Permits are required to use the trail, and reservations encouraged to use any of the 18 trailside camps (3-7 miles apart) that also provide cleared tent sites, a pit or composting toilet, and a nearby water source. All water must be boiled prior to use.

The National Park Service offers an unusual service on the Wonderland Trail. Trail users can have food supplies cached at ranger stations so they can lighten their hiking loads.

Pacific Northwest Trail

The Pacific Northwest Trail was formed in 1977 and is a 1,200 mile-long trail between Glacier National Park in Montana on the Continental Divide, to the Olympic National Park in Washington. The trail has 44 individual segments that are partially developed, and has no specific campgrounds or other support facilities. The trail is managed by a non-profit organization (Pacific Northwest Trail Association—or PNTA) that has one paid staff person and many volunteers, including several volunteer trail maintenance groups. PNTA has also received numerous large grants from private donors, including the Ford Motor Company. The National Park Service has identified several segments of the trail as National Recreational Trails. One of the most unique aspects of the trail organization is a group called SKY (Service Knowledge Youth) that brings in young people to learn environmental, trail development and maintenance, and other educational topics.

Appalachia National Scenic Trail

The Appalachia Trail is one of the oldest (opened in 1937), longest (2,174-miles), and best-known and used trails in the United States. The trail starts at the summit of Mt. Katahdin in Maine and terminates at the summit of Springer Mountain in Georgia. The trail was originally

laid out in the 1920s by volunteers, and was developed and managed by the National Park Service in collaboration with the Appalachian Trail Conference and its 31 member trail clubs. Much of the original alignment was located on private land. In order to protect the route, the National Trails Systems Act was passed by Congress to facilitate acquiring land and easements for the trail, which is now 99% on publicly controlled land. Over 4,000 volunteers work more than 175,000 hours annually on the trail.

Pacific Crest Trail

The Pacific Crest Trail is a 2,650-mile trail from the Mexican to the Canadian border in California, Oregon, and Washington. The trail connects to destinations such as Mt. Whitney, Yosemite National Park, Mt. Shasta, Mt. Hood, Crater Lake, and Mt. Rainier. The trail alignment was developed between 1935 and 1938 by volunteers of teams of young hikers (ages 14-18) under the direction of the YMCA. The 1968 National Trails Act called for the formation of a Pacific Crest National Scenic Trail Advisory Council. A non-profit group, the Pacific Crest Trail Association, was formed in 1977 to support development and management of the trail. The trail was completed in 1993. Campgrounds are provided as part of existing National Forest and National Parks along the trail.

San Francisco Bay Trail

The Bay Trail is a 400-mile long trail and pathway system encircling the San Francisco Bay, and linking all nine Bay Area counties and 47 of its cities. To date, 240 miles have been completed. The Bay Trail is a project of a non-profit organization housed within and supported by the Association of Bay Area Governments (ABAG), the regional planning agency for the San Francisco region. The trail was authorized by state law in 1987. The 'trail' consists of both paved and unpaved sections, and on-road and off-road segments, including all of the region's bridges. No campgrounds are provided with the Bay Trail.

COMPARISON OF COMPARABLE TRAILS

Table 2 illustrates how the Mauka Trail compares to these trails in Hawaii and the Mainland. Explanations for the criteria are presented below.

Scenery: 1-5, 1 being the lowest and 5 being excellent scenery, as in views of the ocean, views from mountain summits, etc.

Access: 1-5, 1 being poor access and 5 being very good access from major visitor or population centers.

Management: Gov = government, NPO = non-profit

Activities:

- 1 = hiking, walking, jogging
- 2 = bicycling
- 3 = equestrian, pack trains
- 4 = camping
- 5 = ATVs
- 6 = Hunting

Climate: 1-5, 1 being very extreme climate (temperatures, rain or snow fall, changeable weather), 5 being very temperate climate

Facilities:

- 1 = campground
- 2 = campgrounds with shelters
- 3 = huts or cabins
- 4 = lodges

Table 2: Comparison of Trail Qualities

Name of Trail	Length (miles)	Scenery	Access	Management	Activities	Climate	Facilities
Mauka Trail	129	2	2	N/a	1,2,3,4,5,6	5	1,2,3,4
Crater Rim Trail	11	5	4	Gov	1,4	3	1,3
Puu Laau Road	8.4	3	4	Gov-priv	1,2,3,5	5	
Na Pali Coast Trail	4	5	2	Gov	1,4	4	
Wonderland Trail	93	5	3	Gov	1,3,4	1	1,3
Pacific Northwest Trail	1,100	4	2	NPO	1,2,3,4	2	None
Appalachian National Scenic Trail	2,174	2	2	Gov	1,4	3	1,2
Pacific Crest Trail	2,650	5	1	Gov	1,3,4	2	1
San Francisco Bay Trail	400	3	5	Gov	1,2	5	None

CONCLUSION

As can be seen in the table above, the Mauka Trail will be unique in several respects that in turn will directly influence types of activities and facilities provided, the attractiveness of the trail, and the potential usage. Unique aspects of the Mauka Trail include:

1. The longest trail in the Hawaiian Islands, which will attract activities where distance is an asset (mountain bicycling, pack trains, backpacking)
2. The diversity of activities will be an attraction, especially those that may not be provided or permitted on National Park or other government operated trails (mountain bicycling, pack trains, ATVs, car camping, guided tours, and hunting)
3. The temperate climate will be attractive to visitors and residents year-round, especially when the coastal areas are humid.
4. The variety of facilities will be attractive, especially those that are not provided on other trails in Hawaii (car camping, campgrounds with shelters, lodges).
5. Access to some ecologically remote and beautiful areas will attract some people, especially those interested in local eco-systems.

At the same time, it is important to understand the limitations of the Mauka Trail. It typically does not provide stunning views of the ocean or volcanic summits like other Hawaiian trails, except for selected locations. It is relatively remote. Some sections have been environmentally degraded. Some sections may have incompatible uses (logging, hunting, etc.).

7. ESTIMATES OF DEMAND

Demand estimates for the Mauka Trail are based on the three sources of background information discussed previously: (1) trends in visitor activities in Hawaii, (2) trends in activity participation rates nationwide, and (3) comparisons with similar trails nationwide. Using this information, estimates of demand have been developed using our Trail Demand Model. Results from the Model are then used for the purpose of establishing priorities, costs, and financial needs.

Table 3: Estimates of Mauka Trail Demand by Activity

DEMAND	Activity	Resident	Visitor	Annual Visits			Visitor	Daily	
		Attraction /26	Attraction /27	Residents	Visitors	Total	Days /28	Peak /29	Average
	Day Hiking /12	0.2	0.15	6,661	54,549	61,210	61,210	553	168
	Trail Running /13	0.05	0.01	858	1,873	2,731	2,731	25	7
	Backpacking /14	0.2	0.15	1,211	9,918	11,129	11,129	101	30
	Guided Tours /15	0.1	0.25	174	13,775	13,949	13,949	126	38
	Destination Lodge /16	n/a	0.2	-	7,908	7,908	23,725	400	65
	Camping (hike-in) /17	0.1	0.1	807	8,816	9,623	28,870	261	79
	Camping (car access) /18	0.5	0.01	12,110	2,645	14,755	44,266	400	121
	Pack trains /19	n/a	0.2	-	2,204	2,204	6,612	60	18
	Equestrians /20	0.1	0.02	348	760	1,108	1,108	10	3
	ATVs /21	0.3	0.03	2,610	2,850	5,460	5,460	49	15
	4WD /22	0.3	n/a	2,610	-	2,610	2,610	24	7
	Mountain biking /23	0.1	0.2	1,817	39,672	41,489	41,489	375	114
	Bird watching /24	0.2	0.2	1,413	15,428	16,841	16,841	152	46
	Hunting /25	0.3	0.01	2,088	760	2,848	2,848	26	8
	TOTAL			32,707	161,159	193,865	262,847	2,562	720

Source: Refer to the appendix for details on assumptions and data sources

As can be seen, 193,865 people are projected to visit and use the Mauka Trail and its facilities annually, or over 262,000 visitor days per year. It is important to remember that these 'visits' may often be by the same person or persons. For example, a lodge visitor may also be a day hiker or a mountain bicyclist. Backpackers and camping (hike-in) patrons are most likely the same people.

The combined visitor trips (161,159) translates into about 9% of total Big Island visits being on or near the Mauka Trail—making it one of the more popular visitor destinations on the Island. Of the 1.9 million annual visitors to the Big Island in 2004, 1.3 million engaged in recreational activities (DBEDT, 2005). The Mauka Trail is projected to increase that figure and account for about 15% of all recreational activities (including the destination eco-lodge) when completed. With 32,707 resident trips, the trail and its activities would also be one of the more popular local destinations.

By way of comparison, Volcanoes National Park had 2.6 million visits in 2004 (of which 1.3 million were recreational visits), with 34,873 people staying in the park hotel (Volcano House) and 82,000 staying in campgrounds and other facilities (NPS, Public Use Statistics office). Over 5,000 backcountry permits were issued in 2004, but this represents only a fraction of the total number of people using trails in the park. The National Park Service does

not conduct regular counts of all trail users in its parks. This compares with 7,900 estimated patrons of the Mauka destination lodge and about 24,000 campers.

The Kalalau Trail on Kauai, which is substantially shorter but more scenic than the Mauka Trail, has between 60,000 and 70,000 users per year. In contrast, the Mauka Trail is estimated to have 61,000 hikers per year. Given its length, this translates into 17,500 hikers per mile per year on the Kalalau Trail versus 328 hikers per mile on the Mauka Trail.

8. ESTIMATES OF ECONOMIC BENEFIT

The economic benefit of the Mauka Trail will come from a variety of sources, including direct sources (fees, permits, room reservations, tour guides, etc.) and indirect sources (local hotels, equipment purchases, rentals, meals, etc.). Estimates of economic benefits are based on the demand and usage assumptions from the previous table, coupled with several studies of average expenditures by trail users. The single most important source for the expenditure data is the Appalachian Trail in 2000 (Use and Users of the Appalachian Trail: A Source Book). Other sources include the International Mountain Bicycling Association (IMBA), Association of Bicycle and Pedestrian Professionals (Bicycle and Pedestrian National Clearinghouse), and the Office of Business, Economic Development, and Tourism (DBED&T). Expenditure data from these sources has been customized to reflect conditions in Hawaii and on the Mauka Trail. A full breakdown of the methodology used is presented in the Appendix.

Table 4: Annual Expenditures Generated by Trail Users

Activity	-----Average Daily-----		Annual Expenditure	Food/ Restaurants	Equip./ Personal	Guides	Lodging	Net New Revenues
	Expenditure							
	Local	Visitor						
Day Hiking	\$ 10	\$ 80	\$ 4,430,527	\$ 1,373,463	\$ 708,884			\$ 443,053
Trail Running	\$ 10	\$ 80	\$ 158,450	\$ 49,120	\$ 25,352			\$ 15,845
Backpacking	\$ 10	\$ 80	\$ 2,392,430	\$ 741,653	\$ 382,789			\$ 239,243
Guided Tours	n/a	\$ 200	\$ 2,755,000	\$ 854,050	\$ 440,800	\$ 1,763,200		\$ 275,500
Destination Lodge /31		\$ 350	\$ 8,303,750	\$ 2,574,163	\$ 1,328,600		\$ 4,151,875	\$ 1,660,750
Camping (hike-in)	\$ 30	\$ 120	\$ 3,197,981	\$ 991,374	\$ 511,677		\$ 479,697	\$ 319,798
Camping (car access)	\$ 50	\$ 150	\$ 1,795,680	\$ 556,661	\$ 287,309		\$ 269,352	\$ 179,568
Pack trains		\$ 200	\$ 1,322,400	\$ 409,944	\$ 211,584	\$ 846,336	\$ 198,360	\$ 132,240
Equestrians	\$ 50	\$ 120	\$ 108,600	\$ 33,666	\$ 17,376			\$ 10,860
ATVs	\$ 150	\$ 150	\$ 819,000	\$ 253,890	\$ 131,040			\$ 81,900
4WD			\$ -	\$ -	\$ -			\$ -
Mountain biking	\$ 20	\$ 100	\$ 4,003,531	\$ 1,241,095	\$ 640,565			\$ 800,706
Bird watching	\$ 10	\$ 80	\$ 1,248,369	\$ 386,994	\$ 199,739			\$ 124,837
Hunting	\$ 50	\$ 150	\$ 218,400	\$ 67,704	\$ 34,944			\$ 21,840
TOTAL			\$30,754,119	\$ 9,533,777	\$ 4,920,659	\$ 2,609,536	\$ 5,099,284	\$ 4,306,140

Source: Refer to the appendix for details on assumptions and data sources

As can be seen in **Table 4**, trail users are projected to generate an estimated \$30.8 million in annual expenditures, the majority of which would come from the destination lodge (66%). Day hikers are projected to spend \$80/day on average, while mountain bicyclists are projected to spend \$100/day on average. These are very similar to the expenditure rates per user day identified on the Appalachian Trail, both of which are much higher than a typical urban or suburban trail on the U.S. Mainland (\$9 - \$25/day; Source: IMBA). The expenditure rates for day users on the Appalachia Trail and Mauka Trail are projected to be substantially higher than typical suburban or urban trails due to the fact the trips are part of a larger vacation trip, the trips are longer, and expenditures include items such as hotels, restaurants, and equipment purchases.

Visitor expenditure information developed by the Department of Business, Economic Development, & Tourism (DBED&T) for the Big Island confirms these estimates. As of 2002,

the average visitor expenditure on the Big Island (exclusive of air travel costs) was \$140.73. Considering that most day trips on the Mauka Trail would be all-day affairs and the primary activity of that day, the estimates of \$80-\$100 per day for day hikers and mountain bicyclists seems reasonable.

Expenditures on food and restaurants accounts for the largest source of revenue for most activities, except the destination lodge, guided tours, and pack trains. Of the \$53 million in total revenues, it is estimated that about \$9.1 million would represent 'new' revenues to the Big Island, excluding airfares. This is based on the comparison between activity rates in places like Lake Tahoe with the Kona Coast, and assuming that the Mauka Trail will attract some people who would have the Trail as their primary destination. This is corroborated by statistics that show that 11% of all discretionary (non-business) trips have 'recreation' as a primary factor (DBEDT, 2005).

TRAIL REVENUE

Depending on what type of entity ends up developing and managing the Mauka Trail, it may need to generate some revenue. In either case, grants will likely be the source for most if not all capital costs. If a non-profit organization (NPO) takes the lead on the project, it could also receive donations from local foundations. Fees could also be collected from a variety of sources, such as those listed below.

Possible Sources of Fees

- Parking:** Parking areas could require payment of a fee, although this may lead to spillover parking into other areas.
- Day use permits:** Permits could be required for anybody entering the trail. A small fee could be charged for the permits. This could be difficult and expensive to manage and could also affect the amount of day users who would use the trail.
- Camping permits:** Permits and fees for camping are a typical element of most trail and park systems. This not only allows for reservations to be made to make sure campgrounds are not over-capacity, but they help defray the cost of the campground services. It is recommended that permits and fees be charged for all campgrounds. The revenue projections below are based on fees of \$20/night per site for hike-in campgrounds, and \$30-\$45/night per site for car campgrounds.
- Commercial Fees:** Use fees for commercial use of the trail by tour operators, packhorses, and others would be a normal part of any trail or park operation, and would help defray the cost of trail and campground maintenance. In return for fees, operators may request exclusive rights to the trail or trail segments.
- Lodge Fee:** As part of the county permitting process for the destination lodge, dedication of a portion of revenues to trail development and maintenance could be negotiated. Trail development and maintenance

could also be a required environmental mitigation identified in the Environmental Impact Statement (EIS).

ATV Fees: An ATV ‘park’ could be developed and operated by an ATV-group, which could provide their own internal trail system, be responsible for all permits, approvals, insurance, and impacts, and defray these costs by charging annual or day use fees for users. It is recommended that this operation be kept separate from the Mauka Trail operation.

Hunting Fees: Hunting is already allowed on a permit or landowner permission basis in the study corridor. The trail may facilitate hunting access in specific areas, and hunters may use part of the trail for access along with the campgrounds.

Based on this analysis, it is projected that the Mauka Trail could eventually generate as much as \$1.2 million in annual revenue from the following sources:

Lodge (1% of annual revenues)	\$	83,000
Campgrounds /1	\$	749,000
Tour fees /2	\$	203,000
Total	\$	1,035,000

/1 Camping fees range between \$20 and \$45 per site per night

/2 Tour use fees are estimated at 5% of gross revenues

It is important to note that (1) these are highly conceptual figures and (2) these figures will be phased in over many years, and not represent a Year 1 revenue stream.

Funding sources

There are numerous funding sources available to public and non-profit organizations seeking to develop trails, acquire right-of-way or easements, provide environmental restoration as part of a trail project, and other projects and programs. Funding sources are constantly changing in terms of money available, level of competition, authorization, and policy focus. The programs below may or may not be applicable to the Mauka Trail depending on a wide of variety of factors, but are a good starting point for planning purposes.

Program:

US DEPARTMENT OF AGRICULTURE NATIONAL RESOURCES CONSERVATION SERVICE GRANTS

These three programs can be used to develop trail and to restore trail corridors, depending on the surrounding type of land use, ownership, and activity. These programs are funded at different levels every year, and have a different policy focus as well.

- **Conservation Reserve Enhancement Program**
- **Environmental Quality Incentives Program**
- **Forest Recreation Enhancement**

National Urban And Community Forestry Advisory Council - The focus of this grant program changes annually, but in the past funding has been provided for projects related to the costs and benefits of urban forestry, and the development of municipal urban forestry programs.

- **Rural Utilities Service Water & Wastewater Disposal Program**
- **Small Watershed Program**
- **Solid Waste Management Grants**

ENVIRONMENTAL PROTECTION AGENCY

Sustainable Development Challenge Grant Program - funds development of place-based approaches to problem solving that can be replicated in other communities. Problems addressed should be related to current patterns of growth that accelerate loss of open space and wetlands, fragment habitat, and increase consumption of fossil fuels. The program strongly encourages partnering among community members, public and private, to work cooperatively to develop flexible, locally oriented approaches that link environmental management and quality of life with sustainable development and revitalization.

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Micro-Grants to Support Goals of Healthy People 2010 Program: HHS Secretary Tommy G. Thompson recently announced that HHS plans to award hundreds of "micro-grants" to community organizations for activities that support the goals of Healthy People 2010. Worth up to \$2,010 each, the micro-grants represent a new, low-cost approach to foster effective prevention efforts at the community level. Each grant will support efforts by local groups to promote health education, quality care, access to care and other projects that support the far-reaching national health goals of Healthy People 2010. Healthy People 2010 has established a broad set of goals and specific targets for improving the nation's health over the next 10 years. The plan is grouped into focus areas devoted to a comprehensive array of diseases, conditions and public health challenges, such as promoting exercise, reducing obesity and discouraging tobacco use.

HHS will launch the new micro-grant initiative with a two-year pilot project. If successful, the approach could be expanded nationally. HHS will commit between \$500,000 to \$700,000 to a pilot project this year in order to study the potential of the micro-grant approach to further the goals of Healthy People 2010.

The money will be distributed to local, non-profit organizations -- and coalitions of such groups -- in different geographic areas to support programs designed to increase the quality and years of healthy life of residents and to eliminate health disparities.

HHS will choose several not-for-profit organizations or groups of organizations to recruit, review and award grant applications in different geographic areas. Those organizations will make the decisions about micro-grants for specific community projects in their region.

RECREATION FEE PROGRAM

The Recreational Fee Demonstration Program (Fee Demo), created in 1996 as a three-year experiment and subsequently extended several times through FY 2005, will soon be replaced by a new recreation fee program covering five federal agencies and providing a ten-year fee authorization. The new Federal Lands Recreation Enhancement Act was added as a rider to the omnibus appropriations measure for Fiscal Year 2005, which passed in fall 2004.

The new program is based upon legislation (H.R. 3283) introduced by Rep. Regula (R-OH) in October 2003 and later amended and approved by the House Committee on Resources, chaired by Rep. Pombo (R-CA).

EVOLVING FUNDING OPPORTUNITIES

Congress bundled nine appropriations bills--including the Interior bill, which funds trail and recreation programs in national parks, forests, and public lands--together into an "omnibus" bill this November after failing to complete the individual bills by October 1, the start of Fiscal Year 2005. Budget levels for FY 2005 Interior Appropriations for major trail and recreation programs are as follows, excluding a 1.4% across-the-board cut:

National Park Service, National Trails System (18 national scenic and historic trails administered by the National Park Service):

FY 2005: \$500,000 increase

Administration request: \$6.96 million

American Hiking request: \$10 million

FY 2004: \$6.96 million

National Park Service, Rivers, Trails and Conservation Assistance program:

FY 2005: approx. \$50,000 increase

Administration request: no increase

American Hiking request: \$13 million

FY 04: \$8.2 million

Forest Service, Recreation Management, Heritage, and Wilderness:

FY 2005: \$261 million

Administration request: \$257 million

American Hiking request: \$300 million

FY 04: \$255.1 million

Forest Service, Trails Capital Improvement and Maintenance:

FY 2005: \$76.8 million

Administration request: \$71.8 million

American Hiking request: \$85 million

FY 04: \$74.7 million

Bureau of Land Management, Recreation Management:

FY 2005: \$61.5 million

Administration request: \$60.8 million

American Hiking request: \$70 million

FY 04: \$62.3 million

The USDA Forest Service estimates that recreation creates about 75% of the Gross Domestic Product generated from Forest Service land, yet only about 10% of the Forest Service budget is for recreation. The Forest Service requires increased funding to restore and maintain thousands of miles of trails, protect resources, upgrade recreation facilities, reduce the maintenance backlog, augment on-the-ground recreation staff, and more effectively utilize volunteers.

The National Park Service administers eighteen of the twenty-three national scenic and historic trails. For most of these trails, barely one-half of their congressionally authorized length and resources are protected and available for public use. Increased funding is needed

for resource protection, trail maintenance, interpretation, and volunteer coordination and support.

The National Park Service's Rivers, Trails and Conservation Assistance Program (RTCA) is a federal technical assistance program that helps communities nationwide restore rivers, develop trails and greenways, and preserve open spaces. Despite the program's successes, funding has remained relatively flat. The program only assists half of all applicants and even cut back on staff and projects this past year.

The Bureau of Land Management (BLM) manages thousands of miles of trails. BLM requires increased funding for Recreation Management and the National Landscape Conservation System to manage existing recreation programs, protect resources, upgrade planning and infrastructure development, adapt to increasing visitor demands, and to manage all-terrain recreational vehicle usage more effectively. Recreation facilities are inadequate in many areas, and staff shortages place recreational, natural, and cultural resources at risk.

LAND AND WATER CONSERVATION FUND

The Land and Water Conservation Fund (LWCF) has been used to buy land to preserve wilderness, create parks, and protect trails for the last forty years. For instance, LWCF has provided more than \$15 million for the purchase of unprotected land along the Appalachian Trail, bringing an eighty-year conservation effort to a happy conclusion. A strong LWCF could mean more of the same.

Land and Water Conservation Fund, Federal side:

FY 2005: \$166 million

Administration request: \$220 million

American Hiking request: \$450 million

FY 04: \$177 million

Land and Water Conservation Fund, Stateside:

FY 2005: \$92.5 million

Administration request: \$94 million

American Hiking request: \$300 million

FY 04: \$94 million

Although LWCF appropriations are down from last year, the program almost received zero funding for new federal acquisitions in FY 2005. The House bill included just \$49 million for the federal side of LWCF, with no funding for new acquisitions, only administrative costs related to ongoing acquisitions. This would have marked the first time in the 40 year history of LWCF that no funding was available for land acquisition.

TEA-21 REAUTHORIZATION (RECREATIONAL TRAIL PROGRAM, ENHANCEMENTS)

Thanks to transportation policy reform in the early 1990s, the U.S. Department of Transportation's Federal Highway Administration has become the nation's largest single source of funding for multiple use paths, trails, and related projects. Comprehensive six-year transportation legislation (TEA-21) that benefits foot trails is now up for reauthorization.

TEA-21, the nation's primary federal surface transportation law, was due to expire in September 2003, but Congress passed a series of short-term extensions while it works on the new law. In September 2004, Congress passed an eight-month extension through May 31, 2005

when it became clear that completion of a new law in the 108th Congress was unlikely. Both the House and Senate had proposed comprehensive packages – including funding for trail programs – but because they did not reach agreement on a final bill and because of significant funding differences (in the billions) between the House, Senate, and Administration proposals, the 109th Congress will have to work on transportation legislation after convening in January 2005.

Background

In 1998, Congress enacted the Transportation Equity Act for the Twenty-First Century (TEA-21), a six year law that was due to expire in September 2003. Its predecessor, the Intermodal Surface Transportation Efficiency Act (ISTEA), authorized in 1991, marked the beginning of transportation reform by funding community and recreational projects, like foot trails, bike paths, and conversion of rails to trails, in addition to highways.

ISTEA and TEA-21 have been a tremendous boon to trail development and bicycle and pedestrian systems and facilities, providing almost \$3 billion since 1991. The two key transportation trail programs for hikers are the Transportation Enhancements Activities program and Recreational Trails Program.

Transportation Enhancements (TE) are investments that protect the environment and provide significant economic and community benefits, including the development of walking and bicycling infrastructure. The Recreational Trails Program (RTP) provides money to states to develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized recreational trail uses, including hiking.

STATE SOURCES

The State of Hawaii receives and administers many of the funding programs mentioned previously, including all TEA-21 moneys. Grants are available on a competitive basis as moneys are received from the Federal Government. The Land and Natural Resources Division of the Division of Forestry and Wildlife has some grant and capital funds available, but these are largely obligated to on-going state parks, trails, and other programs. The Hawaii Tourist Authority also provides grants for studies, plans, and in some cases, infrastructure improvements.

Local sources include donations from foundations, developer requirements and fees, local bond measures, and other measures. Perhaps the most effective for a trail project like the Mauka Trail are volunteer efforts from local groups, contributions of time and manpower from groups such as the SeaBees and Army Corps of Engineers.

9. SURVEY RESULTS

Surveys and interviews of local tourism-related business were conducted as part of this analysis, with the objective to gather input from local visitor-oriented businesses. In order to compliment other data collection efforts, the focus of these surveys were on tourist-related businesses. Of over 300 surveys sent out—which in turn were sent out to numerous organization listserves, 32 surveys were returned to date and numerous interviews compiled. These results can be used to crosscheck the conclusions and assumptions used to estimate demand and expenditures. A copy of the survey is shown in the appendix. The following results were collected:

ALTA SURVEY OF BUSINESSES

Affiliation: Hotel (14%)
Rental agency (14%)
Tour operator (14%)
Travel agency (14%)
Other (43%)

Support for project: Strongly support trail (57%)
Will improve stays but not length of stays (43%)

The trail would be: A major new attraction (29%)
A welcome new attraction (71%)

Which user groups would use the trail:

Day hikers (19%)
Nature enthusiasts (19%)
Multi-day trekkers (19%)
Runners (7%)
Equestrians (15%)
Mountain bikers (11%)
Four wheel drive (11%)

While the sample size is too small to draw major conclusions from this survey, it does indicate measured support for the trail by local businesses and the belief that it would attract a diverse number of user groups. Interviews with local businesses provided additional insight. One owner of a tour company (Pat Wright) that provides jeep tours of Mauna Kea provided the following comments:

- There are attractions along the trail corridor such as Umi's Temple that would be of interest to people;
- Hunters, who are currently the only recreational users in the trail corridor, may also use the trail.
- Astro-tourism, or star gazing, may be popular.
- There are very few places for car camping on the Big Island. Providing a car-accessible campground would prove popular.
- Some people may want to climb to the Mauna Loa summit from the Kona side.

- Mountain bicyclists and ATV users would also be attracted.
- Despite these attractions, had doubts about the feasibility of commercial jeep tours leading to the trail. While there is a demand for good trails, the scenery on the trail was not unique enough that, combined with accessibility, the effects of timbering, and water problems may limit demand for the trail.

The majority of respondents and interviewees to the Mauna Loa Trail System were very interested in the development of a trail system. The level of interest varied slightly, however, all were neutral to positive. In most instances the trail was viewed as being economically and socially beneficial to the Big Island. Connecting the existing trails to one another and providing some sort of continuity along them was recommended. Further suggestions included enhancing the exiting system with signs and/or some type of federal designation.

Some of the concerns that were mentioned in these surveys included noise and property damage. For this reason, it was noted that a safe, well-constructed and maintained trail was important to residents along the trail.

One of the respondents, a local resident and business owner, noted: "A trail such as this with campsites would add a great deal of diversity to the Hawaii ecotourism experience, as well as better general access to interior areas that, even for residents, remains largely unexperienced and under-appreciated." Most of the respondents not only responded favorably to the idea of the trail, but also offered to assist in any way possible.

Richard Kuehner's interview results are presented in the appendix of this report. They provide invaluable information from a wide variety of public and private individuals on the opportunities and challenges facing the trail.

10. SUMMARY OF IMPACTS AND BENEFITS

The impacts and benefits of the Mauka Trail go far beyond the economic expenditures documented in the previous chapter. All across the country, trails that accommodate bicyclists, hikers, and others are proving to be a wise economic investment for the communities through which they pass. Studies have shown that they stimulate local economies by attracting bicyclists, hikers, cross-country skiers and other tourists to an area. This, in turn, attracts and revitalizes businesses, creates jobs, and increases public revenue. Trails and pathways also have a positive effect on nearby properties as homebuyers and business owners realize the value that such facilities bring to a community.

Some of these benefits and potential impacts are explored below.

HEALTH

The health benefits of exercise derived from recreational activities such as bicycling and walking lessen health-related problems and reduce health care costs. A recent U.S. Center for Disease Control Handbook, *Promoting Physical Activity Among Adults*, states that "...the most effective activity regimens may be those that are moderate in intensity, individualized, and incorporated into daily activity."

Such regular, moderate exercise has been proven to reduce the risk of developing coronary heart disease, stroke, colon cancer, hypertension, diabetes, osteoporosis, obesity, and depression. This kind of exercise is also known to protect against injury and disability because it builds muscular strength and flexibility, which helps to maintain functional independence in later years of life.

Bicycling and walking offer many health benefits not only by improving physical health and quality of life but also by reducing health care costs. According to a National Park Service study, *Economic Impacts of Protecting Rivers, Trails, and Greenways Corridors*, people who exercise regularly have 14 percent lower claims against their medical insurance and spend 30 percent fewer days in the hospital.

PROPERTY AND LOCAL BUSINESS VALUE

The economic analysis section of this report indicated that the Mauka Trail and its related facilities would generate \$55.7 million in revenue once completed, of which about \$9.2 million would represent net new annual expenditures on the Big Island. The Mauka Trail would attract some visitors who would not otherwise come to Hawaii, and extend the stay of others who would have come anyway but not stayed as long. While most of this economic benefit would accrue to the destination lodge developers and operators, others would accrue to local businesses including hotels, tour guides, equipment suppliers, food outlets and restaurants, and other groups.

Property owners would also accrue benefits in the form of increased property values. "Walking and biking paths" ranked third among 39 features identified by homebuyers as crucial factors in their home-purchasing decisions, according to a 1994 study by American Lives, a research firm serving the real estate industry. The increased salability of listings is considered to be the greatest value that the Northern Central Rail-Trail has brought to trailside properties in Baltimore County, Maryland. According to a 1994 study conducted for the Maryland Department of Natural Resources, "if two identical properties are for sale and one is near the trail and the other is not, the trail is used as a selling point and helps many nearby owners sell their property faster." (Analysis of Economic Impacts of the Northern Central Rail-Trail).

Not only has Seattle's Burke-Gilman Trail been used as a selling point for nearby properties, but it has also been proven to increase the value of those properties. According to a study conducted by the Seattle Engineering Department (1987), "property near but not immediately adjacent to the trail is significantly easier to sell and, according to real estate agents, sells for an average of 6 percent more as a result of its proximity to the trail. Property immediately adjacent to the trail, however, is only slightly easier to sell..."

The 376 kilometer (235-mile) Katy Trail traverses nine counties and adjoins 35 towns in Missouri, ranging in population from 60 to 60,000. These communities, many in economic decline since the railroad's demise, were initially opposed to the trail. But when the first sections opened, sentiments changed. Visitors flocking to the new rail-trail proved to be responsible, likable guests who needed goods and services available in the towns.

Within weeks of the trail dedication, new and old businesses were vying for tourist dollars. Restaurants, bed-and-breakfasts, bicycle rental shops, antique dealers, and campgrounds all opened to meet the needs of hundreds of thousands of visitors. A 1993 user survey on the trail's western half showed that it generated an estimated \$3 million in local revenue.

The Northern Central Rail-Trail attracts 457,000 visitors every year and has had an enormous economic impact on nearby businesses, leading to the creation and support of 262 jobs. These positions range from trail construction and maintenance work, to jobs in local restaurants and hotels serving trail users, to added positions in regional sporting goods companies and supermarket chains due to increased business.

ENVIRONMENTAL

Bringing people into environmentally sensitive areas on a new trail would seem to run counter to environmental protection, but this has not proven the case with many regional trails around the country. The opposite often occurs. Most new trails are accompanied by new or enhanced environmental protection and restoration efforts. For example, the Mauka Trail could provide environmental restoration as part of any new trail segment within 1,000 feet on both sides of the trail. This may include reforestation, erosion control, and native plant protection efforts. Trails allow for access by heavy machinery that may be needed to provide erosion control and other measures. Environmental education through various means can turn trail users into environmental supporters, helping to build public, political, and financial support for habitat.

The impacts of new trails and new trail users must be studied closely to minimize or eliminate impacts. Trail users can bring in non-native seeds, they can cause erosion by cutting off trails, start fires at campgrounds, cause litter and sanitary problems, and increase the demand for water and protection.

Experience on other regional trails around the country has shown that these problems can be overcome with proper management. Trails in pristine environments like Mt. Rainier and Yosemite have existed for many years with no major impacts. The endangered black-crowned night heron have found homes along the Fox River Trail in Illinois. Trail Manager John Carlson stated, "The habitat for wildlife such as these rare birds has been dramatically improved by the trail. The wildlife along the trail is abundant compared to other sections of the river where there are private homes and manicured lawns abutting the river's edge."

11. TRAIL DESIGN AND MANAGEMENT

The design guidelines and final design of the Mauka Trail have not been developed in detail at this point. Concepts for the trail, its features, and potential users were addressed in a report entitled Mauna Loa Mauka Loop Trail System prepared by Richard A. Kuehner. While the system described by Mr. Kuehner is somewhat different than the route proposed in this report, the basic concept is very similar.

A full master plan, feasibility study, and final design and operating/management plan will eventually address all of the details of the Mauka Trail. Master Plans differ from this feasibility study in that they result in a final preferred trail alignment, which in turn is based on extensive field review, mapping, and meetings with local property owners. The final alignment is adopted by the Trail management Group, and the Master Plan would be adopted by the appropriate local agencies and become an official facility. Master Plans typically are accompanied by a full environmental analysis of the proposed trail, which includes a review of potential environmental, social, economic, and other impacts. Finally, the trail, campgrounds, and other facilities will need to be designed, although for an unpaved trail this is typically accomplished by ‘field staking’ an alignment.

While the main focus of this plan is on benefits, impacts, right-of-way, and cost issues, some of the basic alignment, features, and design elements of the trail system must be understood in order to fully cover these issues.

Some of the basic elements of a Trail Master Plan, including design and operational elements, are addressed in summary format below.

TRAIL DESIGN

It is recommended that all trails be constructed to U.S. Forest Service guidelines, including trail signage, erosion control, and other features. Some specific design guidance includes:

Trail width: Jeep roads (8 to 12 feet wide)
Single-track trails (2 to 4 feet wide)

Trail surface: Compacted native material (unpaved)
Erosion control features where needed

Trail types: Single-track trails are appropriate for hikers and backpackers at any volume, and by mountain bicycles, equestrians, and pack trains when total usage is under 500 persons per day.

Jeep roads are appropriate for all users, although separate single-track trails should be provided whenever motorized vehicles will be on the jeep road, or when pack trains, mountain bikes, or equestrians exceed 250 people per day.

Special ATV tracks should be developed, or existing ones enhanced, that are completely separate from other users. These tracks should be

developed to avoid environmentally-sensitive areas, and to provide a challenge to users.

Trail markers: USFS standard trail markers, with customized trail logo, operating and management entity, and any use restrictions

Trailheads: Trail access points need to be clearly identified from major roads, with appropriate directional signage to trailheads. Public trail use can be controlled at trailheads through a combination of entry gate design (keeping out motorcycles, for example), parking restrictions, and gate closures. Permits may be required on some segments to control the number of types of users.

Campgrounds: Hike-in campgrounds will be designed to USFS standards, including the use of composting toilets, water cisterns (non-potable), fire circles, and tables. Depending on the terrain and soil, tent sites may need to be excavated.

Car accessible campgrounds should be designed to USFS standards, including the provision of central pit toilets, running potable water, parking bays, tables, tent sites, refuse boxes, barbeque pits, and other features.

TRAIL MANAGEMENT

As was seen in the Comparable Trail Analysis, many regional trails in the United States are either managed by a non-profit organization (NPO), or have a very close collaboration between a NPO and a government agency such as the National Park Service. It is recommended that the a group of key decision-makers including representatives from all appropriate local, state, and Federal agencies, local NPOs and other organizations, and landowners agree to form a new non-profit organization (Trail Management Group-TMG) with the specific objective of developing and managing the Mauka Trail.

For the section of trail in the Volcanoes National Park, an agreement between this new TMG and the National Park Service (NPS) would need to be reached in terms of responsibilities. Trails such as the Pacific Crest Trail, which are managed by a non-profit, do traverse National Parks and other Federal lands. While each case is different, the NPS will typically want to retain control over the approval, alignments, development and operation of trails within its parklands, although they may allow volunteers to help develop and maintain trails under NPS supervision.

The advantage of a TMG managing the trail versus a government agency includes (a) more flexibility to acquire easements and right-of-way access agreements, (b) greater ability to work in a collaborative fashion with all stakeholders, public and private, (c) ability to work with private operators and developers where appropriate, (d) the ability to offer tax incentives to property owners, (e) lower liability exposure, and (f) more cost effective in management and seeking outside funding.

The new TMG would have a board that included all of the stakeholders, and a clear Vision and master Plan that outlined the goals and objectives of the group. The TMG would become a 501c3 organization with the ability to apply for and receive competitive and non-competitive

grants and public moneys. The TMG Board of Directors would in turn hire a President and support staff (as needed) to oversee development and management of the trail.

Some of the responsibilities of the TMG include:

1. Preparation of a Trail Master Plan
2. Preparation of a Trail Environmental Plan
3. Preparation of a Model easement or License Agreement for the Trail on private land
4. Acquisition of land and easements for the trail
5. Negotiations with landowners for access and development of the trail
6. Obtaining indemnifications and insurance
7. Developing a Management Plan
8. Designing and building trails and campgrounds
9. Working with local agencies to develop access, signage, and trailheads
10. Working with potential tour operators, special interest groups, and a destination lodge operator
11. Managing access to the trail through appropriate permits, reservations, restrictions, gate and trail closures
12. Maintaining the trail, campgrounds, water cisterns
13. Referring all emergency calls to appropriate response agencies

The TMG overhead would be paid for by a combination of grants, local agency underwriting, permits and fees from users and tour operators, and possibly a small percentage of the revenue of the destination lodge. The annual budget for the TMG would need to be determined, but it is expected that a minimum operating budget in the early years would be approximately \$100,000/yr. for direct overhead (labor, office). The Trail Master Plan, Trail Management Plan, and Environmental document would cost approximately \$200,000.

DESTINATION LODGE

While there appears to be a demand for a destination lodge on or near the Mauka Trail, the determination to pursue this option is up to private investors, hotel operators, and landowners. The Mauka Trail management group could support and facilitate this effort, but it is unlikely they would play a leadership role in bringing in such a facility. The lodge would have many obstacles to overcome, including zoning, water, sewer, and environmental impacts. By including a destination lodge in this feasibility study and subsequent documents, some of the preliminary approval process could be initiated which might attract appropriate investors.

12. SAFETY, LIABILITY, AND PRIVACY

The Mauka Trail must be managed, operated, and maintained in a way so as to (a) protect the adjacent landowners, (b) minimize impacts and costs to the trail operator, and (c) maximize the enjoyment and safety of the public. This section contains an overview of the recommended management, operations, and maintenance of the Mauka Trail to address safety, liability, and privacy issues.

TRAIL MANAGEMENT PLAN

A Trail Management Plan will eventually be developed and adopted by all stakeholders, including landowners, serving as the basis for agreements between the TMG and the landowners. This section addresses typical management issues and recommends approaches or policies that should be considered by the TMG once it is formed, including safety, security, and privacy. Elements of the Management Plan are presented below.

AREA TO BE MANAGED

The Mauka Trail will be designed and constructed under the auspices of the Trail Management Group (TMG), yet to be formed. The TMG will then take over day-to-day operations and maintenance of the project. The right-of-way (R-O-W) is or will be owned or easements controlled by the TMG. The easement or property needed for the Mauka Trail will consist of two components: (1) Trail zone of at least 100 feet in width, and (2) a Conservation zone of at least 2,000 feet in width that will limit the types of activities that occur by private landowners, and may also be the focus of environmental restoration. An easement or license agreement between the TMG and landowners will be needed to determine responsibilities, liabilities, and other items.

ELEMENTS OF AN AGREEMENT

An agreement between the TMG and landowners will be required in order to assign responsibilities and liabilities. The agreement would include:

- a. Acknowledgement that a public trail is acceptable to the landowner.
- b. That the uses, rights, and responsibilities of each easement (trail, conservation) is clearly identified.
- c. The identification of the trail easement boundary.
- d. Reference to and local adoption of a Trail Management Plan determining responsibilities for operations, maintenance, and liability.

These responsibilities and liabilities will have a direct impact on operations and maintenance costs. Other interested parties who may be part of an agreement include the National Park Service, State of Hawaii, and the County of Hawaii. An amended version of the management plan may be adopted as part of that future agreement.

TRAIL MANAGER RESPONSIBILITIES

The TMG will serve as the designated Trail Manager for this project and will be responsible for each of the activities involved in operating the trail. The following sections address specific operating procedures and responsibilities.

Developing Trail Use Regulations

The purpose of trail regulations is to promote user safety and enhance the enjoyment of all users. It is imperative that before the trail is opened it must include posted trail use regulations at entry points and key access points. Establishing that the trail facility is a regulated environment like other public rights-of-way is critical for compliance and often results in a facility requiring minimal enforcement. Appropriate civil statutes and penalties for trespassing, hunting, illegal camping, and other activities should be referenced on regulatory signs. The TMG will review proposed trail regulations with the County Attorney for consistency with existing ordinances and enforceability.

Below are the recommended trail regulations to be adopted and enforced by the TMG:

1. Hours of use (proposed); 24 hours per day, although some trailheads may be closed at sunset
2. Motor vehicles, other than where specifically allowed, and excluding service and emergency vehicles, are prohibited
3. No loitering; no vandalism; no dumping (civil statutes)
4. Fires allowed only in designated fire rings
5. No potable water is provided, and water may or may not be available at each campground
6. Bicycles always yield to pedestrians and equestrians
7. Give a vocal warning when passing
8. Pets must always be on leashes
9. Travel no more than two abreast
10. Alcoholic beverages are not permitted on the trail (civil statute)
11. Noise ordinances in all campgrounds after 10pm
20 mph speed limit
12. Trail users to yield to maintenance vehicles

Trail Closures

The trail, or sections of the trail, may be closed from time to time during periodic maintenance of the facility, if there is a chronic lack of water, during hunting seasons, when adjacent activities may impact trail user safety, or when there is severe fire hazard. Trail users will need to be managed during these closures. The procedural policies that will be followed prior to the trail closing, including a variety of means to inform the public, are listed below:

The Trail Manager will provide at least 48 hours advance notice to post signs at all trail entrances on the impacted segments to be closed indicating the duration of the closure. Do everything possible to keep the public informed and make every effort to keep the closure period as short as possible. The 48-hour notice will be waived in the case of emergencies. The Manager will physically block the trail that is being closed with barriers and post “Trail Closed” signs, and post ‘Trail Closed’ signs at all access route entry points.

The Manager will provide “Detour” signs describing alternate routes where feasible.

The Manager will not re-open the trail until it has been inspected to ensure that the trail is in usable condition. Where obstructions remain, provide warning signs for bicyclists to slow down or dismount where needed.

Trail Monitoring

In order to manage multiple user types with potential conflicts, the Trail Manager will be prepared to address user conflicts as they arise, based on patterns of usage and recorded incidents. The Trail Manager will also review complaints and accident reports on an on-going basis to determine if there is a pattern of user conflicts that needs to be enforced. Remedial actions may be in the form of signage and enforcement and may include:

- Lowered speed limits in some areas
- New or increased patrols
- Citizen volunteer education efforts
- Enforcement of overtaking and other requirements
- Changes in the hours of operation for specific user groups

Liability

Liability is of paramount interest and concern to the TMG and adjacent property owners. It is important to note upfront that liability and lawsuits are relatively uncommon on unpaved recreational trails, as opposed to paved trails that are funded with transportation dollars. Trails operated by non-profit groups with very little assets experience even fewer lawsuits, although an insurance policy or self-insurance program is still recommended for most privately-operated trails.

Since the Mauka Trail will serve primarily as a recreational versus transportation facility, it should be defined simply as a "multi-use trail" similar to a fire road or service road. By identifying the Mauka Trail as a recreational facility and turning over management of the facility to a TMG, the trail would enjoy the benefits of indemnification provided through existing statutes such as the Recreational Use Statute (Hawaii Government Code Div. 3, Title 28, Chapter 520):

"[520-3] Except as specifically recognized by or provided in section 520-6, an owner of land owes no duty of care to keep premises safe for the entry or use by others for recreational purposes (...). [520-4] (...) An owner of land who either directly or indirectly invites or permits without charge any person to use the property for recreational purposes does not (...) assume responsibility for, or incur liability for, any injury to person or property caused by an act of omission or commission of such persons (...)."

There are three major exceptions to this liability immunity that would extend to all landowners who granted easements for the Mauka Trail:

- A. Malicious or willful failure to guard against or warn against a dangerous condition, use, or structure (...);
- B. For injury suffered in any case where the owner of land charges the person who enter or go on the land for recreational purposes; and
- C. For injuries suffered by a house-guest while on the owner's premises.

Recreational immunities will provide landowners with a very strong immunity from liability. These immunities will apply even if the landowner charges people to use its trail access roads, or for staying near the trail, or even if a fee was paid by the TMG for the trail easement. This same liability protection would not cover for-hire services offered by landowners such as tour services on or off the Mauka Trail. The operating permits required for any private operator on the Mauka Trail would specifically require adequate insurance and

hold the operator responsible for any and all occurrences on the trail. All trail users would use the trail at their own risk, and camping permits would also have 'hold harmless' clauses and 'use at your own risk' statements. The Trail Management Plan would also identify specific measures that could be taken by the TMG to further reduce or eliminate liabilities. Specific strategies may include:

1. Risk Management Program

A competent risk management program for the trail will help assure that the TMG is doing all that it can to be responsible stewards of the trail. Proper insurance coverage or budgeting for self-insurance to cover potential liability will do much to alleviate concerns.

2. Adhere to Design Standards

Careful compliance with applicable laws, regulations, route selection criteria, and design standards should greatly reduce the risk of injury to users, and also provide strong evidence that the agency used reasonable care. A detailed Trail master Plan and Management Plan is specifically designed to address existing standards.

3. Adhere to Maintenance Standards

Maintenance practices should be consistent along the entire trail, and conform to recognized maintenance practices. The responsible maintenance agency(ies) should have a written procedure to follow to maintain all portions of the trail.

4. Monitor Conditions

The responsible agency(ies) should have an internal mechanism to monitor and respond to actual operating conditions on the trail. This is typically done through the maintenance procedures, a record of field observations and public comments, and an annual accident analysis. Accidents should be reviewed to determine if physical conditions on the trail were a contributing cause.

5. Keep Written Records

Written records of all maintenance activities and procedures, responses to reports of safety hazards, and other regular activities must be recorded in order to be of use. Where a trail travels through numerous jurisdictions, it may make sense to have one contact persons/department responsible for the entire facility, rather than risk confusion by incidents being reported to the wrong jurisdiction. Mileposts on the route may also help maintenance and enforcement personnel respond to problems.

OPERATIONS AND MAINTENANCE

Operations and maintenance of the Mauka Trail is of utmost importance for the productive use of the facility, and the financial resources and liability of the TMG and local agencies. Operation activities on the Mauka Trail will consist primarily of monitoring and security. Monitoring accidents including identifying the primary cause and rectifying any physical deficiencies must be accomplished by the TMG.

Required maintenance on the trail is expected to consist of occasional regarding of trails and roads, controlling areas where informal paths have developed, and re-working areas where

erosion is occurring. It is recommended that a consistent maintenance procedure be developed for the Trail to ensure, at a minimum, that the facility is safe for trail users. The TMG should have a mechanism to identify, record, and respond to maintenance problems, and to keep written records of such actions.

Typical maintenance vehicles for the trail will be light pick up trucks and occasionally heavy dump trucks and tractors. Care should be taken when operating heavier equipment on the Trail to warn trail users and to avoid damaging the trail and road surfaces.

Community Projects

The support and work provided through friends-of-the-trail groups could help provide low-cost maintenance for the trail. Ideas for community projects that have been successful on other trail projects include volunteer planting events, interpretive research projects, or even trail re- building events. These community projects are the strongest means of creating a sense of ownership along the trail that is perhaps the strongest single deterrent to undesirable activity along the trail.

Privacy

Neighborhood concerns typically include a loss of privacy, and concerns about increased crime, vandalism, noise, and fire. With a proposed 200-foot wide easement zone within which to locate the trail, and two 1,000-foot wide buffer zones, the trail alignment can be located as far away from residences as possible. Posted penalties for trespassing combined with stiff trespassing fines and aggressive responses from the TMG if there are reports of trespassing problems will help keep trail users on the trail.

Security and Public Safety

If properly designed and managed, the Mauka Trail will provide a reasonable level of safety and security. A significant portion of the mauka Trail would be within the Volcanoes National Park, and would be designed and managed to the high standards of the National Park Service. Studies by the Rails-to-Trails Conservancy indicate that crime and other problems on trails is generally is the same as the adjoining communities. These studies have also shown that the best and most effective method of enhancing safety and security is to design a functional facility that is well used by the general public. The approach to safety and security outlined in this plan is to provide reasonable security features and be prepared to enhance those efforts in the future if safety and security prove to be problems.

Signage: Installation of key regulatory signs at regular intervals along the trail will help users internalize the rules. This would include “Bicyclists Yield to Pedestrians and Equestrians,” “No Trespassing,” “Camping in Designated Areas Only” and methods of reducing the intrusion of non-native seeds. Enforcement by repetition may be the most inexpensive and effective kind.

Patrols and Enforcement: Like other trails, the Mauka Trail is expected to be generally self-enforcing by the general public. It is recommended that horse- and/or bicycle-mounted rangers be available to patrol all single-track trails, and that 4WD-mounted rangers patrol all jeep roads on an intermittent and as-needed basis. Strategically placed solar-powered emergency cell phones may be placed on the trail every 10-20 miles or at trailheads to provide communications, but these are typically not found on any major trail systems around the country. The cost of these patrols is included in the operating costs for the project.

Security Features: Below is a summary of key security recommendations:

- Provide fire and police departments with map of system, along with access points and keys/combinations to gates/bollards.
- Make sure all segments of the jeep trails are accessible to emergency vehicles.
- Locate mileposts every mile; identify markers on maps.
- Provide and maintain up to four (4) emergency telephones or call box systems at trailheads to the local 911 network with instructions for use and penalties for misuse.

Emergency Response and Access

Emergency access for safety, security, or maintenance purposes will be based on an established protocol between local agencies and the fire and police departments for the County of Hawaii. Response protocol will be developed along with an Emergency Plan that will be developed by each department. The initial responding party will notify the other departments as soon as possible. Normally, the County will take primary responsibility for all incidents on the trail itself, and will immediately contact the TMG and other local agencies as needed and appropriate. The jeep-trail portions of the trail is designed to allow emergency vehicles full access to the facility, although vehicles should proceed cautiously where there is restricted space.

13. IMPLEMENTATION STRATEGIES

Implementation of the Mauka Trail will require completion of the steps identified in Trail Management chapter. It is recommended that the trail be constructed in phases as identified in the Preliminary Trail System chapter. Phasing of the trail will be dependent to a large extent on the success of obtaining easements from property owners, but it is recommended that the following basic phasing of segments be followed if possible:

Short Term (1-5 years):

Kau Forest:	Trail and access improvements Remote campgrounds
South Kona:	ATV park Car-access campground
North Kona:	Trail and access improvements Remote campgrounds
Hualalai:	Day hiking trail system Remote campgrounds

Mid-Term (5-10 years):

South Kona	Trail and access improvements Remote campgrounds
Hualalai	Destination Lodge
Mauna Kea Connector Trail	Trail and access improvements Car access campground
Mauna Kea Summit	Trail improvements
Southwest Rift Zone	Trail improvements

Long Term (10-20 years):

Mauna Loa Circumference Trail

RIGHT-OF-WAY ACQUISITION

A significant amount of the Mauka Trail corridor is in private ownership, including large tracts that are crucial for trails. There are a variety of ways that trails can be developed on private property, with each situation requiring its own solution. Tools include:

1. **Trail Easement:** either purchased or donated to a non-profit land trust, and designed so as to minimize impacts on the property owner. The easement would carry with it specific maintenance and liability protections. This is similar to conservation and agricultural easement purchases.
2. **Easement Purchase:** A trail organization could purchase an easement, possibly through a land trust that could grant some tax benefits, and own the property. Landowners could also potentially receive a share of the revenue generated by the Trail permit and user fees.

3. **Land Swaps:** While it is not possible to swap, for example, government land for private land, it is possible to trade long-term easements between public and private land owners. For example, a private property owner may agree to a long-term trail easement on their property in exchange for an easement of equivalent length on State or other property.
4. **Development/Resource Rights:** Some of the privately owned parcels in the Trail corridor have development or resource extraction restrictions. A public agency may agree to grant rights or exceptions in exchange for providing some type of public benefit such as a trail easement.
5. **Trail Master Plan:** If all else fails, by showing a trail alignment on an adopted Trail Master Plan, it would be possible to require an easement as part of any future building permit or property change in ownership.

It is recommended that individual meetings be held with each landowner as part of the Trail Master Plan process to discuss possible access and alignments, liability, safety, and other issues.

COSTS

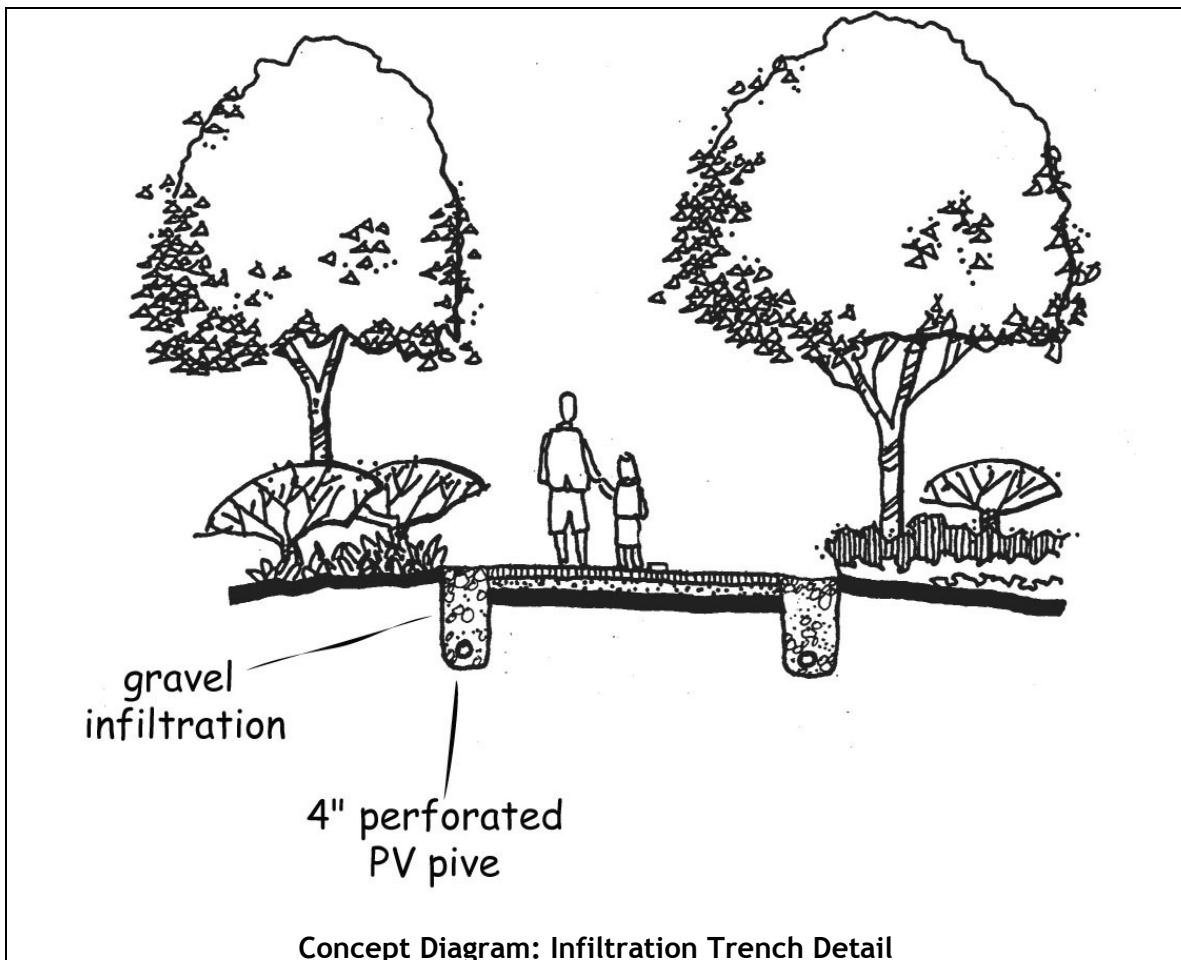
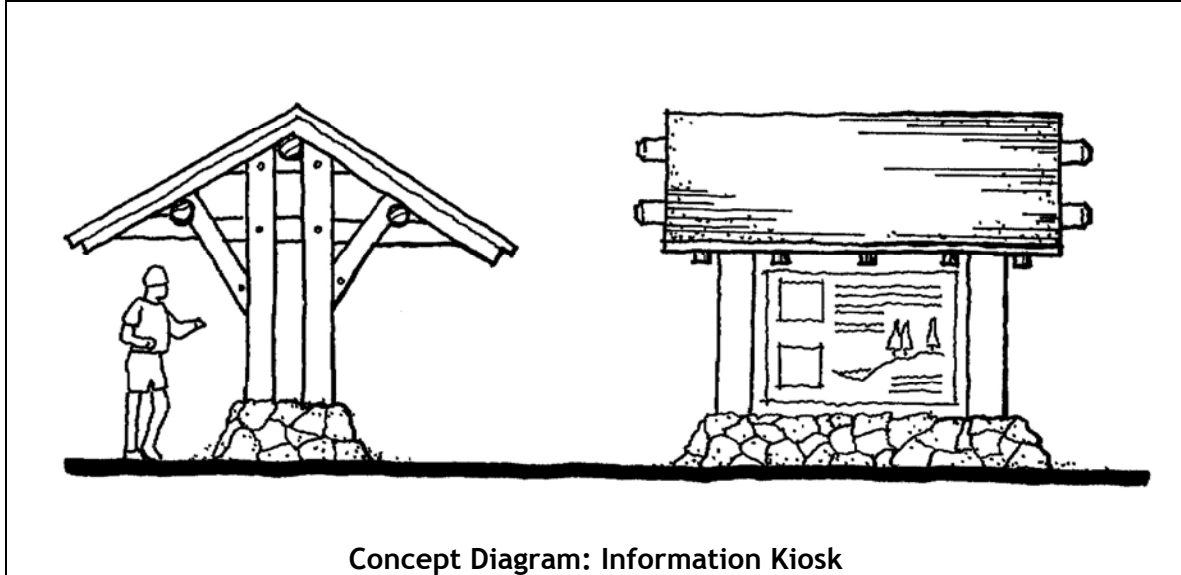
The Mauka Trail ‘system’ described in this plan is composed of a wide variety of improvements both directly and indirectly with the trail itself. Costs for the trail, campgrounds, water cisterns, and trailheads are difficult to determine without in-depth field review, mapping, soils tests, and other measures. The destination lodge and other non-trail facilities are very difficult to estimate at this concept level. Some very general costs have been developed for Trail Management Group (TMG), required studies and plans, and design and construction of the trail, access points, and campgrounds.

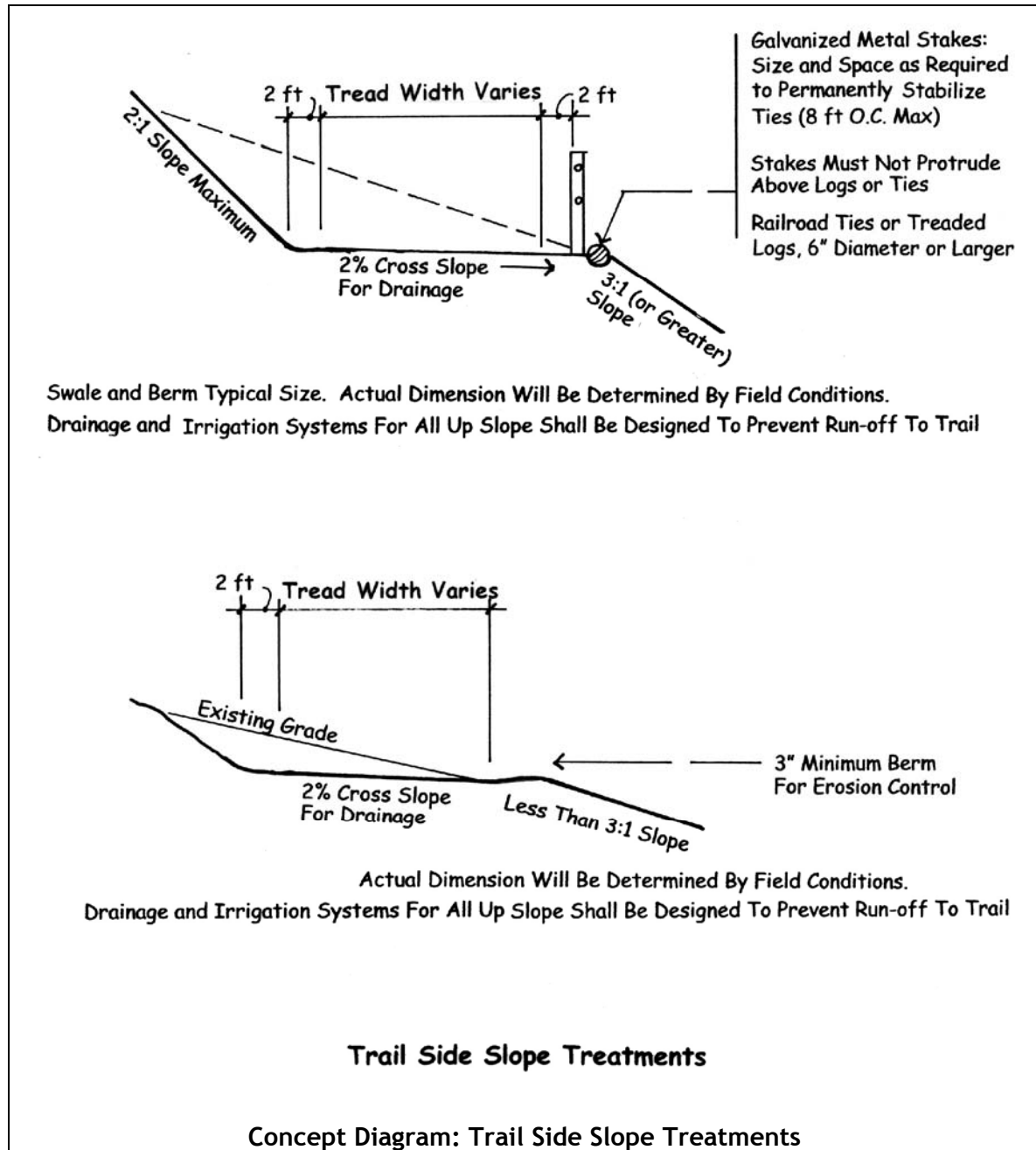
Trail Management Group Staff/Office:	\$50,000/yr to \$300,000/year
Trail Master Plan/Preliminary Design:	\$100,000
Trail Management Plan:	\$25,000
Trail Environmental Impact Statement:	\$100,000 - \$300,000
Permits/Easement Acquisitions:	\$250,000
Trail Design/Construction:	\$1.5 million
Campgrounds:	\$1 million
Water Cisterns:	\$500,000
Trail Access:	\$700,000
Trail maintenance:	\$150,000/year

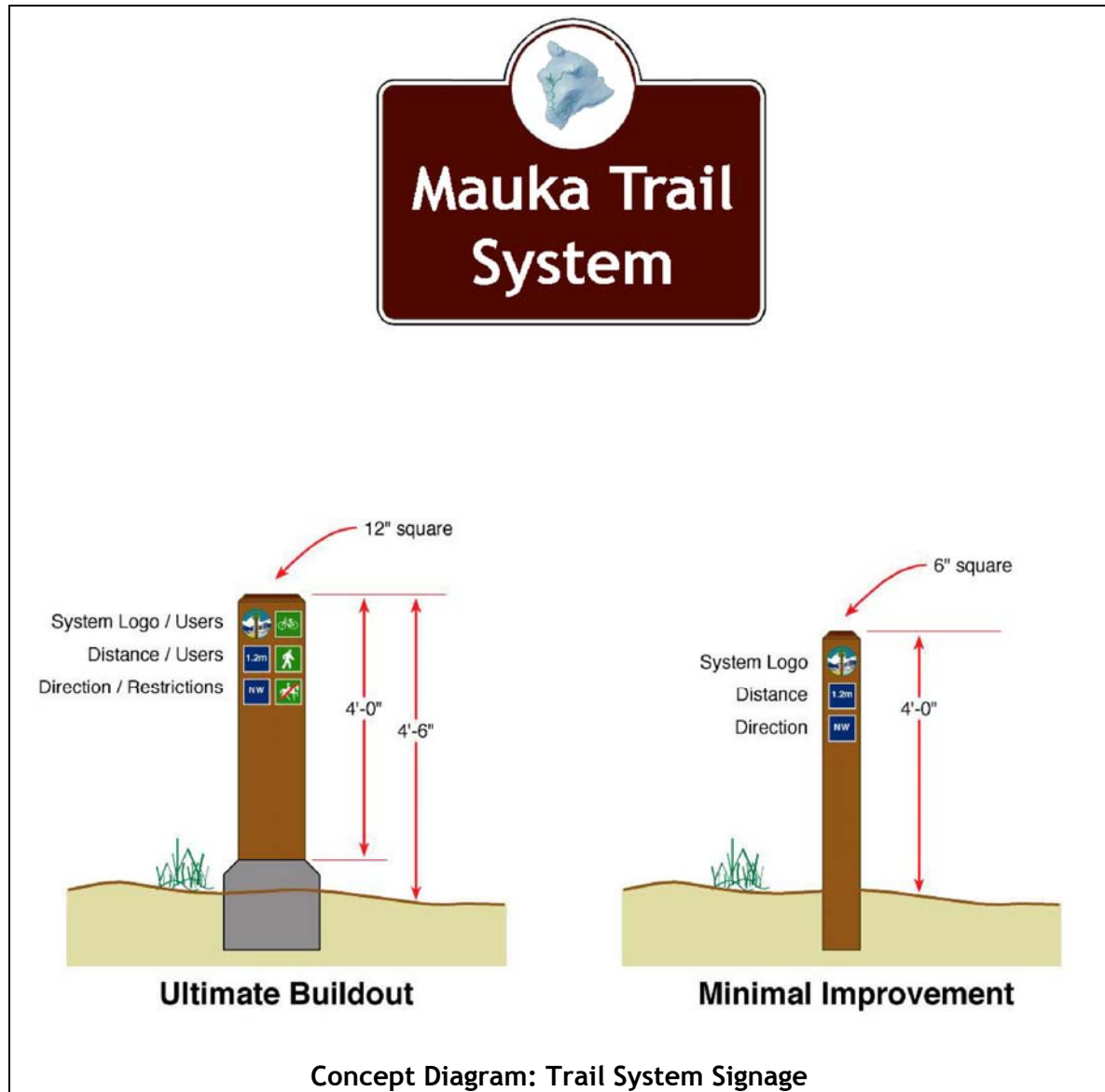
Total capital costs are estimated to cost \$4.2 million. The trail construction costs assume approximately \$8,000/mile for existing jeep road rehabilitation, and \$20,000/mile for new 4 feet wide trails. Both of these costs assume extensive volunteer and public agency assistance with items such as trail cats. More detailed field analysis into road, soil, drainage, and other conditions would need to be accomplished prior to finalizing this estimate. Total annual operating cost for the trail and campgrounds, when completed, and assuming some level of volunteer help in trail and campground management, is \$450,000/year.

APPENDIX

TRAIL DESIGN ELEMENTS







TRAIL DEMAND MODEL

The Trail Demand Model created by Alta Planning + Design is an attempt to provide a systematic approach to estimating potential trail usage for new and developing trail systems in a variety of locations. The model builds on published data and provides several methods of ‘factoring’ demand to reflect local knowledge and conditions. A step-by-step explanation of the model and its assumptions and methods is presented below.

Step 1:

The ‘base sources’ of resident population and annual visitors are obtained and represent the base population of potential users for trails in the region.

Step 2:

A series of ‘demand factors’ are next used to estimate the potential capture rate of a specific trail of the total population. These factors not only reflect individual factors such as scenery and access. For example, for the Mauka Trail the capture rate is estimated to be 20% of all potential users. This is based on a number of surveys and counts done around the country, along with national studies of recreational activities. This figure represents the potential pool of users who are likely to use the Mauka Trail.

Step 3:

Specific activity rates reflect a combination of factors including national participation rates in specific activities, the percentage of the population who are physically able to pursue these activities, and the unique attributes of the trail and local area. An example of this is shown below for resident hiking.

Base population:	174,000	
Factor #1:	58%	Proportion of population between 16 and 60
Factor #2:	33%	National participation rate of these people in this activity
Factor #3:	20%	Capture rate from Step 2
Result:	6,661	Residents who would use trail

Base Sources

- County population: latest population of the county(ies) served by the trail.
- Annual visitors: latest estimates of annual visitors to the area, typically from a visitor’s bureau or chamber of commerce

Demand Factors:

These factors provide a general level of demand for a specific facility based on various characteristics.

- Comparable facilities: how many similar types of trails are in the same region? (3=none, 2=1-3, 1=4 or more)
- Length of trail (3=over 100 miles, 2=20 to 100 miles, 1=under 20 miles)
- Scenery (on a scale of 1 to 5, 5 being highest, rank the scenery on the trail compared to others in the region)

- Access (on a scale of 1 to 5, 5 being highest, rank the access to the trail from population and visitor areas)
- Management (National Park Service =3, State Parks=2, other=1, reflects the relative attractiveness of trails developed by established agencies)
- Number of activities (out of 14 possible listed in the tables) on or near the trail
- Year of data
- The score produced by this methodology indicates the basic 'capture rate' of the local population and annual visitors, ranging from 5% up to 50%. This represents the base population from which activity rates are derived.
- Days per year: number of days per year the trail would be opened with moderate temperatures and conditions for trail users.

Demand by Activity:

- Day hiking: while day hiking is one of the most popular activities with Americans, it has been factored down to .15% for the Mauka Trail due to very limited access points and isolation from resort areas.
- Trail running: while 17% of adult Americans participate in this sport, it is factored heavily for both residents (5%) and visitors (1%) to reflect the fact that this is a predominately urban or suburban trail exercise activity—similar to jogging—that is unlikely to see heavy use on the Mauka Trail.
- Backpacking: while this is expected to be popular on the Muaka Trail, it has been factored down to .15% of visitors due to the relative scarcity of water and campsites.
- Guided tours: few Big Island residents are expected to take guided tours on the Mauka Trail, given a variety of factors. The visitor rate has been increased to .25% to reflect the existing pattern of guided tours on the Big Island.
- The destination lodge was projected to be 65% occupied, with 2 persons per room with 3-day average stays.
- Hike-in campers are somewhat redundant with backpackers, although backpackers typically have multi-camp trips while this group hikes in to one camp only. In either event, both visitor and residents were factored to 10% to reflect the lack of access and relatively few campgrounds.
- Car access camping for residents was identified as a major area of interest in interviews, with few other local options. This factor was increased to 50% for residents given the level of interest and lack of other options on the Island. It was decreased to 10% for visitors given the fact that almost all visitors arrive by plane and most are unlikely to rent a car to camp.
- Use of pack trains depends on the quality and quantity of services, but the projection reflects a standard service for this trail.
- Both visitors (.02%) and residents (10%) had their demand decreased significantly for equestrian use because this use, while it may be allowed, would not be encouraged due to access and trailhead constraints, concerns about water, trail conflicts, and environmental impacts.
- ATV use was decreased to 3% for very similar reasons cited above.
- 4WD usage by residents on some segments was increased due to interview responses, although it is unclear where this access would be provided. This could be in the form of using unpaved roads to access car campgrounds.
- Mountain bicycling was factored down for residents due to poor access from population centers, but kept at 20% for visitors.
- Bird watching was kept normal for both residents and visitors.

- Hunting was increased to 30% for residents based on interviews, but decreased for visitors (1%) under the assumption that few visitors would come to the Big Island to use the Mauka Trail to access hunting areas.
- Resident attraction rates are adjusted from the basic capture rate to reflect local conditions.
- Visitor attraction rates are adjusted from the basic capture rate to reflect local conditions.
- Visitor days differ for overnight uses, where an average of a 3-day stay is used for the lodge, camping, and pack trains.
- Daily peak figures are the number of people in each group who would be on the trail on a peak day, which is 230% of the average figure based on internal trail counts.
- Visitor expenditures (2=location requires most visitors to fly to destination, 1=most visitors can drive within 3-10 hours). While expenditures do not include airplane flight costs, they do reflect higher expenditures associated with vacation trips made by air versus car.

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SURVEY

Mauna Loa Mauka Trail System
Trail Demand and Economic Analysis

Visitor Information Survey

Background

We are conducting a survey of potential visitor use for a proposed 125 mile long Loop Trail that would traverse the mid elevation slopes of Mauna Loa from Hawaii Volcanoes National Park to Hualalai and the Saddle Road. Additional trails in this system will connect the loop trail to the Belt Road. The trail will use existing ranch roads on public and private land. Expected activities include: backpacking, day hiking, guided eco-tours, mountain biking and horseback riding. Vehicle use may be confined to the connecting trails. Potential facilities include camp sites, huts, and lodges. Regional trails as this have proven to be major attractions in other states and countries.

Please provide us your input on the potential demand for this facility:

1. I am affiliated with a:

- Hotel Rental Agency Tour Operator Travel Agency Other

2. Based on what I know, I (you may check more than one box):

- Strongly support and promote this trail
 Believe this trail would increase visitor stays and length of stays in the area
 Believe that it would improve visitor stays but not increase the length of visitor stays in the area
 Do not believe this trail would be of interest to my clients/customers

3. Based on what I know, this trail would:

- Be a major new attraction in the area Be a welcome new attraction
 Be similar to existing attractions Be a very minor attraction in the area

4. Which specific user groups do you think would use the trail the most:

- Day hikers Nature enthusiasts/eco tourists Multi-day trekkers
 Runners Horseback riders Mountain bikers
 Four Wheel Drive vehicle tours

5. Would you like to be directly involved in directing, managing, or operating trips to tourists on this trail?

- Yes No

Please return this survey by February 15, 2005, to: Jennifer Hagan, Project Planner, Alta Planning & Design, 707 C Street, San Rafael, CA 94901. Phone (415) 482-8660 Fax (415) 482-8603; or e-mail to jhagan@altaplanning.com. Please feel free to include any additional materials that would be useful such as drawings of site improvements or problem areas, related information about the trails, additional contacts, etc. Thanks for your assistance!