CENTRAL MAUI PEDESTRIAN & BICYCLE MASTER PLAN for 2030

Prepared by:

State of Hawaii - Department of Health - Healthy Hawaii Initiative

with assistance from:

County of Maui - Department of Planning
Department of Public Works
Police Department

MARCH 2012

A WORLD CLASS PEDESTRIAN & BICYCLIST COMMUNITY
ACKNOWLEDGEMENTS

The State Department of Health, Healthy Hawai`i Initiative, would like to thank all of those dedicated professionals, pedestrian and bicycle advocates, and concerned citizens that contributed to the development of the Central Maui Pedestrian & Bicycle Master Plan for 2030.

Project Steering Committee

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Steering Committee Statement of Vision

The people who live, work and play in Central Maui desire a community in which bicycling and walking for health, transportation or enjoyment can be done safely and without physical barriers. Further, we desire a future where bicycling, walking, and other non-motorized activities are accommodated in a safe, well-maintained, and easily accessible manner for the following reasons:

- Promoting a healthier lifestyle,
- Creating more livable communities, and
- Facilitating greater social, economic and environmental sustainability.

Consultant / Funder / Evaluation Team

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</tbody>
</table>
# Table of Contents

## I. Introduction
1. Introduction .......................... 1
   1.1 Benefits on Non-Motorized Transportation 1
   1.2 Organization of the Plan 5
   1.3 Study Area 6
   1.4 Public Participation
      1.4.1 Steering Committee 8
      1.4.2 Public Meetings 10
      1.4.3 Community Surveys 10
   1.5 Existing and Ongoing Planning 10
   1.6 Complete Street Guidelines 11

## II. Walking & Bicycling in Central Maui Today
2.1 Bicyclist Types 13
2.2 Pedestrian Types 15
2.3 Community Attitudes – Survey Responses 16
2.4 Collision Analysis
   2.4.1 Kahului 22
   2.4.2 Wailuku 24

## III. Designing the Walkable and Bikeable Community
3.1 Introduction 27
3.2 Central Maui Pedestrian & Bicycle Master Plan 28
3.3 Using This Section 35
3.4 Wailuku 36
3.5 Waikapu – Waiale Road Connector 38
3.6 Kahului 40
3.7 Kaahumanu Avenue 42
3.8 Papa Avenue 44
3.9 Kamehameha Avenue 46
3.10 Onehee Avenue 48

## IV. CIP Priorities
4.1 Priority Projects
   4.1.1 Comprehensive Signage & Striping Program 61
   4.1.2 Wailuku Pedestrian District 62
   4.1.3 Kahului Bicycle District 63
   4.1.4 Kahului Pedestrian District 64
   4.1.5 Waiale Road Pedestrian & Bike Path 65
   4.1.6 Kahului Beach Road Esplanade 66

## V. Implementation – Getting from Here to There
5.1 General & Community Plan Policies 68
5.2 Regulatory Barriers 69
5.3 Enforcement, Education, and Encouragement Programs
   5.3.1 Enforcement Programs 70
   5.3.2 Education Policies & Programs
      5.3.2.1 Child/School Education Programs 71
      5.3.2.2 Adult Cycling Skills Education 72
      5.3.2.3 Education Campaigns 72
   5.3.3 Encouragement & Awareness Programs 72
5.4 Funding for Improvements
   5.4.1 Federal 75
   5.4.2 State Highway Modernization Plan 78
   5.4.3 Private & Non Profit 79
5.5 Strategic Community & Agency Partners 80
Table of Contents (Cont.)

5.5.1 Community Organizations 80
5.5.2 County Agencies 81
5.5.3 State Agencies 81
5.6 A Path Forward 82

VI. Evaluation – Measuring Progress 85
   6.1 Regularly Update the Plan 85
   6.2 Establish Measures for Effectiveness 85

VII. Appendix A - Design Guidelines A-2

VII. Appendix B - Cost Estimate Factors B-2
PART ONE -
INTRODUCTION

CENTRAL MAUI PEDESTRIAN & BICYCLE MASTER PLAN FOR 2030
A world class pedestrian and bicyclist community
PART ONE - INTRODUCTION

I. Introduction

Do Maui residents’ desire more walkable and bikeable communities?

Does the existing infrastructure allow for safe biking and walking to school, shops, work, church, the park or simply around the block?

A survey of Central Maui residents asked the question: “Do you agree with the statement that Wailuku, Waikapu and Kahului would be more livable if there was better walking and bicycling infrastructure?”

Ninety-five percent responded, “Yes”!

The Central Maui Pedestrian and Bicycle Master Plan is part of the Healthy Hawai’i Initiative’s (HII) efforts to encourage walking and bicycling, thereby increasing physical activity in residents everyday lives. The Plan identifies opportunities to create an environment conducive to active living through improving pedestrian and cyclist safety, mobility and access. The focus areas include improving walking and bicycling within urban cores and between communities in the Central Maui area and providing design guidelines for constructing new and retrofitting existing facilities into pedestrian and cyclist-friendly facilities.

1.1 Benefits of Non-Motorized Transportation

Bicycling and walking offer many benefits to a community. A more bicycle and pedestrian-friendly Central Maui area will:
- Contribute to reducing traffic congestion,
- Improving air quality, slowing climate change,
- Improving public health, and
- Improving community quality of life.

This Non-Motorized Plan can affect these issues by guiding the Central Maui area in retrofitting existing areas and guiding future development in a more bicycle- and pedestrian-friendly manner, which will collectively have a profound effect on the existing and future quality of life in Central Maui.

Improves Health and Well-Being

Creating bicycle- and pedestrian-friendly communities is an effective means of encouraging active and healthy lifestyles. Public health problems like obesity and asthma, both of which are at epidemic levels in Hawai’i, are linked to the design and quality of the built environment. Sprawling land use patterns and a lack of bicycle and pedestrian infrastructure increase reliance on automobiles for transportation and contribute to inactive lifestyles. The progressive decline in physical activity and increase in a more sedentary lifestyle corresponds with increased obesity rates. Automobiles are also a primary source of...
the environmental pollutants such as ozone and particulate matter that trigger asthma.17

Safe and comfortable routes for biking and walking improve access to recreational and social opportunities, like parks and civic centers. New facilities may allow individuals to replace an automobile trip with a walking or bicycling trip, which reduces auto traffic, congestion, and pollution. Lastly, safe and comfortable active transportation makes the journey more enjoyable for all.

**Improves Access for Seniors and Children**

Safe and comfortable walking and bicycling facilities provide necessary transportation alternatives for people of all ages, from children to seniors. The “Eight to Eighty” concept is the idea that non-motorized facilities should be designed to be comfortably used by a range of people from an 8 year old child to an 80 year old grandmother. Both seniors and children can benefit from the independence provided by safe walking and bicycling facilities. As people become older, they tend to drive less due to decreasing willingness and ability. Transportation options help ensure seniors continue to have access to medical care, shopping and dining opportunities, and social interaction.

Children similarly rely on biking and walking for travel when not driven by family or friends. Whereas half of all students walked or biked to school in 1969; fewer than fifteen percent of students do so today.18 19 Being driven to school, and lacking access to recreational areas, libraries, and social centers all contribute toward a sedentary lifestyle which can lead to other, more serious health problems. Safe and comfortable biking and walking facilities can improve mobility for children and alleviate safety concerns for parents, who consistently cite traffic danger as a reason why their children are unable to bicycle or walk to school.20

**Reduces Automobile Dependence**

Although also dependent on development patterns and land use density, areas with extensive walking and bicycling infrastructure have greater numbers of bicyclists and pedestrians, and a corresponding decrease in auto mode share and ownership. More than a third (36%) of all trips in internationally-known bicycle friendly cities Amsterdam and Copenhagen occur by bicycle. These cities also have dense development patterns, extensive public transit systems, bicycle and pedestrian-friendly traffic laws, restrictions on auto operations, and high auto ownership costs. Domestically, Portland, Oregon has a bicycle mode share ranging from more than 4% (2007 ACS) to 8% (Citywide auditor’s survey).21

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18 Source 2001 National Household Travel Survey
19 http://fhwa.dot.gov/environment/te/apportionments.htm
20 Barriers to Children Walking and Biking to School, CDC, 2005
21 Bike to School Day Phoenix, AZ by Mike Cynecki

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Bike Path, Taipei by Shawn Turner
Table 1-1 presents Central Maui’s recorded year 2000 commute mode share against the rest of Maui County, the State of Hawai‘i, and the Nation. While Central Maui has a slightly higher bicycle mode share than the rest of the nation, it is lower than the overall State and Maui County. Central Maui, similarly, has a lower walking rate than the Nation, State, and County for work commute purposes.

### Table 1-1 Commute Mode, Census 2000

<table>
<thead>
<tr>
<th>Commute Mode</th>
<th>United States</th>
<th>Hawai‘i</th>
<th>Maui County</th>
<th>Central Maui¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car, truck, or van:</td>
<td>87.9%</td>
<td>82.9%</td>
<td>88.3%</td>
<td>92.0%</td>
</tr>
<tr>
<td>Public transportation:</td>
<td>4.7%</td>
<td>6.3%</td>
<td>0.8%</td>
<td>0.7%</td>
</tr>
<tr>
<td>Motorcycle</td>
<td>0.1%</td>
<td>0.6%</td>
<td>0.6%</td>
<td>0.3%</td>
</tr>
<tr>
<td>Bicycle</td>
<td>0.4%</td>
<td>0.9%</td>
<td>1.2%</td>
<td>0.6%</td>
</tr>
<tr>
<td>Walked</td>
<td>2.9%</td>
<td>4.8%</td>
<td>2.8%</td>
<td>2.1%</td>
</tr>
<tr>
<td>Other means</td>
<td>0.7%</td>
<td>0.9%</td>
<td>1.4%</td>
<td>2.0%</td>
</tr>
<tr>
<td>Worked at home</td>
<td>3.3%</td>
<td>3.6%</td>
<td>4.9%</td>
<td>2.3%</td>
</tr>
</tbody>
</table>

¹Central Maui census tracts: 309.01, 309.02, 309.03, 310, 311.01, 311.02, 311.03,

The more recent 2005-2009 American Community Survey estimates that only 2 percent of Central Maui residents commute to work by public transit and less than 2 percent walk to work, which is consistent with the Census 2000 data. The survey does not distinguish bicyclists from motorcycle or taxi riders commuting to work.

### Reduces Greenhouse Gas Emissions

Replacing vehicular trips with bicycling and walking trips has a measurable impact on reducing human-generated greenhouse gases (GHGs). Fewer vehicle trips and vehicle miles traveled (VMT) translate into fewer mobile source pollutants, such as carbon dioxide, nitrogen oxides, and hydrocarbons, released into the air. Providing transportation options that reduce VMT is an important component of decreasing GHG emissions and improving air quality.

### Economic Benefits

Bicycling is economically advantageous to individuals and communities. According to some statistics, the annual operating costs for bicycle commuters are 1.5 percent to 3.5 percent of those for automobile commuters.¹⁶ Hawai‘i is the most expensive state to own a car when accounting for taxes and fees, insurance, fuel, and maintenance.¹⁷ The 2005-2009 American

¹⁶ Active Transportation website: [http://activetransportation.org/costs.htm](http://activetransportation.org/costs.htm)
¹⁷ [Edmonds.com Hawai‘i and California Most Expensive States to own a Car. Published May 4, 2010.](http://edmonds.com)
Community Survey estimates that 93 percent of households in Central Maui own at least one automobile. Potential savings in health care costs also accompany cost savings associated with bicycle expenses. On a community scale, bicycle infrastructure projects are generally far less expensive than automobile-related infrastructure. Further, shifting a greater share of daily trips to bike trips reduces the impact on the region’s transportation system, thus reducing the need for roadway expansion and maintenance.

**Creates More Active and Livable Communities**

Fostering conditions where bicycling is accepted and encouraged increases a community’s livability from a number of different perspectives. The design, land use patterns, and transportation systems that comprise the built environment have a profound impact on quality of life issues. Studies have found that people living in communities that promote bicycling and walking tend to be more socially active, civically engaged, and are more likely to know their neighbors; whereas urban sprawl has been correlated with social and mental health problems. The aesthetic quality of a community improves when it minimizes visual and noise pollution caused by automobiles and when it provides green space facilities that enable people of all ages to recreate and commute in a pleasant setting.

**Implements Cyclist, Pedestrian, and Motorist Safety**

Conflicts between bicyclists and motorists result from poor riding and/or driving behavior as well as insufficient or ineffective facility design. Encouraging development that accounts for biking and walking from the onset improves the overall safety of the roadway environment for all users. Well-designed bicycle facilities improve security for existing bicyclists and also encourage more people to bike, which in turn can further improve bicycling safety. Studies show that bicycle collision frequency has an inverse relationship to bicycling rates, which means that more bicyclists on the road equate to lower crash rates. Providing information and educational opportunities about safe and lawful interactions between bicyclists and other roadway users also improves safety.
1.2 Organization of the Plan
The Plan is organized into six sections. These include:

PART ONE - Introduction
The introduction introduces the reader to the study area and describes the Plan’s purpose and organization.

PART TWO - Walking and Biking in Central Maui
How do residents perceive walking and bicycling in Central Maui today? What key constraints and opportunities exist for increasing the rate of walking and bicycling within the study area?

This section summarizes community attitudes towards walking and biking, describes the different types of users within the study area, and identifies the region’s major destinations and the physical constraints and opportunities for expanding non-motorized access.

PART THREE - Designing the Walkable & Bikeable Community
Can Central Maui become a world class pedestrian and bicyclist’s community? Yes it can!

This section describes the Plan’s vision - and the necessary actions required to achieve it. The Plan provides an illustrative 2030 vision map and more detailed maps that link the major destinations and activity nodes by pedestrian and bicycle routes. The Plan further establishes cost estimates and an implementation schedule for priority projects.

PART FOUR - CIP Priorities
The Plan’s priority projects are identified in a table by location, “order of magnitude” cost estimate, and timing.

PART FIVE - Implementation, Getting from Here to There
Getting from “Here to There” will require a long-term vision of what the possibilities are. It will also require the active participation and advocacy of a community committed to healthier lifestyles and reduced automobile dependence. This section describes the governmental, non-governmental and community partners responsible for implementation. Projects are prioritized and listed within a short- and long-term implementation schedule with cost estimates. Existing and supplemental alternative funding sources are identified.

PART SIX - Evaluation
This section identifies specific milestones and benchmarks to help planners’ and community stakeholders measure progress towards attainment of the desired outcomes.

APPENDIX A - Design Guide
The design guide illustrates the types of improvements proposed in the Plan. These improvements include pedestrian and bicycle infrastructure, traffic calming, and beautification.
PART ONE - INTRODUCTION

projects to retrofit existing facilities and design new facilities. Taken together the design guide describes the non-motorized facilities required for a less auto dependent and more pedestrian and bicycle-oriented community.

APPENDIX B - Cost Estimate Factors

Cost estimate factors are provided based on mainland construction costs per linear foot of improvement. An escalation factor of thirty percent is built into the Maui cost estimates to account for the higher cost of construction in Hawaii.

1.3 Study Area

The Central Maui study area encompasses Wailuku-Kahului, Maui’s largest population and employment center. In 2005, Wailuku-Kahului was home to over 46,000 residents and an equal number of jobs.

Wailuku is the seat of Maui County government and is the island’s civic center. This community developed organically during the early 1900’s and has distinct commercial, residential, civic, and public use districts within close proximity of each other. Wailuku has a settlement pattern that favors walking and bicycling, but non-motorized infrastructure is non-existent or substandard in many areas.

Kahului is the island’s major commercial and industrial center and is home to Maui’s major seaport and airport. Kahului experienced significant population growth during the early 1960’s and 1970’s resulting from the closure of many of Maui’s plantation camps and the corresponding development of fee-simple housing in Kahului for sugar and pineapple workers. Shopping, commercial, education and entertainment facilities are sizable employment and activity generators within Kahului.

Kahului’s settlement pattern is more auto dependent than Wailuku’s because land uses are more homogenous and less compact. Established residential neighborhoods are characterized by single-family residential lots fronting along a modified grid pattern of neighborhood and collector streets. Within the commercial/retail core along Kaahumanu Avenue, there are several large mixed-use urban infill projects proposed that will increase the need for pedestrian and bicyclist facilities. The quality of pedestrian and bicycle infrastructure varies greatly throughout Kahului with large gaps and substandard infrastructure common in older neighborhoods.

Waikapu is a small rural settlement between Wailuku and Mā'alaea along Honoapiilani Highway. Waikapu is mostly residential with limited commercial development. The current draft Maui Island Plan directs new residential development to the Waikapu area. Limited pedestrian and bicyclist infrastructure exists in the area.

Within Central Maui there are four elementary schools, two intermediate schools, and two high schools with a student population of 8,619 in 2010-2011. The island’s only university, the 78-acre University of Hawaii, Maui College, is located in Kahului. The campus had a student population of 4,400 in spring 2011. The region’s urban areas are bound by highly productive agricultural lands that are currently in sugarcane production by Hawaiian Commercial & Sugar Company (HC&$). The eastern flank of the West Maui Mountains provides a dramatic backdrop to the region.

Vineyard St, Wailuku. Narrow without Sidewalks
PART ONE - INTRODUCTION

CENTRAL MAUI PEDESTRIAN & BICYCLE MASTER PLAN FOR 2030

A world class pedestrian and bicyclist community

IMPORTANT CONNECTIONS & CORE AREAS
1.4 Public Participation

Public participation is critical in plan development because it leads to more informed and effective decision making and a more empowered and vested community. An empowered community can be an important ally during budget deliberations to secure funds for implementation.

A robust public participation program was conducted to develop the recommendations presented in this plan. The Public Participation Program comprised three primary modes of community input:

- Establishment of a Steering Committee;
- Community Outreach Events; and
- Surveys administered to area school children and residents.

1.4.1 Steering Committee

A thirteen member steering committee of agency and community stakeholders was formed to provide input into the planning process. The committee met three times between October 2010 and November 2011. Steering Committee responsibilities included:

- Providing professional expertise and input to the consultant team;
- Identifying issues, barriers and opportunities to improving biking and walking conditions in the study area;
- Communicating with agency and community stakeholders;
- Facilitating community outreach; and
- Assisting with Plan implementation.

Steering Committee representatives included:

- Maui Police Department;
- University of Hawaii, Maui College;
- Department of Public Works;
- Maui Economic Opportunity;
- Maui Bicycle Alliance;
- Wailuku Community Association;
- Waikapu Community Association;
- State Department of Transportation;
- State Department of Education;
- Department of Planning;
- A&B Properties;
- Realtors Association of Maui; and
- Wailuku Main Street Association.
PART ONE - INTRODUCTION

IMPORTANT CONNECTIONS & CORE AREAS
Summary of Input to Identify Important Connections and Core Areas

Core Areas
The mapping exercise identified key core areas of activity (red dots and blue circles)

Important Routes
The Public mapping exercise identified key routes for pedestrian & bicycle activity (identified with colors)

Important Routes
The Steering Committee identified several key routes (identified with arrowheads)

The Central Maui Non-Motorized Pedestrian and Bicycle Access Plan is part of the Healthy Hawaii Initiative’s (HHI) efforts to encourage walking and bicycling, thereby increasing physical activity in resident’s everyday lives. The Plan identifies opportunities to create an environment conducive to active living through improving pedestrian and cyclist safety, mobility and access.
1.4.2 Public Meetings
Community meetings were conducted in December 2010 and September 2011. The purpose of these meetings was to inform the public of the project and to involve the community in the preparation of the plan. The meetings were conducted in the charrette style format with community members collaborating with the Consultant Team to identify core destinations, routes, barriers and opportunities. At the final meeting, participants were invited to join with the project’s Steering Committee to advocate for the Plan’s recommendations.

1.4.3 Community Surveys
The Consultant Team conducted a survey within the study area to obtain community input on bicycling and walking conditions and to assess non-motorized transportation activity levels. The survey was administered at various locations from October 2010 to February 2011. A total of 129 responses were collected. The results of the survey are summarized in Section 2.3.

The Consultant team also administered a survey at area schools to obtain input on non-motorized travel patterns and to elicit the primary barriers that keep children from walking and biking more often. The surveys were administered from March through April 2011 at Baldwin High School, Iao Intermediate School and Maui Waena Intermediate School. A total of 250 surveys were administered and 166 collected. These are summarized in Section 2.3.

1.5 Existing and Ongoing Planning
The State of Hawaii and County of Maui are responsible for transportation planning in Maui County. The State of Hawaii plans for Maui’s airports, harbors and State Highways. The County of Maui is responsible for County roadways, including neighborhood streets, collectors and arterials. State Highways within the project area include:
- Main Street (High Street to Kaahumanu Avenue),
- High Street (Keanu Street to Main Street),
- Kaahumanu Avenue,
- Dairy Road (Puuene Avenue to Keolani Place/Haleakala Highway) and
- Kahului Beach Road.

The State of Hawaii also conducts Bicycle and Pedestrian Planning activities through its Highways Division. Bike Plan Hawaii (2003) is the State’s long-range bicycle transportation plan. The Plan serves as the State’s blueprint for integrating bicycling into the State’s transportation system. It includes maps of proposed bicycle facility improvements, preferred facility types, project prioritization and strategies for implementation.

The State of Hawaii has updated its Statewide Pedestrian Master Plan (2011). The purpose of the Plan is to “increase pedestrian safety and mobility, support a multi-modal transportation system, and provide guidance on the best use of resources to implement pedestrian initiatives”. Bike Plan Hawaii (2003) and the Statewide Pedestrian Master Plan (2011) address conditions on State Highways within the study area. Whenever possible the Central Maui Pedestrian and Bicycle Master Plan is consistent with the State’s recommendations.

The County of Maui doesn’t have an on-going program dedicated to bicycle and pedestrian planning. However, the County’s subdivision ordinance, Title 18 “Subdivisions”, does require sidewalks on at least one side of all roadways fronting residential and commercial development. Title 18 also requires that traffic calming elements be incorporated into all newly constructed streets in residential subdivisions. The most common traffic calming elements are the required minimum treatment, speed humps.

Maui County Code
18.20.105 - Traffic calming elements.

“Traffic calming elements shall be installed on all newly constructed streets in residential subdivisions... may include speed humps, speed tables, raised crosswalks, chokers, chicanes, roundabouts, mini-traffic circles, median or landscape treatments which facilitate pedestrian movement... At a minimum, speed humps ... shall be installed on minor collector streets...”
The County of Maui is also subject to Senate Bill 718 which requires the State Department of Transportation and the County transportation departments to adopt complete street policies. The Nutritional and Physical and Activity Coalition of Maui County (NPAC) is facilitating the adoption of such a policy for Maui County. There are several non-profit advocacy organizations that have a history of promoting bicycling and walking on Maui. These include:

- Maui Bicycle Alliance;
- Kihei Community Association;
- Wailuku Main Street Association Tri Isle Resource Center; and
- Nutrition and Physical Activity Coalition of Maui County (NPAC).

Projects supported by these groups include Kihei’s North-South Collector Road, Northshore Greenway, Mokulele Highway Bike Path, Market Street Improvement Project, the adoption of a ‘Complete Streets’ policy, and several others.

1.6 Complete Street Guidelines

‘Complete Streets’ are designed and operated to accommodate not only automobile users, but also pedestrian, bicyclist, and transit users in a manner that is safe for users of all abilities. For many decades, community design was done with little emphasis placed on creating neighborhoods that would promote safe and convenient pedestrian and bicycle transportation. More recently, in response to a biting critique of urban sprawl by proponents of “new urbanism” and “smart growth”, planners have advocated for community design that fosters non-motorized transportation. A movement to promote “Complete Streets” is sweeping the Country with twenty-three states (and Puerto Rico and the District of Columbia) and more than 200 regional and local jurisdictions adopting Complete Streets policies.

On May 6, 2009, Hawaii’s State legislature also adopted Complete Streets legislation. Senate Bill 718 requires the State Department of Transportation and the County transportation departments to adopt a complete streets policy to accommodate all users of the public highways, including pedestrians, bicyclists, transit users, motorists, and persons of all ages and abilities. The law applies to new construction, reconstruction, and maintenance of highways, roads, streets, ways, and lanes located in urban and rural areas. The law also established a task force to prepare recommendations for changes to design standards and guidelines to implement Complete Street standards.
PART TWO - WALKING & BICYCLING IN CENTRAL MAUI TODAY
II. Walking & Bicycling in Central Maui Today

Data collected by the project team and other sources indicate that residents choose to walk or bicycle within Central Maui. However, project survey responses and collision records indicate that residents need additional reinforcement through infrastructure, policies, and programs to increase walking and bicycling rates as normal, everyday activities. Sections 2.1 and 2.2 summarize national research on classifying bicyclists and pedestrians. Information on the continuum of user types provides a greater understanding of distinct user needs. Section 2.3 reports on the resident’s perspective through a survey administered by the project team. The survey analysis includes questions on reasons for walking and bicycling, deterrents to walking and bicycling, and activity frequency. Section 1.42 describes the Plan’s ongoing planning efforts, and the Plan’s process and outcomes from public workshops. Section 2.4 describes and summarizes collision-related data between 2007-2010.

2.1 Bicyclist Types

It is important to consider bicyclists of all skill levels in creating a non-motorized plan. Cyclist skill level greatly influences expected speeds and behavior, both in separated bikeways and on shared roadways. The bicycle planning and engineering professions currently use several systems to classify bicyclists, which can assist in understanding the characteristics and infrastructure preferences of different bicyclists. Bicycle infrastructure should be planned to accommodate as many user types as possible, with decisions for separate or parallel facilities based on providing a comfortable experience for the greatest number of bicyclists.

The following user types come from an excerpt from the 1999 AASHTO Guide for the Development of Bicycle Facilities:

“Although their physical dimensions may be relatively consistent, the skills, confidence and preferences of bicyclists vary dramatically. Some riders are confident riding anywhere they are legally allowed to operate and can negotiate busy and high speed roads that have few, if any, special accommodations for bicyclists. Most adult riders are less confident and prefer to use roadways with a more comfortable amount of operating space, perhaps with designated space for bicyclists, or shared-use paths that are away from motor vehicle traffic. Children may be confident riders and have excellent bicycle handling skills, but have yet to develop the traffic sense and experience of an everyday adult rider. All categories of rider require smooth riding surfaces with bicycle-compatible highway appurtenances, such as bicycle-safe drainage inlet grates.

A 1994 report by the Federal Highway Administration used the following general categories of bicycle user types (A, B and C) to assist highway designers in determining the impact of different facility types and roadway conditions on bicyclists:

PEDESTRIAN TYPES

A - Advanced or experienced riders are generally using their bicycles as they would a motor vehicle. They are riding for convenience and speed and want direct access to destinations with a minimum of detour or delay. They are typically comfortable riding with motor vehicle traffic; however, they need sufficient operating space on the traveled way or shoulder to eliminate the need for either themselves or a passing motor vehicle to shift position.

B - Basic or less confident adult riders may also be using their bicycles for transportation purposes, e.g., to get to the store or to visit friends, but prefer to avoid roads with fast and busy motor vehicle traffic unless there is ample roadway width to allow easy overtaking by faster motor vehicles. Thus, basic riders are comfortable riding on neighborhood streets and shared-use paths and prefer designated facilities such as bicycle lanes or wide shoulder lanes on busier streets.

C - Children, riding on their own or with their parents, may not travel as fast as their adult counterparts but still require access to key destinations in their community, such as schools, convenience stores and recreational facilities. Residential streets with low motor vehicle speeds, linked with shared-use paths and busier streets with well defined pavement markings between bicycles and motor vehicles can accommodate children without encouraging them to ride in the travel lane of major arterials.”
The AASHTO classifications have been the standard for at least 15 years, and are helpful when assessing existing bicyclists. However, these classifications do not accurately describe all existing types of bicyclists, nor can they account for the population as a whole. For instance, they do not include potential bicyclists who are interested in riding, but have reservations about existing facilities’ safety.

Supported by data collected nationally since 2006, planners developed alternative categories to address the Americans’ varying attitudes towards bicycling. According to this recent data, less than 1% of Americans comprise a group of bicyclists who are ‘Strong and Fearless’. These bicyclists typically ride anywhere on any roadway regardless of roadway conditions or weather. These bicyclists can ride faster than other user types, prefer direct routes and will typically choose roadway connections – even if shared with vehicles – over separate bicycle facilities such as bicycle paths.

Approximately 7% fall under the category of ‘Enthused & Confident’ bicyclists who are confident and mostly comfortable riding on all types of bicycle facilities but will usually prefer low traffic streets or multi-use pathways when available. These bicyclists may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists including commuters, recreationalists, racers, and utilitarian bicyclists. The remainder of the American population does not currently ride a bicycle regularly.

Approximately 60% of the population fall into the category of ‘Interested but Concerned’, which represents bicyclists that typically only ride a bicycle on low traffic streets or bicycle paths under favorable conditions and weather. These infrequent or potential bicyclists perceive traffic and safety as significant barriers towards increased use of bicycling. These bicyclists may ride more regularly with encouragement, education and experience.

Approximately 25% of Americans are not bicyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually consider bicycling and may progress to one of the user types above. A significant portion of these people will never ride a bicycle under any circumstances.
2.2 Pedestrian Types

Throughout this Pedestrian & Bicycle Master Plan, the term “pedestrian” refers to a person moving from place to place, on foot and/or with the use of an assistive mobility device (when that person has a disability and/or medical condition). “Walking” or “to walk” are the terms used to describe this movement of a pedestrian. Pedestrians are a universal “user group,” in that everybody is a pedestrian during some part of every journey. Whether a person walks the entire distance from home to work, or only walks the short distance from his or her parking spot to the front door of an office, the person was a pedestrian during at least some portion of the journey.

While all pedestrians require a basic level of accommodation, there are some pedestrians that have special mobility needs including:

- Seniors
- Children
- Individuals with limited/impaired mobility
- Persons using mobility assistance devices

The Americans with Disabilities Act (ADA) establishes the minimum legal standard for pedestrian facilities. ADA standards provide guidance on items within the public realm, including walkway width and slope, curb ramps. Although ensuring ADA compliance is a priority, this Plan also aims to provide facilities that are safe, universally accessible, connected to desirable destinations, easily navigable, aesthetically pleasing, and economical.

This Plan provides a Design Guide in Appendix A to present a catalogue of improvements and recommendations to ensure that all Central Maui residents can navigate areas on foot safely and at their leisure.
2.3 Community Attitudes towards Bicycling and Walking – Survey Responses

The project team prepared and distributed surveys to receive community input on bicycling and walking in Central Maui. The project Steering Committee and staff from Healthy Hawaii Initiative (HHI) provided input on the survey questions. Survey responses provided insight on community members’ current bicycling and walking activity levels, reasons for their activity, views on existing barriers to walking and bicycling, ideas on projects or programs that would encourage bicycling and walking, and overall opinion on Central Maui’s livability. The project team developed and distributed two versions of the survey – one for the general population, and another specially designed to collect responses at elementary and intermediate schools.

General Survey Responses

The general survey asked members of the general public questions about their travel behavior, bicycling and walking activity levels, obstacles to bicycling and walking, and factors that would encourage walking and bicycling. The project team collected responses from October 2010 to February 2011. The project team provided the link to an online version of the survey and distributed paper copies at public workshops. The survey received 122 responses.

Figure 1 shows the general modal distribution for short trips. The results indicate the opportunity to increase bicycle use for short-distance trips. Traveling at a moderate 10 mph a bicyclist can cover a distance of 3 miles in about 20 minutes, and can be become a competitive substitute for driving for short trips.

Walking

The survey asked respondents to list all purposes for which they choose walking as a mode of transportation. The highest response was for “exercise / health” (over 70%) followed by “for pleasure” (over 50%), indicating that a majority of respondents are walking for recreational purposes. The third highest response was for “shopping/errands.” Notably, the top three responses are for discretionary activities, whereas fewer than ten respondents used walking as a means for making compulsory trips, e.g. for work and school. These responses indicate obstacles in Central Maui’s built environment for realizing the Plan’s goal to make walking an everyday, normal activity.
Respondents identified factors that prevented them from walking more often. The top obstacles identified were the following:

1. Lack of sidewalks:
2. Lack of time,
3. Distance from destinations,
4. Concerns about safety, and
5. Poor sidewalk conditions.

Two of these top five barriers deal with walking infrastructure – sidewalk availability and sidewalk maintenance. The lack of time and distance between destinations relates to the physical layout of the community, e.g. land use density and the local housing/shopping/jobs mix. Personal safety could relate to a mix of infrastructure (e.g. poor lighting or no call boxes), community outreach (e.g. community policing and community activities), or both.

Cycling

The survey asked respondents to indicate how often they rode a bicycle in the past month. The survey data shows that about 75% of respondents rode their bicycle at least once in the past month. About 1% ride daily. Similar to walking, most bicycling trips were for discretionary purposes (exercise/health and pleasure), rather than utilitarian (work, groceries).

Survey respondents’ most common reasons for not bicycling more often were poor roadway safety, a lack of bikeways, poor road conditions, fast moving traffic, and a lack of time. Respondents’ concerns about safety and automobile speed reflect both the design of collector and arterial roadways, and the prevalence of highway facilities within the Central Maui area. State highways form the backbone for travel between Kahului, Wailuku, Waikapu, and Waihee-Waiehu. Because there are few alternatives to the highways for inter-community travel, this Plan specifically examines the potential for providing off-street bicycle paths that separate users from automobile traffic.

The survey asked respondents to identify areas needing improvements to the bicycle or pedestrian infrastructure. The following locations received the highest number of responses:

1. Ka‘ahumanu Avenue serves as a major corridor in Central Maui. The road provides access to the Maui airport, a commercial shopping corridor, Maui Community College, and the War Memorial Sports Complex. Ka‘ahumanu Avenue currently provides bike lanes and sidewalks on both sides from Hana Highway and Wailuku.

2. Hana Highway within Central Maui runs between the airport and light industrial uses. The roadway provides a striped shoulder, but lacks sidewalks. The corridor experiences high amounts of automobile traffic due to its proximity to the airport.

3. Dairy Road provides access to commercial uses, but lacks adequate width for bike lanes and
only intermittent sidewalks on the west side of the road. Dairy Road has large blocks and does not provide controlled mid-block crossings. The distance between traffic signals and crosswalks along Dairy Road range from 400 feet to more than a thousand feet.

4. The Wailuku Core, formed by Main Street, Central Avenue, and Vineyard Street, is a downtown corridor that services low-speed local traffic. Parts of the streetscape were constructed prior to current roadway standards, which occasionally results in intermittent sidewalks, on-street parking, and driveways. The inconsistent streetscape provides few visual cues for pedestrians and cyclists’ proper placement, resulting in many people walking or biking in the street.

5. Waiale Road runs along the eastern edge of Wailuku. The roadway services local traffic, has some wide paved shoulders but few sidewalks. Lower Main / Waiale Rd. provides uninterrupted connectivity to Waikapu to the south and is the main direct route to Kahului Beach Road to the north.

School Survey
A separate survey targeted students at HP Baldwin High School, Iao Intermediate School, and Maui Waena Intermediate School. The student survey focused on travel behavior to school, deterrents to walking and bicycling, student perceptions about community safety and livability, and areas needing improvement. The project team gathered 164 responses: 16 from HP Baldwin High School, 89 from Iao Intermediate, and 59 from Maui Waena Intermediate School. Slightly more females (54%) responded to the survey than males (46%). Most respondents were below the age of 13 (60%) and the remainder were between 13 and 16 years old.

The survey started by asking students how they travel to school (Figure 2). The students’ responses were consistent with the reported mode share from the general survey (Figure 1), although many more students reported walking to school (14% vs. 3%).

Most students do not regularly commute to school by bike, but 20% of respondents (33 students) reported doing so at least once. Among these students, more than a quarter reported that bicycling to school took them less than five minutes. 90% of students that had bicycled to school at least once took less than twenty minutes to get their destination. Although very few students reported commuting to school by bike, nearly two-thirds reported riding mostly for health and recreational purposes.

When asked why they do not bicycle more often, students’ most commonly cited reason was the lack of time. It is unclear whether the students thought the question related to only school trips or trips in general, since the lack of time should not be a strong reason against exercise and recreational trips. Other commonly cited
reasons against bicycling included being far away from destinations and safety concerns, especially from parents (“Not allowed to”).

Bicycle safety and infrastructure improvements can alleviate safety concerns. However, the students’ response that there is not enough time to bicycle could indicate a bias toward driving as being the fastest, most efficient mode of travel. Community outreach and encouragement efforts, such as “Bike to School” days, could show that bicycling is a competitive and enjoyable way to travel for short and medium-length trips.

Even though only 14% of students regularly commute to school on foot, around 30% reported having walked to school at least once. Nearly half of the students that had walked to school before were able to reach their destination in less than ten minutes. The most commonly reported reasons for not walking more often were distance to destinations and the related lack of time. These reasons mirror the students’ reported reasons for not bicycling more often. Safety concerns and parental permission were in the second tier of reasons against walking. As with bicycling, infrastructure improvements like Safe Routes to School can alleviate safety concerns. Programs that encourage walking can work toward changing the perception that destinations are too far away or that it takes too long to walk. Streetscape improvements can also make walking a more enjoyable and therefore less tedious experience.

Nearly three-fourths of students feel their community is safe for walking and cycling. Eighty-five percent feel that additional infrastructure would improve community livability. Yet safety concerns were consistently in the second tier of reasons for why students choose not to walk or bicycle more often. Therefore, while the students may feel that their neighborhood is safe, their other responses indicate a need for infrastructure improvements and education to reinforce the notion that walking and bicycling is a feasible mode of transport.

### 2.4 Collision Analysis

This section summarizes cyclist- and pedestrian-involved collisions within the Central Maui area from 2007 to 2010 from data collected by the State of Hawai‘i Department of Health. Figure 2-22 presents the collision locations, differentiating between the bicyclist and pedestrian collisions. Figure 2-23 presents the bicyclist and pedestrian-involved collisions separated by severity rather than mode.

The Central Maui area had 28 cyclist-involved collisions during that period, an average of approximately 8 collisions per year. There was a significant drop from high-incident years in 2007 and 2008 to relatively few collisions in 2009 and 2010. Central Maui during the same period had 45 pedestrian-involved collisions, an average of 11 per year. Similar to the biking data, collisions dropped markedly from a high in 2007 to one-third the number of incidents in 2009.

As shown in Table 2-1, bicyclists comprised approximately 40% of the collisions recorded over the past 3.5 years. Six of the collisions involved children aged 5 to 12 and one involved

<table>
<thead>
<tr>
<th>Year</th>
<th>Minor Cyclist</th>
<th>Serious/ Fatality</th>
<th>Total Cyclist</th>
<th>Minor Pedestrian</th>
<th>Serious Pedestrian</th>
<th>Total Pedestrian</th>
<th>Total Collisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>6</td>
<td>4</td>
<td>10</td>
<td>10</td>
<td>9</td>
<td>19</td>
<td>29</td>
</tr>
<tr>
<td>2008</td>
<td>11</td>
<td>2 (1 fatality)</td>
<td>13</td>
<td>4</td>
<td>3</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>2009</td>
<td>2</td>
<td>0</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>8</td>
<td>10</td>
</tr>
<tr>
<td>2010</td>
<td>1</td>
<td>0</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>11</td>
<td>13</td>
</tr>
<tr>
<td>Four-Year Total</td>
<td>20</td>
<td>8</td>
<td>28</td>
<td>22</td>
<td>23</td>
<td>45</td>
<td>73</td>
</tr>
</tbody>
</table>

Source: State of Hawai‘i Department of Health
PART TWO - WALKING & BICYCLING IN CENTRAL MAUI TODAY

Figure 2-22 Cyclist- and Pedestrian-Involved Collisions (Mode)

LEGEND
- Cyclist-Involved Collision
  - 1
  - 2
  - 3
- Pedestrian-Involved Collision
  - 1
  - 2
  - 3

CYCLIST- AND PEDESTRIAN-INVOLVED COLLISIONS 2007-2010

Healthy Hawai‘i Initiative
Central Maui Nonmotorized Access Plan
Date: MARCH 2018

Hawai‘i State Department of Health - Healthy Hawai‘i Initiative
Central Maui Pedestrian & Bicycle Master Plan for 2030

20
Figure 2-23 Cyclist- and Pedestrian-Involved Collisions (Severity)
a teenager. Twenty-two collisions involved adults aged 18 to 64. More than a third of cyclist-involved collisions resulted in a serious injury, all involving adults.

Pedestrians comprised 60% of the recorded collisions. Eight collisions involved children, 5 involved teenagers (ages 13-17), 23 involved adults, and 9 involved seniors (65+). Half of all pedestrian-involved collisions (23) resulted in a serious injury, including 3 children (13%), 3 teenagers (13%), 14 adults (61%), and 3 seniors (13%).

The rate at which non-motorized collisions occurred in Central Maui communities generally followed each community’s relative geographical size. Kahului is the largest community and had 46 collisions over the past 4-year period. Wailuku had 21 collisions, Waiheea-Waiehu had 5 collisions, and Waikapu had 1 collision.

The collisions tended to concentrate at several locations in Kahului and Wailuku. This section summarizes the collision attributes at these problematic locations, examines factors that may increase the likelihood for a collision, and suggests areas for further study.

Figure 2-24 presents the problem areas by location marker (X).

2.4.1 Kahului

Most of Kahului’s cyclist- and pedestrian-involved collisions occurred on its north and east side, near its commercial corridors. Kahului’s residential areas had fewer collisions, which typically occurred along major roadways and intersections.

Papa Avenue at Kamehameha Avenue (A) had 3 minor collisions involving one cyclist and 2 pedestrians. One of the pedestrians was a child; the other two victims were adults. The signalized intersection has a four-lane cross-section at each approach. The corners have large curb radii, which allows for high-speed right turns. There are painted guides on the pavement that attempt to reduce the curb radii. Pedestrian facilities at this intersection consist of zebra-stripe crosswalks, perpendicular curb ramps and truncated domes.

Kahului Beach Road / Lower Main St (B) had four cyclist-involved collisions. These facilities are high-speed, four-lane roadways. Kahului Beach Road provides wide shoulders suitable for cycling as a highway. Lower Main Street provides four vehicular travel lanes, but lacks shoulders and a median. Kahului Beach Road provides access to Maui’s north shoreline, while Lower Main Street provides access into Wailuku.

A 1.3 mile stretch of Wakea Avenue, between Kaahumanu Avenue and Hoohana Street (C), experienced 6 pedestrian collisions and 1 cyclist collision. Wakea Avenue has continuous bike lanes but intermittent sidewalks. Its signalized intersections generally have a three to four lane cross-section and zebra-stripe crosswalks, although three collisions occurred at or near the two-lane unsignalized Wakea Avenue / Niihau Street intersection.

The one-mile stretch of Dairy Road from Pu’unene Avenue to Hana Highway (D) had two major and four minor collisions involving two cyclists and four pedestrians. At the Maui Marketplace shopping center, there were 3 minor and 1 major collision within a 1000-foot stretch of Dairy Road. Of the four collisions, the 3 collisions involving adults (1 cyclist and 2 pedestrians) also involved alcohol use. This stretch of Dairy Road has four travel lanes and a center left-turn lane. There are commercial uses on both sides of the roadway. Dairy Road has intermittent traffic signals and crosswalks at its intersections with commercial driveways.

Kahului Airport (E) had 3 pedestrian and 1 cyclist-involved collision occur over the past 3.5 years. All 4 victims were adults; 1 victim was a senior. The Airport has a one-way road that circulates automobile and shuttle traffic through the terminal. The six lane road has a landscaped median that separates vehicular flow and serves as a refuge for crossing pedestrians. Hedges and gates prevent pedestrians from crossing the road apart from the zebra-stripe crosswalks.

Alahao Street at Kanaha Beach Park (F) had two major collisions. Alahao Street is a two-lane roadway with wide shoulders and speed
Figure 2-24 Cyclist- and Pedestrian-Collision Problem Areas
PART TWO - WALKING & BICYCLING IN CENTRAL MAUI TODAY

humps. The posted speed limit is 20 mph. Kanaha Beach Park provides coastal access immediately outside Kahului.

2.4.2 Wailuku
Wailuku’s pedestrian-involved collisions occurred predominantly in its community core. Central Wailuku had a high concentration of cyclist- and pedestrian-involved collisions, with 10 collisions (4 major and 6 minor severity) occurring within a 1/2 mile radius of the Main Street / Market Street intersection.

The intersection of Main Street / High Street (G) had 2 collisions of minor severity involving pedestrians. This signalized location has particularly wide curb radii, especially at the southwest and northeast corners.

The intersection of Vineyard Street / Market Street (H) had 5 collisions occurring within a 500-foot radius, including two major-injury collisions. There were 2 collisions that involved cyclists and 3 collisions involving pedestrians. The area has abundant pedestrian amenities, including bulb-outs, textured concrete crosswalks, curb ramps with truncated domes, and landscaping.

The intersection of Main Street / Waiale Road (I) had 2 major collisions involving pedestrians. This section of Waiale Road has a narrow pass beneath a bridge, which sits adjacent to the skewed intersection. The angle at which the streets intersect diminishes the ability for northbound and eastbound drivers to see northbound pedestrians crossing the intersection. The southwest corner also has a large curb radius and painted right-turn channel, which may encourage right-turning drivers to travel at high speed.

Maui Memorial Hospital on Mahalani Street (J) had 3 major and 1 minor collision. There were 3 collisions involving pedestrians and 1 involving a cyclist. This roadway segment is a long downhill. Mahalani Street at its intersection with the Hospital driveway has a bus stop and allows on-street parking on the east side of the street. The roadway provides a zebra-stripe crosswalk for pedestrian traffic from bus riders and parked motorists.

Kanaloa Road next to the War Memorial Sports Complex (K) had 2 major-injury collisions involving 1 cyclist and one pedestrian. The four lane road provides bike lanes and several zebra-stripe cross-walks. The area has the War Memorial Stadium and Sports Complex on the west side of the road, and a Boys and Girls Club and botanical gardens on the east side.

Summary
Overall the data show a positive trend of bicycle and pedestrian collisions in Central Maui decreasing significantly between 2007/2008 (49 total) and 2009/2010 (23 total). While the overall collision numbers are decreasing it is still useful to consider areas where collisions have occurred to consider potential infrastructure deficiencies and improvements that could improve safety. The types of locations with concentrations of collisions in Central Maui did not show a consistent pattern, but were a range of different roadway and land use types. Furthermore, even identified “concentrated” locations of bicyclist and pedestrian collisions have relatively small numbers of collisions over a several year period (in some cases only 2 or 3 collisions) so it is difficult to draw precise conclusions on causal relationships.

Infrastructure deficiencies noted at collision locations included wide curb radii at intersections which facilitate fast turning radii, lack of sidewalks which may force pedestrians to walk in the roadway, limited vehicle sight distance to crossing locations, and lack of separated facilities in areas with high concentrations of recreational cyclists and walkers. Design recommendations noted later in this plan are intended to enhance...
the pedestrian and bicycle environment and improve safety at these and other locations, thereby reducing the potential for future non-motorized collisions.
PART THREE - DESIGNING the WALKABLE & BIKEABLE COMMUNITY

CENTRAL MAUI PEDESTRIAN & BICYCLE MASTER PLAN FOR 2030
A world class pedestrian and bicyclist community
III. Designing the Walkable and Bikeable Community

3.1 Introduction
Poor urban planning and design decisions have left many American cities dependent on motorized transportation. The large-scale adoption of the automobile as the preferred mode of transportation in the 1920’s and 30’s led to dramatic changes in how communities were designed. Prior to the automobile, communities were designed for horse & buggy and pedestrians, which required more compact and mixed-use settlement patterns. During this era, travel lanes were narrower and there was little demand for parking.

With the large-scale introduction of the automobile into American life, walking to and from work and to obtain daily needs was largely abandoned in favor of motorized transportation. Beginning in the 1920’s, urban planners, believing that mixing land uses would lead to poorer living environments, segregated and pushed land uses further apart. Over the ensuing decades, a spectacular increase in the capacity of roadways and the necessity to designate large tracts of land to surface parking transformed once walkable communities into urban sprawl. Today, it is common for fifty percent of commercial zoned properties to be dedicated to parking. For these reasons – greater commuting distances, the potential for vehicular-pedestrian conflict, and unsightly urban design - many communities are no longer safe or particularly desirable for biking and walking.

Ten Planning & Design Principles
Creating more pedestrian and bicycle friendly communities will require both retrofitting existing auto-dependent settlement patterns and changing how new communities are built. Key planning and design principles include:

1. Promote more self-contained compact mixed-use development that allows for employment, commercial, civic and residential uses within a 5-minute walk, i.e. the “Neighborhood Unit” concept.

2. Provide pedestrian and vehicular connectivity between neighborhoods and between neighborhoods and commercial districts by encouraging through streets.

3. Incorporate traffic calming, i.e. curvilinear streets, bulb-outs, speed tables, etc., into roadway design.

4. Incorporate sidewalks along both sides of all neighborhood, collector and arterial streets.

5. Provide safe pedestrian crossings at multiple locations along all collector and arterial intersections.

6. Where feasible, incorporate separated bike lanes along all collector and arterial streets. Joint use paths may be developed in lieu of sidewalks and bike lanes.

7. Where separated bike lanes are not possible, incorporate striped bike lanes onto collector and arterial roads.

8. Incorporate transit infrastructure into roadway design.

9. Incorporate canopy shade trees along all neighborhood, arterial and collector streets.

10. Incorporate bicycle parking at key destinations and within activity nodes.
3.2 Central Maui Pedestrian & Bicycle Master Plan For 2030

Vision 2030 Urban Corridor Maps
The illustrative Vision 2030 Urban Corridor Pedestrian and Bicycle Maps describe a future where the quality of walking and biking infrastructure in Central Maui is world class. As a result, Central Maui residents walk and bike significantly more than they do today. In 2030 the dominant mode of travel for children living within one mile of school will be walking or biking. Walking or biking to and from work and between home and restaurants, shops, parks, and civic uses will be the preferred mode of transportation for short trips. The most popular form of passive recreation for adults will be walking and biking and children will routinely commute between their homes and their friends not by their parents’ automobiles – but by bicycles.

How will Central Maui residents reclaim the ability to walk and bike with greater safety, convenience and enjoyment?

The Vision 2030 Maps identify existing pedestrian and bicycle infrastructure, proposed pedestrian districts, bicycle districts, and pedestrian and bicycle routes that together form a robust non-motorized transportation network.

Pedestrian Districts
Pedestrian Districts comprise those areas where a high concentration of activity generating land uses is within close proximity to each other. These areas are characterized by a mix of land uses with sufficient density to generate a high volume of pedestrian trips. Significant investment into pedestrian infrastructure to improve safety, comfort and aesthetics is warranted in these areas.

Bicycle Districts
Bicycle Districts are those areas where significant concentrations of residents live within a 5 to 10 minute ride of major destinations, including schools, employment and commercial centers. Within Bicycle Districts, lower density settlement patterns may make walking impractical for daily needs, but gentle topography and moderate distances makes bicycle travel an attractive alternative to motorized travel. Within these Districts, sufficient right-of-way may exist along collector and arterial roadways to separate bicycle traffic from vehicular traffic, greatly increasing the use of bicycles.

Routes
Pedestrian and Bicycle Routes link the major destinations together and form the greater part of the non-motorized network.
PART THREE - DESIGNING THE WALKABLE & BIKEABLE COMMUNITY

VISION 2030 URBAN CORRIDOR MAPS
INDEX MAP FOR THE INFRASTRUCTURE & VISION MAPS

WAILUKU

WAIKAPU

KAHULUI

PUUNENE

MAP 1

MAP 2

MAP 3

MAP 4

PRIORITY ROUTES
1. Waiale Rd
2. Kaahumanu Ave
3. Papa Ave
4. Kamehameha Ave
5. Onehee Ave
6. Dairy Rd
7. Lono Ave
8. Kahului Beach Rd
9. Kea Street
10. Wakea Avenue

As determined by community & steering committee meetings & input. See Part 1.4 of this report.

Hawai`i State Department of Health - Healthy Hawai`i Initiative
Central Maui Pedestrian & Bicycle Master Plan for 2030
VISION 2030
Pedestrian & Bicycle Master Plan

LEGEND
- HIGH PRIORITY NON-MOTORIZED ROUTE
- NON-MOTORIZED ROUTE
- PEDESTRIAN DISTRICT

A world class pedestrian and bicyclist community
PART THREE - DESIGNING THE WALKABLE & BIKEABLE COMMUNITY

VISION 2030
Pedestrian & Bicycle Master Plan

Hawai‘i State Department of Health - Healthy Hawai‘i Initiative
Central Maui Pedestrian & Bicycle Master Plan for 2030
VISION 2030
Pedestrian & Bicycle Master Plan

MAP 3

Legend
- High Priority Non-Motorized Route
- Non-Motorized Route
- Pedestrian District

Central Maui Pedestrian & Bicycle Master Plan for 2030
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PART THREE - DESIGNING THE WALKABLE & BIKEABLE COMMUNITY

VISION 2030
Pedestrian & Bicycle Master Plan

MAP 4

Hawai‘i State Department of Health - Healthy Hawai‘i Initiative
Central Maui Pedestrian & Bicycle Master Plan for 2030
PART THREE - DESIGNING THE WALKABLE & BIKEABLE COMMUNITY

VISION 2030
Pedestrian & Bicycle Master Plan

CENTRAL MAUI PEDESTRIAN & BICYCLE MASTER PLAN FOR 2030
A world class pedestrian and bicyclist community
3.3 USING THIS SECTION
An Explanation of How to Use this Section of the Report

Each area of study has 2 pages of information. Page 1 presents the existing conditions of the area and page 2 shows options for improvement. Each improvement is numbered for reference, with a brief description.

Improvements
Areas for improvement are suggested in order to increase non-motorized access within the study area. When applicable, Design Guidelines are referenced from that section of the report.

Existing Conditions Map
The base map shows existing non-motorized access infrastructure. A legend is present on most maps, space permitting. Parcel colors represent standard community plan designations.

Summary
This area summarizes the study area and includes a description of the existing conditions and how they relate to access issues and future improvements. The physical dimensions of route rights-of-way are described, if applicable.

Infrastructure Overview
This area presents the physical inventory of the study area. Infrastructure was measured and counted and includes: sidewalks, pedestrian crossings, crossing-controlled intersections, bicycle paths, lanes, routes & bus stops.

Aerial Overview
A Google Earth aerial overview shows the area of interest with site photograph references.
3.4 Wailuku

Vision
By 2030 Wailuku will be a pedestrian and bicycle friendly community. Because of its unique historic buildings, charm and livability, Wailuku Town is a popular place for residents of all ages to live.

Within the Town’s civic and commercial districts – along High, Main, Vineyard, Church, Kaohu and Wells Streets – walking is the preferred mode of transportation for short trips. Residents who live and work in Wailuku walk between home and work because the town offers a safe and pleasant pedestrian experience. Safe pedestrian and bicycle routes also link Wailuku Town’s residential neighborhoods with Baldwin High School, Iao Intermediate School, and Wailuku Elementary School.

The residential communities of Maui Lani and Kehalani are connected to Wailuku by safe pedestrian and bicycle routes and a separated bike path connects the growing community of Waikapu with Maui Lani and Wailuku Town. Wailuku’s newer residential communities were developed pursuant to “Complete Street” standards and walking and biking is popular in these communities.

Study Area Summary
Wailuku Town should be promoted as a pedestrian-friendly, walkable business center that interconnects stores, businesses, the civic core, schools and neighborhoods. The core area is formed by Main Street, Central Avenue, and Vineyard Street and is a downtown corridor that services low-speed local traffic. Parts of the streetscape were constructed prior to current roadway standards, which occasionally results in intermittent sidewalks, on-street parking, and driveways. The inconsistent streetscape provides few visual cues for pedestrians and cyclists’ proper placement, resulting in many people walking or biking in the street.

Some Existing Market Street Amenities

**TRASH RECEPTACLE**

**COLORED & SCORED CONCRETE CROSSWALK**

**BENCH**

**PEDESTRIAN LIGHT STANDARD**

**CAST IRON TREE GRATE**
Several key areas were highlighted as part of the study. Key connections included those between Iao School and Wailuku (4,12), pedestrian access along Vineyard Street (2), pedestrian & bike access along Wai'ale Drive (13), the Wailuku Bridge crossing (10,11) and Kaohu St. One area in particular, the pedestrian connection from Kaahumanu Avenue to Lower Main Street (9) requires a creative solution to allow students to walk and cycle safely to Baldwin High School. Stairs with a bicycle ramp is one option (Design Guidelines 4.3.4.5). Continuation of the sidewalk from the bridge, over Naniloa Drive, and back to Kaahumanu Ave is also an option.
WAIALE ROAD

3.5 WAIAKU - WAIALE ROAD CONNECTOR

Study Area Summary

Waiale Drive will be an important link, connecting future growth in Waikapu to Kahului and Wailuku. There is currently a two lane road from Waiko Road to Lower Main Street, with an approximate road right-of-way of 60 to 70-feet. Much of this road has a bike lane designation with striping, signs and painted bicycle symbols. However, it is not continuous, with a segment missing near the Maui Community Correctional Center.

There are sidewalks that were built in conjunction with the developments on the west side of Waiale Drive. It is assumed that sidewalks will continue to be built along this side of the street, towards Waikapu, as more development occurs on currently vacant parcels.

Towards Lower Main Street, near the residential Sandhills neighborhood, the pavement becomes narrow with no sidewalks. This area serves to connect pedestrian and cyclists to Wailuku and as such is in need of some type of safe route. A vacant 30-ft. parcel parallels Waiale Drive in this area and could accommodate a wide multi-use path for pedestrian and bike traffic. An informal survey at Iao Intermediate School revealed safety concerns for children from the Sandhills neighborhood walking Kaohu Road to the school.

AREA PROFILE

Existing Infrastructure

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Pedestrian Infrastructure

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Bicycle Infrastructure

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CENTRAL MAUI PEDESTRIAN & BICYCLE MASTER PLAN FOR 2030
A world class pedestrian and bicyclist community
3.5 Waikapu - Waiale Road Connector

Vision
By 2030 Waikapu will be a pedestrian and bicycle friendly community. Because of its close proximity to employment and services, Waikapu has evolved into a distinct and vibrant country town with a mix of housing opportunities and supporting schools, parks, and commercial and civic uses. Waikapu’s newer residential and commercial districts were designed pursuant to “Complete Street” standards making non-motorized commuting the preferred mode for short daily trips. Waikapu is also connected to its larger neighbors – Wailuku and Kahului – by the Waiale Road Bikeway, which provides a safe and convenient commute between these communities.

Bike Path Separated from Traffic Flow
There is an opportunity to construct a contiguous bike path, possibly wide enough to accommodate foot traffic, along Waiale Road, within the 70-ft. right-of-way. The separated bike path or ‘Cycle Track’ would occur between Waiko Road and Kuikahi Drive. See Design Guideline Figure 4-3 ‘Cycle Track’ options. (WWC.2)

Bike Lanes On-street
Right-of-way space may be available to continue the separated path to Waiinu Road, but this area has more obstacles. At a minimum it should be marked with Bike Lanes and have signage. (WWC.3)

Bike & Pedestrian Shared-Use Path
There is a 30-feet wide parcel of land adjacent to Waiale Road, on the east-side of the street, from Waiinu Road to Lower Main Street. This land is currently unused and could accommodate a wide multi-use path. Such a path would be wide enough for 2-way bike and pedestrian traffic and would be vital to connecting Wailuku to the Residential area of Sandhills. See Design Guideline 4-2 ‘Bicycle Path’. (WWC.4)
3.6 Kahului

Vision
By 2030 Kahului will be a pedestrian and bicycle friendly community. The commercial, retail and entertainment core of the community is known as the “Kahului Town Center”. The Kahului Town Center comprises the blocks between the Queen Kaahumanu Shopping Center to the west and the Maui Mall to the east. This is an area with an eclectic mix of residential, commercial and entertainment uses where short pedestrian commutes is the preferred mode of transportation. The Kahului Town Center is a major destination that attracts non-motorized traffic from the University of Hawaii-Maui College, and neighboring residential neighborhoods.

Because Kahului’s residential neighborhoods are generally too far from commercial and institutional uses to make walking practical for many residents, great emphasis has been placed on developing a network of separated bike paths that link these areas together. The resulting infrastructure investment has produced a truly world class bicyclists community where even modest riders can safely commute to and from work, school, shopping, and to obtain other daily needs. Because of the community’s gentle topography, pleasant climate, and safe riding conditions it is common for families to enjoy riding their bicycles together.
Pedestrian Mall
Provide pedestrian amenities in this area. Included facilities: decorative surfaces, street furniture, street trees, trash receptacles, bicycle parking, pedestrian lighting, traffic calming, raised crosswalks, pedestrian crossings. (KPD.1)

See Design Guidelines 7.5 & 5.2.1
KAHULUI BICYCLE DISTRICT
EXISTING CONDITIONS & FUTURE IMPROVEMENTS
3.7 KAHAUMANU AVENUE

Existing Conditions

Kaahumanu Avenue is the main arterial road that connects Kahului to Wailuku. The road right-of-way is up to 200-feet wide in some places. It includes 4 lanes of traffic with a 25-feet grass median between traffic flows. There are 5-ft. wide bike lanes on either side of the roadways. Adjacent to the curb are 6-feet sidewalks on both sides.

Kaahumanu is a key arterial road that connects many activity generators. Some of these include: Maui Mall, Kahului Shopping Center, 2 hotels, a Park & Canoe Hale, Queen Kaahumanu Shopping Center, University of Hawaii-Maui College, Keoupalani Park, War Memorial Stadium, Baldwin High School and a Kaiser medical clinic. Together, these facilities make the Kaahumanu Avenue corridor a core area of activity.

The existing pedestrian and bicycle amenities are adequate with only a few areas for improvement. The sidewalk is continuous from Hana Highway to Market Street, except for 2 missing segments (see plan). Bicycle lanes are important, but the connection into Wailuku is in need of a remedy. Roadway width in this area creates a hazardous pedestrian and cycling condition entering Wailuku.
**PART THREE - DESIGNING THE WALKABLE & BIKEABLE COMMUNITY**

**EXISTING CONDITIONS & FUTURE IMPROVEMENTS**  
**AREA 5 - KAHAUMANU AVENUE**

1. **Stair Connection to Lower Main St.**  
   A connection from the top of the Wailuku Bridge, down to Lower Main Road is of vital importance for creating a connection between Baldwin High School and Wailuku. One possible solution would be a bicycle-friendly staircase (Design Guideline 4.3.4.5 Bicycle Stair Ramp). (KBD.1)

2. **Colored Bike Lanes at Intersections**  
   Colored bike lanes at high volume intersections are an option for increased safety. (Design Guideline 4.3.3.3 Colored Bike Lanes) (KBD.2)

3. **Additional Sidewalk Connection**  
   There is a portion of Kaahumanu Avenue where an additional sidewalk connection would connect Wharf Road to Puunene Avenue (KBD.3)

4. **Additional Sidewalk Connection**  
   There is a portion of Kaahumanu Avenue where an additional sidewalk connection would connect Wahinepio Avenue to the Wailuku Bridge. (KBD.4)

5. **Bike Storage & Parking**  
   Bike Storage and Parking would provide greater access to the transit hub located at Queen Kaahumanu Shopping Center. See Guideline 5.8 Bicycle Parking (KBD.5)

**LEGEND**

*Pedestrian Control Intersections*

*Crosswalk*

*Sidewalks*

*Bicycle Lanes*

*Bus stop*
KAHULUI BICYCLE DISTRICT
EXISTING CONDITIONS & FUTURE IMPROVEMENTS
3.8 PAPA AVENUE

Study Area Summary

Papa Avenue is a main collector road through the center of Kahului, connecting residential areas from Puunene Avenue to Kaahumanu Avenue. There are several activity generators along Papa Avenue; Maui High School, Lihikai Elementary School, a pre-school, four places of worship and an assisted living facility. It has bike routes striped and signed. The bike lanes are 4-feet wide with signage at regular intervals. However, there is one key segment where bike lanes are absent: between Kamehameha Avenue and Laau Street. Crosswalks are present at most roadway crossings, and this is critical due to the residential nature of most of Papa Avenue. The 80-feet right-of-way typically includes two 12-ft. travel lanes with two 4-feet bike lanes. The remaining 24-feet on either side of the lanes consists of 4-foot sidewalks adjacent to the r.o.w. boundaries and grassed/gravel areas used for informal parking. These significant 20-foot grassed areas are wide enough to allow 5-feet bike lanes. Long-term, these lanes can be located next to the sidewalks, with grass planter strips separating them from on-street parking and the travel lanes. This configuration would create a very safe alternative design and encourage more bicycling. See Design Guideline Fig. 4-3 Cycle Tracks.

AREA PROFILE

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Bicycle Infrastructure

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CENTRAL MAUI PEDESTRIAN & BICYCLE MASTER PLAN FOR 2030
A world class pedestrian and bicyclist community
PART THREE - DESIGNING THE WALKABLE & BIKEABLE COMMUNITY

Sidewalk Connections
There are two locations near Kaahumanu Avenue where sidewalk connections would assist a nearby pre-school, church and senior assisted living facility. (PAPA.1)

LONG-TERM
Separated Bike Lanes
The ample 80-ft right-of-way width allows Papa Avenue the opportunity to install separated bike lanes on both sides of the street. Papa Ave could become a major bicycle arterial. See Design Guideline Fig. 4-3 Cycle Tracks (PAPA.5)

Sidewalk Connections
Both Sides of Road
Sidewalk segments should be added between Kamehameha and Onehee Avenues (PAPA.2)

Bike Lanes Complete the Papa Ave. Route
Bike Lanes should be added between Kamehameha Avenue and Laau Street to make the Papa Avenue route complete. (PAPA.3)

Sidewalk Connections
Both Sides of Road
Sidewalks are missing between Hina and Puunene Avenues. A pedestrian crossing at Hina Avenue should also be a consideration. (PAPA.4)
KAHULUI BICYCLE DISTRICT
EXISTING CONDITIONS & FUTURE IMPROVEMENTS
3.9 KAMEHAMEHA AVENUE

Study Area Summary

Kamehameha Avenue is another key roadway connection because it traverses most of Kahului from North to South, connecting a diversity of activity areas, destinations and residential neighborhoods. The right-of-way width varies from 100-ft. to 80-feet. Typically, it consists of 2 lanes of traffic of 24 to 32-feet, with approximately 20-feet grassed areas used as parking on either side of the pavement and 4-ft. sidewalks along the r.o.w. boundaries.

Most of Kamehameha Avenue has bicycle lane markings and signage. There are some missing segments, however. In addition, given the amount r.o.w. width, it may be possible to install bike lanes that are separated from travel lanes, called ‘Cycle Tracks’. These lanes promote bicycling for a wide demographic and range of abilities because they are perceived as being much safer than on-street bike lanes. See Design Guideline Figure 4-3.

As with most roads in Kahului, there is ample room to provide wider bike lanes and to also add buffering options such as 2-3-feet painted striping between vehicle travel lanes and the bike lanes.

AREA PROFILE

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Pedestrian Infrastructure

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Bicycle Infrastructure

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<td>Width</td>
<td>4 ft</td>
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</table>
**LEGEND**

- Pedestrian Control Intersections
- Crosswalk
- Sidewalks
- Bicycle Lanes
- Bus stop

**1. On-street Bike Lanes**
Connects to Elementary School and Neighborhoods in the Maui Lani development. (KAM.1)

**2. Separated Bike Lanes Both Sides (Cycle Tracks)**
Separated bike lanes (cycle tracks) are a possibility, given the amount of unused road right-of-way. Such lanes are protected from travel lanes with planter strips and/or parallel parking. See Design Guideline Fig. 4-3. (KAM.2)

**3. Additional Sidewalk Connections**
There are 3 areas that lack sidewalks, interrupting pedestrian access. Added sidewalks would ensure pedestrian access for the entire length of Kamehameha Avenue (red dashed lines). (KAM.3)

**4. 2-way Shared Use Path or 2-way Cycle Track**
A separated 2-way shared-use path or 2-way cycle track may be possible along the south side of the roadway, from Maui Lani Parkway to Papa Avenue. See Photo 2 at left. (KAM.4)

**5. Additional Bike Lane**
An additional bike lane segment would complete the bicycle connection from Maui Lani Parkway to Lono Avenue. (KAM.5)
PART THREE - DESIGNING THE WALKABLE & BIKEABLE COMMUNITY

KAHULUI BICYCLE DISTRICT
EXISTING CONDITIONS & FUTURE IMPROVEMENTS

3.10 ONEHEE AVENUE

Study Area Summary

Onehee Avenue is a main collector road that extends from Queen Kaahumanu Shopping Center to Waena Intermediate School. The roadway consists of two travel lanes, grassed or paved areas and sidewalks. The entire length has 4-ft sidewalks on both sides of the street, except adjacent to Kahului Community Park. The 24-ft to 30-ft of travel lanes are usually flanked by approximately 20-ft of grassed or paved right-of-way. The sidewalks are adjacent to right-of-way boundaries.

As with most roads in Kahului, there is ample room to provide wider bike lanes and to also add buffering options such as 2-ft painted striping between vehicle travel lanes and the bike lanes. See Design Guideline Fig. 4-4 Buffered Bicycle Lane.

Given the connection to Waena Intermediate School and presence of students along roadways, Onehee Avenue may also be a candidate for Cycle Tracks next to the sidewalks. These offer a safe cycling route by providing a physical buffer and separation from vehicle traffic flow.

AREA PROFILE

Existing Infrastructure

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Pedestrian Infrastructure

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Bicycle Infrastructure

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<tr>
<td>Width</td>
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</table>
**Pedestrian Crossing**  
Raised pedestrian crossings (Design Guidelines 7.3) at Ola Street would enhance safety and calm traffic. (ONE.2)

**Additional Sidewalk**  
An additional sidewalk would make access safer along the Kahului Park frontage, from Uhu Street to Wakea Avenue. (ONE.3)

**Bike Lanes**  
Designated bike lanes along Onehee Avenue would improve access between Maui Lani residential areas, Waena Intermediate School, Kahului Community Park and Queen Kaahumanu Shopping Center. Buffered lanes, 5-ft. wide are possible because much of Onehee Avenue has existing extended pavement -See Photo 3 at left & Design Guidelines Fig. 4-3. (ONE.1)
Study Area Summary

Dairy Road presents a unique challenge for non-motorized transportation planning. This is due to the combination of high traffic volumes, limited space and lack of pedestrian and bicycle facilities. While pedestrian use along Dairy Road may not be accommodated with pedestrian facilities, it may not be as critical as the lack of bicycle facilities. Dairy Road represents a key bicycle link from Puunene Avenue / Mokulele Highway to Hana Highway and as such should have a minimum level of service for cyclists. The limited roadway width, with 4 lanes of high-volume traffic limits the possibility, such as buffered bike lanes. However, one option is to install signed & shared bike lanes - See Design Guideline 5.6. Shared lane markings in addition to signage are a common treatment in higher traffic locations. Narrow (4-ft) bike lane markings may be possible with a reconfiguration of all lane markings - See Design Guidelines 4.3.4 Retrofitting Existing Streets.

Pedestrian facilities include 3 crossings and sidewalk in front of Aloha Marketplace to McDonald’s. Dairy Road may never be a high priority walking environment without store frontages along Dairy Road as well as reduced volumes and speeds of traffic.
**PART THREE - DESIGNING THE WALKABLE & BIKEABLE COMMUNITY**

**LEGEND**
- Pedestrian Control Intersections
- Crosswalk
- Sidewalks
- Bicycle Lanes
- Bus stop

1. **Bike Lanes**
   Bike lanes along Puunene Avenue would be a vital link to Mokulele Highway. (DRV.1)

2. **Bike Lanes on Both Sides of Highway**
   Bike lanes along Kuihelani Highway would connect to the existing bike lane designations along the highway, from Maui Lani Parkway to Puunene Avenue. See Design Guidelines Fig. 4-2 Arterial / Highway Continuum -‘Wide Shoulder’ (DRV.2)

3. **Bike Parking at Park-n-Ride**
   Bike storage and parking should be available at the Park-N-Ride lot. See Design Guidelines 4.8.2 Long-term Parking. (DRV.3)

4. **Mokulele Connection**
   A bike path connection should be installed on the south side of Mokulele Highway, connecting the Mokulele bike path to the Park’N’Ride lot. (DRV.4)

5. **Bike Lanes**
   Hookele Street has the opportunity to be an alternative connection to Dairy Road, moving bike traffic between Mokulele Highway and Hana Highway. (DRV.5)

6. **Bike Lanes on Both Sides or Signed & Shared Roadway**
   Installed bike lanes, if possible, and signed & shared designation if not. Lane reconfiguration may be necessary to accommodate 4-ft. bike lanes. See Design Guidelines 4.6 Shared Roadway (DRV.6)
KAHULUI BICYCLE DISTRICT
EXISTING CONDITIONS & FUTURE IMPROVEMENTS
3.12 LONO AVENUE

Study Area Summary

Lono Avenue is a key North-South collector street, linking Kaahumanu Avenue to Papa Avenue. Between these two streets, Lono Avenue connects various commercial areas, including Kahului Shopping Center, to residential neighborhoods, Kahului Elementary School, and Maui High School.

Lono Avenue is an 80-feet right-of-way (r.o.w) with two 16-feet lanes. Where bike lanes occur, they are 4-feet wide. There is typically a 40-feet distance from the pavement edge to the r.o.w. boundary. Within these areas are 4-feet sidewalks on one or both sides of the street, adjacent to the r.o.w. boundaries. Parking often occurs within these 40-ft. areas.

Due to the ample 40-feet distance between the edge-of-pavement and the property lines of residential lots, there may be an opportunity to install wide bike lanes adjacent to existing sidewalks. This would create a 32-feet separation between the pavement and the bike lanes. Within this 32-feet, on-street parking could occur.

At a minimum, bike lane striping and signage should be added as shown in the accompanying map.

AREA PROFILE

Existing Infrastructure
Length 1.29 Miles (6,800 ft)
Right-of-Way Width 80 ft
No. of Vehicle Lanes 2
No. of Bus Stops 0

Pedestrian Infrastructure
Sidewalk Length 10,000 ft (2-sides)
Coverage 74 %
Width 4-5 ft
Crosswalks 16
Controlled Crossings 7

Bicycle Infrastructure
Bike Lane Length 3,500 ft.
Coverage 51%
Width 4 ft
PART THREE - DESIGNING THE WALKABLE & BIKEABLE COMMUNITY

Bike Lanes
Bike lane striping and signage should be added to Lono Avenue between Papa Avenue and Hina Avenue. This is an important linkage as it is adjacent to Maui High School. (LONO.1)

Bike Lanes
There is a missing segment of bike lane striping between Kamehameha Avenue and Kaahumanu Avenue. (LONO.2)
KAHULUI BICYCLE DISTRICT
EXISTING CONDITIONS & FUTURE IMPROVEMENTS
3.13 KAHULUI BEACH ROAD-

Study Area Summary

Kahului Beach Road represents a key link in the Kahului bicycle transportation system. This roadway links the Queen Kaahumanu Shopping Center area with the residential condominium development, Harbor Lights, and the residential area of Paukakalo. From a commuter standpoint, links from Harbor Lights and Paukakalo to neighboring industrial and commercial areas should be promoted as an alternative mode of daily commuter transportation. The roadway width is such that wide 7-ft shoulder bikeways could be accommodated.

Kahului Beach Road could also become a key bicycle link between Kahului and Waihee-Waiehu.

AREA PROFILE

Existing Infrastructure

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Pedestrian Infrastructure

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Bicycle Infrastructure

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CENTRAL MAUI PEDESTRIAN & BICYCLE MASTER PLAN FOR 2030
A world class pedestrian and bicyclist community
PART THREE - DESIGNING THE WALKABLE & BIKEABLE COMMUNITY

Bike Lanes on both Sides of Kahului Beach Road
Kahului Beach Road should have wide (5-ft) bike lanes on both sides of the travel lanes. A future crossing may be necessitated if the State Department of Transportation and, Kahului Harbor West Breakwater, were to be developed with pedestrian & bicycle linkages from Keopuolani Park across Kahului Beach Road. In front of Harbor Lights, a cyclist & pedestrian-controlled crossing may be desired for safely crossing four lanes of traffic. Further study would be required for this determination. See DesignGuideline Fig. 4-2 for options. (KBR.1)

KAHULUI BEACH ROAD ESPLANADE on makai side of Kahului Beach Road
Kahului Beach Road offers an outstanding opportunity to create an approximate one-mile long esplanade along the shoreline. A tree lined esplanade would be a popular attraction for walking, bicycling and ocean recreation. Install 2-way separated pedestrian and bicycle shared-use path on Makai/harbor side of roadway with amenities including canopy shade trees, bicycle parking, pedestrian lighting, street furniture and trash receptacles. (KBR.2)
### AREA PROFILE

<table>
<thead>
<tr>
<th>Existing Infrastructure</th>
<th>Pedestrian Infrastructure</th>
<th>Bicycle Infrastructure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length</td>
<td>Length</td>
<td>Length</td>
</tr>
<tr>
<td>0.86 Miles (4,550 ft)</td>
<td>4,550 ft (2-sides)</td>
<td>0 ft.</td>
</tr>
<tr>
<td>Right-of-Way Width</td>
<td>Coverage</td>
<td>Coverage</td>
</tr>
<tr>
<td>60 ft</td>
<td>50 %</td>
<td>0 %</td>
</tr>
<tr>
<td>No. of Vehicle Lanes</td>
<td>Width</td>
<td>Width</td>
</tr>
<tr>
<td>2</td>
<td>4 ft</td>
<td>NA</td>
</tr>
<tr>
<td>No. of Bus Stops</td>
<td>Crosswalks</td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Controlled Crossings</td>
<td>1</td>
</tr>
</tbody>
</table>

Kea Street has an existing continuous 4-feet sidewalk along one side of the street. This street seems to be an obvious route for pedestrians to move from neighboring areas to the hub of Queen Kaahumanu Shopping Center and UH Maui College. This activity should be encouraged by designating it as a preferred pedestrian route as well as a bicycle route (i.e. a Signed & Shared Roadway). A bicycle route is more practical than a bicycle lane designation, due to limited space available and the foreseeable amount of pedestrian & bicycle traffic. Of course, this designation could be upgraded in the future if warranted.
Bike Route Designation
Due to its narrowness and low expected bike volumes, a bicycle lane would not be required. But a Bicycle Route designation (Signed & Shared) is an opportunity for Kea Street to become a designated connection between residential neighborhoods west of Kaahumanu Shopping Center and the shopping center itself. (KEA.1)

See Design Guidelines 4.6 Shared Roadway
KAHULULI BICYCLE DISTRICT
EXISTING CONDITIONS & FUTURE IMPROVEMENTS
3.15 WAKEA AVENUE

Study Area Summary

Wakea Avenue is a main collector road through the core of Kahului, linking residential and commercial uses from Hana Highway to Kaahumanu Avenue. There are several major activity generators within close proximity to Wakea Avenue: Queen Kaahumanu Shopping Center, the Kahului Library, Foodland, Safeway, several churches, single- and multi-family residential, and commercial and industrial uses.

Wakea Avenue has bike routes striped and signed. The bike lanes are 4-feet wide with signage at regular intervals. However, along the corridor bike lane coverage is only 55% and sidewalks coverage is just 63%.

The 80-feet right-of-way typically includes two 12-feet travel lanes with two 4-feet bike lanes. The remaining 24-feet on either side of the lanes consists of intermittent 4-foot sidewalks adjacent to the r.o.w. boundaries and grassed/gravel areas used for informal parking. These significant 20-foot grassed areas are wide enough to allow 5-feet bike lanes. Long-term, these lanes can be located next to the sidewalks, with grass planter strips separating them from on-street parking and the travel lanes. This configuration would create a very safe alternative design and encourage more bicycling. See Design Guideline Fig. 4-3 Cycle Tracks.

AREA PROFILE

**Existing Infrastructure**
- Length: 1.67 Miles (8,830 ft)
- Right-of-Way Width: 80 ft
- No. of Vehicle Lanes: 2
- No. of Bus Stops: 0

**Pedestrian Infrastructure**
- Sidewalk Length: 11,100 ft. (2-sides)
- Coverage: 63%
- Width: 4 ft
- Crosswalks: 16
- Controlled Crossings: 7

**Bicycle Infrastructure**
- Bike Lane Length: 4900 ft.
- Coverage: 55%
- Width: 4 ft.
Part Three - Designing the Walkable & Bikeable Community

Legend:
- Pedestrian Control Intersections
- Crosswalk
- Sidewalks
- Bicycle Lanes
- Bus stop

Long-Term: Separated Bike Lanes
The ample 80-ft right-of-way width allows Wakea Avenue the opportunity to install separated bike lanes on both sides of the street. Papa Ave could become a useful connection for cyclists to access UH Maui College. See Design Guideline Fig. 4-3 Cycle Tracks (WAK.3)

Sidewalks
It may be advisable to add sidewalk connections from Puunene Avenue to Kamehameha Avenue on the North side of Wakea Avenue as this area is residential. (WAK.1)

Bike Lanes
Bike lane striping and signage should be added between Lono Avenue and Hana Highway to complete the bicycle lane connection along Wakea Avenue. (WAK.2)
PART FOUR -
CIP PRIORITIES

CENTRAL MAUI PEDESTRIAN & BICYCLE MASTER PLAN FOR 2030
A world class pedestrian and bicyclist community
**IV. CIP Priorities**

The Pedestrian & Bicycle Master Plan for 2030 is a “roadmap” for Central Maui to become a truly world class pedestrian and bicyclist community.

It is envisioned that the projects recommended in this Plan will be implemented over the next twenty years. The prioritization of the CIP projects is meant to be flexible, and to respond to changing conditions, opportunities and priorities.

The Plan’s Steering Committee evaluated and identified the highest priority projects that would most improve bicycling and walking conditions in Central Maui. All of the projects presented in this Chapter will greatly enhance the region’s quality of life by making Central Maui a more sustainable, healthy and livable community.

### 4.1 Priority Projects

#### 4.1.1 Comprehensive Signage & Striping Program

The quickest and most cost effective Project to improve bicycling conditions in Central Maui is to ensure that the area’s roadways are properly striped and signed for biking. Initiating a comprehensive signage and striping program can be done at modest cost and with few barriers to implementation. Effective signage and striping will increase ridership, improve safety, and promote community awareness.

### Improvement Schedule / Table

The *Comprehensive Signage & Striping Program* includes striping and signage placement throughout the planning area. These improvements should be incorporated into the next available State and County CIP budgets.

<table>
<thead>
<tr>
<th>ID</th>
<th>Roadway(s)</th>
<th>Jurisdiction</th>
<th>Improvement</th>
<th>Design Guide Reference</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wpd.1</td>
<td>Market Street</td>
<td>County</td>
<td>Install Bike Route Signs</td>
<td></td>
<td>$2,340</td>
</tr>
<tr>
<td>Wpd.5b</td>
<td>Kaohu Street</td>
<td>County</td>
<td>Install Bike Route Signs (Signed and Shared)</td>
<td></td>
<td>$1,170</td>
</tr>
<tr>
<td>Wpd.6</td>
<td>High Street</td>
<td>County</td>
<td>Install Bike Route Signs</td>
<td></td>
<td>$520</td>
</tr>
<tr>
<td>Wpd.7</td>
<td>Kaniela Rd.</td>
<td>County</td>
<td>Install a Bike Route Designation</td>
<td></td>
<td>$780</td>
</tr>
<tr>
<td>Wpd.11</td>
<td>Main Street</td>
<td>State</td>
<td>Install Bike Route on sidewalk with “cyclist dismount” signage</td>
<td></td>
<td>$520</td>
</tr>
<tr>
<td>Kbd.5</td>
<td>Kaahumanu</td>
<td>State</td>
<td>Install bicycle storage/parking in the vicinity of the transit hub at Queen Kaahumanu Shopping Center</td>
<td>5.8</td>
<td>$10,140</td>
</tr>
<tr>
<td>Papa.3</td>
<td>Papa Ave.</td>
<td>County</td>
<td>Install bike lanes between Kamehameha Ave. and Laau Street to make the Papa Ave. route complete.</td>
<td>4-3</td>
<td>$41,210</td>
</tr>
<tr>
<td>Kam.1</td>
<td>Kamehameha</td>
<td>County</td>
<td>Install on-street bike lanes to connect elementary schools and neighborhoods with Maui Lani.</td>
<td></td>
<td>$13,130</td>
</tr>
<tr>
<td>Kam.5</td>
<td>Kamehameha</td>
<td>County</td>
<td>Install a bike lane segment to complete the connection from Maui Lani Parkway to Lono Ave.</td>
<td></td>
<td>$43,030</td>
</tr>
<tr>
<td>One.1</td>
<td>Onehee Ave.</td>
<td>County</td>
<td>Install designated 5-feet wide bike lanes along the Ohehee Avenue.</td>
<td>4.3</td>
<td>$41,210</td>
</tr>
<tr>
<td>Drv.1</td>
<td>Puunene Ave.</td>
<td>State</td>
<td>Install bike lanes along Puunene Ave.</td>
<td></td>
<td>$34,840</td>
</tr>
<tr>
<td>Drv.2</td>
<td>K i a h i l a i i Hwy.</td>
<td>State</td>
<td>Install bike lanes along Kuihelani Highway to connect from Maui Lani Parkway to Puunene Avenue.</td>
<td>4.2</td>
<td>$87,490</td>
</tr>
<tr>
<td>Drv.3</td>
<td>K i a h i l a i i Hwy.</td>
<td>State</td>
<td>Install bicycle parking at the Park-n-Ride facility.</td>
<td>4.8.2</td>
<td>$9,360</td>
</tr>
<tr>
<td>Drv.5</td>
<td>Hookele Street</td>
<td>County</td>
<td>Install bike lanes.</td>
<td></td>
<td>$19,370</td>
</tr>
<tr>
<td>Drv.6</td>
<td>Dairy Road</td>
<td>State</td>
<td>Install minimum 4-feet bike lanes and signed and shared designation along entire length of Dairy Road.</td>
<td>4.6</td>
<td>$30,550</td>
</tr>
<tr>
<td>Lono.1</td>
<td>Lono Ave.</td>
<td>County</td>
<td>Install bike lane and striping and signage between Papa and Hina Avenues.</td>
<td></td>
<td>$17,160</td>
</tr>
<tr>
<td>Lono.2</td>
<td>Lono Ave.</td>
<td>County</td>
<td>Install missing bike lane striping between Kamehameha Ave. and Kaahumanu Ave.</td>
<td></td>
<td>$7,410</td>
</tr>
<tr>
<td>Kbr.1</td>
<td>Kahului Beach Road</td>
<td>State</td>
<td>Install 5-feet wide bike lanes on both sides of travel lanes.</td>
<td>4-2</td>
<td>$43,030</td>
</tr>
<tr>
<td>Kea.1</td>
<td>Kea Avenue</td>
<td>County</td>
<td>Create a Bicycle Route Designation (signed and shared) along Kea Street.</td>
<td>4.6</td>
<td>$2,470</td>
</tr>
<tr>
<td>Wak.2</td>
<td>Wakea Ave.</td>
<td>County</td>
<td>Install bike lane and striping from Lono Avenue to Hana Highway.</td>
<td></td>
<td>$27,430</td>
</tr>
</tbody>
</table>
4.1.2 Wailuku Pedestrian District

Wailuku Town is a relatively small, mixed-use community that offers tremendous potential for more walking and bicycling. Within this small town are residential neighborhoods, a commercial district, a government center; elementary, intermediate, and high schools; parks, medical offices and churches. Unfortunately, many of Wailuku Town’s roadways lack basic pedestrian and bicycle infrastructure - including sidewalks, traffic calming improvements, bicycle striping and signage. Many of the Town’s bicycle striping and signage needs are included in the Comprehensive Striping & Signage Program. More substantial sidewalk and traffic calming improvements are listed here.

**Improvement Schedule / Table**

Sidewalk and/or traffic calming improvements should address existing gaps in pedestrian infrastructure on the following streets:

- Vineyard Street from Mission Street to Main Street;
- Central Avenue;
- North and South Church Streets;
- Wells Street;
- South Market Street;
- Kaohu Street; and
- High Street connection from Kehalani to Kaohu Street.

<table>
<thead>
<tr>
<th>ID</th>
<th>Roadway(s)</th>
<th>Jurisdiction</th>
<th>Improvement</th>
<th>Design Guide Reference</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wpd.2</td>
<td>Vineyard Street</td>
<td>County</td>
<td>Install raised crosswalks &amp; traffic calming improvements</td>
<td></td>
<td>$334,880</td>
</tr>
<tr>
<td>Wpd.3</td>
<td>High Street</td>
<td>County</td>
<td>Install sidewalk connection on west side of street between Main Street and Aupuna</td>
<td></td>
<td>$67,730</td>
</tr>
<tr>
<td>Wpd.4</td>
<td>Market Street</td>
<td>County</td>
<td>Install sidewalks from Wells Park to Iao School</td>
<td></td>
<td>$119,730</td>
</tr>
<tr>
<td>Wpd.5a</td>
<td>Kaohu Street</td>
<td>County</td>
<td>Install sidewalks where gaps exist</td>
<td></td>
<td>$4,680</td>
</tr>
<tr>
<td>Wpd.8</td>
<td>Lower Main</td>
<td>County</td>
<td>Install pedestrian crossing at Lower Main and Nani Street</td>
<td></td>
<td>$1,560</td>
</tr>
<tr>
<td>Wpd.9</td>
<td>Lower Main</td>
<td>County</td>
<td>Install stairs with bike ramp to link Lower Main and Main Street just east of Bridge</td>
<td></td>
<td>$15,600</td>
</tr>
<tr>
<td>Wpd.10</td>
<td>Main Street</td>
<td>State</td>
<td>Continuation of sidewalk to connect with sidewalk on Kahului-side of Bridge</td>
<td></td>
<td>$96,200</td>
</tr>
<tr>
<td>Wpd.12</td>
<td>Wells Street</td>
<td>County</td>
<td>Install additional pedestrian crossings and install sidewalks where gaps exist</td>
<td></td>
<td>$40,300</td>
</tr>
</tbody>
</table>
4.1.3 Kahului Bicycle District

Kahului's relatively flat topography makes it an ideal location for bicycling. Within a short ten minute ride of Kahului's residential neighborhoods are shopping districts, medical offices and parks; elementary, intermediate, and high schools; and the University of Hawaii campus. Many of Kahului's streets have significant unused right-of-way (ROW). These spaces create the opportunity to establish a network of separated bicycle and pedestrian paths throughout the District. Once these improvements are made, Kahului will become a truly world class bicycling community for all levels of riders. Streets with great potential for enhanced pedestrian and bicycling infrastructure include:

- Wakea Avenue;
- Onehee Avenue;
- South Papa Avenue;
- Kamehameha Avenue; and
- Kahului Beach Road.

**Improvement Schedule / Table**

Striping and signage improvements within the Kahului Bicycle District are addressed by the *Comprehensive Striping & Signage Program*. More extensive improvements to the ROW, such as developing separated bike paths, are listed here.

<table>
<thead>
<tr>
<th>ID</th>
<th>Roadway(s)</th>
<th>Jurisdiction</th>
<th>Improvement</th>
<th>Design Guide Reference</th>
<th>Schedule</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kbd.1</td>
<td>Kaahumanu</td>
<td>State</td>
<td>Install stairs and bicycle stair ramp to link the Wailuku Bridge and Lower Main Street (See: Wpd.9)</td>
<td>4.3.4.5</td>
<td>2012-2021</td>
<td>$15,600</td>
</tr>
<tr>
<td>Kbd.2</td>
<td>Kaahumanu</td>
<td>State</td>
<td>Install colored bike lanes at high volume intersections</td>
<td>4.3.3.3</td>
<td>2012-2016</td>
<td>$52,000</td>
</tr>
<tr>
<td>Kbd.3</td>
<td>Kaahumanu</td>
<td>State</td>
<td>Install sidewalk connection to link Wharf Road to Puunene Avenue</td>
<td></td>
<td>2017-2021</td>
<td>$70,200</td>
</tr>
<tr>
<td>Kbd.4</td>
<td>Kaahumanu</td>
<td>State</td>
<td>Install sidewalk to connect Wahinepio Avenue to the Wailuku Bridge</td>
<td></td>
<td>2017-2021</td>
<td>$161,720</td>
</tr>
<tr>
<td>Kbd.5</td>
<td>Kaahumanu</td>
<td>State</td>
<td>Install bicycle storage/parking in the vicinity of the transit hub at Queen Kaahumanu Shopping Center</td>
<td>5.8</td>
<td>2017-2021</td>
<td>$10,140</td>
</tr>
</tbody>
</table>

**Papa Avenue**

<table>
<thead>
<tr>
<th>ID</th>
<th>Roadway(s)</th>
<th>Jurisdiction</th>
<th>Improvement</th>
<th>Design Guide Reference</th>
<th>Schedule</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Papa.1</td>
<td>Papa Ave.</td>
<td>County</td>
<td>Address sidewalk gaps along Papa Ave. near the intersection with Kaahumanu Ave.</td>
<td></td>
<td>2017-2021</td>
<td>$66,690</td>
</tr>
<tr>
<td>Papa.2</td>
<td>Papa Ave.</td>
<td>County</td>
<td>Connect sidewalk connections along both sides of road between Kamehameha and Onehee Avenues.</td>
<td></td>
<td>2017-2021</td>
<td>$228,280</td>
</tr>
<tr>
<td>Papa.4</td>
<td>Papa Ave.</td>
<td>County</td>
<td>Address sidewalk gaps between Hina and Puunene Avenues. Install a pedestrian crossing at Hina Avenue.</td>
<td></td>
<td>2017-2021</td>
<td>$207,740</td>
</tr>
<tr>
<td>Papa.5</td>
<td>Papa Ave.</td>
<td>County</td>
<td>Install separated bike lanes within the existing right-of-way along the entire length of Papa Ave.</td>
<td>4-3, cycle tracks</td>
<td>2017-2026</td>
<td>Conceptual</td>
</tr>
</tbody>
</table>

**Kamehameha Avenue**

<table>
<thead>
<tr>
<th>ID</th>
<th>Roadway(s)</th>
<th>Jurisdiction</th>
<th>Improvement</th>
<th>Design Guide Reference</th>
<th>Schedule</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kam.2</td>
<td>Kamehameha</td>
<td>County</td>
<td>Install separated bike lanes (cycle tracks) along the entire length of both sides of roadway. Protect such lanes from travel lanes with planter strips and/or parallel parking.</td>
<td>4-3, cycle tracks</td>
<td>2017-2021</td>
<td>$125,450</td>
</tr>
<tr>
<td>Kam.3</td>
<td>Kamehameha</td>
<td>County</td>
<td>Install sidewalk connections where gaps exist near just north of the intersection of Kamehameha and Wakea Avenues.</td>
<td></td>
<td>2017-2021</td>
<td>$222,040</td>
</tr>
<tr>
<td>Kam.4</td>
<td>Kamehameha</td>
<td>County</td>
<td>Install 2-way shared use path or 2-way cycle track along the south side of the roadway, from Maui Lani Parkway to Papa Ave.</td>
<td></td>
<td>2017-2021</td>
<td>$537,940</td>
</tr>
</tbody>
</table>

**Onehee Avenue**

<table>
<thead>
<tr>
<th>ID</th>
<th>Roadway(s)</th>
<th>Jurisdiction</th>
<th>Improvement</th>
<th>Design Guide Reference</th>
<th>Schedule</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>One.2</td>
<td>Onehee Ave.</td>
<td>County</td>
<td>Install raised pedestrian crossing at Ola Street</td>
<td></td>
<td>2017-2021</td>
<td>$26,000</td>
</tr>
<tr>
<td>One.3</td>
<td>Onehee Ave.</td>
<td>County</td>
<td>Install an additional sidewalk along the Kahului Park frontage, from Uhu Street to Wakea Ave.</td>
<td></td>
<td>2017-2021</td>
<td>$119,860</td>
</tr>
</tbody>
</table>

**Dairy and Vicinity**

<table>
<thead>
<tr>
<th>ID</th>
<th>Roadway(s)</th>
<th>Jurisdiction</th>
<th>Improvement</th>
<th>Design Guide Reference</th>
<th>Schedule</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Drv.4</td>
<td>Mokulele Hwy.</td>
<td>State</td>
<td>Install a bike path on the south side of Mokulele Highway, connecting the Mokulele bike path to the Park 'N' Ride.</td>
<td></td>
<td>2017-2021</td>
<td>$182,780</td>
</tr>
</tbody>
</table>
4.1.4 Kahului Pedestrian District

The Kahului Pedestrian District encompasses an area that is now dominated by automobile-oriented strip shopping malls. However, plans are well underway to transform this area into a truly mixed-use and pedestrian-oriented town center. The District is located in the core of Kahului, and with the implementation of quality urban planning and design, it will become the “cultural heart” of a thriving “downtown” community. Since much of the property is owned by A&B properties, public/private partnerships to plan, design and implement a district-wide improvements is possible. It is envisioned that by 2026 walking will be the dominant mode of transportation within the District.

Improvement Schedule / Table

Traffic calming improvements, raised crosswalks, pedestrian crossings, and streetscape improvements including street trees, bicycle parking and pedestrian lighting will be installed on the following streets:

- Kaahumanu Avenue;
- Kane Street;
- Lono Avenue;
- Puunene Avenue;
- Vevau Street; and
- School Street.

<table>
<thead>
<tr>
<th>ID</th>
<th>Roadway(s)</th>
<th>Jurisdiction</th>
<th>Improvement</th>
<th>Design Guide Reference</th>
<th>Schedule</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kpd.1</td>
<td>Various State County</td>
<td>Install traffic calming, raised crosswalks and pedestrian crossings throughout district (Kaahumanu Ave., Kane Street, Lono Ave., Puunene Ave., Vevau Street, School Street). Install decorative surfaces, street furniture, street trees, trash receptacles, bicycle parking, and pedestrian lighting.</td>
<td>5.2.1 and 7.5</td>
<td>2017-2021</td>
<td>$119,080</td>
<td></td>
</tr>
</tbody>
</table>
4.1.5 Waiale Road Pedestrian & Bike Path

Waikapu is a small bedroom community just south of its larger neighbors Wailuku and Kahului. By bicycle, using Waiale Road, one can ride from Waikapu to Wailuku Town in just 15 minutes and to Kahului in just 10 minutes. There is significant unused ROW along Waiale Road that could be used to create a separated pedestrian and bicycle path that links Wailuku, Waikapu and Kahului together. Steps should be taken immediately to reserve lands within the ROW and to prepare County approved plans and guidelines for this important facility.

Improvement Schedule / Table

<table>
<thead>
<tr>
<th>ID</th>
<th>Roadway(s)</th>
<th>Jurisdiction</th>
<th>Improvement</th>
<th>Design Guide Reference</th>
<th>Schedule</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wwc.1</td>
<td>Waiale Road</td>
<td>County; Private</td>
<td>Acquire access to right-of-way and prepare and process plans for pedestrian &amp; bicycle path</td>
<td>2012-2016</td>
<td>Conceptual</td>
<td></td>
</tr>
<tr>
<td>Wwc.2</td>
<td>Waiale Road</td>
<td>County; Private</td>
<td>Install a separated bike path or 'Cycle Track' between Waiko Road and Kuikahi Drive</td>
<td>2016-2022</td>
<td>$136,240</td>
<td></td>
</tr>
<tr>
<td>Wwc.3</td>
<td>Waiale Road</td>
<td>County; Private</td>
<td>Install separated bike path, or at a minimum bike lane with signage, to Waiinu Road.</td>
<td>2016-2022</td>
<td>$23,270</td>
<td></td>
</tr>
<tr>
<td>Wwc.4</td>
<td>Waiale Road</td>
<td>County; Private</td>
<td>Install separated two way bike and pedestrian path on the east side of Waiinu Road to Lower Main Street</td>
<td>4-2 Bicycle Path</td>
<td>2016-2022</td>
<td>$525,330</td>
</tr>
</tbody>
</table>
4.1.6 Kahului Beach Road Esplanade

In addition to being Maui’s dominant working harbor, Kahului Harbor is a popular surf spot and location for Hawaiian outrigger canoe racing. The Harbor offers unique views of the Pacific Ocean, and provides the opportunity to see working merchant vessels, cruise ships and harbor activities from close proximity. At the east end of the Harbor is Hoaloha Park with its sandy shoreline and nearby hotels and to the north is the large, and largely undeveloped, Kahului Harbor Park. The State managed Kahului Beach Road is the primary frontage along the harbor front and offers uninterrupted views and access to the shoreline. A project of considerable community benefit is the realignment of Kahului Beach Road further mauka of the shoreline. The State has plans for such a realignment to reinforce the facility from the threat of Tsunami. By realigning the roadway, a nearly one mile long esplanade could be developed to link Kahului Harbor Park to Hoaloha Park and Kahului’s hotel and shopping district. A tree lined esplanade would be a popular attraction for walking, bicycling and ocean recreation.

**Improvement Schedule / Table**

<table>
<thead>
<tr>
<th>ID</th>
<th>Roadway(s)</th>
<th>Jurisdiction</th>
<th>Improvement</th>
<th>Design Guide Reference</th>
<th>Schedule</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kbr.1</td>
<td>Kahului Beach Road</td>
<td>State</td>
<td>Install 5-feet wide bike lanes on both sides of travel lanes.</td>
<td>4-2</td>
<td>2012-2016</td>
<td>$43,030</td>
</tr>
<tr>
<td>Kbr.2</td>
<td>Kahului Beach Road</td>
<td>State</td>
<td>Install 2-way separated pedestrian and bicycle shared-use path on Makai/harbor side of roadway with amenities including canopy shade trees, bicycle parking, pedestrian lighting, street furniture and trash receptacles</td>
<td>4-2 Bicycle Path</td>
<td>2022-2026</td>
<td>$977,340</td>
</tr>
</tbody>
</table>
PART FIVE -
IMPLEMENTATION

CENTRAL MAUI PEDESTRIAN & BICYCLE MASTER PLAN FOR 2030
A world class pedestrian and bicyclist community
V. Implementation – Getting from Here to There

Part 5 presents the overall scheme for putting the Plan into effect. The chapter includes the County’s General Plan policies that guided its development, regulatory barriers to Plan implementation, programs that comprise the non-infrastructure portion of the Plan, potential funding sources, and Plan implementation strategy and schedule.

5.1 General & Community Plan Policies

Maui County’s General Plan comprises a set of documents that direct future growth and development in the County. The Countywide Policy Plan acts as an overall values statement for the County and provides guidance for the development of the Maui Island Plan and Community Plans. The Maui Island Plan and Wailuku-Kahului Community Plan are the guiding documents for growth and development in Central Maui. Policies contained in these plans strongly support non-motorized transportation.

Draft Maui Island Plan:

Chapter 6 “Infrastructure and Public Facilities” of the Draft Maui Island Plan contains the following objectives and policies related to transportation:

Objectives:
- Provide for a more integrated island-wide transportation and land use planning program that reduces congestion and promotes more efficient (transit-friendly) land use patterns.

Policies:
- Plan for an integrated multi-modal transportation system comprised of public transit, bicycle, pedestrian, automobile, and other transportation modes.
- Refocus transportation investment from the construction of additional roadways only for the automobile to the expansion of a multi-modal transportation system.
- Encourage the use of “complete streets” design methods.

2002 Wailuku-Kahului Community Plan

Transportation – Objectives, Policies & Actions

2. Provide bikeway and walkway systems in the Wailuku-Kahului area which offer safe and pleasant means of access, particularly along routes accessing residential districts, major community facilities and activity centers, school sites, and the shoreline between Kahului Harbor and Pa’ia.

6. Accommodate bicycle and pedestrian ways within planned roadway improvements.

Urban Design – Objectives & Policies

3. Improve pedestrian and bicycle access within the region.

Objectives & Policies for Wailuku Town

3. Circulation and Parking
   d. Provide a continuous and pleasant pedestrian pathway connecting the Historic District, Civic Center, commercial office areas and park and public facilities.
Objectives & Policies for Kahului

2. Circulation: provide and maintain sidewalks and bikeways for convenient and pleasant connections between activity centers, such as shopping centers, schools, Maui Community College and public parks. These pathways should have adequate separation from vehicular traffic for safety purposes.

Implementing Actions

3. Implement related actions specified in the Transportation section of the Community Plan related to roadways, pedestrian and bikeway improvements.

4. Provide pedestrian and bicyclist amenities within Wailuku Town, including shaded rest stops, bicycle parking, trash receptacles and public restroom facilities.

5.2 Regulatory Barriers

The primary barriers to non-motorized transportation includes sprawl development that segregates and spreads land uses so far apart that walking and bicycling becomes impractical and substandard pedestrian and bicycling infrastructure. The County’s General Plan places great emphasis on addressing these two issues. To increase the rate of walking and biking within the study area the County’s zoning ordinance must allow for higher density mixed-use development.

In addition to more pedestrian accessible development patterns, the State and County’s roadway design standards must place greater emphasis on pedestrian and bicycle mobility. A State and County “Complete Streets” policy and pedestrian and bicycle friendly design standards will significantly increase the rate of walking and biking within the study area. In addition, a long-term source of funding needs to be established to support improvements to existing streets where gaps in walking and bicycling infrastructure exists. By developing a dedicated source of funding for improvements, Wailuku-Kahului can truly become a world class walking and bicycling community.
5.3 Enforcement, Education and Encouragement Programs

Creating a county that supports and encourages its residents to bicycle and walk involves more than just infrastructure and amenity improvements. This chapter contains a discussion of enforcement, education and awareness policies and programs for Central Maui.

The programs and policies discussed in this chapter may require additional funding for implementation. Volunteers and other groups and other means, such as grant funding, will be necessary sources of support for these efforts if County staff cannot support these endeavors. In some cases, these programs may expand the role of County staff if policies and programs fall within their purview upon implementation.

5.3.1 Enforcement Programs

Motorists, pedestrians and bicyclists alike are sometimes unaware of each other’s rights as they travel county streets. Educating the public through enforcement policies will supplement the physical improvements made in Central Maui. The Hawai’i Statewide Traffic Code, as enforced by the Maui Police Department, protects pedestrians and bicyclists in the public right-of-way.

Targeted Enforcement

Targeted enforcement action along streets should focus on areas with high volumes of bicycle, pedestrian, and other non-motorized traffic. Law enforcement efforts could target locations where motorists and the public will become aware of bicycle/pedestrian laws and their penalties for violations.

Bicycle Patrol Unit

Central Maui’s size and topography make many areas accessible by bicycle. The Maui Police offers bike patrols as part of its police force. However, these positions are currently unstaffed due to current staffing levels. Central Maui communities may also explore with the Maui Police Department, local businesses and neighborhood groups to find opportunities to establish local bicycle patrol units, a private security guard patrol, or an expanded volunteer program. Bicycles are an excellent community-policing tool, as the public views officers on bikes as more approachable, thus improving trust and relations between the citizens and police.

Bicycle patrol units can work closely with citizens to address concerns before they become problems, and can have a direct impact on bicycle safety by enforcing bicycle traffic laws (e.g. wrong-way riding, sidewalk riding, obeying traffic controls, children wearing helmets, etc.), and providing bicycle safety education.

Speed Limit Enforcement

County staff can work with police to enforce speed limits on designated streets with bikeways, near schools, and in response to bicyclist/pedestrian

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16 http://www.mauinews.com/page/content/detail/id/544792.html
complaints. This increases safety and may reduce crashes, which improves walking and bicycling conditions.

**Speed Radar Trailer/Permanent Speed Signs**

Speed Radar Trailers can help reduce speeds and may help to enforce speed limits in areas with speeding problems. Police set up an unmanned trailer that displays the speed of approaching motorists along with a speed limit sign. Speed trailers may be effective on busy arterial roads without bikeway facilities or near schools with reported speeding. Speed trailers should be located in a position that mitigates its influence on bicycle traffic when placed on the road.

Speed trailers work as both an educational and enforcement tool. By itself, the unmanned trailer educates motorists about their current speed in relation to the speed limit. As an alternative enforcement measure, the Maui Police Department may choose to station an officer near the trailer to issue citations to motorists exceeding the speed limit. Radar trailers can transport easily to streets where local residents complain about speeding problems. However, motorists may not obey the speed limit without an officer present for enforcement.

County Public Works Department staff may provide the management role for this program and can work with the public to determine which locations are in most need. This program can be administered randomly, cyclically, or as demand necessitates because of the speed trailers’ portability.

### 5.3.2 Education Policies & Programs

The following section outlines the variety of education programs that can contribute to a cyclist and pedestrian community.

#### 5.3.2.1 Child/School-based Education Programs

School-based bicycle and pedestrian education programs teach students about the rules of the road, proper use of bicycle equipment, bicycling skills, street crossing skills, and the benefits of bicycling and walking. These education programs typically receive support from a joint County/school district committee that includes appointed parents, teachers, student representatives, administrators, active bicyclists, Maui Police Department and the County Public Works Department. These programs can also incorporate into a Safe Routes to School Program.

**Safety Handbook**

Safety handbooks are part of a school-based bicycle and pedestrian safety program. These handbooks may include a circulation map of the campus and immediate neighborhood, suggested routes to school, crosswalk and crossing guard locations, signalized intersection locations, bicycle maintenance and use instructions, helmet wear instructions, street crossing instructions, and emergency and school numbers. The County or school district can publish the handbook for use at each school, in conjunction with a school-specific map.

**Walking School Bus / Bike Train**

Parent and neighborhood volunteers can escort children walking to school together in a “Walking School Bus” if parents are uncomfortable allowing their children to walk or bicycle alone to or from school. Children can join the “Walking School Bus” if the home runs along the route or at designated staging areas. The parents offer supervision and protection, and the group size makes the children more visible to traffic. Usually, one parent acts as the organizer and recruits other parents, neighbors, seniors or community volunteers to walk with the children. As in a motor carpool, the participants need to coordinate schedules and meeting places. Adults and children can wear safety vests or use other means to enhance visibility. Sometimes the adult pulls a wagon to carry the children's books and projects.

Certified Safe Routes to School Instructors can train volunteers. Supplemental training materials are available through the National Safe Routes to School partnership at www.saferoutes.org.

Bike trains work exactly like the Walking School Bus program, but with children on
bicycles. Parents and volunteers should select residential and low-traffic volume streets to get to school if sidewalks cannot accommodate multiple children.

5.3.2.2 Adult Cycling Skills Education
Most bicyclists learn to ride when they are children and do not have the opportunity to learn riding skills or safe road positioning. Adult bike skills training are an excellent way to improve both cyclist confidence and safety.

The League of American Bicyclists developed a comprehensive bicycle skills curriculum considered the national standard for adults seeking to improve their on-bike skills. The classes available include basic and advanced on-road skills, commuting, and driver education. Local League of American Bicyclist Certified Instructors offer “StreetSmarts Cycling” classes that teach participants how to operate a bicycle under various conditions, and about bicyclists’ rights and responsibilities. There are currently nine League-Certified Instructors in the State, but none in Maui. More information on this program is available online at: www.bikeleague.org/programs/education/courses.php.

5.3.2.3 Education Campaigns
Motorists have limited education on the rights of bicyclists and pedestrians. Many motorists mistakenly believe that bicyclists do not have a right to ride in travel lanes, and that bicyclists should ride on sidewalks. Education about the rights and responsibilities of pedestrians and bicyclists can include:
- Incorporating bicycle and pedestrian safety into traffic school curriculum;
- Producing a brochure on bicycle and pedestrian safety and laws for public distribution;
- Instructing of law enforcement officers on laws that pertain to bicyclists;
- Providing bicycle and pedestrian awareness training for all County staff who work within the public right-of-way; and
- Working with contractors, sub contractors and County maintenance and utility crews to ensure they understand the needs of bicyclists and pedestrians and follow standard procedures when working on or adjacent to roadways and walkways.

Additional resources for a police education course include:
- www.bicyclinginfo.org/enforcement/training.cfm
- www.massbike.org/police

5.3.3 Encouragement & Awareness Programs
Awareness and encouragement programs play a critical role in growing bicycling and pedestrian activity in a county. The programs listed in the following section will help walking and bicycling grow in Central Maui.
Share the Road Education Campaign
One main request from the public is for more motorist education on bicyclists and pedestrians’ rights to the road. A Share the Road campaign educates motorists, bicyclists and pedestrians about their legal rights and responsibilities on the road, and the need for increased courtesy and cooperation among all users.

Share the Road campaigns often hold periodic traffic checkpoints along roadways with concentrated bicycle and pedestrian activity. Motorists, bicyclists and pedestrians stop at these checkpoints to receive a Share the Road flyer and can give feedback to officers regarding the campaign. Checkpoints can also occur along local bikeways and paths. Public service announcements on radio and television can help promote the Share the Road campaign. The Marin County (CA) Bicycle Coalition offers an example of a successful Share the Road campaign.

Bike Light Campaign
Hawai‘i Statute §291C-147 requires bicycles to mount a front white light and red rear reflectors. Bicycle lights are more visible than reflectors at night. A bike light campaign in Central Maui could promote cooperation with State law and increase safe riding habits.

Portland, Oregon developed a “See and Be Seen” public safety campaign to encourage bicyclists to use lights and to remind motorists to watch for bikes. Campaign elements included coupons for bike lights and other reflective gear, and a parade to celebrate bright bikes.

Bike-to-Health Campaign
As part of the Healthy Hawai‘i Initiative, this Plan aims to support healthier lifestyles by encouraging and enabling bicycling and walking. Obesity and sedentary lifestyles are on the rise for both adults and children in America, and one way to combat this is to integrate daily exercise into the American lifestyle.

A Bike-to-Health marketing campaign may include:

- Websites with information on getting started, event calendars, advice from health professionals, and safety information for adults and children
- Print ads in community newspapers to increase the exposure of the campaign
- Community events and rides. These rides occur during the summer and early fall months. Participants earn prizes and attain better health through reaching mileage goals. Campaigns encourage families to bike to better health together.

Event Bicycle Parking
Providing safe and secure bicycle parking helps encourage individuals to bicycle. San Francisco passed a city ordinance that requires all major city events to provide bike parking and pioneered an innovative tool for stacking hundreds of bicycles without racks. Central Maui should consider temporary bicycle parking for events with expected large attendance and at regularly occurring events like the Maui Swap Meet and Aloha Friday Farmers Market.

Community Bikeway/Walkway Adoption
Community Bikeway/Walkway Adoption programs resemble the widely instituted Adopt-a-Highway programs throughout the country. These programs identify local individuals, organizations, or businesses interested in “adopting” a bikeway, walkway, or shared-use path. “Adopting” a facility means that person or group is responsible for the facility’s maintenance, either through direct action or funding the County’s maintenance of that facility. For example, members of a local recreation group may volunteer every other weekend to sweep a bikeway and identify larger maintenance needs. Alternatively, a local bike shop may adopt a bikeway by providing funding for the maintenance costs. Some adopted bikeways post sponsors’ names on bikeway signs to display their commitment to bicycling.
Multi-Modal Access Guide
A multi-modal access guide provides information on accessing specific destinations using bicycling, walking and public transit. Simple access guides are maps printed on the back as a business card, or while complex guides can be multi-page packets distributed to employees. Items commonly included in access guides are:

- An area map depicting bus stops, recommended walking and bicycling routes, landmarks, facilities such as restrooms and drinking fountains, bicycle and vehicle parking, and major roads;
- Information on transit service, including frequency, fares, accepted payment methods, first and last runs, schedules, and contact information for transit service providers and taxis;
- Information on walk or bike travel time from a transit center to a destination;
- Accessibility information for people with disabilities; and
- Wayfinding and local advertisements.

Best practices include using graphics rather than text, providing specific step-by-step travel directions, providing parking location and pricing information, and providing information about the benefits of walking and bicycling. High quality access guides should be concise and accurate, and incorporate input from key stakeholders including public transportation operators, public officials, public and private

Ciclovias/“Sunday Streets”
First implemented in Bogota, Colombia, the Ciclovia is a community event based around a street closure. Ciclovias provide local recreational and business opportunities for the community and are increasingly popular citywide events. Ciclovias can combine with other popular community events to promote walking and bicycling as a form of viable transportation. Ideally, Ciclovias should provide access to civic, cultural, or commercial destinations. More information is available at: www.healthystreets.org/pages/sunday_parkways.htm

Community Walks/Bike Tours
Community walks and tours are healthy ways to promote historical and cultural aspects of the County. Groups that can organize community tours include County staff, neighborhood organizations, schools, and other groups that want the public to interact with the physical environment. Community walks and bike tours are effective tools for examining potential improvements to the physical environment and educating participants on resources/amenities available within the County.

Bicycle & Pedestrian Signage Program
Central Maui should develop a uniform signage concept and plan for on/off-street bikeways and pedestrian corridors. The Plan should include uniform sign design(s), placement guidelines (where and how often), and a map of proposed bikeways and corridors to receive signage, and guidelines to avoid placing too many signs, which creates “sign clutter.”

Central Maui can support individuals choosing to make non-motorized trips within Central Maui by advertising routes and destinations to bicyclists and pedestrians. Signage posted along bikeways and pedestrian corridors should advertise linkages to popular destinations, and be in harmony with other State and County signage standards. Sign placement should be strategic and thoughtful to have the greatest impact and to avoid the “clutter” of over-signing.
5.4 **Funding for Improvements**

The primary federal source of surface transportation funding, including bicycle and pedestrian facilities, is SAFETEA-LU, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users. SAFETEA-LU is the third iteration of the transportation vision established by Congress in 1991 with the Intermodal Surface Transportation Efficiency Act (ISTEA), renewed in 1998 and 2003 through the Transportation Equity Act for the 21st Century (TEA-21) and the Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003 (SAFETEA). Also known as the Federal Transportation Bill, the $193.1 billion SAFETEA-LU bill passed in 2005 and authorizes federal surface transportation programs for the five-year period between 2005 and 2009. As of September 30, 2009, SAFETEA-LU has expired, though the bill's programs have been kept alive at a 30 percent reduction in funding by Congress through a series of continuing resolutions.

Administration of SAFETEA-LU funding occurs through Hawai‘i Department of Transportation (HDOT). Most of these funding programs emphasize reducing auto trips and providing inter-modal connections.

Specific funding programs under SAFETEA-LU include, but are not limited to:
- Congestion Mitigation and Air Quality (CMAQ)
- Highway Safety Improvement Program (HSIP)
- Surface Transportation Program (STP)
- Recreational Trails Program
- Safe Routes to School Program (SRTS)
- Transportation, Community and System Preservation Program (TCSP)

The following section summarizes these and other funding sources.

### 5.4.1 Federal

**Congestion Mitigation and Air Quality (CMAQ) Improvement Program**

Congestion Mitigation and Air Quality (CMAQ) Improvement funds are programmed by the Federal Transportation Bill for projects that are likely to contribute to the attainment of a national ambient air quality standard, and congestion mitigation. These funds can be used for a broad variety of bicycle and pedestrian projects, particularly those that are developed primarily for transportation purposes. The funds can be used either for construction of bicycle transportation facilities and pedestrian walkways or for non-construction projects related to safe bicycle and pedestrian use (maps, brochures, etc.). The federal government apportioned $8.4 million to the State of Hawai‘i under the FY 2000-2009 funding cycle.\(^16\)

**Highway Safety Improvement Program (HSIP)**

SAFETEA-LU established the Highway Safety Improvement Program (HSIP) as a core federal aid program. The overall purpose of this program is to achieve a significant reduction in traffic fatalities and serious injuries on all public roads through the implementation of infrastructure-related highway safety improvements. Funds may be used for projects on any public road or publicly-owned bicycle and pedestrian pathway or trail for correcting or improving a hazardous road location, or addressing a highway safety problem. The State of Hawai‘i has a $20 million annual allocation; Maui County receives $3.9 million of those funds.\(^17\)

**Surface Transportation Program (STP)**

The State or County may use Surface Transportation Program funds for projects on any Federal-aid highway, including facilities on the National Highway System (NHS), bridge projects on any public road, resurfacing projects, and bicycle facilities and programs.

**Safe Routes to School (SRTS) Program**

Authorized under Section 1404 of SAFETEA-LU, the Safe Routes to School (SRTS) Program began August 2005. Consistent with other federal-aid programs, each State DOT is responsible for disbursing grant funds throughout the life of SAFETEA-LU. Some expected outcomes of the program include:
- Increased bicycle, pedestrian, and traffic safety around schools;
- More children walking and bicycling to school.

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and from schools;
- Decreased traffic congestion around schools;
- Reduced childhood obesity;
- Improved air quality, community safety; and security, and community involvement; and
- Improved partnerships among schools, local agencies, parents, community groups, and nonprofit organizations.

A minimum of 70 percent of each year’s apportionment is available for infrastructure projects, with the remaining funds available for non-infrastructure projects. Currently, SAFETEA-LU programs operate under a temporary extension, although SRTS will likely be included in future reauthorizations.

**Infrastructure Projects**

Infrastructure projects are engineering projects or capital improvements that will substantially improve safety and the ability of students to walk and bicycle to school. They typically involve the planning, design, and construction of facilities within a two-mile radius from a grade school or middle school. The maximum funding cap for an infrastructure project is $1 million. The project cost estimate may include eligible direct and indirect costs. Eligible projects may include but are not limited to:

- New bicycle trails and paths, bicycle racks, bicycle lane striping and widening, new sidewalks, widening of sidewalks, sidewalk gap closures, curbs, gutters, curb ramps, new pedestrian trails, paths, and pedestrian over and under crossings, roundabouts, bulb-outs, speed bumps, raised intersections, median refuges, narrowed traffic lanes, lane reductions, full or half-street closures, and other speed reduction techniques; and
- Traffic control devices, including: new or upgraded traffic signals, crosswalks, pavement markings, traffic signs, traffic stripes, in-roadway crosswalk lights, flashing beacons, bicycle-sensitive signal actuation devices, pedestrian count down signals, vehicle speed feed back signs, pedestrian activated upgrades, and all other pedestrian and bicycle-related traffic control devices.

Infrastructure projects should directly support increased safety and convenience for children in K-8 (including children with disabilities) to walk and bicycle to school.

**Non-Infrastructure Projects**

Non-infrastructure projects are education/encouragement/enforcement activities intended to change community behavior, attitudes, and social norms to improve the safety of children in grades K-8 walking and bicycling to school. Non-infrastructure projects should increase the likelihood of programs becoming institutionalized once in place. The application must clearly state the non-infrastructure project deliverables and
the final invoice or Progress Report must provide tangible samples (e.g., sample training materials or promotional brochures). The funding cap for a non-infrastructure project is $500,000. Multi-year funding allows the applicant to staff up and deliver their project over the course of four years, thereby reducing overhead and increasing project sustainability.

Transportation, Community, and System Preservation Program (TSCP)
Implementation grants under the TCSP Program provide financial resources to states, metropolitan planning organizations, local governments and tribal governments to address transportation efficiency while meeting community preservation and environmental goals. Examples policies and programs include directing funds to high-growth regions of the country, urban growth boundaries to guide metropolitan expansion, and green corridor programs targeted for efficient and compact development. The federal government allocated $1.7 million to the State of Hawai‘i in FY 2006.18

Land and Water Conservation Fund
The Land and Water Conservation Fund allocates money to state and local governments to acquire new land for recreational purposes, including bicycle paths. The fund is administered by the National Parks Service and the Hawai‘i Department of Land and Natural Resources19 and has been reauthorized until 2015.

Cities, counties and districts authorized to acquire, develop, operate, and maintain park and recreation facilities are eligible to apply. Applicants must fund the entire project, and will be reimbursed for 50 percent of costs. Property acquired or developed under the program must be retained in perpetuity for public recreational use. The grant process for local agencies is competitive. The State of Hawai‘i received a FY 2010 apportionment of $402,000.20

Rivers, Trails and Conservation Assistance (RTCA) Program
The Rivers, Trails and Conservation Assistance (RTCA) Program is a National Parks Service program which provides technical assistance via direct staff involvement to establish and restore greenways, rivers, trails, watersheds and open space. The RTCA program provides funding only for planning assistance—there are no implementation monies available. The program determines project priority based on criteria, which include conserving significant community resources, fostering cooperation between agencies, serving a large number of users, encouraging public involvement in planning and implementation, and focusing on lasting accomplishments.

Public Lands Highways
The General Fund of the US Treasury funds the Public Lands Highway programs. The program’s intent is to improve access to Federal lands via transportation projects. Eligible projects include transportation planning, research and engineering, and construction of highways, roads, parkways, and transit facilities. Bicycling projects can receive funding provided they fall within one of the eligible project categories. The Hawai‘i DOT submits applications competing for these funds with other states.

Transportation Enhancement (TE) Activities
Transportation Enhancement (TE) Activities are a subset of federal Surface Transportation Program funds aimed at expanding travel choice and enhancing the transportation experience. Activities eligible for funding include pedestrian and bicycle facilities, and pedestrian and bicycle safety and educational activities. The federal government apportioned $3.8 million to the State of Hawai‘i in FY 2010.21

Petroleum Violation Escrow Account (PVEA)
PVEA funds come from fines paid by oil companies in the 1970’s for violating oil price caps set by the federal government. The Department of Energy’s State Energy and Weatherization Assistance Program distributes the money at the state level through grants. PVEA funds projects with an emphasis on energy saving, including public transportation and bridge construction or maintenance.

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18 http://www.fhwa.dot.gov/tcsp/19992004.htm
19 http://www.nps.gov/lwcf/contact_list.html
21http://www.fhwa.dot.gov/environment/apportionments.htm
Recreational Trails Program (RTP)
The Recreational Trails Program provides funds to states to develop and maintain recreational trails and trail-related facilities for both non-motorized and motorized recreational trail uses. The federal government allocated $853,000 to the State of Hawai‘i in FY 2010. Examples of trail uses include hiking, bicycling, in-line skating, equestrian use, and other non-motorized as well as motorized uses. Recreational Trails Program funds may be used for:

- Maintenance and restoration of existing trails;
- Development and rehabilitation of trail side and trailhead facilities and trail linkages;
- Purchase and lease of trail construction and maintenance equipment;
- Construction of new trails (with restrictions for new trails on federal lands);
- Acquisition of easements or property for trails;
- State administrative costs related to this program (limited to seven percent of a State’s funds); and
- Operation of educational programs to promote safety and environmental protection related to trails (limited to five percent of a State’s funds).

Community Development Block Grants (CDBG)
The Department of Housing and Urban Development (HUD) administers the Community Development Block Grant (CDBG) program. The CDBG program funds community-based projects such as community district streetscape improvements, sidewalk improvements, school-based safety improvements, and neighborhood-based bicycling improvements.

National Highway System
The National Highway System provides funding to facilities located along or adjacent to NHS corridors. Central Maui contains several roadways designated as “Other Principal Arterials”, which are highways in rural and urban areas which provide access between an arterial and a major port, airport, public transportation facility, or other intermodal facility.

5.4.2 State Highway Modernization Plan
The six-year, $4.2 billion Highway Modernization Plan is a statewide plan that funds highway projects for reducing traffic congestion, improving highway safety, and maintaining existing facilities. Funding for the Highway Modernization Plan will come from conditional future increases in the fuel tax, state vehicle registration fee, vehicle weight tax, and rental car surcharges, projected to begin mid-2011. This new funding will supplement the existing State highway budget and additional federal funding. Within Maui County, the Highway Modernization Plan will provide $3.2 million specifically for bikeway improvements. Other programs that could involve pedestrian or bicycle components include $3.9 million for safety improvements (HSIP), $47.5 million for bridge improvements, $364 million for capacity improvements (e.g. new facilities and widening), and $74 million for maintenance (e.g. roadway paving and restriping).

Safe Community Program (SCP)
The Safe Community Program provides staff to work with community groups to establish a Safe Community Program in a neighborhood. Hawai‘i DOT SCP staff serves as a planning resource to guide SCP groups in finding solutions to speeding, pedestrian and bicycle safety, and other issues. The program provides $2,000 grants to program implementation.

Bikeway Fund
The bicycle registration fees collected in each county apply toward projects where the funds were collected. The monies can fund construction of new and maintenance of existing bikeways, bikeway lights, and traffic controls. The funds can also repay bonds financing bikeway construction, and fund bicycle outreach efforts.

**Footnotes:**
24 [http://Hawai‘i.gov/dot/highways/modernization/maui/index/](http://Hawai‘i.gov/dot/highways/modernization/maui/index/)
25 [http://Hawai‘i.gov/dot/highways/safe-communities/safecommunities/scp.htm](http://Hawai‘i.gov/dot/highways/safe-communities/safecommunities/scp.htm)
Hawai‘i Health Initiative (HHI)
The State Department of Health administers the Hawai‘i Health Initiative using funds from the State’s share of tobacco settlement funds. Walking and biking fall within HHI’s “Start Living Healthy” campaign to improve dietary habits, increase physical activity, and reduce tobacco use. HHI funds cannot apply toward capital improvements, but can fund planning, design, and grant applications.

Office of Hawai‘ian Affairs (OHA)
The Office of Hawai‘ian Affairs awarded a grant of $24,800 in 2009 to enhance and expand the Hawai‘i County Police Department’s bicycle patrol. The money will provide training for officers in the areas of cultural awareness, crisis intervention, homelessness and mental illness.26

The vibrant street scene along Front Street, Lahaina by R. Bridges

5.4.3 County of Maui
The County of Maui’s Capital Improvement Program (CIP) is a six-year plan to address the infrastructure needs of the County. Capital projects include land acquisition, design, construction, expansion and major repairs of infrastructure. The Mayor’s proposed 2012 CIP budget totals over $116 million. Of this amount, over $18 million is proposed for roadway improvements, which may include pedestrian and bicycle facilities within the County road right-of-ways.

5.4.4 Private & Non Profit
The following organizations support bicycle and pedestrian facilities and programs from private and non-profit sources.

Bikes Belong Coalition, Ltd.
The American Bicycle Industry sponsors the Bikes Belong Coalition, which encourages people to ride bicycles throughout the United States. The coalition administers grants of up to $10,000 to develop bicycle facilities through the Federal Transportation Act.

Robert Wood Johnson Foundation (RWJF)
The RWJF funds aim to improve health and health care in the United States. RWJF funds approximately 12 percent of unsolicited projects with grant funds ranging from $2,000 to $14 million. Bicycle and pedestrian projects applying for RWJF funds qualify under the program’s goal to “promote healthy communities and lifestyles.”
5.5 Strategic Community & Agency Partnerships

Implementation will require the formation of strategic agency and community partnerships. These partnerships will help to create broad community awareness and support for the Plan. Such support is critical to ensure that Plan priorities are adequately represented in the State and County CIP budgets and through other funding opportunities.

Creating a coalition, or partnership, among the following organizations is an important first step towards Plan implementation.

5.5.1 Community Organizations

Nutrition & Physical Activity Coalition (NPAC) of Maui County
The Nutrition & Physical Activity Coalition (NPAC) of Maui County is a program of the State of Hawaii’s Healthy Hawaii Initiative (HHI). The Maui NPAC first convened in March, 2008, with the purpose of improving health in the areas of physical activity and nutrition. The organization’s priority areas of interest are:

• Worksite Wellness;
• Built Environment;
• Healthcare;
• Schools; and
• Nutrition & Physical Activity.

The Maui NPAC has become a strong and effective advocate for changes to the built environment. NPAC’s built environment committee has been instrumental in advocating for Complete Streets legislation, generating community awareness and support for active transportation, and working with State and County agencies to update outdated and autocentric roadway design standards.

Pioneering Healthy Communities (YMCA)
The Pioneering Healthy Communities (PHC) initiative of the YMCA is a national organization serving more than 160 communities across the country.

The PHC was launched in 2004 with the following primary objectives:

• Enhancing the importance of a healthy lifestyle;
• Building relationships within communities by focusing on the leading health issues facing the country;
• Strengthening the capacity for coalition building in communities;
• Attracting a new set of volunteers to the effort to build a healthy community; and
• Increasing the community’s ability to promote policy and environmental changes that encourage and support healthy living.

Maui Bicycle Alliance
The Maui Bicycle Alliance has been an advocate for Maui’s bicycling community for over twenty years. The Alliance monitors the State and County’s CIP and advocates for increased spending on bicycling infrastructure. The Alliance has been instrumental in facilitating several important community projects including the Kihei and North-Shore Greenway. The Alliance also provides testimony on State and County legislation and distributes cycling information, news, and resources to its membership.

Wailuku Community Association
The Wailuku Community Association is a concerned group of citizens that advocates for infrastructure, planning and development projects to protect the unique character, livability
and viability of Wailuku Town. Like the Waikapu Community Association, the Association reviews and comments on land use policy and development projects that impact the Wailuku community.

Wailuku Main Street Association / Tri-Isle Resource Center
The Wailuku Main Street Association / Tri-Isle Main Street Resource Center (WMSA) was established in 1986 with a mission to foster, promote, maintain and encourage the civic, social, economic, environmental and cultural welfare of downtown Wailuku and other Maui County small towns. The WMSA has been a strong advocate for the implementation of the Wailuku Redevelopment Plan. The organization reviews and comments on land use policy and development projects that affect Wailuku and the County’s other small towns.

5.52 County Agencies

Department of Planning
The Department of Planning conducts land-policy planning for the County of Maui. The Department also reviews and processes development and entitlement applications. The Department’s Long-range Division prepares updates to the County’s General Plan and Community Plans and prepares special studies, and updates ordinances, design guidelines and area studies as needed to implement the General Plan. The Current Planning Division reviews and comments on all development projects within the State’s Special Management Area (SMA). The Division also reviews and processes environmental assessments and entitlement applications for consistency with State and County land use policies and regulations. The Current Planning Division provides support staff to the Wailuku Redevelopment Agency (WRA).

The Department of Planning can play a key role in helping to facilitate the implementation of the Plan. Most helpful would be to have the Plan referred to by reference as an implementing action in the Maui Island Plan and/or Wailuku Kahului Community Plan.

Department of Public Works
The Department of Public Works Engineering Division is responsible for planning, designing and constructing County roadways. One of the Division’s objectives is to increase the number of traffic calming, bikeway and safety improvement projects.

The Department prepares the County’s annual and six-year CIP project list for County roadway improvements. This includes bicycle and pedestrian improvements.

Working closely with the Department of Public Works will be necessary to ensure that adequate funding is set-aside to fund the Plan’s recommendations.

5.53 State Agencies

Department of Transportation (DOT)
The State Department of Transportation (DOT) manages approximately 2,433 miles of freeways, highways and roadways throughout Hawaii. Within the Project Area, the State DOT has jurisdiction over several important roadways, including: Kaahumanu Avenue, Main Street, Kahului Beach Road, Dairy Road and Puunene Avenue. In addition to managing and developing improvements for vehicular traffic, the DOT also manages and develops improvements for pedestrians and bicyclists. The Department’s master plan for cycling is Bike Plan Hawaii 2003. The State DOT also manages the Federal government’s Safe Routes to School (SRTS) Program. The purpose of SRTS is to improve walking and bicycling conditions between our residential neighborhoods and schools.

The State DOT recently released a draft version of its Statewide Pedestrian Master Plan. The Plan aims to decrease injuries and fatalities by identifying problem areas and projects to increase pedestrian safety and mobility. The Plan identifies several projects within the Central Maui area. Like the County Department of Public Works, a strategic partnership with DOT will help to ensure that the Plan’s recommendations are adequately funded through the Statewide Transportation Improvement Program (STIP).
Department of Education (DOE)
The State Department of Education (DOE) manages the Hawaii public school system. Within Central Maui there are four elementary schools, two intermediate schools, and two high schools with a student population of 8,619 in 2010-2011.

The DOE is an important stakeholder in active transportation because it desires that its students are active, healthy and safe. The Safe Routes to School Program provides federal funding in order to promote healthier and more active lifestyles for our children. Partnering with local schools is necessary to obtain SRTS grant funding.

5.6 A Path Forward
With limited funding available, and competing priorities, getting active transportation projects implemented will be no easy task. Therefore, establishing strategic partnerships that work towards a common set of goals and objectives will be critical.

Getting Projects Built and Designed
Most infrastructure projects share a common development process - concept planning, permitting, design, bidding and construction.

Concept Planning
For large projects such as the Waiale Road Pedestrian/Bike Path or the Kahului Beach Road Esplanade, the project often begins with the preparation of a concept master plan. The master plan identifies the community’s vision for the project in one or more color rendered drawings. Accompanying the drawings is a brief summary of the project, description of physical and regulatory barriers, cost estimates, and schedule. Producing concept drawings is less expensive than producing more detailed construction documents. Such drawings are an important tool to help facilitate community support and funding for the project.

Permitting
Many infrastructure projects require a development permit before construction can be initiated. A Hawaii Revised Statutes (HRS) Chapter 343 Environmental Assessment (EA) or Environmental Impact Statement (EIS) is required for projects that use State or County funds or require the use of public lands. However, Section 343, HRS, authorizes each County to establish exemptions for specific types of actions. For Maui County, the following exemptions exempt some pedestrian and bicycling projects from having to prepare an EA:

- Class 3 - Construction and location of single, new small facilities or structures and the alteration and modification of same and installation of new, small equipment and facilities and the alteration of same including, but not limited to:
  - 10) Minor street widening and improvements within existing or future County streets rights of way.

- Class 4 - Minor alteration in the conditions of land, water, or vegetation. Which includes:
  - 2) Landscaping alongside roadways, around buildings, and within parks, and beach accesses.

- Class 6 - Construction or placement of minor structures accessory to existing facilities. Which includes:
  - 1) Construction of sidewalks and curbs and gutters.

In addition to compliance with HRS Chapter 343, infrastructure projects must also comply with HRS Chapter 205A “Coastal Zone Management”. Chapter 205A establishes “Special Management Area” (SMA) boundaries along the shorelines of the major Hawaiian Islands. “Development” that occurs within SMA boundaries is subject to SMA permit requirements. Any “development” with a valuation over $500,000 must obtain a “major” SMA permit prior to initiating construction. Improvements - beyond just repair and maintenance of existing facilities - are subject to
PART FIVE - IMPLEMENTATION

SMA permit requirements.

The time required to prepare and process an EA or Major SMA Permit may range from 9 to 18 months. Meanwhile, the cost to prepare and process one or both of these applications can range from a few thousand dollars to several hundred thousand.

Design

Construction drawings are typically prepared once the necessary development permits are issued. Construction drawings may cost from 5% to 8% of the total construction cost. County review and approval of such drawings can take several months.

Bidding & Construction

Once funding has been secured, the project will be advertised for bidding to secure the best price for construction. After the contractor is selected and building permits are issued, construction may be initiated. The construction period may range from a few days to several months for large-scale projects.

Since each phase of development is unique, projects may be implemented simultaneously. For example, as a project is undergoing concept planning, a second project may be going through permitting, while a third is in the construction phase.

When planning for bicycle and pedestrian improvements, it is important to have corridor plans and guidelines in place well before abutting development takes place. Such plans and guidelines will help to ensure that pedestrian and bicycle improvements are accommodated within the right-of-way and not displaced as development occurs.

Developing Traditional & Non-traditional Funding Sources

A central objective of the implementation plan should be to develop traditional and non-traditional funding for the Plan’s projects. Traditional sources of funding include State and County CIP funds. To tap into these monies the Plan’s implementation committee should work closely with the State DOT and the County Department of Public Works to have projects funded. Once identified on the State STIP and County CIP, it will be critical that the Plan’s implementation committee advocate to the State legislature and County council for funding of the projects.

Non-traditional funding sources are described in Section 5.4. Developing a strategy to identify and pursue the most promising grant opportunities should be a central component of the implementation program. Identifying opportunities where grant funds can be coupled with State and County CIP funds will produce significantly greater results than just relying upon single sources of funding.

Updating the Plan

The Plan should be updated as projects are completed, priorities change, and as schedule and cost assumptions are revised.
PART SIX - EVALUATION
VI. Evaluation – Measuring Progress

The Plan provides a long-term vision for the development of an area-wide bicycle and pedestrian network that can be used by all residents for all types of trips. Implementation of the Plan will take place incrementally over many years. The following actions and measures of effectiveness will guide Central Maui toward the vision identified in the Plan.

6.1 Regularly Update the Plan

As discussed in Chapter 5, the Plan should be regularly updated to reflect changes to the Central Maui area. The project list is one aspect of the plan that should regularly receive updates, in order to reflect completed facilities, developing areas, and emerging community direction.

For instance, project priority accounts for bicycling and walking demand, facility deficiencies, barriers to implementation, public input, and other criteria should be kept as current as possible. The sub-committee should review the list on a regular basis, add new projects, remove completed projects, and revise the priorities as conditions change. Future updates to the Plan will reflect these changes.

6.2 Establish Measures of Effectiveness

Measures of effectiveness quantitatively measure the region’s progress toward implementing the Plan. Well-crafted measures of effectiveness will allow the County to determine the degree of progress toward meeting the Plan’s goals, and should include time-sensitive targets for Central Maui to target.

Table 9.1 describes several measures the sub-committee may consider as measures of effectiveness. These measures were based on known baseline conditions. Goal targets are based on reasonable expectations within the time frame. The sub-committee should reevaluate, revise, and update the measures of effectiveness as new baseline information becomes available and as more of the Plan is implemented.
### Table 9-1 Program Measures of Effectiveness

<table>
<thead>
<tr>
<th>Measure</th>
<th>Existing Benchmark (if available)</th>
<th>Target</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bicycle mode share</td>
<td>Establish benchmark data using bicycle counts, census data, or other survey techniques</td>
<td>Within 5 years increase the percentage of people who bike for recreation and utilitarian purposes by 50%.</td>
</tr>
<tr>
<td>Public attitudes about walking and bicycling in Maui County</td>
<td>Create a survey geared specifically toward attitudes of cyclists and pedestrians.</td>
<td>Increase in positive attitudes about walking and bicycling; and about walking and bicycling facilities.</td>
</tr>
<tr>
<td>Number of miles of bike paths, lanes and routes within Central Maui</td>
<td>Class 1 Bike Paths – xx.x miles Class 2 Bike Lanes – xx.x miles Class 3 Bike Routes – xx.x miles</td>
<td>Increase in bicycle facilities. (list the total amount of proposed facilities)</td>
</tr>
<tr>
<td>Proportion of Arterial Streets with Bike Lanes</td>
<td>Establish benchmark data with County roadway records</td>
<td>Within 5 years increase in the proportion of arterial streets with bicycle facilities. Suggested target of 25 to spur greater bicycle commuting.</td>
</tr>
<tr>
<td>Independent recognition of Non-Motorized Transportation Planning Efforts</td>
<td>No bicycle awards to date.</td>
<td>Independent recognition of efforts to promote biking within 3 years. League of American Bicyclist's Bronze Award within 8 years and Silver or Gold Award within 18 years.</td>
</tr>
<tr>
<td>Number of collisions involving bicyclists/pedestrians</td>
<td>Year</td>
<td>Crashes</td>
</tr>
<tr>
<td>Year</td>
<td>Crashes</td>
<td>Killed</td>
</tr>
<tr>
<td>2007</td>
<td>29</td>
<td>1</td>
</tr>
<tr>
<td>2008</td>
<td>20</td>
<td>0</td>
</tr>
<tr>
<td>2009</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>2010 (July)</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>Percentage of students within the study area that walk or bike to school on a regular basis.</td>
<td>Establish benchmark data using using bicycle and pedestrian counts and/or survey techniques to measure the percentage of students that walk or bike to school.</td>
<td>Within 5 years increase the percentage of students who walk or bike to school by 30%.</td>
</tr>
</tbody>
</table>
PART VII - Appendix A
~
DESIGN GUIDELINES

CENTRAL MAUI PEDESTRIAN & BICYCLE MASTER PLAN FOR 2030
A world class pedestrian and bicyclist community
1 Introduction

As part of the Healthy Hawaii Initiative, the County of Maui is seeking to expand Central Maui’s pedestrian and bicycle networks to combat health-related effects from sedentary lifestyles and increasing traffic congestion. The purpose of these Design Guidelines is to provide a consistent and comprehensive reference for the implementation of walkway and bikeway networks throughout Central Maui, containing the highest quality standards of pedestrian and bicycle safety, comfort, and convenience.

This document provides non-motorized facility design guidance gathered from national best practices, including standards prescribed by the American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities and Guide for the Planning, Design and Operation of Pedestrian Facilities, and the Manual of Uniform Traffic Control Devices (MUTCD). The standards and guidelines presented by AASHTO and the MUTCD provide basic information about the design of bicycle and pedestrian facilities, such as minimum sidewalk widths, bicycle lane dimensions, striping requirements and recommended signage and pavement markings. Going beyond AASHTO and the MUTCD, this Design Guidelines document also includes recommendations for innovative design treatments that include experimental or nonstandard best practices. A number of emerging treatments that are considered “experimental” are being tested and implemented by communities throughout the US, and many appear promising in improving safety and comfort of bicyclists and pedestrians. Regardless of what is contained in these Design Guidelines, all non-motorized facilities should be designed by a licensed engineer using sound engineering judgment.

1.1 Guiding Principles

The following are guiding principles for these pedestrian and bicycle design guidelines:

- The walking and bicycling environments should be safe. Sidewalks, multi-use trails, crossings, and bicycle routes should be free of hazards and minimize conflicts with external factors, such as noise, vehicular traffic and protruding architectural elements.
- The pedestrian and bicycle network should be accessible. Sidewalks, multi-use trails, and crosswalks should ensure the mobility of all users by accommodating the needs of people regardless of age or ability. Bicyclists have a range of skill levels. Facilities should have designs that can accommodate experienced cyclists at a minimum, with a goal of providing for inexperienced and/or recreational bicyclists, especially children and seniors, to the greatest extent possible. In areas with specific needs (e.g. schools), improvements should accommodate the needs of the target bicyclist population.
- The pedestrian and bicycle network should connect to places people want to go. The pedestrian and bicycle network should provide continuous direct routes and convenient connections between destinations, including homes, schools, shopping areas, public services, recreational opportunities and transit.
- The walking and bicycling environment should be clear and easy to use. Sidewalks, multi-use trails, and crossings should allow all people to easily find a direct route to a destination with minimal delays, regardless of whether these persons have mobility, sensory, and cognitive disability impairments. All roads in Central Maui are legal for the use of bicyclists. Therefore, most streets are bicycle facilities, and should be designed, marked, and maintained accordingly.
- The walking and bicycling environment should provide good places. Good design should integrate with, and support the development of, complementary uses, and should encourage preservation and construction of art, landscaping and other items that add value to public ways. These components might include open spaces such as plazas, courtyards, and squares and amenities including street furniture, banners, art, plantings and special paving, which, along with historical elements and cultural references, should promote a sense of place. Public activities should be encouraged. The municipal code should permit commercial activities such as dining, vending, and advertising when they do not interfere with safety and accessibility. A complete network of on-street bicycling facilities should connect
DESIGN GUIDELINES

seamlessly to the existing and proposed multi-use trails to complete recre-

ational and commuting routes around Central Maui.

• Bicycle and pedestrian improvements should be economical. Bicycle and
pedestrian improvements should achieve the maximum benefit for their
cost, including initial cost and maintenance cost, as well as reduced reli-
ance on more expensive modes of transportation. Where possible, improve-
ments in the right-of-way should stimulate, reinforce and connect with
adjacent private improvements.

• Design guidelines are flexible and can be applied with professional judg-
ment by designers. This document references specific national guidelines
for bicycle and pedestrian facility design, as well as a number of design
treatments not specifically covered under current guidelines. Statutory
and regulatory guidance may change. For this reason, among others, the
guidance and recommendations in this document complement the other
resources considered during the design process, and in all cases sound
engineering judgment must be used.

1.2 Design References

The basic bicycle and pedestrian design principals outlined in this chapter
are derived from the documents listed below. Many of these documents are
available online and provide a wealth of information and resources to the
public.

**U.S. Federal Guidelines**

• American Association of State Highway and Transportation Officials.
Washington, DC. www.transportation.org

• American Association of State Highway and Transportation Officials.
ington, DC. www.transportation.org

• American Association of State Highway and Transportation Officials.
trian Facilities. Washington, DC. www.transportation.org


• United States Access Board. (2002). Accessibility Guidelines for Build-

**Best Practice Documents**

• Alta Planning + Design and the Initiative for Bicycle & Pedestrian Innova-
http://www.ibpi.usp.pdx.edu/media/BicycleBoulevardGuidebook.pdf

www.altaplanning.com/App_Content/files/pres_stud_docs/Cycle%20Track%20lessons%20learned.pdf

• Association of Pedestrian and Bicycle Professionals (APBP). (2010). Bicycle

• City of Chicago and the Pedestrian and Bicycle Information Center (PBIC).

• City of Portland Bureau of Transportation. (2010). Portland Bicycle Master

• Federal Highway Administration. (2005). BIKESAFE: Bicycle Countermea-


• Federal Highway Administration. (2005). Report HRT-04-100, Safety
Effects of Marked Versus Unmarked Crosswalks at Uncontrolled Loca-

• Federal Highway Administration. (2001). Designing Sidewalks and Trails

• King, Michael, for the Pedestrian and Bicycle Information Center. (2002).


2 Bicycle as a Design Vehicle

The purpose of this section is to provide the facility designer with an understanding of how cyclists operate and how their bicycle influences that operation. Cyclists, by nature, are much more sensitive to poor facility design, construction and maintenance than motor vehicle drivers. Cyclists lack the protection from the elements and roadway hazards provided by an automobile’s structure and safety features. By understanding the unique characteristics and needs of cyclists, the facility designer can provide the highest quality facilities and minimize risk to the cyclists using them.

2.1 Dimensions

Similar to motor vehicles, cyclists and their bicycles come in a variety of sizes and configurations. This variation can occur in the types of vehicle (such as a conventional bicycle, a recumbent bicycle, or a tricycle), and behavioral characteristics (such as the comfort level of the cyclist). Any bikeway undergoing design should consider reasonably expected bicycle types on the facility and design with that set of critical dimensions in mind.

Figure 2.1 shows the operating space and physical dimensions of a typical adult cyclist, which is the basis for typical facility design. The cyclist requires clear space to operate within a facility; this is why the minimum operating width is greater than the physical dimensions of the cyclist. Cyclists prefer five feet or
more operating width, although four feet is minimally acceptable.

Outside the design dimensions of a typical bicycle, there are many commonly used pedal-driven cycles and accessories to consider when planning and designing bicycle facilities. The most common types include tandem bicycles, recumbent bicycles, and trailer accessories. Figure 2.2 and Table 2.1 summarizes the typical dimensions for typical bicycle designs.

Table 2.1 Bicycle as Design Vehicle, Typical Dimensions

<table>
<thead>
<tr>
<th>Bicycle Type</th>
<th>Feature</th>
<th>Typical Dimensions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upright Adult Cyclist</td>
<td>Physical width</td>
<td>2 ft 6 in</td>
</tr>
<tr>
<td></td>
<td>Operating width (Minimum)</td>
<td>4 ft</td>
</tr>
<tr>
<td></td>
<td>Operating width (Preferred)</td>
<td>5 ft</td>
</tr>
<tr>
<td></td>
<td>Physical length</td>
<td>5 ft 10 in</td>
</tr>
<tr>
<td></td>
<td>Physical height of handlebars</td>
<td>3 ft 8 in</td>
</tr>
<tr>
<td></td>
<td>Operating height</td>
<td>8 ft 4 in</td>
</tr>
<tr>
<td></td>
<td>Eye height</td>
<td>5 ft</td>
</tr>
<tr>
<td></td>
<td>Vertical clearance to obstructions (tunnel height, lighting, etc)</td>
<td>10 ft</td>
</tr>
<tr>
<td></td>
<td>Approximate center of gravity</td>
<td>2 ft 9 in to 3 ft 4 in</td>
</tr>
<tr>
<td>Recumbent Cyclist</td>
<td>Physical length</td>
<td>8 ft</td>
</tr>
<tr>
<td></td>
<td>Eye height</td>
<td>3 ft 10 in</td>
</tr>
<tr>
<td>Tandem Cyclist</td>
<td>Physical length</td>
<td>8 ft</td>
</tr>
<tr>
<td>Cyclist with child trailer</td>
<td>Physical length</td>
<td>10 ft</td>
</tr>
<tr>
<td></td>
<td>Physical width</td>
<td>2 ft 6 in</td>
</tr>
</tbody>
</table>

Table 2.2 Bicycle as Design Vehicle, Design Speed Expectations

<table>
<thead>
<tr>
<th>Bicycle Type</th>
<th>Feature</th>
<th>Typical Speed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upright Adult Cyclist</td>
<td>Paved level surfacing</td>
<td>15 mph</td>
</tr>
<tr>
<td></td>
<td>Crossing Intersections</td>
<td>10 mph</td>
</tr>
<tr>
<td></td>
<td>Downhill</td>
<td>30 mph</td>
</tr>
<tr>
<td></td>
<td>Uphill</td>
<td>5-12 mph</td>
</tr>
<tr>
<td>Recumbent Cyclist</td>
<td>Paved level surfacing</td>
<td>18 mph</td>
</tr>
</tbody>
</table>

The expected speed that various types of cyclists can maintain under various conditions can also influence the design of facilities such as shared use paths.

Table 2.2 provides typical cyclist speeds for a variety of conditions.
2.2 Types of Cyclists

It is important to consider bicyclists of all skill levels in creating a non-motorized plan. Cyclist skill level greatly influences expected speeds and behavior, both in separated bikeways and on shared roadways. Bicycle infrastructure should accommodate as many user types as possible, with decisions for separate or parallel facilities based on providing a comfortable experience for the greatest number of bicyclists.

The bicycle planning and engineering professions currently use several systems to classify bicyclists, which can assist in understanding the characteristics and infrastructure preferences of different bicyclists. Supported by data collected nationally since 2006, planners developed the following alternative categories to address the Americans’ ‘varying attitudes’ towards bicycling:

- **Strong and Fearless (Very low percentage of population)** – Characterized by bicyclists that will typically ride anywhere regardless of roadway conditions or weather. These bicyclists can ride faster than other user types, prefer direct routes and will typically choose roadway connections – even if shared with vehicles – over separate bicycle facilities such as multi-use trails.

- **Enthused and Confident (5-10% of population)** – This user group encompasses the ‘intermediate’ cyclists who are mostly comfortable riding on all types of bicycle facilities but will usually prefer low traffic streets or multi-use trails when available. These cyclists may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of cyclists including commuters, recreationalists, racers, and utilitarian cyclists.

- **Interested but concerned (60%)**

- **No way, no how (33%)**

---

**Figure 2.3 Bicyclist Types**
3 Types of Pedestrians

Similar to cyclists, pedestrians have a variety of characteristics and the transportation network should accommodate a variety of needs, abilities, and possible impairments. Age is one major factor that affects pedestrians’ physical characteristics, walking speed, and environmental perception. Children have limited vision due to their height, and they walk at slower speeds than adults walk. They also perceive the environment differently at various stages of their cognitive development. Older adults walk more slowly and may require assistive devices for walking stability, sight, and hearing.

Table 3.1 summarizes common pedestrian characteristics for various age groups.

The MUTCD recommends a normal walking speed of four feet per second when calculating the pedestrian clearance interval at traffic signals. The walking speed can drop to three feet per second for areas with older populations and persons with mobility impairments.

While the type and degree of mobility impairment varies greatly across the population, the transportation system should accommodate these users to the greatest reasonable extent.

Table 3.2 summarizes common physical and cognitive impairments, how they affect personal mobility, and recommendations for improved pedestrian-friendly design.

• Interested but Concerned (approximately 60% of population) – This user type makes up the bulk of the cycling population and represents cyclists who typically only ride a bicycle on low traffic streets or multi-use trails under favorable conditions and weather. These cyclists perceive significant barriers towards increased use of cycling, specifically traffic and other safety issues. These cyclists may become “Enthused & Confident” with encouragement, education and experience.

• No Way, No How (approximately 30% of population) – Persons in this category are not cyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually give cycling a second look and may progress to the user types above. A significant portion of these people will never ride a bicycle under any circumstances.
### Table 3.1 Pedestrian Characteristics by Age

<table>
<thead>
<tr>
<th>Age</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-4</td>
<td>• Learning to walk&lt;br&gt;• Requires constant adult supervision&lt;br&gt;• Developing peripheral vision and depth perception</td>
</tr>
<tr>
<td>5-8</td>
<td>• Increasing independence, but still requires supervision&lt;br&gt;• Poor depth perception</td>
</tr>
<tr>
<td>9-13</td>
<td>• Susceptible to “dart out” intersection dash&lt;br&gt;• Poor judgment&lt;br&gt;• Sense of invulnerability</td>
</tr>
<tr>
<td>14-18</td>
<td>• Improved awareness of traffic environment&lt;br&gt;• Poor judgment</td>
</tr>
<tr>
<td>19-40</td>
<td>• Active, fully aware of traffic environment</td>
</tr>
<tr>
<td>41-65</td>
<td>• Slowing of reflexes</td>
</tr>
<tr>
<td>65+</td>
<td>• Difficulty crossing street&lt;br&gt;• Vision loss&lt;br&gt;• Difficulty hearing vehicles approaching from behind</td>
</tr>
</tbody>
</table>

### Table 3.2 Disabled Pedestrian Design Considerations

<table>
<thead>
<tr>
<th>Impairment</th>
<th>Effect on Mobility</th>
<th>Design Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheelchair and Scooter Users</td>
<td>Difficulty propelling over uneven or soft surfaces.</td>
<td>Firm, stable surfaces and structures, including ramps or beveled edges.</td>
</tr>
<tr>
<td></td>
<td>Cross-slopes cause wheelchairs to veer downhill.</td>
<td>Cross-slopes to less than two percent.</td>
</tr>
<tr>
<td></td>
<td>Require wider path of travel.</td>
<td>Sufficient width and maneuvering space.</td>
</tr>
<tr>
<td>Walking Aid Users</td>
<td>Difficulty negotiating steep grades and cross slopes; decreased stability.</td>
<td>Smooth, non-slippery travel surface.</td>
</tr>
<tr>
<td></td>
<td>Slower walking speed and reduced endurance; reduced ability to react.</td>
<td>Longer pedestrian signal cycles, shorter crossing distances, median refuges, and street furniture.</td>
</tr>
<tr>
<td>Hearing Impairment</td>
<td>Less able to detect oncoming hazards at locations with limited sight lines (e.g. driveways, angled intersections, right-turn slip lanes) and complex intersections.</td>
<td>Longer pedestrian signal cycles, clear sight distances, highly visible pedestrian signals and markings.</td>
</tr>
<tr>
<td>Vision Impairment</td>
<td>Limited perception of path ahead and obstacles</td>
<td>Accessible text (larger print and raised text), accessible pedestrian signals (APS), guide strips and detectible warning surfaces, safety barriers, and lighting.</td>
</tr>
<tr>
<td></td>
<td>Reliance on memory</td>
<td>–</td>
</tr>
<tr>
<td></td>
<td>Reliance on non-visual indicators (e.g. sound and texture)</td>
<td>–</td>
</tr>
<tr>
<td>Cognitive Impairment</td>
<td>Varies greatly. Can affect ability to perceive, recognize, understand, interpret, and respond to information.</td>
<td>Signs with pictures, universal symbols, and colors, rather than text.</td>
</tr>
</tbody>
</table>
4 Bicycle Facility Design Guide

This section summarizes the bicycle facility selection typology developed for the Central Maui Pedestrian & Bicycle Master Plan for 2030. The specific facility type that the County should provide depends on the surrounding environment (e.g. auto speed and volume, topography, and adjacent land use) and expected cyclist needs (e.g. cyclists commuting on a highway versus students riding to school on residential streets).

4.1 Facility Selection Guidelines

There are no ‘hard and fast’ rules for determining the most appropriate type of bicycle facility for a particular location – roadway speeds, volumes, right-of-way width, presence of parking, adjacent land uses, and expected bicycle user types are critical elements of this decision. Studies find that the most significant factors influencing bicycle use are motor vehicle traffic volumes and speeds. They also found that most cyclists prefer facilities separated from motor vehicle traffic or located on local roads with low motor vehicle traffic speeds and volumes. Because off-street pathways have a physical separation from the roadway, they are perceived as safe and attractive routes for cyclists who prefer to avoid motor vehicle traffic. Consistent use of treatments and application of bikeway facilities allows users to anticipate whether they would feel comfortable riding on a particular facility, and plan their trips accordingly. This section provides guidance on various factors that affect what type of facilities to provide.

4.1.1 Facility Classification

Consistent with bicycle facility classifications throughout the nation, the Design Guide identifies the following classes of facilities by user type: Figure 4.1 illustrates the different facility attributes.

- Shared Roadways are roadways without an official bikeway designation that permit bicycle traffic. Most bicycle travel in the United States occurs on streets and highways without bikeway designations.
• Signed Shared Roadways are designated by bike route signs and serve either to:
  • Provide continuity to other bicycle facilities (usually Bike Lanes); or
  • Designate preferred routes through high-demand corridors
• Bike Lanes use signage and striping to delineate the right-of-way assigned to bicyclists and motorists on mixed-flow roadways. Bike lanes encourage predictable movements by cyclists and motorists.
• Shared Use Paths are facilities for cyclists and pedestrians separated from roadways carrying auto traffic.

4.1.2 Roadway Context

Context describes conditions on the roadway. Many roadway factors impact the experience of cycling; automobile speeds and volumes, presence of heavy vehicles, trucks, or transit vehicles, roadway width, visibility, adjacent land uses, and urban or rural context all contribute to the context of a bikeway. While all these factors are important, the major indicators of the context are automobile speed and volume.

In addition, urban or rural context affects engineering treatments appropriate on a particular roadway. Roadway classification indicates many of these context issues and provides guidance for what types of bikeway facilities are appropriate.

Table 4.1 summarizes general roadway classification attributes.

<table>
<thead>
<tr>
<th>Road Class</th>
<th>Definition</th>
<th>Posted Speeds</th>
<th>Average Daily Traffic Volumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highway</td>
<td>Controlled access, typically divided carriageway/ a primary or secondary provincial highway, may be single or multilane each way</td>
<td>45-65 mph</td>
<td>&gt;7500 veh/ln</td>
</tr>
<tr>
<td>Arterial</td>
<td>A thoroughfare with a generally large traffic capacity, generally multilane each way</td>
<td>35-55 mph</td>
<td>4000 – 7500 veh/ln</td>
</tr>
<tr>
<td>Collector</td>
<td>A road to collect traffic from areas and/or to cross town with the general right of way, generally one lane each way</td>
<td>30-45 mph</td>
<td>1000-5000 veh/ln</td>
</tr>
<tr>
<td>Local</td>
<td>Local, residential roads</td>
<td>10-30 mph</td>
<td>&lt;1000 veh/ln</td>
</tr>
</tbody>
</table>

While this dataset is a useful first step in facility selection, additional engineering judgment should be applied when selecting bicycle facilities appropriate to a particular roadway.

4.1.3 Facility Continuum

The following figures show the range of bicycle facilities applicable for various roadway environments, based on the roadway type and desired degree of separation. Engineering judgment, traffic studies, previous municipal planning efforts, community input, and local context should refine facility recommendations for a particular street. In some corridors, it may be desirable to construct facilities to a higher level of development than those recommended in this Plan, to enhance user safety and comfort. In other cases, existing and/or future motor vehicle speeds and volumes may not justify the recommended level of separation, and a lesser treatment may be acceptable.
Bikeway Continuum on Arterial Street without Curb and Gutter

Least protected (Class III Facilities)

- Shared Lane
- Marked Curb Lane
- Shoulder Bikeway
- Wide Shoulder Bikeway
- Cycle Track: protected with barrier
- Cycle Track: two-way, curb separated

Most protected (Class I Facilities)

- No special accommodation for bicyclists
- Not comfortable for many cyclists
- Visibly reminds motorists to expect bicyclists on the roadway
- Provides small cushion of space to mitigate friction with motor vehicles
- Increases motorist shy distance from cyclists sharing a lane
- Not comfortable for many cyclists
- Increases safety and promotes proper riding
- Reduces possibility that motorists will stray into bicyclists' path
- Visual reminder of bicyclists' right to the road
- Can include pavement markings and signs
- Increases motorist shy distance from cyclists in the shoulder bikeway more than a conventional shoulder
- Enables cyclists to pass one another and avoid obstacles without encroaching into the travel lane
- Shoulder bikeways wider than 3.0m may encourage vehicle cycling or traveling in the lane
- Best used on roads with long distances between intersections and driveways
- Innovative bicycle-friendly design needed at intersections to reduce conflicts between turning motorists and bicyclists
- Maintenance of the cycle track requires specialized sweepers
- Sufficient separation between cyclists in cycle track and vehicles in the roadway
- Where cyclists may enter or leave the cycle track, or where motorists cross at a driveway, the curb should be mountable with a small 45 degree ramp, allowing cyclist turning movements
- Provide safe transitions to bike lanes or popular destinations to reduce wrong-side riding

Figure 4.2 Continuum of Bikeway Facilities on Arterials / Highways without Curb and Gutter
### Arterial/Highway Bikeway Continuum (with curb and gutter)

#### Least protected (Class III) Facilities
- **Wide Curb Lane: SLM**
- **Conventional Bicycle Lane**
- **Buffered Bicycle Lane**
- **Cycle Track: at-grade, protected, with parking**
- **Cycle Track: protected with barrier**
- **Cycle Track: curb separated**

<table>
<thead>
<tr>
<th>Wide Curb Lane: SLM</th>
<th>Conventional Bicycle Lane</th>
<th>Buffered Bicycle Lane</th>
<th>Cycle Track: at-grade, protected, with parking</th>
<th>Cycle Track: protected with barrier</th>
<th>Cycle Track: curb separated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Travel Lane 3’</td>
<td>Travel Lane 5-7’</td>
<td>Travel Lane 2’ 6’</td>
<td>Travel Lane 3’ 5-7’</td>
<td>Travel Lane 3’ 5-7’</td>
<td>Travel Lane 3’ 5-7’</td>
</tr>
</tbody>
</table>

- Increases safety and promotes proper riding
- Reduces possibility that motorists will stray into bicyclists’ path
- Visual reminder of bicyclists’ right to the road
- Dedicated space for cyclists increases comfort and safety of cyclists
- Cyclists must encroach into the travel lane to pass one another
- Bike lanes wider than 2.1m may encourage vehicle loading in bike lane
- Provides cushion of space to mitigate friction with motor vehicles on streets with narrow bike lanes
- Allows cyclists to pass one another without encroaching into the travel lane
- Increases motorist shy distance from cyclists in the bike lane
- Requires additional roadway space and maintenance
- Dedicates and protects space for bicyclists and improves perceived comfort and safety
- Reduces risk of ‘dooring’ compared to a bike lane, and eliminates the risk of a doored cyclist being run over by a motor vehicle
- Low implementation cost through use of existing pavement using parking lane as a barrier
- Apply along roadways with high motor vehicle volumes and/or speeds
- Best on streets with parking lanes that stay mostly occupied
- Provides similar benefits as a cycle track with an on-street parking buffer
- Best used on roads with high speeds and long distances between intersections and driveways
- Innovative bicycle-friendly design needed at intersections to reduce conflicts between turning motorists and bicyclists
- Maintenance of the cycle track requires specialized sweepers
- Width should never be taken from the pedestrian zone to make room for a cycle track
- Cycle track should be two or three inches above street level, and the sidewalk should be an additional two to three inches above that
- Change in level clearly demarcates space for different users and reducing conflicts between bicyclists and pedestrians
- Where cyclists may enter or leave the cycle track, or where motorists cross at a driveway, the curb should be mountable with a small 45 degree ramp, allowing cyclist turning movements

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**Figure 4.3 Continuum of Bikeway Facilities on Arterials / Highways with Curb and Gutter**

**Central Maui Pedestrian & Bicycle Master Plan for 2030**

A world class pedestrian and bicyclist community
**Collector Bikeway Continuum**

<table>
<thead>
<tr>
<th>Continuum</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shared Lane</td>
<td>No specific bicycle accommodation</td>
</tr>
<tr>
<td>Marked Wide Curb Lane</td>
<td>Increases safety and promotes proper riding</td>
</tr>
<tr>
<td>Conventional Bicycle Lane</td>
<td>Increases safety and promotes proper riding</td>
</tr>
<tr>
<td>Wide Bicycle Lane</td>
<td>Increases motorist shy distance from cyclists in the bike lane more than a conventional bike lane</td>
</tr>
<tr>
<td>Buffered Bicycle Lane</td>
<td>Provides cushion of space to mitigate friction with motor vehicles on streets with narrow bike lanes</td>
</tr>
</tbody>
</table>

- Increases possibility that motorists will stray into bicyclists’ path
- Visual reminder of bicyclists’ right to the road
- Can be used with on-street parking; place 3.4 m from curb where parking is present
- Visual reminder of bicyclists’ right to the road
- Can be curb-tight or adjacent to on-street parking. Where parking is permitted, the lane should be at least 1.5 m due to conflicts with car doors
- Enables cyclists to pass one another without encroaching into the travel lane
- Bike lanes wider than 2.1 m may encourage vehicle loading in bike lane
- Allows cyclists to pass one another without encroaching into the travel lane
- Increases motorist shy distance from cyclists in the bike lane
- Requires additional roadway space and maintenance

Figure 4.4 Continuum of Bikeway Facilities on Collector Streets
4.2 Bicycle Paths

Design Summary

Width:
- Minimum for a two-way shared-use path (only recommended for low traffic situations): 10'
- Recommended for high-use areas with multiple users such as joggers, bicyclists, in-line skaters, and pedestrians: 12’ or greater
- Lateral clearance: 2’ or greater shoulder on both sides.
- Overhead clearance: 8’ minimum, 10’ recommended.
- Maximum design speed for shared-use paths: 20 mph. Speed bumps or other surface irregularities should not be used to slow bicycles.

Grade:
- Recommended maximum: 5%
- Steeper grades can be tolerated for a maximum of 500 feet

Discussion

Shared-use paths should provide a hard surface. Concrete, while more expensive than asphalt, is the hardest of all shared-use path surfaces and lasts the longest. Joggers and runners prefer surfaces such as asphalt or decomposed granite due to its relative “softness”. While most asphalt is black, dyes and pigments can increase the aesthetic value of the path surface. When using concrete, the path should be designed and installed using the narrowest possible expansion joints to minimize the amount of ‘bumping’ cyclists experience on the path.

Guidance

- FHWA. Designing Sidewalks and Trails for Access.
4.3 Bike Lanes

Design Summary
Designated exclusively for bicycle travel, bike lanes are separated from vehicle travel lanes with striping, and include pavement stencils. Bike lanes are most appropriate on arterial and collector streets where higher traffic volumes and speeds warrant greater separation.

AASHTO and other guidance recommend a five-foot minimum for bike lanes, with four feet only in restricted corridors.

Discussion
Commuter and other types of bicyclists have stated their preference for marked on-street bike lanes in numerous national surveys. Many bicyclists, particularly less experienced riders, become more comfortable riding on a busy street if it has a striped and signed bike lane than if they are expected to share a wide lane. Providing marked facilities such as bike lanes is one way of helping to persuade tentative riders to try bicycling.

Bike lanes can increase safety and promote proper riding by:

- Defining road space for bicyclists and motorists, reducing the possibility that motorists will stray into the cyclists’ path
- Discouraging bicyclists from riding on the sidewalk
- Reminding motorists that cyclists have a right to the road.

In an urban setting, it is crucial to ensure that bike lanes and adjacent parking lanes have sufficient width, so that cyclists have enough room to avoid a suddenly opened vehicle door.

Additional Guidance
The AASHTO Guide for the Development of Bicycle Facilities guideline states, “if used, the bicycle lane symbol marking shall be placed immediately after an intersection and other locations as needed… If the word or symbol pavement markings are used, Bicycle Lane signs shall also be used, but the signs need not be adjacent to every symbol to avoid overuse of the signs.”
4.3.1 Bike Lane Adjacent to On-Street Parallel Parking

Design Summary

- Bike Lane Width:
  - 4’ minimum in constrained locations.
  - 5’ acceptable for streets with unmarked parking.
  - 6’ recommended when adjacent to marked parking stalls.
  - 7’ maximum. Greater widths may encourage vehicle loading in bike lane.

Discussion

Bike lanes adjacent to on-street parallel parking require special treatment to avoid crashes caused by a suddenly opened vehicle door. The bike lane should have sufficient width to allow cyclists to stay out of the door zone, while not encroaching into the adjacent vehicular lane. Parking stall markings, such as “Parking ‘Ts’” and diagonal stripes, are common treatments to indicate proper placement within the bike lane.

Bike lanes adjacent to on-street parallel parking should remain below 7’ wide to discourage motorists from encroaching into the lane, particularly as a travel lane or loading/unloading zone.

Some treatments to encourage bicyclists to ride away from the ‘door zone’ include:

- Installing parking “Ts” and smaller bike lane stencils placed to the left.
- Using diagonal stripes to encourage cyclists to ride on the left side of the bike lane (this treatment is not standard and should be studied before use).
- Provide a buffer zone (preferred design). Bicyclists traveling in the center of the bike lane will be less likely to encounter open car doors. Motorists have space to stand outside the bike lane when loading and unloading.
**Guidance**

AASHTO Guide for the Development of Bicycle Facilities states, “If parking is permitted, the bike lane should be placed between the parking area and the travel lane and have a minimum width of 5’. With streets with unmarked parking stalls, the shared area should be a minimum of 11’ when without a curb face and 12’ when adjacent to a curb face. If the parking volume is substantial or turnover is high, an additional 1’- 2’ of width is desirable.”

### 4.3.2 Bike Lane Without On-Street Parking

**Design Summary**

- **Bike Lane Width:**
  - 4’ minimum when not adjacent to curb and gutter.
  - 5’ minimum when adjacent to curb and gutter, assuming the gutter pan is 2’ wide.
  - 6’ recommended design.
  - 8’ maximum when adjacent to arterials with high travel speeds (45 mph+)

**Discussion**

Wider bike lanes are desirable in certain circumstances such as on higher speed arterials (45 mph+) where a wider bike lane can increase separation between passing vehicles and cyclists. Wide bike lanes are also appropriate in areas with high bicycle use. A bike lane width of six to eight feet makes it possible for bicyclists to ride side-by-side or pass each other without leaving the bike lane, increasing the capacity of the lane. Appropriate signing and stenciling is important with wide bike lanes to ensure motorists do not mistake the lane for a vehicle lane or parking lane.
4.3.3 Innovative Treatments

4.3.3.1 Bike Box

Design Summary

- Bike Box Dimensions:
  - 14’ deep to allow for bicycle positioning.
- Signage:
  - Appropriate signage as recommended by the MUTCD applies. Signage should be present to prohibit ‘right turn on red’ and to indicate where the motorist must stop.

Discussion

A bike box is generally a right angle extension of a bike lane at the head of a signalized intersection. The bike box allows bicyclists to move to the front of the traffic queue on a red light and proceed first when that signal turns green. Motor vehicles must stop behind the white stop line at the rear of the bike box.

Bike boxes can combine with dashed lines through the intersection for green light situations to remind right-turning motorists to be aware of bicyclists traveling straight, similar to the colored bike lane treatment described in 4.3.3.3. Bike boxes can be striping only or use colored treatments to increase visibility. Use of coloration substantially increases costs of maintenance over uncolored (striping, bicycle symbol, and text only) treatments.

Bike boxes should occur at signalized intersections only, and right turns on red should be prohibited. Bike boxes should be used at locations that have a large volume of cyclists, and are often utilized in central areas where traffic is usually moving slowly. Reducing right turns on red improves safety for cyclists and does not significantly impede motor vehicle travel.

On roadways with one travel lane in each direction, the bike box also facilitates left turning movements for cyclists.

Guidance

Evaluation of Innovative Bike-Box Application in Eugene, Oregon, Author: Hunter, W.W., 2000

Bike boxes have been installed at several intersections in Portland, OR where right-turning motorists conflict with through bicyclists.
**DESIGN GUIDELINES**

4.3.3.2 Shared Bike/Right Turn Lane

*Design Summary*
- **Width:**
  - Shared turn lane – min. 12’ width.
  - Bike lane pocket – min. 4’-5’ preferred.

*Discussion*
This treatment is recommended at intersections lacking sufficient space to accommodate a standard bike lane and right turn lane. The shared bicycle/right turn lane places a standard-width bike lane on the left side of a dedicated right turn lane. A dashed strip delineates the space for bicyclists and motorists within the shared lane. This treatment includes signage advising motorists and bicyclists of proper positioning within the lane.

Case studies cited by the Pedestrian and Bicycle Information Center indicate that this treatment works best on streets with lower posted speeds (30 mph or less) and with lower traffic volumes (10,000 ADT or less).

**Advantages:**
- Aids in correct positioning of cyclists at intersections with a dedicated right turn lane, but without a dedicated bike lane.
- Encourages motorists to yield to bicyclists when using the right turn lane.
- Reduces motor vehicle speed within the right turn lane.

**Disadvantages/potential hazards:**
- May not be appropriate for high-speed arterials or intersections with long right turn lanes.
- May not be appropriate for intersections with large percentages of right-turning heavy vehicles.

*Guidance*
This treatment has coverage in the draft 2009 AASHTO Guide For the Development of Bicycle Facilities. It has been previously implemented in the Cities of San Francisco, CA and Eugene, OR.
4.3.3.3 Colored Bike Lanes

Design Summary

- Bike lane pocket – min. 4’-5’ preferred.
- Use colored pavement through entire merge area.
- Dashed lines can be used to indicate that automobiles are crossing the bike lane.
- Signage reminds drivers to yield to cyclists in the bike lane.

Discussion

Cyclists are especially vulnerable at locations where the volume of conflicting vehicle traffic is high, and where the vehicle/bicycle conflict area is long. Some cities are using colored bike lanes to guide cyclists through major vehicle/bicycle conflict points. These conflict areas are locations where motorists and cyclists must cross each other’s path (e.g., at intersections or merge areas). Colored bike lanes typically extend through the entire bicycle/vehicle conflict zone (e.g., through the entire intersection, or through the transition zone where motorists cross a bike lane to enter a dedicated right turn lane).

There are three colors commonly used in bike lanes: blue, green, and red. Several cities initially used blue; however, this color is associated with amenities for handicapped drivers or pedestrians. Green is becoming the recommended color for bike lane treatments.

Advantages:

- Draws attention to conflict areas
- Increases motorist yielding behavior
- Emphasizes expectation of bicyclists on the road

Guidance

The FHWA recently issued interim approval for optional use of green colored pavement in bike lanes.

Cities that implemented green bikes lanes on an experimental basis include Portland, OR, Philadelphia, PA, Cambridge, MA, Toronto, Ontario, Vancouver, BC and Tempe, AZ. Portland’s Blue Bike Lane report found that significantly more motorists yielded to bicyclists and slowed or stopped before entering the conflict area after the application of the colored pavement.

Additional information available in Portland’s Blue Bike Lanes: Improved Safety through Enhanced Visibility, Portland Office of Transportation (1999), www.portlandonline.com/shared/cfm/image.cfm?id=58842
4.3.3.4 Buffered Bike Lanes

**Design Summary**
- Guidelines for buffer width varies:
  - Provides a space cushion to mitigate friction with motor vehicles.
  - 2.6 feet/80 cm (London and Brussels)
  - 1.6-2.5 feet/50-75 cm (CROW Guide)
  - 6 feet (Portland, OR)

**Discussion**
Bike lanes on high-volume or high-speed roadways can be dangerous or uncomfortable for cyclists, as automobiles pass or are parked too close to bicyclists. Buffered bike lanes increase the space between the bike lanes, the travel lane, or parked cars. This treatment is appropriate on bike lanes with high automobile traffic volumes and speed, bike lanes adjacent to parked cars, and bike lanes with a high volume of truck or oversized vehicle traffic. Frequency of right turns by motor vehicles at major intersections should determine whether continuous or truncated buffer striping should be used approaching the intersection.

**Advantages:**
- Provides a space cushion to mitigate friction with motor vehicles.
- Provides space for cyclists to pass one another without encroaching into the travel lane.
- Provides space for cyclists to avoid potential obstacles in the bike lanes, including drainage inlets, manholes, trashcans or debris.
- Parking side buffer provides cyclists with space to avoid the ‘door zone’ of parked cars.
- Provides motorists greater shy distances from cyclists in the bike lane.

**Disadvantages / potential hazards**
- Requires additional roadway space.
- Requires additional maintenance for the buffer striping.
- Frequency of parking turnover should be considered prior to installing buffered bike lanes.

**Guidance**
MUTCD guidelines for buffered preferential lanes (Section 3D-01) permit buffered bike lanes. The City of Portland, OR included this treatment in the Bikeway Design Best Practices for the 2030 Bicycle Master Plan. Buffered bike lanes are currently also used in Seattle, WA, San Francisco, CA, and New York, NY.
4.3.4 Retrofitting Existing Streets with Bike Lanes

Major streets in Central Maui that have high vehicle speeds and volumes are good candidates for retrofitting with dedicated bike lanes, which will improve cyclists’ comfort and safety.

Although opportunities to add bike lanes through roadway widening may exist in some locations, most major streets in Central Maui pose physical and other constraints requiring street retrofit measures within existing curb-to-curb widths. As a result, many of the recommended measures effectively reallocate existing street width through striping modifications to accommodate dedicated bike lanes. While largely intended for major streets, these measures may be appropriate on some lower-order streets where bike lanes would best accommodate cyclists.

4.3.4.1 Roadway Widening

Design Summary

- Bike Lane Width:
  - 6’ preferred.
  - 4’ minimum (see bike lane guidance).

Discussion

The County can add bike lanes on streets with excess right-of-way through shoulder widening. Although street widening incurs higher expenses compared with re-stripping projects, streets currently lacking curbs, gutters and sidewalks can add bike lanes without the high costs of major infrastructure reconstruction.

As a long-term measure, the County should find opportunities to add bike lanes to other major streets where warranted. Opportunities include adding bike lanes simultaneously during streets and bridges widening projects or as property development necessitates street reconstruction.

Roadway widening is preferred on roads lacking curbs, gutters and sidewalks. Waiale Road, n/o Kuikani Drive.
**DESIGN GUIDELINES**

4.3.4.2 Lane Reconfiguration (Road Diet 1)

**Design Summary**
- Vehicle Lane Widths:
  - Before: 12 to 15 feet; after: 10 to 11 feet.
- Bike Lane Width:
  - See bike lane design guidance.

**Discussion**

Also called a ‘Road Diet’, lane narrowing utilizes roadway space that exceeds minimum standards to create the needed space to provide bike lanes. Most standards allow for the use of 11-foot and sometimes 10-foot wide travel lanes to create space for bike lanes.

Preliminary engineering studies should provide special consideration to the amount of heavy vehicle traffic and horizontal curvature before making a decision to narrow travel lanes. Narrowed center turn lanes can also free up pavement space for bike lanes.

![Example of vehicle travel lane narrowing to accommodate bike lanes.](image)

This street in Portland, Oregon previously had 13’ lanes, which were narrowed to accommodate bike lanes without removing a lane.
4.3.4.3 Lane Reconfiguration (Road Diet 2)

**Design Summary**
- Vehicle Lane Widths:
  - Width depends on project. No narrowing required if a lane is removed.
- Bike Lane Width:
  - See bike lane design guidance.

**Discussion**
The removal of a single travel lane will generally provide sufficient space for bike lanes on both sides of a street. Streets with excess vehicle capacity provide opportunities for bike lane retrofit projects.

Depending on a street’s existing configuration, traffic operations, user needs, and safety concerns, various lane reduction configurations exist. For instance, a four-lane street (with two travel lanes in each direction) could be modified to provide one travel lane in each direction, a center turn lane, and bike lanes. Prior to implementing this measure, a traffic analysis should identify impacts.

This treatment is planned for inclusion in the update to the AASHTO Guide for the Development of Bicycle Facilities.

This road was re-striped to convert four vehicle travel lanes into three travel lanes with bike lanes.

Example of vehicle travel lane reconfiguration to accommodate bike lanes.
4.3.4.4 Parking Reduction (Road Diet 3)

**Design Summary**

- **Vehicle Lane Widths:**
  - Width depends on project. Narrowing may not be needed, depending on the width of the parking lane to be removed.

- **Bike Lane Width:**
  - See bike lane design guidance.

**Discussion**

Bike lanes could replace one or more on-street parking lanes on streets where excess parking exists and/or the importance of bike lanes outweighs parking needs. For instance, parking may be needed on only one side of a street (as shown below and at right). Eliminating or reducing on-street parking also improves sight distance for cyclists in bike lanes and for motorists on approaching side streets and driveways. Prior to reallocating on-street parking for other uses, a parking study should be performed to gauge demand and to evaluate impacts to people with disabilities.

*Some streets may not require parking on both sides.*
4.4 Bicycle Lanes at Roundabouts

Design Summary
- Reduce the speed differential between circulating motorists and bicyclists (25 mph maximum circulating design speed).
- Design approaches/exits to the lowest speeds possible, to reduce the severity of potential collisions with pedestrians.
- Encourage bicyclists navigating the roundabout like motor vehicles to “take the lane.”
- Maximize yielding rate of motorists to pedestrians and bicyclists at crosswalks.
- Provide separated facilities for bicyclists who prefer not to navigate the roundabout on the roadway.
- Indicate to drivers and bicyclists the correct way for them to circulate through the roundabout through appropriately-designed signage, pavement markings and geometric design elements.
- Indicate to drivers, bicyclists and pedestrians the right-of-way rules through appropriately-designed signage, pavement markings and geometric design elements.

Discussion
Research indicates that while single-lane roundabouts may benefit bicyclists and pedestrians by slowing traffic, multi-lane roundabouts may significantly increase safety problems for these users. Multi-lane roundabouts pose the following challenges to bicyclists riding in a bicycle lane:

- Bicyclists must take the lane before they enter the roundabout to avoid becoming caught in a “right hook,” a situation in which a motorist turns right, across the path of a bicyclist traveling straight. Entry leg speeds must be slow enough for bicyclists to be able to take the lane safely.
- Theoretically, once motor vehicle volumes reach a certain magnitude, there are no gaps in traffic large enough to accommodate a bicyclist.
- Bicyclists must be able to correctly judge the speed of circulating motorists to find a gap that is large enough for them to safely enter the roundabout. This task is particularly difficult if the circulating motorists travel much faster than the bicyclists. In addition, if circulating speeds in a roundabout are much higher than 20 mph, drivers behind a bicyclist may become impatient, and may pass the bicyclist and turn in front of him, creating more risks for the bicyclist.
- As a circulating bicyclist approaches an entry lane, a driver waiting to enter must notice the bicyclist, properly judge the bicyclist’s speed, and yield to him/her if necessary. In a location where there are few bicyclists, motorists may not even register that there is a bicyclist approaching. If a bicyclist is hugging the curb, s/he may be outside the motorist’s cone of vision.

Guidance
- TAC Guidelines for the Design and Application of Bikeway Pavement Markings.

Recommended bicycle bypass at roundabout design. Source: TAC Guidelines for the Design and Application of Bikeway Pavement Markings
4.5 Shoulder Bikeways

**Design Summary**
- Rural highway and arterial facilities where bicycling is permitted.
- Minimum 4’ ridable width, excluding the gutter pan.
- Recommended 5’ width from the face of the guardrail, curb, or other roadside barriers. Additional shoulder width desirable if auto speeds exceed 50 mph or roadway carries high truck, bus, and RV volumes.
- See AASHTO Policy on Geometric Design of Streets and Highways for general guidance on shoulder width based on traffic volumes and speed, and heavy vehicle traffic.
- Can include pavement markings and “Share the Road” signage.

**Discussion**
Most appropriate on rural roads with a large shoulder. Due to the speed and heavy vehicle traffic on the adjacent street, shoulder bikeways are most comfortable for commuter and long-distance recreational riders, rather than inexperienced riders.

Although the shoulder width may be sufficient to stripe a bike lane, the facility may need to reserve the shoulder as a break-down area for motor vehicles.

**Guidance**
4.6 Shared Roadway

Design Summary
Any street without specific bicycle facilities that permits bicycling and does not have sufficient width to accommodate bike lanes. Bicyclists must share a travel lane with automobiles. This type of facility can occur on a rural roadway without curb and gutter. They are also appropriate on urban roads with low traffic speeds and volumes.

The standard treatment for Shared Roadways is Bike Route signage. Shared lane markings in addition to signage are a common treatment in higher-traffic locations.

Discussion
High-visibility pavement markings called shared lane markings (“sharrows”) help to position bicyclists within the travel lane. These markings are appropriate for streets without adequate right-of-way for dedicated bike lanes. Shared lane markings placed in the travel lane alert motorists of bicycle traffic, while also encouraging cyclists to ride at an appropriate distance from the “door zone” of adjacent parked cars. Shared lane markings encourage cyclists to ride in a predictable manner. Shared lane markings made of thermoplastic tend to last longer than painted ones.

Guidance
From Federal Highway Administration (2005). BIKESAFE: Bicycle Countermeasure Selection System:

- Desirable width is 14’, not including the gutter pan area. Lanes wider than 14’ sometimes results in two motor vehicles driving side-by-side.
4.7 Bicycle Boulevards

**Design Summary**

“Bicycle Boulevards” are local roads or residential streets enhanced with signage, traffic calming and other treatments to prioritize bicycle travel. Bicycle boulevards are typically found on low-traffic / low-volume streets that can accommodate bicyclists and motorists in the same travel lanes, without specific bicycle lane delineation. Bicycle Boulevards are not defined as a specific bikeway type by AASHTO; however, the basic design features of bicycle boulevards comply with national and state roadway standards.

**Discussion**

Bicycle boulevards serve a variety of purposes:

- Parallel major streets lacking dedicated bicycle facilities – bicycle boulevards serve as alternate parallel facilities that allow cyclists to avoid major streets for longer trips. Children and less-experienced riders might find these environments especially challenging. Utilizing lower-order streets, bicycle boulevards provide alternate route choices for these bicyclists.
- Bike lanes on major streets provide important access to key land uses, and the major street network often provides the most direct routes between major destinations. Bicycle boulevards should complement a bike lane network and not serve as a substitute.
- Ease of implementation on most local streets:
  - Bicycle boulevards incorporate cost-effective and less physically intrusive treatments than bike lanes and cycle tracks.
  - Most streets could accommodate relatively inexpensive treatments like new signage, pavement markings, striping and signal improvements.
- Benefits beyond an improved bicycling environment:
  - Residents living on bicycle boulevards benefit from reduced vehicle speeds and through traffic, creating a safer and more attractive environment.
  - Pedestrians and other users can also benefit from boulevard treatments, such as improved intersection crossings.

Sample bicycle boulevard treatments.
Guidance

Potential Applications
Corridors targeted for higher-level applications would also receive relevant lower-level treatments. For instance, a street targeted for Level 3 applications should also include Level 1 and 2 applications as necessary. Some applications might be appropriate on some streets while inappropriate on others.

In other words, it may not be appropriate or necessary to implement all Level 2 applications on a Level 2 street.

Furthermore, several treatments could fall within multiple categories as they achieve multiple goals. To identify and develop specific treatments for each bicycle boulevard, the County of Maui should involve the bicycling community and neighborhood groups.

Further analysis and engineering work may also be necessary to determine the feasibility of some applications.

The County should strive to implement bicycle boulevards of Level 3 or higher, with additional traffic calming or diversion as needed.

4.7.1 Level 1: Bicycle Boulevard Signing
Signage is a cost-effective yet highly visible treatment that can improve the riding environment on a bicycle boulevard network. The County should adopt consistent signage and paint markings throughout Central Maui.

4.7.1.1 Wayfinding Signs
Wayfinding signs are typically placed at key locations leading to and along bicycle boulevards, including where multiple routes intersect and at key bicyclist “decision points.” Wayfinding signs displaying destinations, distances and “riding time” can dispel common misperceptions about time and distance while increasing users’ comfort and accessibility to the boulevard network.

Wayfinding signs also visually cue motorists that they are driving along a bicycle route and should correspondingly use caution. Note that too many signs tend to clutter the right-of-way, and it is recommended that these signs be posted at a level most visible to bicyclists and pedestrians, rather than per vehicle signage standards.
4.7.1.2 Warning signs
Warning signs advising motorists to “share the road” and “watch for bicyclists” may also improve bicycling conditions on shared streets. These signs are especially useful near major bicycle trip generators such as schools, parks and other activity centers. Warning signs placed on major streets approaching bicycle boulevards can alert motorists of bicyclist crossings.

4.7.2 Level 2: Bicycle Boulevard Pavement Markings
4.7.2.1 On-Street Parking Delineation
Delineating on-street parking spaces with paint or other materials clearly indicates where a vehicle should park, and can discourage motorists from parking their vehicles too far into the adjacent travel lane. This helps cyclists by maintaining a space wide enough to share a travel lane safely with moving vehicles while minimizing the need to swerve farther into the travel lane to maneuver around parked cars.

In addition to benefiting cyclists, delineated parking spaces also promote the efficient use of on-street parking by maximizing the number of spaces in high-demand areas.

4.7.2.2 Bicycle Boulevard/Directional Pavement Markings
Directional pavement markings (also known as “bicycle boulevard markings” or “breadcrumbs”) lead cyclists along a boulevard and reinforce that they are on a designated route. Markings can take a variety of forms, such as small bicycle symbols placed every 600–800 feet along a linear corridor, as currently used on Portland, Oregon’s boulevard network.

When a bicycle boulevard follows several streets (with multiple turns at intersections), additional markings accompanied by directional arrows are provided to guide cyclists through turns and other complex routing areas.

Directional pavement markings also visually cue motorists that they are traveling along a bicycle route and should exercise caution.

4.7.2.3 Shared Lane Markings
Shared lane markings are typical on streets where dedicated bike lanes are desirable but not possible due to physical or other constraints. Such markings delineate specifically where bicyclists should operate within a shared vehicle/bicycle travel lane.

Shared lane markings are appropriate for bicycle boulevard markings. See shared lane marking guidelines for additional information on this treatment.
4.7.3 Level 3: Bicycle Boulevard Intersection Treatments

Design Summary

Intersection treatments represent a critical component of bicycle boulevards. Intersection traffic controls favoring through bicycle movement on the boulevard facilitate continuous and convenient bicycle travel.

Unmarked intersections are dangerous for bicyclists; stops signs on minor cross-streets are a preferred control. Parking could be restricted near corners to increase visibility of cyclists.

Intersection treatments also provide convenient and safe crossings where boulevards intersect major roads. Half-signals or flashing crosswalk lights are appropriate treatments for crossings at major, unsignalized streets. All signalized intersections should include a traffic loop that recognizes bicycles.

The following sections discuss various intersection improvement tools. Guidance is provided from the Berkley Bicycle Boulevard Design Tools and Guidelines.

4.7.3.1 Stop Sign on Cross-Street

The installation of a stop sign on cross streets along the bicycle boulevard maximizes through bicycle connectivity and momentum and forces motorists crossing the facility to stop and proceed when safe. This treatment should be used judiciously. It can combine with traffic-calming efforts to prevent excessive vehicle speeds on the bicycle boulevard.

Stop signs are a relatively inexpensive treatment that is quite effective at minimizing bicycle and cross-vehicle conflicts. However, placing stop signs at all intersections along bicycle boulevards may be unwarranted as a traffic control device.
4.7.3.2 Mini Traffic Circle
Typically mini traffic circles are implemented where the bicycle boulevard intersects a local street or even a Collector if ADT is less than 2,000. Stop signs may be added on the cross streets if necessary, otherwise all traffic yields. Signage and striping treatments should be implemented based on expected traffic volumes.

For example, the circle itself may be appropriate for local intersections with very low ADT, while increased signage and splitter striping may be appropriate on roads experiencing higher traffic volumes. Mini traffic circles can be landscaped for added visual impact and traffic calming effect. This treatment should be designed with adequate curb radii for emergency vehicle access.

Mini traffic circles are very effective at reducing though bicycle and cross vehicle conflicts and add overall traffic calming in all directions. Mini traffic circles have a moderate cost (approx $20,000 per intersection).

4.7.3.3 Curb Extension and High-Visibility Crosswalks
This treatment is appropriate for bicycle boulevards near activity centers that may generate large amounts of pedestrian activity such as schools or commercial areas. The curb extensions should only extend across the parking lane and should not obstruct bicyclists’ path of travel or the travel lane. This treatment may be combined with a stop sign on the cross street if necessary.

Curb extensions and high-visibility crosswalks calm traffic and increase the visibility of pedestrians waiting to cross the street. However, they may impact on-street parking.

4.7.3.4 Patterned Pavement, Logo, or Design Treatment
Intersections that also serve as gateways to neighborhoods, schools, or commercial centers may receive a special design consisting of colored pavers, imprinted asphalt, or other adhesive patterns to provide added emphasis. This treatment adds special attention to an intersection and acts as a traffic-calming device.

Patterned pavement enhances the look and feel of an intersection. These treatments can be community-building activities and provide a sense of place.
4.7.3.5 Bicycle Forward Stop Bar
A second stop bar for cyclists placed closer to the centerline of the cross street than the first stop bar increases the visibility of cyclists waiting to cross a street. This treatment typically combines with other crossing treatments (i.e. curb extension) to encourage cyclists to take full advantage of crossing design.

They are appropriate at unsignalized crossings where fewer than 25 percent of motorists make a right turn movement.

4.7.3.6 Bicycle Left-Turn Lane
Bicycle boulevards crossing major streets at offset intersections can incorporate “bicycle left-turn lanes” to facilitate easier bicyclist crossings. Similar to medians/refuge islands, bicycle left-turn lanes allow cyclists to cross in two phases.

A bicyclist on the boulevard could execute a right-hand turn onto the cross street, and then wait in a delineated left-turn lane (if necessary to wait for a gap in oncoming traffic). The bike turn pockets should be at least 5 feet wide, with a total of 11 feet for both turn pockets and center striping.

4.7.3.7 Bicycle Left Turn Pocket
A bike-only left-turn pocket permits bicyclists to make left turns while restricting vehicle left turns. If the intersection is signal-controlled, a left arrow signal may be appropriate, depending on bicycle and vehicle volumes.

Signs should prohibit motorists from turning. Ideally, the left turn pocket should have a raised curb, but the pocket may also be defined by striping if necessary. Because of the restriction on vehicle left-turning movements, this treatment also acts as traffic diversion.
4.7.3.8 Bicycle Signal Warrant
There are currently no specific national signal warrants for a bicycle signal at present, although some states, such as California, have created bicycle-specific signal warrants.

Traffic control signals used for bicyclist crossing locations shall conform to Part 4 of the MUTCD (that is, they must be pedestrian signals per Chapter 4C or 4F or vehicular signals per Chapter 4C.)

In the latest 2009 version of the MUTCD, this also includes a warrant for half-signals (also known as a pedestrian hybrid beacon - Chapter 4F). A pedestrian hybrid beacon may be considered for installation to facilitate pedestrian crossings at a location that does not meet traffic signal warrants (see Chapter 4C), or at a location that meets traffic signal warrants under Sections 4C.05 and/or 4C.06 but a decision is made to not install a traffic control signal.

4.7.3.9 Half-Signals
In situations where there are few crossable gaps and where vehicles on the major street do not stop for pedestrians and cyclists waiting to cross, “half signals” can improve the crossing environment.

Half signals include pedestrian and bicycle activation buttons and may include bicycle loop detectors on the bicycle boulevard approach. Many of these models have been used successfully for years overseas, and their use in the U.S. has increased dramatically over the last decade.

4.7.3.10 Medians/Refuge Islands
At uncontrolled intersections of bicycle boulevards and major streets, a bicycle crossing island can be provided to allow cyclists to cross one direction of traffic at a time when gaps in traffic allow. The bicycle crossing island should be at least 8 feet wide (measured perpendicular to the centerline of the major road) to be used as the bike refuge area.

Narrower medians can accommodate bikes if the holding area is at an acute angle to the major roadway, which allows stopped cyclists to face oncoming motorists. Railings allow bicyclists to avoid putting their feet down, thus making it quicker to start again.

Crossing islands in the middle of the intersection can prohibit left and through vehicle movements.
4.7.4 Level 4: Bicycle Boulevard Traffic Calming
Traffic calming treatments on bicycle boulevards improve the bicycling environment by reducing vehicle speeds to the point where they generally match cyclists’ operating speeds, enabling motorists and cyclists to safely co-exist on the same facility. Specific traffic calming treatments are described below.

4.7.4.1 Chicanes
Chicanes are a series of raised or delineated curb extensions on alternating sides of a street forming an S-shaped curb, which reduces vehicle speeds through narrowed travel lanes. Chicanes can be achieved by establishing on-street parking on alternate sides of the street. These treatments are most effective on streets with narrower cross-sections.

4.7.4.2 Mini Traffic Circles
Mini traffic circles are raised or delineated islands placed at intersections, reducing vehicle speeds through tighter turning radii and narrowed vehicle travel lanes. These devices can effectively slow vehicle traffic while facilitating all turning movements at an intersection. Mini traffic circles can also include a paved apron to accommodate the turning radii of larger vehicles like fire trucks or school buses.

4.7.4.3 Speed Humps
Speed humps are rounded raised areas of the pavement requiring approaching motor vehicles to reduce speed. These devices also discourage vehicle through travel on a street when a parallel route exists.

Speed humps should never be so steep that they may cause a bicyclist to lose control of the bicycle or be distracted from traffic. In some cases, speed humps have gaps that allow a bicyclist to cross on the level roadway surface, while vehicles must slow down to cross the barrier.

4.7.5 Level 5: Bicycle Boulevard Traffic Diversion
Traffic diversion treatments maintain bicycle through travel on a street while physically restricting vehicle through traffic. These treatments direct vehicle through traffic onto parallel higher-order streets while accommodating bicyclists and local vehicle traffic on the bicycle boulevard. Traffic diversion is most effective when higher-order streets can sufficiently accommodate the diverted traffic associated with these treatments.

4.7.5.1 Choker Entrances
Choker entrances are intersection curb extensions or raised islands allowing full bicycle passage while restricting vehicle access to and from a bicycle boulevard. When they approach a

Speed humps are a common traffic calming treatment. East Waiko Road, Waikapu.
choker entrance at a cross street, motorists on the bicycle boulevard must turn onto the cross street while cyclists may continue forward. These devices can be designed to permit some vehicle turning movements from a cross street onto the bicycle boulevard while restricting other movements.

4.7.5.2 Traffic Diverters
Similar to choker entrances, traffic diverters are raised features directing vehicle traffic off the bicycle boulevard while permitting bicycle through travel.

Advantages:
Provides safe refuge in the median of the major street so that bicyclists only have to cross one direction of traffic at a time; works well with signal-controlled traffic platoons coming from opposite directions.

Disadvantages:
Potential motor vehicle impacts to major roadways, including lane narrowing, loss of some on-street parking and restricted turning movements.

Crossing island may be difficult to maintain and may collect debris.

4.8 Bicycle Parking
Bicycle parking can be broadly defined as either short-term or long-term parking:

- Short-term parking: parking meant to accommodate visitors, customers, messengers and others expected to depart within two hours; requires approved standard rack, appropriate location and placement, and weather protection.
- Long-term parking: parking meant to accommodate employees, students, residents, commuters, and others expected to park more than two hours. This parking should be in a secure and weather-protected location, such as a designated room or other enclosure.

4.8.1 Short-Term Parking
Short-term bicycle parking facilities include racks which permit the locking of the bicycle frame and at least one wheel to the rack and support the bicycle in a stable position without damage to wheels, frame or components. Short-term bicycle parking is free at various locations in Central Maui. Such facilities should continue to be free, as they provide minimal security, but encourage cycling and promote proper bicycle parking.

4.8.1.1 Bicycle Staples
The majority of short-term bicycle parking is provided via a ‘staple’ on the sidewalk, located within the buffer zone.

Art racks can be an attractive way of providing bicycle parking facilities. Businesses can subsidize the cost by sponsoring racks appropriate to their business (e.g., a pair of glasses for an optician).
4.8.1.2 On-Street Corrals
Where it is not possible to place bicycle racks on the sidewalks (e.g., due to narrow sidewalk width, sidewalk obstructions, street trees), bicycle parking can be provided in place of on-street vehicle parking. Racks can cluster in a parking space, or they can be located on sidewalk curb extensions where adequate sight distance exists.

Installing bicycle parking directly in a car parking space incurs only the cost of the racks and bollards or other protective devices.

A curb extension is more expensive to install, and can be prohibitively expensive if it requires substantial drainage and/or utility work. Costs may be less when installing the curb extension as part of a larger street improvement project. While on-street bicycle parking may take space away from automobile parking, it is possible to mitigate lost parking spaces by creating auto parking spaces through driveway consolidation, moving fire hydrants, or otherwise permitting auto parking where currently prohibited. Options for combining bicycle and motorcycle parking also exist.

4.8.1.3 Parking Meter Retrofit
Where older-style parking meters have been replaced with newer models but have not been removed, it is possible to retrofit them to provide short-term parking. While U-locks easily attach to parking meters without any change, cyclists and other pedestrians may perceive this practice as illegal or informal parking, and it may encourage bicyclists to park at less desirable features. The County may weld a loop to the pole to accommodate cable locks and to formalize the meter as bicycle parking.

4.8.2 Long-Term Parking
Long-term bicycle parking facilities provide secure long-term bicycle storage. Long-term facilities protect the entire bicycle, its components, and its accessories against theft and inclement weather. Examples include lockers, check-in facilities, monitored parking, restricted access parking, and personal storage.

Long-term parking facilities are more expensive to provide than short-term facilities, but are also significantly more secure. Although many bicycle commuters would be willing to pay a nominal fee to guarantee the safety of their bicycle, long-term bicycle parking should be free wherever automobile parking is free. Potential locations for long-term bicycle parking include transit stations, large employers and institutions where people use their bikes for commuting, and not consistently throughout the day.

4.8.2.1 Bike Lockers
Bicycle lockers provide space to store a few accessories or rain gear in addition to containing the bicycle. Some lockers allow access to two users - a partition separating the two bicycles can help ensure users feel their bike is secure. Lockers can also be stacked, reducing the footprint of the area, although that makes them more difficult to use.

New federal security requirements mandating that locker contents be visible has highlighted a tradeoff between security and perceived safety. Though these measures increase station security, bicyclists will perceive the contents of their locker to be less safe if they are visible and will be more reluctant to use them.

Traditionally, bicycle lockers have been available on a sign-up basis. Upon registration, the bicycle parking authority issues cyclists a key or a code to access a particular locker. Computerized on-demand systems allow users...
to check for available lockers or sign up online. Models from eLocker and CycleSafe allow keyless access to the locker with the use of a SmartCard or cell phone. With an internet connection, centralized computerized administration allows the transit agency to monitor and respond to demand for one-time use as well as reserved lockers.

Lockers available for one-time use have the advantage of serving multiple users a week. Monthly rentals, by contrast, ensure renters that their own personal locker will always be available.

4.8.2.2 Racks Inside a Cage or Room
A higher-security variation on basic racks is a bike cage that restricts access to bicyclists. The cage can be fitted with a gate and an electronic pass card access to provide unsupervised parking. When there is a high demand for parking, several small cages provide more security than one larger one, as they reduce the number of people who have access to each room.

Parking inside an enclosed room is more secure, but also more expensive than cages. The downside of both is that bicyclists must have a key or know a code prior to using the parking facilities, which is a barrier to incidental use.

A cage of 18.5 feet by 18 feet can accommodate up to 20 bicycles and uses the space of approximately two automobile parking spots.

4.8.2.3 Bike Depot
Bike depots generally refer to full-service parking facilities typically located at major transit locations that offer secure bicycle parking and other amenities. There is no universally accepted terminology to describe different types of full-service bicycle parking facilities. While each depot is unique, they often provide:

- Attended or restricted-access parking spots
- Shared-use bicycle rentals
- Access to public transportation
- Commute trip-planning information

The company BikeStation™, which runs several parking facilities in California and Washington, offers free parking during business hours and key-card access after-hours for members.

Paying members may enjoy a number of services, including bicycle repairs, bicycle rentals, sales and accessories, restrooms, changing rooms and showers, and access to vehicle-sharing, such as ZipCar (a carsharing service). They can also incorporate restaurants or other services.

Seattle Bikestation™ members receive discounted ZipCar and Bicycle Alliance of Washington memberships, as well as access to repair services, rentals, and a library of bicycling resources. They also offer a guaranteed ride home program, which addresses the issue of becoming stranded by a flat tire or other malfunction.
### Table 4.2 Parking policies - quantity and type of parking

<table>
<thead>
<tr>
<th>Design Issue</th>
<th>Recommended Guidance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Rack Height</td>
<td>To increase visibility to pedestrians, racks should have a minimum height of 33 inches or be indicated or cordoned off by visible markers.</td>
</tr>
<tr>
<td>Signing</td>
<td>Signs should direct cyclists to bicycle parking areas that are not clearly visible. The sign should include the name, phone number, and location of the person in charge of the facility, where applicable.</td>
</tr>
<tr>
<td>Lighting</td>
<td>Lighting of not less than one foot-candle illumination at ground level should be provided in all bicycle parking areas.</td>
</tr>
<tr>
<td>Frequency of Racks on Streets</td>
<td>Popular retail areas should install two or more racks on each side of each block. This does not eliminate the inclusion of requests from the public that do not fall in these areas. Areas officially designated or used as bicycle routes may warrant the consideration of more racks.</td>
</tr>
<tr>
<td>Location and Access</td>
<td>Access to facilities should be convenient. Racks located near a sidewalk or walkway should also be near ADA-compliant curb ramps, where appropriate. Parking facilities intended for employees should be located near the employee entrance, and those for customers or visitors near main public entrances. (Convenience should balance against the need for security if the employee entrance is not in a well-traveled area). Bicycle parking should cluster in lots, not to exceed 16 spaces each. Large expanses of bicycle parking make it easier for thieves to operate undetected.</td>
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<table>
<thead>
<tr>
<th>Design Issue</th>
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</thead>
<tbody>
<tr>
<td>Locations within Buildings</td>
<td>Provide bike racks within 50 feet of the entrance. Where a security guard is present, provide racks behind or within view of a security guard. The location should be outside the normal flow of pedestrian traffic.</td>
</tr>
<tr>
<td>Locations near Transit Stops</td>
<td>To prevent bicyclists from locking bikes to bus stop poles - which can create access problems for disabled transit users - transit stops with demand for short-term bike parking should provide racks in a nearby, convenient location.</td>
</tr>
<tr>
<td>Locations within a Campus-Type Setting</td>
<td>Racks are useful in campus-type settings where users may spend two or more hours in classroom buildings. Racks should be located near the entrance to each building. Clusters of racks should receive additional security, such as a fence or attendant. The attendant can often share this duty with other duties to reduce or eliminate the cost of labor. A cheaper alternative may be to site the fenced bicycle compound in a highly visible location on the campus. For long-term parking needs, attendant parking and/or bike lockers are a preferred method to bike racks.</td>
</tr>
<tr>
<td>Retrofit Program</td>
<td>In established locations, such as schools, employment centers, and shopping centers, the City should conduct bicycle audits to assess bicycle parking availability and access, and add additional bicycle racks where necessary.</td>
</tr>
</tbody>
</table>
5 Pedestrian Facility Design Guide

The following pedestrian facility guidance primarily addresses issues of pedestrian safety. The guidance does not thoroughly address issues of urban design, design character, or other amenities that make streets and sidewalks attractive places to travel and spend time as a pedestrian. Because safety concerns clearly and significantly influence a person’s decision to walk or use other modes of transportation, design guides for creating a safe pedestrian environment are important for all communities.

The guidance included in this section is a supplement to Central Maui’s currently adopted development policies, as well as state and federal standards. The purpose of this chapter is to provide general design suggestions for pedestrian facilities that go above minimum standards. Implementation of guides shown herein requires County Public Works Director / County Engineer approval.

5.1 Federal Guidelines

State and federal law regulates the design of many streetscape elements. Traffic control devices must follow the procedures set forth in the Manual of Uniform Traffic Control Devices (MUTCD), while elements such as sidewalks and curb cuts must comply with guidelines implementing the Americans with Disabilities Act (ADA). The American Association of State Highway and Transportation Officials (AASHTO) provides additional design guidance in the Guide for the Planning, Design, and Operation of Pedestrian Facilities (July 2004).

5.1.1 Manual of Uniform Traffic Control Devices (MUTCD)

The State of Hawaii and Maui County follow the procedures and policies set out in the federal MUTCD. Traffic control devices include traffic signals, traffic signs, and street markings. The manual covers placing, constructing, and maintaining devices. The MUTCD emphasizes uniformity in traffic control devices to protect the clarity of the message. A uniform device conforms to regulations for dimensions, color, wording, and graphics and minimizes confusion or misunderstanding on the part of the roadway user.

5.1.2 Americans with Disabilities Act (ADA)

Title II of the Americans with Disabilities Act (ADA), signed into law in 1990, is a civil rights act that prohibits public entities from discrimination based on disability. Newly constructed and modified existing facilities must not have architectural barriers that restrict access or use by individuals with disabilities. Maui County uses the Americans with Disability Act Accessibility Guidelines (ADAAG), adopted by the Department of Justice for places of public accommodation and commercial facilities covered by Title 3 of the ADA, as the technical standard for accessible design.

5.2 Sidewalks

Design Summary

Attributes of well-designed sidewalks include the following:

- Accessibility: A network of sidewalks shall be accessible to all users.
- Adequate width: Two people should be able to walk side-by-side and pass a third comfortably, and different walking speeds should be possible. In areas of intense pedestrian use, sidewalks should accommodate the high volume of walkers.
- Safety: Design features of the sidewalk should allow pedestrians to have a sense of security and predictability. Sidewalk users should not feel they are at risk due to the presence of adjacent traffic.
- Continuity: Walking routes should be obvious and should not require pedestrians to travel out of their way unnecessarily.
- Landscaping: Plantings and street trees within the boulevard should contribute to the overall psychological and visual comfort of sidewalk users, and be designed in a manner that contributes to the safety of people.
- Social space: There should be places for standing, visiting, and sitting. The sidewalk area should be a place where adults and children can safely participate in public life.
- Quality of place: Sidewalks should contribute to the character of neighborhoods and business districts.
**Discussion**

Sidewalks are the most fundamental element of the walking network, as they provide an area for pedestrian travel separated from vehicle traffic. Sidewalks are typically constructed from concrete and are separated from the roadway by a curb or gutter and sometimes a landscaped boulevard. Sidewalks are a common application in urban and suburban environments.

Installing new sidewalks can be costly, particularly if drainage improvements such as undergrounding of roadside culverts and installation of curb/gutter are part of the design. However, fixing short gaps in an existing sidewalk network is important to maximize system continuity, and can be a relatively low-cost fix.

**Guidance**


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**5.2.1 Sidewalk Zones**

**Design Summary**

The sidewalk corridor is typically located within the public right-of-way between the curb or roadway edge and the property line. The sidewalk corridor contains four distinct zones, which have different purposes.

Recommended and minimum widths are provided following.

**Discussion**

- Curbs prevent water in the street gutters from entering the pedestrian space, discourage vehicles from driving over the sidewalk, and make it easy to sweep the streets. In addition, the Curb Zone helps define the pedestrian environment within the streetscape, although other designs can be effective for this purpose. At the corner, the curb is an important tactile element for pedestrians who are finding their way with the use of a cane.

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*A well-designed sidewalk provides plenty of pedestrian space.*

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*Zones in the sidewalk network.*
**DESIGN GUIDELINES**

The Planter / Furniture Zone
- The Planter / Furniture Zone buffers pedestrians from the adjacent roadway, and is also the area where elements such as street trees, signal poles, utility poles, street lights, controller boxes, hydrants, signs, parking meters, driveway aprons, grates, hatch covers, and street furniture are properly located. This is the area where people alight from parked cars.

The Pedestrian Zone
- The Pedestrian Zone is the area intended for pedestrian through travel. This zone should be entirely free of permanent and temporary objects.

The Frontage Zone
- The Frontage Zone allows pedestrians a comfortable “shy” distance from the building fronts, in areas where buildings are at the lot line, or from elements such as fences and hedges on private property. Typically the Frontage Zone is also the area where sidewalk cafes and street vendors are located.

**Guidance**
- Institute of Transportation Engineers. (1998) Design and Safety of Pedestrian Facilities

**5.2.2 Sidewalk Widths**

**Design Summary**
- Sidewalk clear width is exclusive of the curb and obstructions. Recommended widths:
  - Enable two pedestrians (including wheelchair users) to walk side-by-side, or to pass each other comfortably (3’ for each pedestrian)
  - Allow two pedestrians to pass a third pedestrian without leaving the sidewalk
- Sidewalk width should be increased by a minimum of 1.5’ where sidewalks are directly against the curb, allowing for street hardware, opening car doors, and to provide additional separation from moving traffic
- In areas near hospitals and nursing homes, minimum sidewalk widths should increase by 1.5’ to accommodate persons in wheelchairs.
- In commercial areas, clear widths of 8’ or more are common to allow for higher pedestrian volumes and storefront window-shopping.
- Additional clearance (2’) recommended for lateral clearance where sidewalks abut retaining walls, fences or similar structures.

**Discussion**
- Proposed sidewalk guidelines apply to new development and depend on available street width, motor vehicle volumes, surrounding land uses, and pedestrian activity levels. Standardizing sidewalk guidelines for different areas within Central Maui, dependent on the above listed factors, ensure a minimum level of quality for all sidewalks.
- Acquiring new right-of-way, creating public walkway easements, and reallocating the existing right-of-way (e.g. reducing the number of lanes) are methods for adding sidewalks in developed areas.
- Acquisition of new right-of-way is feasible when cost is reasonable in proportion to the overall project cost.
- The dedication of public right-of-way or the granting of a public walkway easement to widen the sidewalk corridor can be a condition for obtaining a building permit or land use approval for infill development.

**Guidance**

<table>
<thead>
<tr>
<th>Zone:</th>
<th>Curb</th>
<th>Planter / Furniture</th>
<th>Sidewalk</th>
<th>Frontage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum Width</td>
<td>0.5’</td>
<td>2’ if no trees</td>
<td>5’</td>
<td>2.5’*</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4’ with street trees</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*If at least 2.5’ of space is available between the sidewalk and adjacent property line, no frontage zone is needed.
5.2.3 Sidewalk Surfaces

Design Summary
Sidewalk surfaces should be smooth and continuous.

Discussion
- Surface treatments should avoid patterns and joints that cause excessive vibration for wheelchair users.
- Sidewalk surface should be stable, firm and slip resistant. Preferred materials include Portland Cement Concrete (PCC) and Asphalt Concrete (AC).
  - PCC provides a smooth, long-lasting and durable finish that is easy to grade and repair.
  - AC has a shorter life expectancy but may be more appropriate in less urbanized areas and in park settings. Asphalt concrete is susceptible to root heave.
- Crushed aggregate is appropriate as an all-weather walkway surface in park areas, but this material generally requires a higher level of maintenance to maintain accessibility.
- The Americans with Disabilities Act allows a maximum two percent cross-slope on sidewalks and other walkways.
- Sidewalks should maintain a 3’ wide area with a maximum two percent cross slope at driveways, curb cuts or intersections.
- Curb grades should be 1:12 (8.3%) maximum slope.

Guidance
5.3 Street Furniture

**Design Summary**
A variety of amenities can make a path inviting to the user. Costs vary depending on the design and materials selected for each amenity. Amenities shall not impede accessibility.

**Discussion**
- **Benches**
  - Providing benches at key rest areas and viewpoints encourages people of all ages to use the trail by ensuring that they have a place to rest along the way. Benches can be simple (e.g., wood slates) or more ornate (e.g., stone, wrought iron, concrete).
- **Restrooms**
  - Restrooms benefit path users, especially in more remote areas where other facilities do not exist. Restrooms can be sited at trailheads along the path system and can be provided at standard intervals along the trail.
- **Water Fountains**
  - Water fountains provide water for people (and pets, in some cases) and bicycle racks allow recreational users to safely park their bikes if they wish to stop along the way, particularly at parks and other desirable destinations.
- **Bicycle Parking**
  - Bicycle parking allows trail users to store their bicycles safely for a short time. Bicycle parking should be provided if a trail transitions to an unpaved pedestrian-only area.
- **Trash Receptacles**
  - Litter receptacles should be placed at access points. Litter should be picked up once a week and after any special events held on the trail. If maintenance funds are not available to meet trash removal needs, it is best to remove trash receptacles.
- **Signage**
  - Informational kiosks with maps at trailheads and signage for other destinations can provide information for trail users. They are beneficial for areas with high out-of-area visitation rates as well as for the local citizens.
- **Art**
  - Local artists can provide art for the pathway system, making it uniquely distinct. Many pathway art installations are functional as well as aesthetic, as they may provide places to sit and play on.

**Guidance**

5.4 Transit Stops

**Design Summary**
- Ensure transit stops are located in an accessible location for pedestrians and wheelchair users. Consider the surrounding pedestrian environment and roadway crossings.
- Provide adequate maneuvering space into and out of the enclosure for wheelchair users.
- Ensure that the bus shelter does not block the pedestrian right-of-way.
- Cost varies based on the improvements provided at each stop.

**Discussion**
Since most transit riders reach bus stops as pedestrians, transit stop design and siting must integrate with the pedestrian environment. Bus stops should be located in accessible locations with clear pedestrian pathways, safe roadway crossings, and adequate lighting.
Bus stops not immediately adjacent to a corner curb ramp should provide a separate curb ramp to allow wheelchair using passengers to board from the street if necessary. Buses may not always be able to pull up to the curb to deploy a lift when blocked by traffic or other obstacles.

Typical pedestrian amenities at bus stops should include:

- Bus stop signage showing route and schedule information
- Lighting
- Sheltered seating area
- Trash receptacle
- Bicycle parking

At intersections, place the bus stop on the far side of the crosswalk. This encourages disembarking passengers to walk behind the bus. The bus does not obstruct pedestrians’ view of oncoming traffic, and pedestrians do not obstruct the bus from leaving the stop.

**Guidance**


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### 5.5 Pedestrian-Scale Lighting

**Design Summary**

- Depending on the location, average maintained horizontal illumination levels of 5 lux to 22 lux should be considered (AASHTO).
- Where special security problems exist, higher illumination levels may be considered.
- Light standards (poles) should meet the recommended horizontal and vertical clearances.

**Discussion**

Pedestrian-scale lighting improves safety and enables the facility to operate year-round. Minimizing glare, not lighting the night sky, and protecting the light from vandalism are the three main issues neighborhood lighting design should consider. Lights should not have a visible source, either to the trail users or to neighboring residences, as they can blind users and pollute the night sky. In addition, globes, acorns and other light types without a reflecting or shielding top cover tend to light the sky and should be avoided. Low-level lights, such as very short poles or bollards, are susceptible to vandalism.

In some areas, street lighting is sufficient trail light for users, and in other locations, homeowners may not want to publicize the trails in their neighborhoods. If lights are desired, neighborhood-scale options include:

- In-ground lighting – dim lights which indicate the extent of the path.
- Bollards – low-level lighting, susceptible to vandalism.
- Solar lighting – best used in situations where running power to the trail would be costly or undesirable.

Pedestrian scale lighting can have screens to help prevent glare from affecting neighbors. In
addition, lights can be programmed to dim or turn off later in the night.

A guideline for a pedestrian way is illumination between 5 and 10 meter-candles.

**Guidance**

### 6 Intersection Design Guide

In general, pedestrians are not inclined to travel very far out-of-direction to access a designated crosswalk, so providing sufficient crossings is critical for a safe pedestrian environment. Conversely, excessive numbers of marked crosswalks may result in poor driver compliance.

Crosswalks can also be designed for increased visibility of pedestrians, and curb ramps and vehicle-turning radii should be considered for the pedestrian environment. In areas of high pedestrian use, the convenience and travel time of pedestrians deserves special consideration when considering signal placement and timing. In these locations, pedestrian mobility and access may take priority over the efficiency of vehicle progression.

A wide variety of intersection treatments exist, which provide safe crossing and turning movements of bicyclists on bikeways. Treatments specific to particular facility types were previously discussed; this section addresses general guidelines for crossings. Attributes of pedestrian- and bicycle-friendly intersection design include:

- **Clear space** — Corners should be clear of obstructions. They should also have enough room for curb ramps, for transit stops where appropriate, and for street conversations where pedestrians might congregate.
- **Visibility** — It is critical that pedestrians on the corner have a good view of vehicle travel lanes and that motorists in the travel lanes can easily see waiting pedestrians.
- **Legibility/uniformity** — Symbols, markings, and signs used at corners should clearly indicate what actions the pedestrian should take.
- **Accessibility** — All corner features, such as curb ramps, landings, call buttons, signs, symbols, markings, and textures must meet accessibility standards.
- **Separation from traffic** — Corner design and construction must be effective in discouraging turning vehicles from driving over the pedestrian area.

**Guidance**
- MUTCD

### 6.1 High-Visibility Crosswalks

**Design Summary**

Additional treatments can increase visibility of the crosswalk at high-use locations and in locations with high use from schoolchildren, elderly pedestrians, or pedestrians with disabilities.

**Discussion**

Advance Warning Sign: When visibility of the crosswalk is limited, a W11-2 black-on-yellow “Pedestrian Crosswalk Ahead” warning sign can be used. The recommended distance between the crosswalk and the sign is the safe stopping sight distance, which depends upon approach speed.

Raised Crosswalk: A raised crosswalk can eliminate grade changes from the pedestrian path and give pedestrians greater prominence as they cross the street. Raised crosswalks should be used only in limited cases where a special emphasis on pedestrians is desired such as at a mid-block crossing; review on case-by-case basis.
DESIGN GUIDELINES

Additional guidelines include:

- Use detectable warnings at the curb edges to alert vision-impaired pedestrians that they are entering the roadway.
- Approaches to the raised crosswalk may be designed to be similar to speed humps, or may be designed so they do not have a slowing effect (such as on emergency response routes).
- Use post mounted pedestrian crosswalk signs placed on the median and on the right side of the roadway for each approach.

In-street “Stop for Pedestrians” Signs and Flashers: In-street “Stop for Pedestrians” signs are flexible plastic ‘paddle’ signs installed in the center of a roadway to enhance a crosswalk at uncontrolled crossing locations. In-pavement flashers may be appropriate on undivided roadways in densely developed areas that do not offer median refuges for crossing pedestrians.

Guidance

6.2 Reducing Crossing Distance

Design Summary
- Pedestrian exposure to travel lanes should be minimized to the greatest extent possible.
- In general, 50’ is the longest uninterrupted crossing a pedestrian should encounter at an unsignalized crosswalk (four travel lanes).

Discussion
Curb Extensions: Curb extensions minimize pedestrian exposure by shortening crossing distance and give pedestrians a better chance to see and be seen before committing to crossing. They can be used as bus stop locations to improve safety for transit riders. If there is no parking lane, the extensions may be a problem for bicycle travel and truck or bus turning movements. Curb extensions also decrease the length of the pedestrian phase at signalized intersections due to the smaller crossing distance.

Guidelines for use:
- Design to transition between the extended curb and the running curb in the shortest practicable distance.
- For efficient street sweeping, the minimum radius for the reverse curves of the transition is 10 feet and the two radii should be balanced to be nearly equal.
- Curb extensions should stop one foot short of the parking zone for bicycle safety.

Median Refuge Island: Median refuge islands help improve safety by providing a crossing refuge, allowing pedestrians and cyclists to gauge safe crossing of “one direction” of traffic at a time, and slowing motor vehicle traffic.
This treatment is appropriate where the roadway to be crossed is greater than 50 feet wide or more than four travel lanes; can be used where distance is less to increase available safe gaps. Use at signalized or unsignalized crosswalks. The refuge island must be accessible, preferably with an at-grade passage through the island rather than ramps and landings.

Refuge islands at intersections should have a median “nose” that gives protection to the crossing pedestrian. Median refuge islands break up a crossing and allow pedestrians to cross one side of a street at a time.

A median refuge island should be at least 6 feet wide between travel lanes and at least 20 feet long, with reflectors and paint tapering off to prevent vehicles from parking illegally too close to the crossing. Streets with speeds higher than 25 mph should use a double centerline marking, reflectors, and “KEEP RIGHT” signage.

If a refuge island is landscaped, the landscaping should not compromise the visibility of pedestrians crossing in the crosswalk. Select tree species for small diameter trunks. Tree branches should be no lower than 14 feet. Shrubs and ground plantings should be no higher than 1.5 feet.

**Guidance**

### 6.3 Minimizing Curb Radii

**Design Summary**

An “effective radius” is created by the presence of a parking lane or bicycle lane.

Where there is an effective curb radius sufficient for turning vehicles, the actual curb radius may be as small as 5’.

- Consider the desired pedestrian area of the corner, traffic turning movements, the turning radius of the design vehicle, the geometry of the intersection, the street classifications, and whether there is parking or a bicycle lane (or both) between the travel lane and the curb.
- Use the smallest possible curb radius for the following circumstances:
  - May be three feet where there are no turning movements
  - Five feet where there are turning movements and there is adequate street width and a larger effective curb radius created by parking or bicycle lanes.

**Discussion**

In general, the smaller the curb radius, the better for pedestrians. In comparison to a large curb radius, a tight curb radius provides more pedestrian area at the corner, allows more flexibility in the placement of curb ramps, results in a shorter crosswalk, and requires vehicles to slow more as they turn the corner.

A small curb radius is also beneficial for street

An “effective radius” is created by the presence of a parking lane or bicycle lane.
sweeping operations. The presence of a lane for parking or bicycles creates an “effective radius” that allows the designer to choose a radius for the curb that is smaller than the turning radius required by the design vehicle.

Designers sometimes consider that on-street parking will begin or end at the point of tangency or point of curvature of the corner radius. In practice, however, this point is not always evident in the field. Parking control should not be a factor in selecting curb radius.

**Guidance**

### 6.4 Advance Stop Bars

**Design Summary**
- Separating pedestrians and motor vehicles at intersections improves safety and visibility.

**Discussion**
Advance stop bars increase pedestrian comfort and safety by stopping motor vehicles well in advance of marked crosswalks, allowing vehicle operators a better line of sight of pedestrians and giving inner lane motor vehicle traffic time to stop for pedestrians. Pedestrians feel more comfortable since motor vehicles are not stopped adjacent to the crosswalk. The multiple threat of motor vehicles is reduced, since vehicles in the inner travel lane have a clearer line of sight to pedestrians entering the sidewalk. Without an advance stop bar, the vehicle in the outer lane may stop for the pedestrian, but the vehicle in the inner lane proceeds, increasing the possibility of a vehicle-pedestrian conflict. Conversely, if the setback is too large, compliance may be poor.

Advanced stop bars should be used:
- On streets with at least two travel lanes in each direction.
- Prior to a marked crosswalk.
- In one or both directions of motor vehicle travel.
- Usually three feet in advance of the crosswalk; 10’ minimum if used with a bike box application (NACTO).

**Guidance**
- NACTO Urban Bikeway Design Guide

*Where there is an effective curb radius sufficient for turning vehicles, the actual curb radius may be as small as 5'*
6.5 Accessible Curb Ramps

**Design Summary**
- Every ramp should have a landing at the top and at the bottom.
- Maximum ramp slope is 1:12 (8.3%) with a cross slope of no more than 1:50 (2.0%).
- Minimum width of a ramp should be 3’.

**Discussion**
Curb ramps are the design elements that allow all users to make the transition from the street to the sidewalk. There are a number of factors to consider in the design and placement of curb ramps at corners. Properly designed curb ramps ensure that the sidewalk is accessible from the roadway. A sidewalk without a curb ramp can be useless to someone in a wheelchair, forcing the pedestrian back to a driveway and out into the street for access.

The landing at the top of a ramp shall be at least 4’ long and at least the same width as the ramp itself. It shall slope no more than 1:50 (2.0%) in any direction. If the ramp runs directly into a crosswalk, the landing at the bottom will be in the roadway. The landing, 4’ long, shall be completely contained within the crosswalk and should not have a running slope of greater than 1:20 (5.0%).

If the ramp lands on a dropped landing within the sidewalk or corner area where someone in a wheelchair may have to change direction, the landing must be a minimum of 5’ long and at least as wide as the ramp, although a width of 5’ is preferred. The landing shall not slope more than 1:50 (2.0%) in any direction (including cross-slope). A single landing may serve as the top landing for one ramp and the bottom landing for another.

**Guidance**
6.6 Raised Tactile Devices

Design Summary
Raised tactile devices (also known as truncated domes) alert people with visual impairments to changes in the pedestrian environment and should be used at:

- The edge of depressed corners.
- The border of raised crosswalks and intersections.
- The base of curb ramps.
- The border of medians.
- The edge of transit platforms where railroad tracks cross the sidewalk.

The U.S. Federal guidelines are:
- Bottom diameter: 1”
- Top diameter: 0.4”
- Height: 0.2”
- Center-to-center spacing: 2.3”
- Visual contrast: not specified

The US Access Board recommends:
- Visual contrast of at least 70 percent
- Width: 2’
- Location: 6” to 8” from the bottom of the ramp

Discussion
Contrast between the raised tactile device and the surrounding infrastructure is important so that the change is readily evident. These devices are most effective when adjacent to smooth pavement so the difference is easily detected.

The devices must provide color contrast so partially sighted people can see them.

In addition to use at curbs, raised tactile devices can be used for wayfinding along a pathway or across a road. This is particularly useful to visually impaired pedestrians in areas where the pedestrian environment is unpredictable. Complex intersections, roundabouts, wide intersections and open plazas are areas where raised tactile devices could be considered. No standards or guidelines for these devices have been adopted nationally. Raised devices with bar patterns can indicate the proper walking direction. Textured pavement that provides enough material and color contrast can be used to mark the outside of crosswalks, in addition to white paint or thermoplastic.

Guidance
6.7 Pedestrian Push-Buttons

**Design Summary**
- Pedestrians can be accommodated by an automatic pedestrian phase, or by using a push button (demand-actuated signal).
- The U.S. Access Board recommends buttons be large enough for people with visual impairments to see (min. 2”) and the force to activate the signals should be no more than 5ft-lb.

**Discussion**
Pedestrian push buttons allow pedestrians to call for a crossing phase at semi-actuated traffic signals, at intersections with low pedestrian volumes, and at mid-block crossings. When push buttons are used, they should be:

- Located so that someone in a wheelchair can reach the button from a level area of the sidewalk without deviating from the natural line of travel into the crosswalk.
- Marked with arrows to indicate which signal is affected.

Signalized crossings in areas of high pedestrian use may automatically provide a pedestrian crossing phase during every signal cycle, eliminating the need for push-buttons.

However, there should be a demonstrated benefit for actuated signals before push buttons are installed, which could include:

- The main street carries through-traffic or transit, such as an arterial, collector, or bus route.
- Traffic volumes on the side street are considerably lower than on the main street.
- The pedestrian signal phase is long (for example, on a wide street) and eliminating it when there is no demand would significantly improve the level of service of the main street.

Where push buttons must be installed in high pedestrian use areas, designers should consider using a regular pedestrian phase during off-peak hours. In addition, vibro-tactile buttons and voice recording can be used to improve actuation options.

**Guidance**

6.8 Supplemental Pedestrian Signals

**Design Summary**
- Pedestrians benefit from information provided by signal head indications, countdown signals, and audible signals.
- Traffic signal timing should assume a pedestrian walking speed of 3.2 feet per second (or 2.9 feet per second in an area with a larger population of children or seniors), meaning that the length of a signal phase with parallel pedestrian movements should provide sufficient time for a pedestrian to safely cross the adjacent street.
- At crossings where older pedestrians or pedestrians with disabilities are expected, crossing speeds as low as 2.9 feet per second may be assumed.
- Special pedestrian phases can provide greater visibility or more crossing time for pedestrians at certain intersections.

**Discussion**
Pedestrian Signal Indication (“Ped Head”) and Countdowns: Pedestrian signal indicators use a symbol to indicate when to cross at a signalized crosswalk. All traffic signals should be equipped with pedestrian signal indications except where pedestrian crossing is prohibited by signage. Countdown pedestrian signals are particularly beneficial, as they indicate whether a pedestrian has
time to cross the street before the signal phase ends.

Audible Pedestrian Traffic Signals: Audible pedestrian traffic signals provide crossing assistance to pedestrians with vision impairment at signalized intersections. To be considered for audible signals, the location must be suitable to the installation of audible signals (safety, noise level, and neighborhood acceptance).

Audible signals should be activated by a pedestrian push-button with at least a one second-delay to activate the sound.

Pre-Timed Signal: Pre-timed signals use automatic “phasing” concurrent with parallel vehicle traffic, as opposed to actuated signals, where pedestrians push an activation button to trigger the walk signal.

Leading Pedestrian Interval (LPI): At intersections where there are conflicts between turning vehicles and pedestrians, pedestrians are given a “walk” designation a few seconds before the associated green phase for the intersection.

Guidance

6.9 Bicyclist Crossing Aids

Design Summary
- At signalized intersections, cyclists should be able to trigger signals when cars are not present. Requiring cyclists to dismount to press a pedestrian button is inconvenient and requires the cyclist to merge into traffic at an intersection. It is particularly important to provide bicycle actuation in a left-turn only lane where cyclists regularly make left turn movements.

Discussion
Loop Detectors: Bicycle-activated loop detectors are installed within the roadway to allow the presence of a bicycle to trigger a change in the traffic signal. This allows the cyclist to stay within the lane of travel and avoid maneuvering to the side of the road to trigger a push button.

Some demand-actuated signals use loop detectors, which can be attuned to be sensitive enough to detect any type of metal, including steel and aluminum. The amount of metal in a bicycle’s chainrings and bottom bracket is sufficient to trigger a properly calibrated loop detector.

Current and future loops that are sensitive enough to detect bicycles should have pavement markings to instruct cyclists how to trip them, as well as signage.

Detection Cameras: Video detection cameras can determine when a vehicle
is waiting for a signal. These systems use digital image processing to detect a change in the image at the location. Cameras can detect bicycles, although cyclists should wait in the center of the lane, where an automobile would usually wait, in order to be detected. Video camera system costs range from $20,000 to $25,000 per intersection.

Remote Traffic Microwave Sensor Detection (RTMS): RTMS is a system developed in China, which uses frequency modulated continuous wave radio signals to detect objects in the roadway. This method is marked with a time code that gives information on how far away the object is. The RTMS system is unaffected by temperature and lighting, which can affect standard detection cameras.

Guidance
- Additional technical information is available at: www.humantransport.org/bicycledriving/library/signals/detection.htm

7 Traffic Calming Design Guide

Traffic calming is a design principle that seeks to lower vehicular traffic speeds using physical and visual cues. These tools are typically self-enforcing: the roadway’s physical conditions influence drivers rather than regulatory devices and enforcement measures. Traffic calming works best on local streets with residential areas and highly trafficked commercial corridors. Extensive research shows that slower motorist speeds reduce overall crash severity and frequency, and improve cyclist and pedestrian comfort within and adjacent to traffic. Slower traffic also tends to reduce roadway noise, which contributes to overall neighborhood livability and walking comfort.

An area applying traffic calming measures must make special considerations for bicyclists. Measures such as narrowing the roadway may adversely affect bicyclists’ ability to share the road, while introducing vertical or horizontal deflections to slow traffic may introduce an unexpected hazard to the cyclist. Conversely, carefully designed and applied traffic calming measures can enhance bicyclist safety and access.

The table summarizes the desired effect of the traffic calming measures discussed in the following sections:

Table 8.1 Traffic Calming Measures

<table>
<thead>
<tr>
<th>Speed Control Measures</th>
<th>Horizontal Narrowing</th>
<th>Horizontal Deflection</th>
<th>Vertical Deflection</th>
<th>Volume Control Measure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chokers / Chicanes (Section 7.1, also see Section 4.7.4.1 and Section 4.7.5.1)</td>
<td>Traffic Circles (Section 7.2, also see Section 4.7.4.2)</td>
<td>Speed Humps / Tables (Section 7.3, also see Section 4.7.4.3)</td>
<td>Pedestrian Malls (Section 7.5)</td>
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<tr>
<td>Roundabouts (Section 4.6)</td>
<td>Pavement Treatments (Section 7.4, also see Section 4.7.3.4)</td>
<td>Traffic Diverters (Section 4.7.5.2)</td>
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<tr>
<td>Other: Gateways (Section 7.6)</td>
<td>Raised Crosswalks / Intersections (Section 6.1)</td>
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</tbody>
</table>

Recommended design from MUTCD, R10-26.
### 7.1 Chokers / Chicanes

**Design Summary**
- Introduce horizontal deflections into the roadway (e.g. concrete curb and landscaping) to interrupt straight stretches of roadway and/or narrow overly wide streets.
- Provide physical indication of a roadway transition (e.g. from a commercial corridor to a low-speed residential area).
- Add room for additional sidewalk width and/or planting strip for landscaping or street furniture.
- Design to avoid bicyclist-motorist conflicts at pinch points.

**Discussion**

Chokers and chicanes both introduce horizontal deflections in the roadway. They motivate drivers to slow in order to traverse more carefully through the narrower corridor, or to navigate horizontal shifts. Chokers narrow a street by widening the sidewalks or planting strips, by either extending both curbs simultaneously or only widening one side at a time. Curb extensions that create a meandering or twisting route are known as chicanes.

Chicanes and choker design must prevent motorists from being able to maintain their speed by cutting across the centerline, and must ensure that passing motorists do not squeeze cyclists at conflict points. Signage and pavement markings can reinforce the need for motorists and cyclists to share the road.

**Guidance**
- MUTCD
DESIGN GUIDELINES

7.2 Traffic Circles

Design Summary
- Manage intersection using yield controls, especially where traffic volumes do not warrant a stop sign or a signal.
- Reduce crash problems due to stop sign running.
- Best suited for low-volume, local streets.
- Design to avoid bicyclist-motorist conflicts at pinch points.
- Design must have low turning radii to reduce vehicular turning speeds, which improves pedestrian and bicyclist safety.

Discussion
Traffic circles are intersection controls similar to roundabouts. These raised, circular islands placed within intersections force motorists to circulate around the circle when passing through the intersection. Signs direct motorists to proceed to the right around the circle before turning right, passing through or making a left turn. Entering traffic must slow to perform the right turn and must yield to traffic in the circle.

Because traffic circles employ narrow turning radii to reduce approaching vehicle speeds, larger vehicles may have difficulty navigating through the intersection.

Some traffic circles may allow larger vehicles to turn left against the predominant direction of traffic, when traffic permits, or may include a mountable curb in the outer portion of the circle.

Traffic circles must provide special accommodations for sight impaired pedestrians and wheelchair users, since these intersections allow for continuous traffic circulation. Signage, striping, and pedestrian signals are effective ways of reminding motorists to yield to pedestrians (Section 6).

Guidance
- MUTCD
7.3 Speed Humps / Tables

Design Summary
- Calms traffic by requiring drivers to traverse at slow speeds in order to reduce driver/passenger discomfort and possibly avoid vehicle damage.
- Application at regular intervals has the greatest impact on speed reduction. Drivers will maintain a reasonable speed when expecting additional speed humps.
- When used in conjunction with high-visibility crosswalks, speed humps / tables can create a raised crosswalk.
- Design should use markings and signs to ensure nighttime visibility to cyclists and motorists.

Discussion
Speed humps and speed tables are usually paved asphalt devices three to four inches high at their center and are designed to slow motorists. Rubber bumpers are effective as temporary test treatments. Device effectiveness depends on the device design and placement. In general, the most uncomfortable devices (i.e. the sharpest and highest) are most effective for one-time speed reductions, while regular spacing is most effective for maintaining the speed reduction through a corridor.

Guidance
- MUTCD

Speed humps are generally sharper than speed tables. They usually extend the full width of the street with tapering near the drain gutter. Speed tables used in combination with curb extensions can create raised pedestrian crosswalks.
7.4 Pavement Treatments for Pedestrian Crossings

**Design Summary**
- Helps delineate a separate space for pedestrians and contributes toward aesthetic qualities of a pedestrian area.
- Does not improve visibility for motorists unless combined with other crosswalk enhancements (e.g. striping, signage, and signals).
- Best practices recommend using smooth pavement. Bumpy surfaces are uncomfortable for wheelchair users and may be a tripping hazard for pedestrians.

**Discussion**
Pavement treatment at crosswalks can reinforce the pedestrian zone, although typical treatments (stamped and colored concrete) do not improve crosswalk visibility without additional reinforcement from striping and signage.

Municipalities should strive to utilize smooth travel surfaces and avoid irregular surfaces. Irregular surfaces are potentially difficult to maintain and clean. Pedestrians who have mobility impairments may trip over irregular surfaces, while such surfaces are particularly jarring for wheelchair users.

The Vineyard Street / North Market Street intersection is an example of a crosswalk with colored pavement treatment.

Some cities use colored pavement to delineate the right-of-way for cyclists. See Section 5.5.3.2 for more information.

**Guidance**
- MUTCD
7.5 Pedestrian Zones

Design Summary
- Creates a public space and enhances the pedestrian experience in a commercial district by restricting or prohibiting vehicular travel.
- Vehicular restrictions can be occasional (during festivals), periodic (nightly), or permanent.

Discussion
A community can initiate a pedestrian zone using a continuum of possible treatments and applications. A pedestrian zone can range from periodic closures using removable street barriers (e.g. weekly farmers markets) to permanent installations using concrete traffic diverters and public art installations.

Municipalities should experiment with incremental measures, such as street narrowing, sidewalk widening, and closures using temporary measures (removable barriers). Such incremental measures will help determine operational difficulties and the long-term viability of a street closure.

The Queen Kaʻahumanu Center and the Maui Mall are candidates for new pedestrian zones within Central Maui.

Guidance
7.6 Gateways

Design Summary
- Creates a unique visual cue for drivers entering a community or commercial district.
- Change in roadway character reminds motorists to watch for pedestrians and cyclists.

Discussion
Gateways indicate to motorists a change in the physical environment, usually from a busy street into a quiet residential neighborhood or busy commercial district. Gateways can be signage, art installations, or any other distinctive landmark. On-street treatments can include street narrowing, medians, archways, and roundabouts. Unless combined with these traffic-calming measures, gateways primarily serve to remind motorists to watch for cross traffic, pedestrians, and cyclists.

Each of the major roadways leading into the Central Maui area, such as the Honoapiilani Highway, Kuihelani Highway, Puunene Avenue, and Hana Highway, are candidates for installing a gateway.

Guidance
Part VIII - Appendix B
~
Cost Estimate Factors
### Central Maui Pedestrian & Bicycle Master Plan for 2030

A world class pedestrian and bicyclist community

<table>
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### PART EIGHT - COST ESTIMATE FACTORS

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**TOTAL** $1,650,330 $1,710,250 $304,458 $6,473 $198,225

**Maui Premium @ 30%**

$3,869,736 $5,030,657

Maui Premium is mainland cost + 30%

Chapter 4 Cost Estimates include Maui Premium
Central Maui
Pedestrian & Bicycle Master Plan for 2030

Funded by the Tobacco Settlement Special Fund, Healthy Hawai`i Initiative, Hawai`i State Department of Health

A Worldclass Pedestrian & Bicyclist Community