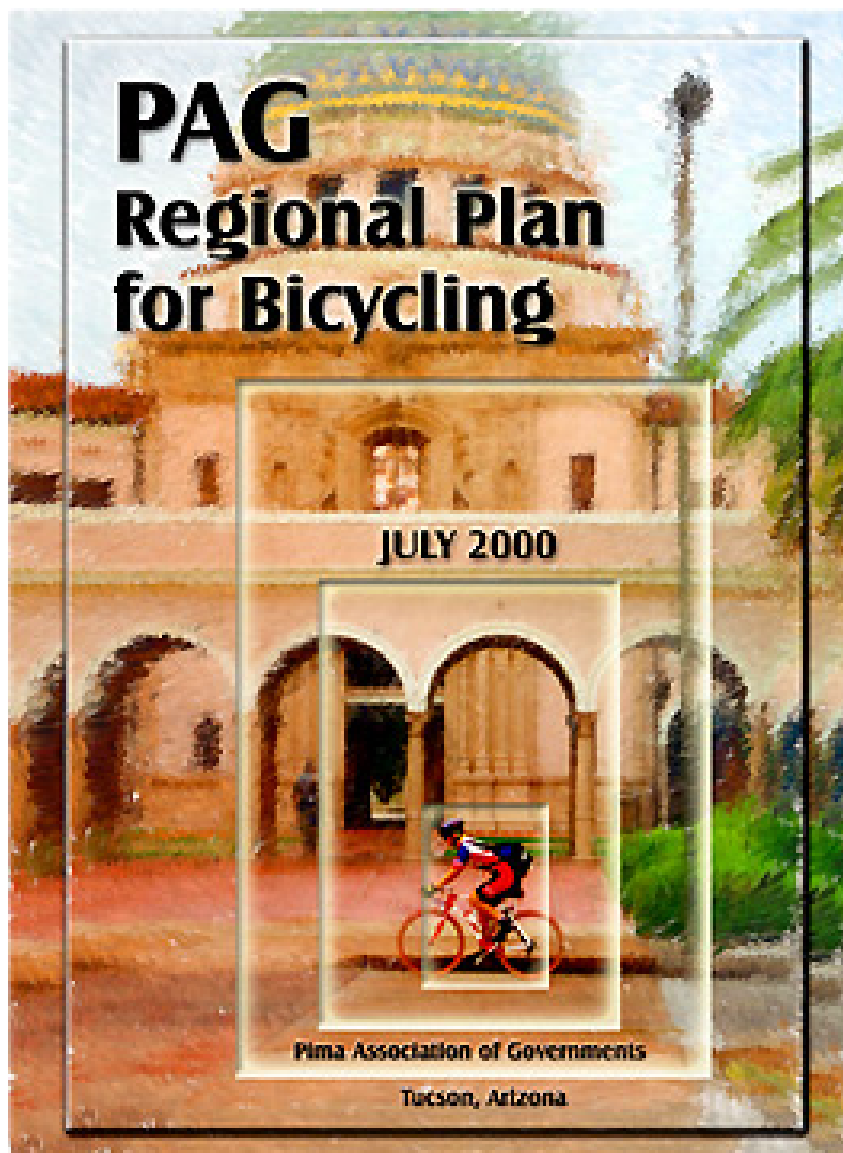


# **Regional Plan for Bicycling**

**July 2000**



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July, 2000

# Regional Plan for Bicycling

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## Executive Summary

### 2000 REGIONAL PLAN FOR BICYCLING



PAG's 2000 Regional Plan for Bicycling has its origins in the planning process undertaken in 1998 after the adoption of the 1998-2020 Metropolitan (Regional) Transportation Plan (MTP). The MTP's Mobility and Accessibility Goal: "To improve the mobility of people and goods throughout the region by providing efficient, effective, convenient, accessible, and safe modes of transportation to employment, education, medical, and other desired destinations", guided the update of the Regional Plan for Bicycling.

This is the fifth in a series of Regional Plans for Bicycling in the Tucson Metropolitan Area. Plans were produced in 1975, 1977, 1981, and 1993. This Plan documents how the Region has progressed from eight miles of bike routes in 1971 to over 400 now. It also documents actions that should be taken over the next 20 years to address existing and anticipated bicycle system and program needs within the Region. This Plan identifies bicycle facility needs with the expectation that many of these can be funded in the future.

There have been many positive developments related to bicycling in this Region during the period covered by the prior plans. The *League of American Bicyclists (LAB)* recognized the City of Tucson as a "Bicycle Friendly Community" in 1992. *Bicycling Magazine* ranked the City of Tucson as the 2<sup>nd</sup> best bicycling city in the United States (in both 1995 and 1999). The City of Tucson has established a position for a full time Alternate Modes Coordinator and a Bicycle Planner. In 1999 the Town of Oro Valley developed a bicycle and pedestrian plan as a specific element of their General Plan, which was originally adopted in 1996.

This Plan was developed over the last two years in cooperation with local jurisdictions, the public, and bicycle interest groups. As part of this process, the Pima Association of Governments and the City of Tucson held seven public open houses in the fall of 1998. Public input from these meetings, along with comments from PAG's web-site bicycle survey, is incorporated in this Plan. Both Citizen's and Technical Advisory Committees participated in the development of this Plan. Active involvement by citizens, local governments, other interested staff, and bicycle advocates within the region, has resulted in the development of a Plan that is both realistic and achievable.

This Plan focuses on urban, suburban, and rural bicycle system and program elements. These include extensive on-road facilities, and limited shared-use paths (i.e. Paths), both paved and unpaved, on which bicyclists have a right to travel. The existing, planned (funded), and proposed (unfunded) on-road facilities have been identified based on jurisdictional input, which include the routes identified in the 1999 Town of Oro Valley Bicycle and Pedestrian Plan. Although backcountry Paths are not directly addressed, this Plan does con-

sider the connection between and interface with these Paths. Recommended Paths from the 1996 Pima County River Parks Plan, the 1989 Eastern Pima County Trails System Master Plan, the 1999 Town of Oro Valley Bicycle and Pedestrian Plan and the 1998 PAG Coyote Trail Elementary School Bicycle Access Study (for the Town of Marana) are incorporated in this Plan.

The Design Guidelines in this Plan come from the 1999 American Association of State Highway & Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities. Maintenance provisions for roadway and off-road bicycle facilities are included, as simply constructing these facilities will not guarantee suitable maintenance in the future. The Tucson Region currently has 425 miles of Signed Bike Routes, 6 miles of Bike Lanes, 50 miles of Urban Shared Use Paths and 7.5 miles of Bus Shared Use lanes for a total of 488.5 miles of Bikeways.

PAG's funding and implementation process includes the development of bike facilities as projects, as well as larger, more inclusive roadway and river park development and improvement projects. The use of local, State, and Federal funding constitutes most of the funding for these projects, with some contributions of right-of-way and facilities provided by private landowners. Continuation of local bond funds is at the will of the voters.

The estimated costs to develop 400 new miles of signed bike routes, shoulders and bike lanes and 50 miles of new shared use paths, by 2010, will be approximately \$112.73 million dollars. The region is estimated to receive approximately \$104.1 million dollars from all revenue sources except development dedications. Through careful planning, dedication and funding allocations the region should be able to reach the goal of developing over 400 mile of bikeways by 2010.

.....

## **Plan Vision**

The participants in the development of this Plan have embraced the previous (1993) Plan's vision for our Region in which bicycle travel is facilitated and consistently provided for. Such a region allows cyclists to ride easily to activity areas, transit stops, schools, parks, natural resources areas, and employment areas using a safe, continuous, and connected system of bikeways.

## **Plan Goals**

The following Goals are recommended to achieve the Plan Vision:

### **◆ Goal 1**

**EDUCATION: Educate All Road Users, Especially Bicyclists, on Legal, Predictable, and Safe Behavior.**

This Plan recommends that the region implement both adult and child bicycle riding and traffic education programs. This should be coordinated with all area school districts and with Bicycle Planning and Enforcement Staff of local jurisdictions and PAG.

**◆ Goal 2**

**ENFORCEMENT: Enforce All Traffic Laws on Bicyclists and Motorists, especially those relating to Bicyclist – Motorist interactions.**

This Plan recommends that the Region develop a targeted multi-modal traffic enforcement program complemented by the education recommendations above.

**◆ Goal 3**

**ENGINEERING: Plan, Design, Construct and Maintain Bicycle Facilities That Meet or Exceed Standards and Guidelines.**

This Plan recommends that PAG jurisdictions work with regional staff to ensure that bicycle facilities meet or exceed AASHTO Guidelines, and that the bikeway system is developed and improved into a continuous, connective, safe, and accessible system.

**◆ Goal 4**

**ENCOURAGEMENT: Encourage the increased Use of Bicycles for Transportation and Recreation.**

The Tucson Region has an ideal climate and facilities for year-round bicycling. A regional bicycle education program should encourage, enhance, and promote bicycle riding for area residents and visitors. Promotion of bicycling to visitors can enhance their experience, and benefit the local economy.



**Conclusion**

This Regional Plan for Bicycling has a bold, publicly based and supported Vision. The Goals and Action Plan contained herein provide a strong, supportive context for PAG member jurisdictions to continue and strengthen their accommodation of bicycle travel, through development or update of Bicycle Improvement Plans, and subsequent implementation of bikeway improvements, educational and enforcement programs.

The Pima Association of Governments will monitor the implementation of this Plan by member jurisdictions, in consultation with the Tucson/Pima County Bicycle Advisory Committee. The BAC's voice should be heard and heeded, on matters in or related to this Plan.

# CHAPTER 1

## Overview

This is the fifth in a series of plans for bicycling in the Tucson Region. Previous plans were produced in 1975, 1977, 1981, and 1993. This Plan documents how the Region has progressed from eight miles of bikeways in 1971 to the present 488 miles of bikeways. It also sets forth actions that the Region should take over the next 20 years to address existing and anticipated needs. This Plan is designed to help “Ensure safe, convenient and efficient vehicle and non-motorized traffic circulation both within and through the community”.

There have been many positive developments related to bicycling in the PAG Region during the period covered by the prior plans. The *League of American Bicyclists (LAB)* recognized the City of Tucson as a “Bicycle Friendly Community” in 1992. *Bicycling Magazine* ranked the City of Tucson as the 2<sup>nd</sup> best bicycling city in the United States (in both 1995 and 1999). The City of Tucson has established a position for a full time Alternate Modes Coordinator and a Bicycle/Pedestrian Planner. In 1999 the Town of Oro Valley developed a bicycle and pedestrian plan as a specific element of their General Plan, which was originally adopted in 1996, and established a position for a Bicycle/Pedestrian Planner.

This Update of the PAG Regional Plan for Bicycling was done cooperatively with member jurisdictions, the public, and bicycle interest groups. As part of this process, PAG and the City of Tucson held seven public open houses in the fall of

1998. Public input from these meetings, along with comments from PAG’s website bicycle survey, is incorporated in this Plan.

Two advisory committees, one public and one technical, developed this Plan. The Citizen’s Committee represented bicycle interests in the region, and included participation from members of the Tucson-Pima County Bicycle Advisory Committee. The Technical Committee included staff from each member jurisdiction of PAG, nine local school districts, the University of Arizona, Pima Community College, and the Arizona Department of Transportation.

Women and minorities were represented on the Citizen’s Advisory Committee, as were the elderly and disabled, representing a cross section of the Region’s ethnic diversity, gender, and age groups. All of PAG’s committees have an open and non-discriminatory policy towards committee members, and all meetings are open to the public.

This Regional Plan for Bicycling was adopted by Regional Council on July 26, 2000.

## Background and Purpose

PAG’s 2000 Regional Plan for Bicycling has its origins in the planning process undertaken in 1998 after the adoption of the 1998-2020 Metropolitan (Regional) Transportation Plan (MTP). The MTP’s Mobility and Accessibility Goal: “To improve the mobility of people and goods

throughout the region by providing efficient, effective, convenient, accessible, and safe modes of transportation to employment, education, medical, and other desired destinations”, guided the update of this Regional Plan for Bicycling. This Plan focuses on urban, suburban, and in some cases rural, bicycle elements. These include roads and shared-use Paths, both paved and unpaved on which bicyclists may travel. Backcountry Paths are not directly addressed, but this Plan does consider the connection between, and interface with, these Paths. Appropriate recommended Paths from the 1996 Pima County River Parks Plan, the 1989 Eastern Pima County Paths System Master Plan, the 1999 Town of Oro Valley Bicycle and Pedestrian Plan, and the PAG 1998 Coyote Trail Elementary School Bicycle Access Study (for the Town of Marana) are incorporated in this Plan.

## **Title VI**

Title VI of the 1964 Civil Rights Act is a Federal mandate which applies to all programs receiving Federal-aid dollars. Persons may not be excluded from participating, obtaining benefits or in any other way discriminated against on the basis of their race, color, national origin, gender, age or disability. It is recognized that Title VI applies equally to planning and public participation processes. The planning and programming process must collect and analyze relevant data such as the distribution and effects of transportation investments in the region on different socio-economic groups. The public participation process must ensure that minority and low-income population groups are engaged in the transportation

decision-making process in a meaningful way.

Transportation planning and programming has had to look more closely at the public participation process, to better define the beneficiaries of projects, analyze the impacts of transportation projects, and have a better understanding of the composition of the community being served. This Plan reflects a pro-active approach by the Region to provide for alternative modes of transportation. The 2000 Regional Plan for Bicycling’s development process specifically included review and consideration of Title VI factors in the Plan development process.

This Plan considered a variety of demographic factors, including population density, income characteristics, ethnicity, and race & age factors. Each population has unique needs that this Plan strives to address. The low-income population, for example, has a greater need for bicycle facilities, whereas school-aged children need safe, well-lit and identified crosswalks.

The most comprehensive compilation of factors, including all Title VI mandated factors, is the City of Tucson’s *Indicators of Neighborhood Stress*. This 1992 report analyzes 31 data items from the 1990 Census (see Appendix C – Indicators of Neighborhood Stress), which were judged the best indicators of social dependency and housing need. There is a close interrelationship between income, minority status, age, and density with the desire and need to bicycle or walk. This review indicates that the central and southern areas of the City of Tucson, the



## **Organization of the Regional Plan for Bicycling**

The PAG Regional Plan for Bicycling is divided into four chapters following this Introduction. The vision, goals, objectives, and action statements of the Plan is set forth in **Chapter 2**. It presents the direction and objectives that the Region should pursue to improve and expand bicycle facilities and programs, as well as to collect data for monitoring the Plan's progress and success over time.

**Chapter 3** provides a summary review of regional, local, and national bicycle plans and programs and references how they promote bicycling. The public input process for this Plan, including a bicycle questionnaire, is described, with survey results identified and analyzed. The Regional Bicycle Facility and Program Plan is also described, including The Bikeway Classification System; the Existing Bikeway and Shared-use Path System; and the Bikeway and Shared-use Path System through the Year 2020.

**Chapter 4** identifies the design guidelines used in this Plan as adopted from the 1999 American Association of State Highway & Transportation Officials (AASHTO), *Guide for the Development of Bicycle Facilities*. Maintenance provisions for roadway and off-road bicycle facilities are included, as construction of these facilities does not guarantee suitable maintenance in the future.

**Chapter 5** describes an implementation process, which includes the development of bike facility projects, and larger, more inclusive roadway and river park development and improvement projects. The use of local, State and Federal funding provides all, or a portion of, the funding for these projects. Continuance of local bonded funding is subject to approval of the voters. It is the purpose of this Plan to identify bicycle facility needs, with the expectation that these can be funded in the future.

## CHAPTER 2

This chapter describes the Regional Plan for Bicycling's Vision and Goals, which guide the Program Recommendations and Action Plan. The Action Plan for the improvement and expansion of the regional bicycling system is presented in Chapter 5.

### **Plan Vision**

The participants in the development of this Plan have embraced the previous (1993) Plan's vision for our Region in which bicycle travel is facilitated and consistently provided for. Such a region allows cyclists to ride easily to activity areas, transit stops, schools, parks, natural resources areas, and employment areas using a safe, continuous, and connected system of bikeways.

### **Plan Goals**

The following Goals are recommended to achieve the Plan Vision:

#### **Goal 1: EDUCATION**

Educate All Road Users, Especially Bicyclists, on Legal, Predictable, and Safe Behavior.

#### **Goal 2: ENFORCEMENT**

Enforce All Traffic Laws on Bicyclists and Motorists, especially those relating to Bicyclist – Motorist interactions.

#### **Goal 3: ENGINEERING**

Plan, Design, Construct and Maintain Bicycle Facilities That Meet or Exceed Standards and Guidelines.

#### **Goal 4: ENCOURAGEMENT**

Encourage the increased Use of Bicycles for Transportation and Recreation.

The specific Action Plan to guide achievement of this Plan's Vision and Goals is set forth in Chapter 5.

### **Bicycle Mode Share**

Bicycle travel offers a mode of transportation that is inexpensive to operate, friendly to the environment, beneficial exercise to the user, and requires less space on roads, paths, and parking. It offers a transportation option for a segment of the population that uses transit. This population group will usually have a higher bicycle mode split than the rest of the population, which has more transportation options available to them. The bicycle mode split for the general population is about three percent, yet the mode split for the economically disadvantaged group is higher, varying between 8 to 15 percent for various minorities and economic population classes.

### **Bicycle Travel Potential**

The potential to increase bicycle mode share exists. A PAG Transportation Improvement Program (TIP) survey found that the number one ranked goal of respondents was to "Protect and Improve the Environment". Other goals, ranked in order, were "Improve the Mobility of People and Goods; "Integrate a Variety of Transportation Modes; and Provide Equity and Mobility to All Segments of the Community". The City of Tucson conducted a

Livable Tucson Vision Program in 1997-1998, and found that the number one vision of participants was “Viable and Accessible Alternatives to Automobile Transportation”.

In addition, Pima County’s Evaluation of the Clean Air Campaign found that 24 percent of respondents would be willing to decrease single passenger automobile travel to work or school. Nearly 26 percent of respondents would be willing to do so on a regular basis if conditions were improved. Respondents also indicated they would bicycle to work or school on a regular basis if their place of work or school were closer (26 percent); riding were less risky (25 percent); there were more bikeways (15 percent); and, there were facilities at work to shower and dress or if they had ownership of a bicycle (10 percent).

The PAG *Regional Plan for Bicycling* presents an approach for the inclusion of bicycle facilities in the regional transportation and paths network, from the connection and continuity of bicycle routes to the extension of urban and suburban Path corridors. This Plan is based on the goals and objectives of the multimodal 2020 PAG *Metropolitan Transportation Plan*, the recommended paths and parks in the 1996 *Pima County River Parks Master Plan*, and the overall objectives to increase bicycling mode share as addressed in the 1997 *National Bicycling and Walking Study*.

A summary of the key relationships between these source documents and this Plan is discussed in the next chapter.

## CHAPTER 3

### **Summary Review of Reference Plans**

Several plans and studies were relevant to the development of the Vision, Goals, and Action Plan of this Regional Plan for Bicycling. The policies of these Plans are directly related to alternate modes of transportation, to the entire regional transportation system, and as a mode choice for commuting and recreation. These included:

#### **PAG Metropolitan (Regional) Transportation Plan**

The Pima Association of Governments' Metropolitan (Regional) Transportation Plan, or MTP, provides a 20-year vision for a balanced, multi-modal and sustainable transportation system for eastern Pima County. The MTP addresses transportation facilities and services in eastern Pima County, including all of the PAG member jurisdictions, the Arizona Department of Transportation (ADOT), and other governmental agencies. The Metropolitan (Regional) Transportation Plan includes a set of four goals that serve as fundamental principles for the development of the Plan. It is the balancing of these primary goals that has shaped, constrained and eventually melded the features and components of the Plan into an identifiable and unified metropolitan transportation system. Specific implementation policies are associated with each of the primary goals.

#### **Pima County River Parks Master Plan**

The 1996 Pima County River Parks Master Plan incorporated the recommendations of the 1989 Eastern Pima County Trails System Master Plan into one recreation river parks and path system. With the continued growth in bicycling as an alternative mode of transportation, the River Parks are well suited for providing cross-town bike linkages, while maintaining their roles as shared-use facilities.

#### **The National Bicycling and Walking Study**

This 1994 report, issued by the Federal Department of Transportation, Federal Highway Administration, presents a plan of action for enhancing the travel options of bicycling and walking. This Study has the dual goals of doubling the 1994 percentage (from 7.9% to 15.8%) of total trips made by bicycling and walking, and simultaneously reducing by 10 percent the number of bicyclist and pedestrians killed or injured in traffic crashes.

#### **Public Involvement**

Public input into the planning process for this *Regional Plan for Bicycling* began in the fall of 1998 with the desire to solicit public opinion on regional bicycle issues.

At seven Open Houses, PAG's Regional Bicycle and Pedestrian Coordinator and the City of Tucson Bicycle and Pedestrian Planner met with the public to discuss future plans and improvements to bicycle and pedestrian facilities. These Open Houses were held across the region in

local neighborhood centers, regional malls, a regional bike swap meet, and at a bicycle festival. Locations were chosen with transit access in mind, and refreshments, prizes and free bike maps were given away as techniques to attract participants. Ideas were solicited for making the Region and its jurisdictions more bicycle and pedestrian friendly.

A survey was developed and distributed in order to obtain the general public's opinions about the existing bicycle system and determine what bicycle plans and

improvements the general public feels are needed. Surveys were distributed at bicycle shops, the University of Arizona, and Pima Community College. The Tucson/Pima County Bicycle Advisory Committee (TCBAC) and the City of Tucson Citizen's Transportation Advisory Committee (CTAC) were also solicited for survey responses and also served as informational resources to the development of this plan. Surveys were also placed on the PAG web site. These results are summarized in Table 1.

**Table 1. Bicycle Questionnaire Summary**

*Total Responses = 270*

**Where do you live?**

- 29% have lived in Tucson less than 5 years
- 67% of the respondents live in the central part of the City of Tucson

**How do you usually travel?**

- 44% Travel to work or school by car
- 25% Travel to work or school by bike
- 11% Travel to work or school by car or bike
- 7% Travel to work or school by bus and bus/bike
- 64% Travel to shop/personal by car
- 9% Travel to shop/personal by bike and by car/bike
- 3% Travel to shop/personal by bus/bike

**Why do you ride a bike?**

- 44% Ride a bike for recreation
- 16% Ride a bike for commuting
- 31% Ride a bike for both recreation/commuting
- 37% Ride a bike between 5 and 7 days a week

**Is bicycling important to you? Why?**

- 94% Rate bicycling as important
- 57% For health/fitness
- 20% Good for the environment

### Is Tucson bicycle friendly?

43% Yes  
48% No

### If Yes, because

60% Many bicycle facilities

### If No, because

39% Few bicycle facilities  
45% Bikeway facilities not safe

### What would encourage you to ride a bike?

24% Safer Streets  
25% More bike lanes and paths  
17% More bike parking  
15% Lived closer to work

### What encouragement could local government give to bicycles?

19% More bike lanes  
17% More shared-use paths  
16% Better bikeway connections  
17% More bike/motorist education  
25% other

## Bicycle Facility Plan

Bicyclists have the same mobility needs as every other user of the transportation system and use the road system as their primary means of access to jobs, services, and recreational activities. Although their physical dimensions may be relatively consistent, the skills, confidence, and preferences of bicyclists vary dramatically.

## Understanding Bicycle Users

A 1994 report by the Federal Highway Administration used three general categories of bicycle user types to assist highway designers in determining the impact of different facility types and roadway conditions on bicyclists.

**Advanced** (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.

**Basic** (less experienced) adult riders may also be using their bicycles for transportation purposes (e.g., to get to the store or

to visit friends). They prefer to avoid roads with fast and busy traffic unless there is ample roadway width to allow easy overtaking by faster motor vehicles. Basic riders are comfortable riding on neighborhood streets and shared-use paths, and prefer designated facilities such as bike lanes or wide shoulder lanes on busier streets.

**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, such as schools, convenience stores and recreational facilities. Residential streets with low motor vehicle speeds, linked with shared-use paths or 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.

### **Existing Facilities**

The existing Regional Bikeway and Shared-use Path System which serves these riders currently contains 438.5 miles of on-street bikeways and 50 miles of urban and suburban Paths. This is a significant improvement over the 250 miles that existed in the Year 1993, when the last Regional Plan for Bicycling was prepared. The existing regional bicycle routes are shown on the Regional Bike Routes by Jurisdictions Map located in the back Pocket.

Bicycle facilities historically have been placed in the areas of most demonstrated need. The first designated bicycle facilities were bicycle routes to the University of

Arizona. The placement of bike facilities to and at the University has, over the past 25 years, provided students, faculty and staff with accessible bicycle routes and parking facilities. Other facilities followed, with the placement of bicycle lanes on major arterials such as Oracle, Grant, Speedway, and 22<sup>nd</sup> Streets and on many minor arterials and collector streets. Bikeways and Paths are located in all areas of the region.

### **Bicycle Ridership**

Bicycling in areas that have high density (greater than 4,000 persons per square mile), and are low income (persons with a median family income less than \$20,000/year), tends to be higher than in other lower density, higher income areas. Persons in households with low incomes are much less likely to have a vehicle, in part because a greater proportion of their income is spent on shelter and food. 1990 Census data indicated that bicycle usage for lower income households is higher than the 5% that commute in the general population. Analysis of demographic data, including population density and income, in conjunction with the City of Tucson's neighborhood stress map, demonstrates a need for connection and expansion of the street and shared-use path facilities. These are needed in the predominately Hispanic neighborhoods of the City of South Tucson, the predominately Hispanic neighborhoods of the southwestern area of the City of Tucson, and the predominately elderly population of the Green Valley area of Pima County. These areas are identified for new projects within the next 10 years. Additional connections to existing and new facilities

that are needed for these populations are addressed in the Priority Projects for the years 2010 to 2020.

Traversing the region by bicycle from southeast to southwest and from northwest to southwest is problematic. Many sections of the roadways do not have adequate shoulders or bike lanes, and the pathway system is incomplete and not connected. The connection of these missing "links" is addressed in both the Priority Projects of 2000 – 2010 and the Priority Projects of 2010 – 2020.

An on road evaluation of bikeways in, around and through the Tucson Metropolitan Area found that some north-south and east-west connections are very good recreational and commuting routes. Bikeways were identified with high, medium and low rankings based on the Ranking Criteria listed below:

### **Regional Bikeway Location Ranking Criteria**

**Access.** Does the proposed bikeway provide ample access to activity centers?

**Connectivity.** Does the bikeway connect directly with other bike routes and Paths?

**Continuity.** Is the bikeway part of a continuous system?

**Safety.** Does the bikeway contribute positively to safety?

### **Bicycle Facility and Program Applications**

The construction and application of bicycle facilities and programs is as much dependent upon the desire of the political

jurisdictions to accommodate bicycling as it is to fund these facilities and programs. It is through a combination of street and pathway standards, development exactions, and other program and facility applications that jurisdictions can use private, local, State and Federal funds to construct facilities and finance programs. The use and application of ten bicycle facility and program applications has been assessed for use by all the PAG member jurisdictions, as well as by the University of Arizona, the Arizona Department of Transportation, the National Park Service, the National Forest Service, and the Pasqua Yaqui & Tohono O'odham Tribes. This assessment can be found in Appendix A.

### **Funding for Bikeways and Shared-use Paths, and Program Activities**

The existing bikeway and pathway system was created over the last 28 years. As the population of the Tucson Region has increased, travel demands, including on-road bicycle and shared-use path demands, have increased. The past five years of funding and the expected revenues for the next five years of funding have been evaluated to determine what funds, at a minimum, will be needed for bicycle facilities in order to keep up with anticipated growth. Between 1996 and 2000 \$17 million was allocated to bicycle related projects of which a total of \$9.335 million was actually spent.

Regional bikeway expenditures have averaged \$1.867 million per year. Annual bikeway expenditures are set for Tucson in Table 2. The 1997 Pima County Transportation Bond Projects have not yet been built.

Funding for the years 2000 through 2005 is expected to remain at similar levels. The Region will need \$56 million dollars between the year 2005 and 2020 in order to increase the bikeway and shared-use path mileage to meet the goals of this Regional

Plan for Bicycling. This estimate is based on a cost per mile for bike lane construction (\$185,000), and a cost per mile for paved shared-use path construction (\$350,000). Tables 3 and 4 summarize estimated 10-year bikeway development costs and funding.

PAG's funding and implementation process includes the development of bike facilities, as well as larger, more inclusive roadway and river park development and

**Table 2. 1995 – 1999 Bikeway Expenditures**

Year	City of Tucson	Pima County
FY 1995	\$1.5 million	\$187,000
FY 1996	\$1.5 million	\$460,000
FY 1997	\$1.5 million	\$480,000
FY 1998	\$1.5 million	\$158,000
FY 1999	\$1.5 million	\$630,000
Total	\$7.5 million	\$1,835,000

**Table 3. Estimated Regional 10-year bikeway facility costs**

Type Of Facility	Unit Cost / Mile	Total 10-Yr Costs (2000 – 2010)
*Signed Routes	\$185,000	\$69.37 Million
Lanes	\$185,000	\$1.85 Million
Shared- Use Paths	\$350,000	\$17.5 Million
Bus/Bike Lanes	\$500,000	\$7.5 Million
	Total:	\$96.22 Million
*Signed Bicycle Routes include Signed Shoulder Routes and Signed Bike Routes with White Painted Line		

**Table 4. Estimated Regional 10 Year bikeway facility funding**

Source	Estimated Annual Amount	Total Amount (2000-2010)
PC Rev Bonds	\$2.8 million	\$28 Million
PC Rec Bonds	\$1 million	\$9.1 million
Fed Transp	\$5 million	\$50 million
Fed Enhance	\$1.5 million	\$15 million
Tucson Overlay	\$0.2 million	\$2 million
Totals:	\$10.5 million	\$104.1 million

improvement projects. The use of local, State, and Federal funding constitutes most of the funding for these projects, with some contributions of right-of-way and facilities provided by private land-owners. Continuation of local bond funds is at the will of the voters. If all of the current funding sources available continue to be used the Region should be able to

meet its 2020 goal of completing 1,200 bikeway miles. Proposed and funded bikeway and path projects are planned for construction by the year 2010. The source of funding for these projects includes Federal, State, and local sources and are identified in Table 5.

**Table 5. Bicycle Funding Opportunities**

<p><b>City of Tucson Roadway Overlay Program.</b> These are a combination of local and Federal STP funds used to improve local roads, including building bike lanes or shoulders and sidewalks, where appropriate. This is a continuous funding source.</p>
<p><b>Pima County Roadway Revenue Bonds.</b> Approval of the sale of these bonds was given by the voters on November 4, 1997 and will be repaid through future State HURF (Highway User Revenue Funds) funds. Funds from the sale of these bonds will be used to construct new roadways, the majority of which will have a bicycle and pedestrian element. Bond projects end near the year 2010.</p>
<p><b>General Obligation Recreation Bonds.</b> Approval of the sale of these bonds was given by the voters on May 20, 1997 and will be repaid through local property taxes. Funds from the sale of these bonds will be used to construct new park pathways, and other public improvements. Bond projects end approximately 2010.</p>
<p><b>Highway User Revenue Funds (HURF).</b> These funds are collected and distributed by the State. The State Department of Transportation uses a portion for road and highway improvement and maintenance. The balance is distributed (by formula entitlement) to Counties, Cities, and Towns. Many roadway shoulders that serve bicycle travel are constructed with these funds.</p>
<p><b>National Highway System (NHS).</b> The Federal Transportation Equity Act for the 21<sup>st</sup> Century (TEA 21) provides roadway funding which can be used for bicycle and pedestrian elements, subject to certain requirements. The primary requirement is that the project specifically serves a transportation function. This is a continuous funding source, through fiscal year 2004.</p>
<p><b>Surface Transportation Program (STP).</b> TEA-21 roadway funding which can be used for bicycle and pedestrian projects; similar to NHS funding described above. This is a continuous funding source, through fiscal year 2004.</p>
<p><b>Transportation Enhancements (TE).</b> TEA-21 bicycle and pedestrian funding, as well as other categories, is provided under a 5.7% local match program. The project selection process is run locally through PAG, and Statewide through ADOT. This is a continuous funding source, through fiscal year 2004.</p>

## **Regional Bikeway Improvement Program**

This Plan's future unfunded needs are based on a Bicycle Improvement Program assessment. The prioritization of future bikeways and shared-use paths is based upon the regional bicycle ranking criteria (Access, Connectivity, Continuity, and Safety), and analysis of a variety of demographic factors including population density, income characteristics, ethnicity,

and race & age factors. Both data and maps assisted in assessing and prioritizing future needs. The Existing Bikeways by Jurisdiction Map, located in the back pocket of this document, shows the existing bikeway system as of April, 2000 and the Existing, Programmed & Planned Regional Bikeway System Map, also located in the back pocket, shows both bikeway and pathway system as envisioned by this Plan for 2020.

## CHAPTER 4

### AASHTO Reference

The Bikeway Design Guidelines of the PAG *Regional Plan for Bicycling* are based on the standards developed in the 1999 American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*. This is the only design guideline document for this Plan, as it represents the latest in nationally agreed upon bicycle facility design guidelines for both roadway and urban and suburban shared-use Path facilities.

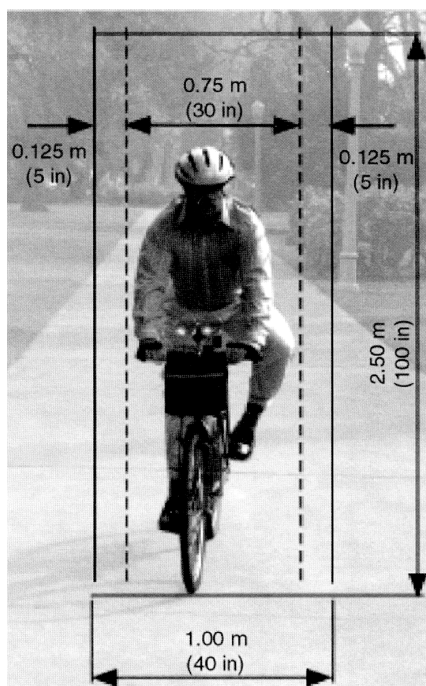


Figure 1. Bicyclist Riding Profile

### General Provisions and Definitions

Bicyclists require at least 1.0 meter or 40 inches of operating space based upon their riding profile (See Figure 1). An op-

erating space of 1.2 meters or four feet is the minimum width for any facility designed of exclusive use for bicyclists. Where motor vehicle traffic volumes, motor vehicle or bicyclist speed, or the mix of truck and bus traffic increase a more comfortable operating space of 1.5 meters or five feet or more, is desirable. Please note that the metric to English conversions used in this section come from national sources, and are all approximate. For example, 5 feet is actually 1.52 meters, and 4 feet is actually 1.22 meters.

Bicycle travel facilities include four classifications of bikeways:

**Shared Roadways** ~ all roads where bicycle travel is permitted. Width is the most critical variable affecting the ability of a roadway to safely accommodate bicycle traffic.

**Signed Shared Roadways** ~ all roads that have been identified by signage as preferred bike routes.

**Bike Lanes** ~ incorporated into a roadway when it is desirable to delineate available road space for preferential use by bicyclists and motorists, and to help provide for more predictable movements by each.

**Shared-Use Paths** ~ facilities on exclusive right-of-way and with very minimal or no cross flow from motor vehicles.

### Other Design Considerations include:

Railroad-highway grade crossings, which should be at right angles (or close) to the rails; bicycles on freeways (bicycles are prohibited on I-10 north of Wilmot Road and on I-19 north of Valencia Road);

bicycles at modern traffic circles; bicycle traffic through signalized intersections; roadway obstruction markings; and bicycle parking facilities.

### Sample AASHTO Design Guidelines

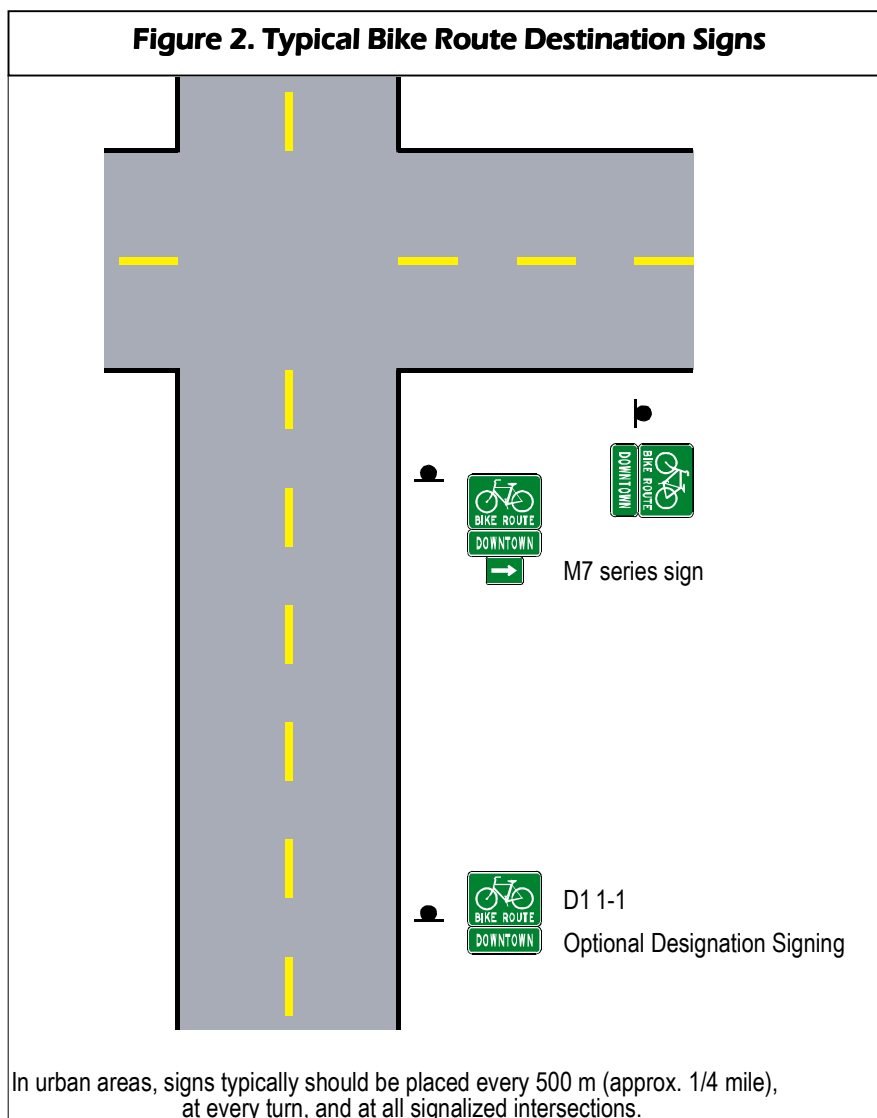
#### Shared Roadway

Design features that can make roadways more compatible with bicycle traffic include bicycle-safe drainage grates and bridge expansion joints, improved railroad crossings, smooth pavements, adequate sight distances, signal timing, and detection systems that respond to bicycles. Width is the most critical variable affecting the ability of a roadway to accommodate bicycle traffic with the least potential conflict. Suitable width can be achieved by providing wide outside lanes or paved shoulders.

**Wide outside lanes** for bicycle use are usually preferred where shoulders are not provided. On street sections without designated bikeways, an outside or curb lane 14 feet or wider (with continuous pavement surface) can

better accommodate both bicyclists and motor vehicles in the same lane, and is beneficial to both bicycles and motorists. In general, no less than 14 feet of *usable* (minimal or no surface defects, such as gutter-pavement joints, gravel, glass, or holes) lane width is recommended for shared-use. On steep grades, where bicyclists need more maneuvering space, the curb lane should be increased to 16 feet.

**Paved shoulders** should be a least four feet wide to accommodate bicycle travel when there is no curb, guardrail, or other



roadside structure. A shoulder width of five feet is recommended from the face of any such guardrail, curb, or roadside barrier. It is desirable to increase the width (six feet or more) of the shoulder where higher bicycle usage is expected. Additional shoulder width is also desirable if motor vehicle speeds exceed 45 mph, or the percentage of trucks, buses, and recreational vehicles is higher than 10 percent.

Rumble strips are raised or cut pavement texturing, installed to discourage or warn motorists they are driving onto the shoulder. They are not recommended where shoulders will be used by bicyclists, unless there is a minimum of four feet from the rumble strip to the outside edge of paved shoulder or five feet to adjacent guardrail, curb, or other roadside structure.

### **Signed Shared Roadways**

Signed shared roadways are those that have been identified with signing as preferred bike routes.

There are several reasons for designating signed bike routes.

- The route provides continuity to other bicycle facilities such as bike lanes and shared-use paths.
- The route is a common way for bicyclists through a high demand corridor.
- The route is preferred for bicycling by all users due to low motor vehicle traffic volume or paved shoulder availability.
- The route extends along neighborhood streets and local collectors that

lead to an internal neighborhood destination, such as a park, school, or a commercial district.

- The route provides connectivity to other bikeways and shared-use paths, access to major destinations, and safety and security from roadway obstacles.

Bike route signs may also be used on streets with shoulders. Regardless of the type of facility, where they are used, it is recommended that bike route signs include destination information as shown in Figure 2 on the previous page.

### **Bike Lanes**

Bike lanes can be incorporated into a roadway when it is desirable to delineate available road space for preferential use by bicyclists and motorists and to provide for more predictable movements by each. Bike lane markings, as identified in Figure 3, can increase a bicyclist's confidence in motorists not straying into their path of travel.

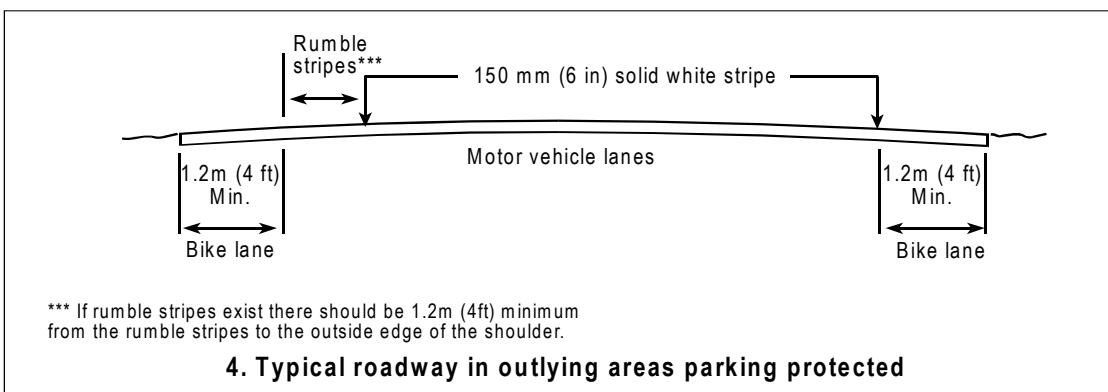
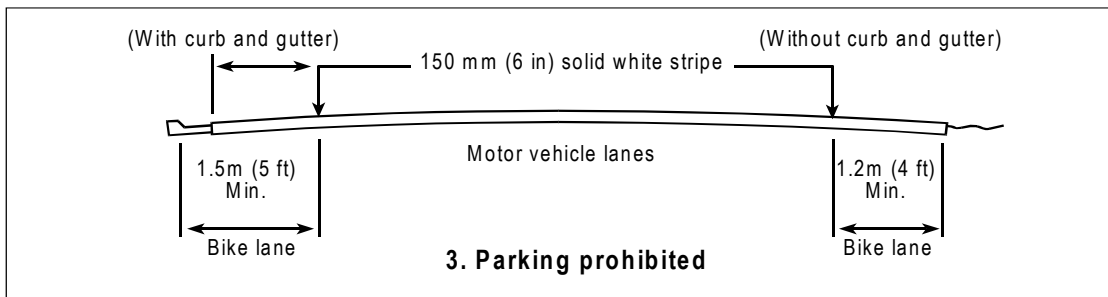
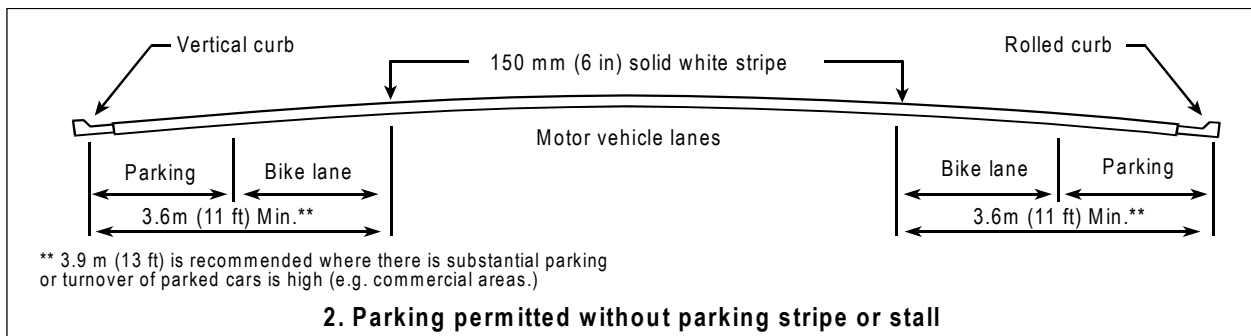
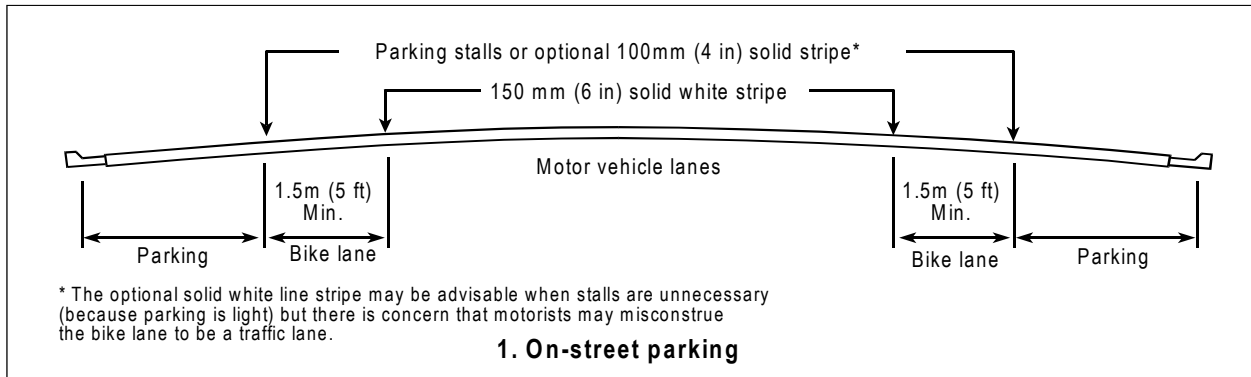
Bike lanes should be one-way facilities and carry bicycle traffic in the same direction as adjacent motor vehicle traffic. Two-way bike lanes on one side of the roadway are not recommended when they result in bicycles riding against the flow of motor vehicle traffic. Wrong-way riding is a major cause of bicycle-motor vehicle collisions and violates the rules of the road as stated in the Uniform Vehicle Code (UVC).

Bike lanes as shown in Figure 3 have varying width requirements. For roadways with no curb or guardrail, the

minimum width of a bike lane should be four feet. The recommended width of a bike lane when a curb or guardrail is present is five feet from the face of a curb or guardrail to the bike lane stripe. A bike

lane should be delineated from the motor vehicle travel lanes with at least a six-inch solid white line.

**Figure 3. Bicycle Lane Cross Sections**



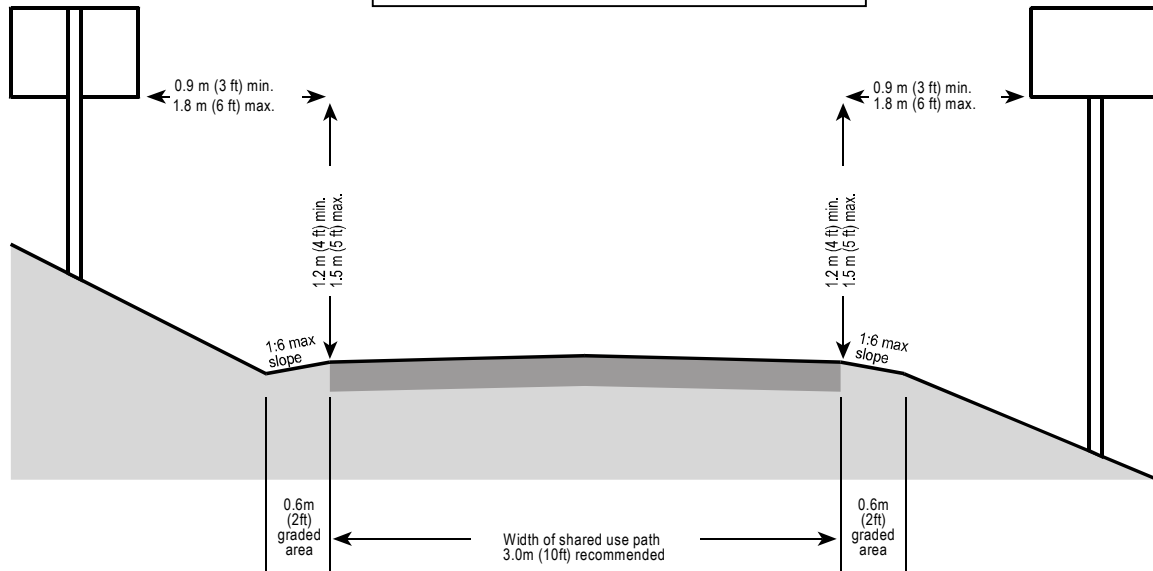
## Shared-use Paths

Acceptable shared-use paths are facilities on exclusive right-of-way with virtually no cross flow by motor vehicles. Users may include, but are not limited to: bicyclists, in-line skaters, roller skaters, wheelchair users (both non-motorized and motorized), and pedestrians (including walkers, runners, people with baby strollers, or people walking dogs). These facilities are most commonly designated for two-way travel and the guidance herein assumes a two-way facility is planned, unless otherwise stated. Shared-use paths should not be used to preclude on-road bicycle facilities, but rather to supplement a system of on-road bike lanes, wide outside lanes, paved shoulders, and bike routes.

Paths along highways are permissible, given no or virtually no driveways or cross streets, and appropriate separation between facilities. Some problems with paths located immediately adjacent to roadways are as follows:

- Unless sufficiently separated they require one direction of bicycle traffic to ride against motor vehicle traffic, contrary to normal rules of the road. (Wrong-way riding contributes to more bicycle-motor vehicle collisions than any other single act of conduct by bicyclists.)
- When the path ends, bicyclists going against traffic will tend to continue to travel on the wrong side of the street. Likewise, bicyclists approaching a shared-use path often travel on the wrong side of the street in getting to the path. (See prior note regarding collision potential this behavior creates.)
- At intersections, motorists entering or crossing the roadway often will not notice bicyclists approaching from their right, as they are not trained or conditioned to expect contra-flow vehicles.
- Signs posted for roadway users are backwards for contra-flow bike traffic; therefore, these cyclists are unable to read the information.
- When the available right-of-way is too narrow to accommodate both highway and shared-use path features, the separation between the two, or the width of the path, may be improperly reduced.
- Many bicyclists will use the roadway instead of the shared-use path because they have found the roadway to be more convenient, better maintained or safer. Some motorists who feel that in all cases bicyclists should be on the adjacent path may harass bicyclists using the roadway.
- Although the shared-use path should be given the same priority through intersections as the parallel highway, many motorists falsely expect bicycles to stop or yield at all cross street and driveways. Shared-use paths should be merged into regular pedestrian crosswalks at intersections in order to avoid this problem.
- Stopped cross-street motor vehicle traffic or vehicles exiting side streets or driveways may block the path.

**Figure 4. Share-Use Path**

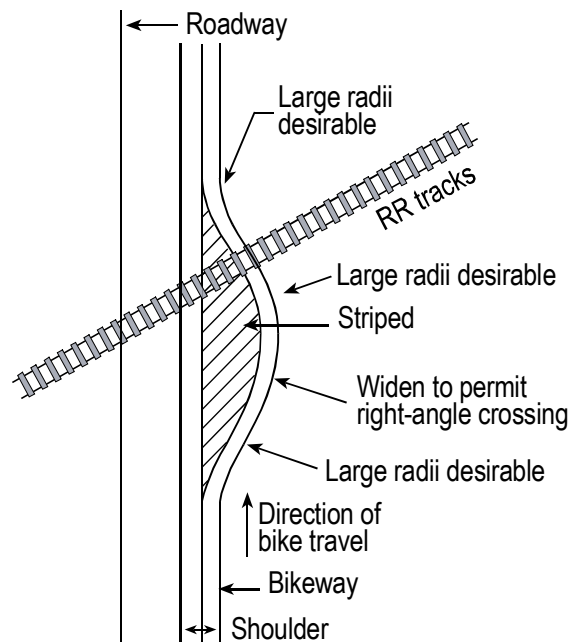


Because of the proximity of motor vehicle traffic to opposing bicycle traffic, barriers are often placed to keep motor vehicles out of shared-use paths and bicyclists out of traffic lanes. These barriers in many cases present a hazard to the bicyclists.

maximum 1:6 slope should be maintained adjacent to both sides of the path.

The paved width and the operating width required for a shared-use path are primary design considerations. Figure 4 depicts a shared-use path on a separated right of way. Under most conditions, a recommended minimum paved width for a two-directional shared-use path is 10 feet. In rare instances, a reduced width of 8 feet can be used. Under certain conditions it may be necessary or desirable to increase the width of a shared-use path to 12 feet, or even 14 feet, due to substantial use by bicyclists, joggers, skaters and pedestrians, and/or steep grades and clearance for maintenance vehicles. A minimum 2-foot wide graded area with a

**Figure 5. Railroad/highway crossings for bicycles**



**Other Design Considerations**  
**Railroad-highway grade crossings**

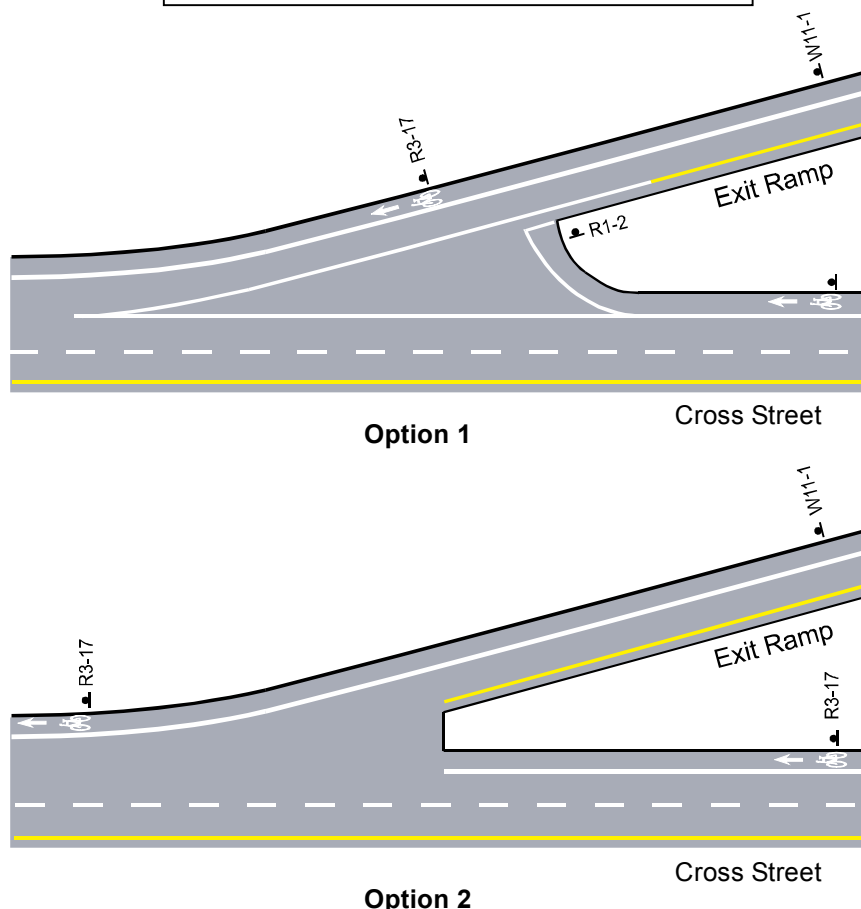
should ideally be at a right angle to the rails. This can be accomplished either as a separate path or a widened shoulder, as shown in Figure 5.

**Bicycles are permitted on the freeway** shoulders south of Wilmot on I-10 and south of Valencia on I-19. Essentially, the criteria involve assessing the safety and convenience of the freeway compared with available alternate routes.

Freeway frontage roads are not yet available on many sections of the freeways where bicycle traffic is permitted and the freeways then offer a better alternative for bicyclists. In determining the suitability of this alternate route on the freeway safety and convenience should be balanced.

**Bicycle facilities through interstate interchange areas** should be delineated both for entering bicycle traffic and for through bicycle traffic. Figure 6 illustrates guidelines for merging bicycle traffic exiting the freeway and merging with traffic and other bicycles onto the cross street.

**Figure 6. Bicycle Facilities in Interstate Interchange Areas**



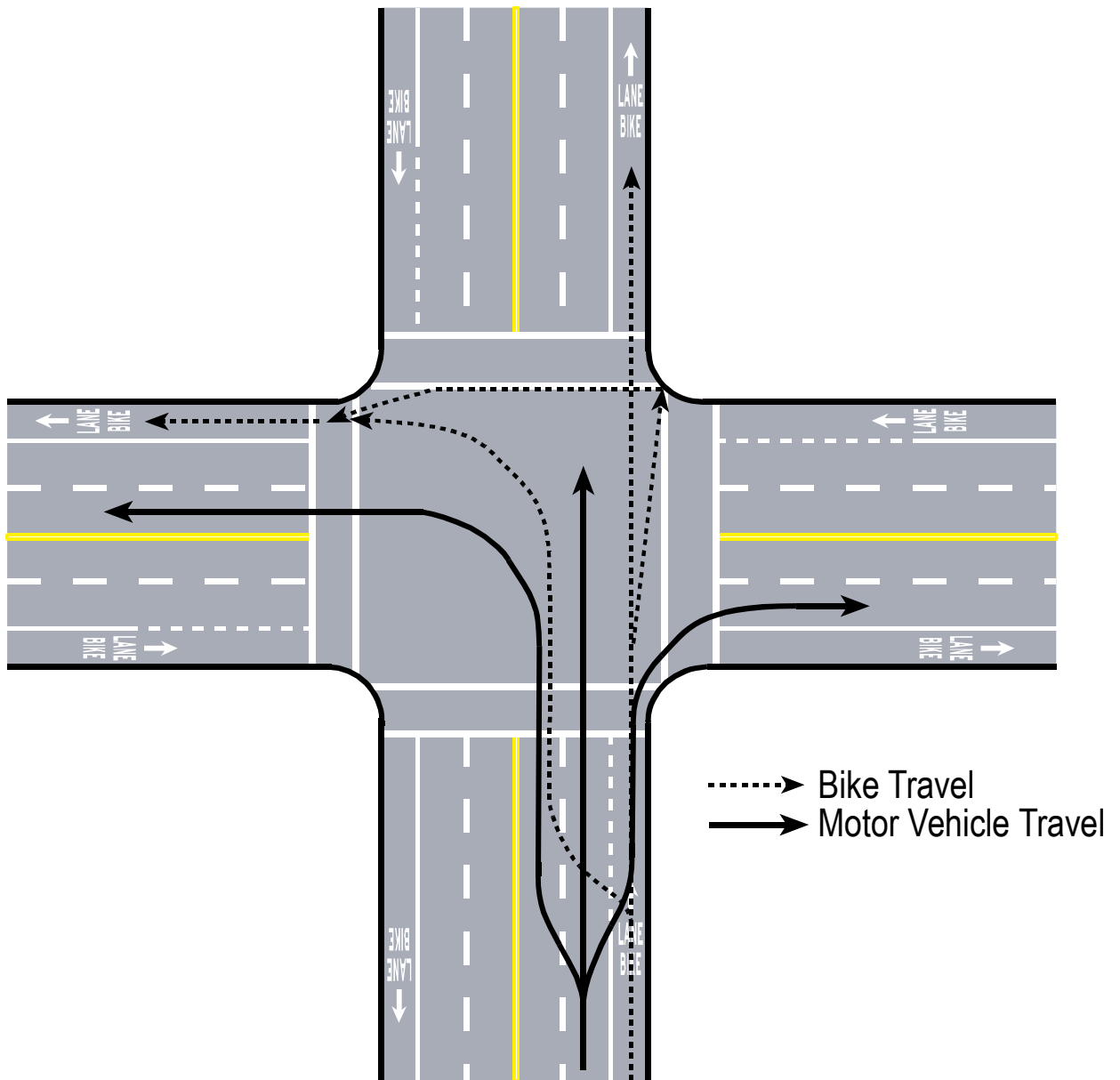
**Traffic Circles** are used in a few locations in the region, primarily on local residential roads. In these locations, there are few negative safety impacts for bicyclists. Bicyclists are expected to circulate in the traffic lane at approximately the same speed as vehicles.

**Bicycles in signalized intersections**, as shown in Figure 7, should be accommodated by providing room for them to avoid right-turning motor vehicle traffic. Figure 8 identifies typical bicycle and auto movements at major intersections with right turn only lanes. It is important to provide a separate bicycle lane to the left

of the right-turn only lane, wherever possible. A common Tucson solution to this situation, where right of way does not exist for a separate bike lane, is permitting the bicyclist to go straight in the right turn only lane. The cyclist should ride to the

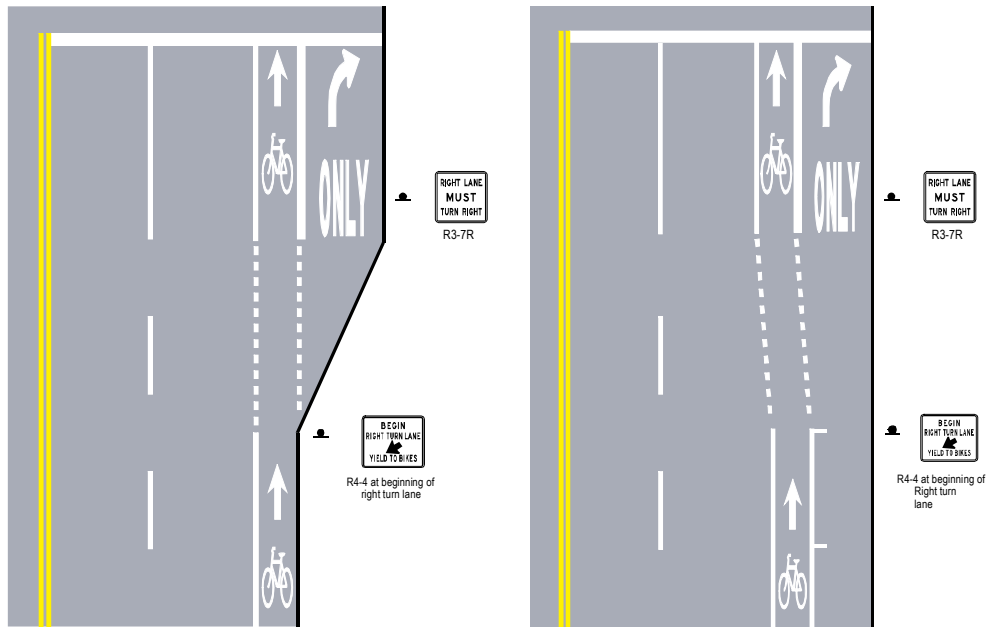
left of the right turn only lane for best safety in these situations. These types of lanes are often shared with buses such as the bus/bike lanes on Broadway and 22<sup>nd</sup> Street.

**Figure 7. Bicycles in signalized intersections**



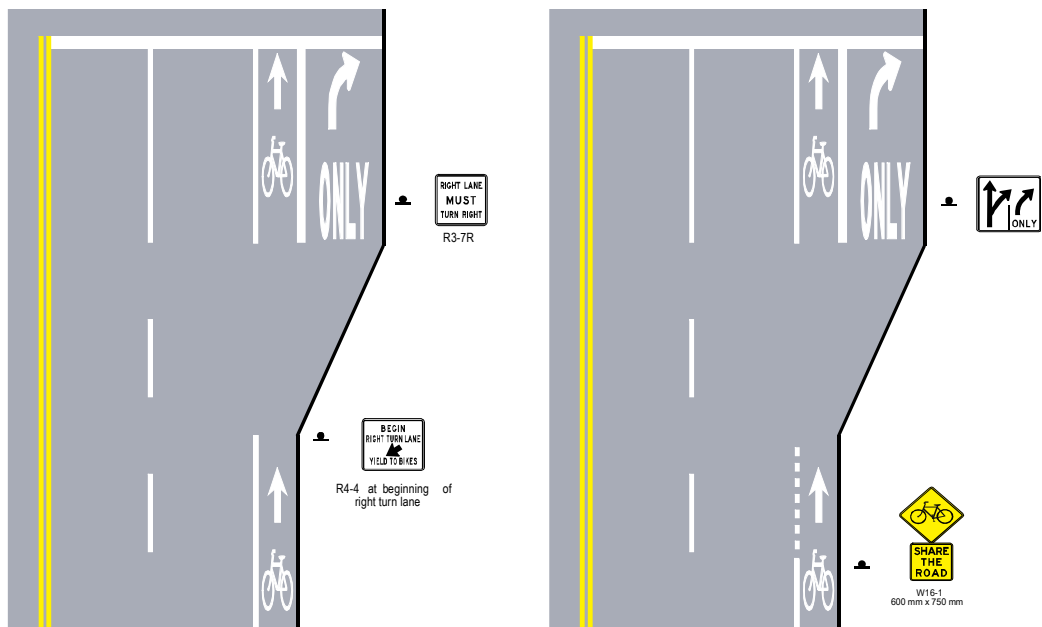
Typical Bike And Auto Movements  
At Major Intersections

**Figure 8. Bicycle Lanes Approaching Right Turns**



a. Right turn only lane

b. Parking lane into right turn only lane



c. Right turn only lane

d. Optional right/straight and right-turn-only

### **Bicycle Level of Service**

The issue of Level of Service has been in the professional arena for some years. Several proposals have been put forth, without any one being agreed upon as the nationally accepted model. Because of this situation, it was decided to not incorporate Level of Service into this Plan. It is anticipated that agreement will be reached in future years as to the approach that should be universally used to assess bicycle level of service.

### **Maintenance Considerations**

In addition to construction costs, operating and maintenance costs must be included in the overall budget for the facility. Neglecting routine maintenance will allow deterioration of bicycle facilities until they become unsafe for riding. Bicyclists should be encouraged to report bicycle facilities in need of maintenance. The City of Tucson is the only jurisdiction at this time that has a bicycle maintenance reporting process. Bicyclists may call the City Bike Coordinator to report problems, or may send in pre-addressed and stamped postcards available at local bike shops and City offices.

A smooth surface free of potholes and debris should be provided on all bikeways. Glass, sand, litter and fallen leaves often accumulate in bike lanes, and on paved shoulders and shared-use paths; therefore, regular sweeping is important. Pavement edges, especially on shoulders, should be uniform and should have no abrupt drop-offs. Signs and pavement markings should be inspected regularly

and kept in good condition, and if determined to be no longer necessary, promptly removed. Roadways with bicycle traffic may require a more frequent and higher level of maintenance than other roadways.

For shared-use paths, attention should be given to maintaining the full paved width and not allowing the edges to erode. Trees, shrubs, and other vegetation should be controlled to provide adequate clearance and sight distances. Trash receptacles should be placed and maintained at convenient locations. Grass areas in the vicinity of shared-use paths should be mowed regularly. Also, enforcement is often necessary to prevent unauthorized motor vehicles from using a shared-use path.

The routine maintenance of roadways and bikeways will usually help provide good riding conditions. Several bicycle improvements described in this Plan can be implemented during routine maintenance activities. Considerations also can be given to adjusting lane widths and providing wider outside curb lanes for bicyclists during re-striping operations. The addition of edge lines can better delineate a shoulder, especially at night. When shoulders are resurfaced, a smooth surface suitable for bicycle riding should be provided.

## CHAPTER 5

### Facility and Program Implementation Strategies and Responsibilities

Implementation of bicycle facility planning and programming is dependent upon funding from Federal, State or local resources. These resources have been used to construct bikeways on new and rebuilt roadways, provide safe crossings of major roadways, build shared-use Paths along river and wash channels, provide exclusive shoulders and bikeways on existing roadways and fund the Bicycle Planning and Bicycle Education Programs with the City of Tucson. These funds have helped provide a bicycle element in proposed and rebuilt roadways, in funding

separate bike lanes and Paths, and for bicycle planning and education programs. Table 5 in Chapter 3 of this document sets out in more detail the funding sources for bicycle and Paths facilities in Pima County.

Bicycle facilities can be built using local and Federal funds, and can take advantage of the land use development process. Developers, in constructing commercial and industrial properties, provide roadway improvements and new construction, including bicycle facilities, lockers and racks for employees and customers. The facility and program implementation strategies and responsibilities that each local jurisdiction uses to develop bicycle facilities are identified in Table 6.

**Table 6. Bicycle Facility Funding Sources**

Facility Type	Funding Source Opportunities
Bicycle Lane or shoulder	Land Use Development Dedication – local land use development process based on local government land use development policies and transportation standards Roadway Revenue Bonds repaid locally using future Highway Users Revenue Funds (HURF) As part of NHS and STP roadway construction process – regional and State process with TEA 21 and HURF funds Roadway Overlay Program – local (City of Tucson) Transportation Enhancements – Regional and State process with Federal TEA 21 funds
Shared-use Pathway	General Obligation bonds repaid locally using future property taxes, or specific locally derived revenues As part of a floodplain improvement project administered by the Army Corp of Engineers. There is a local match for Federal funds. Transportation Enhancements – Regional and State process using Federal TEA 21 funds
Shared-use path and bike lane and shoulder	Local recreation or flood control funds for the path and transportation department funds for the bike lane and shoulder maintenance
Bicycle Planning and Education Programs	State Bikeway Funds Federal TEA 21 Funds Local Funds Project Development Activity Funds (PDAF)

## Recommendations

The Tucson Region has an extensive regional bikeway system, made up of bike lanes, shoulders, bike routes, and shared-use paths. It has grown considerably from its early 1970's beginnings. Local jurisdictions have developed new bicycle facilities and improved existing roadways and floodplain channels for bicycle travel. This includes the application of development regulations that require that bicycle facilities (including parking facilities), when applicable, be constructed on area roadways, and along floodplain channels. County Transportation and Recreation Bonds have been passed which will further increase the bike lanes, roadway shoulders, and shared-use paths that make up the Regional Bikeway System. All these facilities are provided to facilitate bicycle travel in Pima County.

The following recommendations will supplement the vision of providing for and facilitating bicycle travel in Pima County.

## Facility Recommendations

The Tucson Region has grown to 488.5 miles of roadway bikeways and 50 miles of shared-use paths. The region's local governments, using development exactions, area roadway and shared-use path construction, the Pima County Recreation and Transportation Bonds, and City of Tucson bonds, should be able to double bikeway mileage in the next 10 years.

## Bikeways Expansion

This Plan recommends that bikeway expansion continue at an increased level as the region nears a population of 1 million. The connection of shared-use paths and roadway bikeways is a primary element in reaching the goal of 800 miles by the year 2010 resulting in a more continuous and connective bikeway system. Table 7 summarizes existing and planned miles of bikeway facilities.

**Table 7. Existing & Planned Bicycle Facilities** (in Miles)

Type of Facility	Year 2000	Additional	Year 2020 Total
Route	425	775	1200
Lane	6	10	16
Shared Use Path	50	100	150
Bus/Bike	7.5	15	22.5
<b>Totals:</b>	<b>488.5</b>	<b>900</b>	<b>1388.5</b>

## Action Plan

### ◆ Goal 1

#### **EDUCATION – Educate All Road Users, Especially Bicyclists, on Legal, Predictable, and Safe Behavior.**

This Plan recommends that the region implement both adult and child bicycle riding and traffic education programs. This should be coordinated with all area school districts and with Bicycle Planning and Enforcement Staff of local jurisdictions and PAG.

1. Develop and coordinate a Bike-Ed program in elementary schools in the metropolitan Tucson area as part of regular school curriculum.
2. Continue development and use of video and audio PSA's as well as short instructional safety videos to promote proper and legal cyclist behavior.
3. Educate the public on the new three feet minimum passing distance law, passed in 2000.
4. Develop and fully support an Adult Bicycle Education Program utilizing periodic safety, commuter, and defensive driver classes, PSA's, open houses and other marketing methods.
5. Continue and expand local Police Bicycle Patrol Units, and dedicate a distinct percentage of the officers' time to educational efforts on proper bicycling behavior.

6. Develop and test a bike offender diversion program (i.e., community service program) to complement the above enforcement efforts.

7. Promote head injury awareness and helmet usage through educational brochures and low-cost helmets.

8. Maintain the League of American Bicyclists "Bicycle Friendly Communities" designation and Bicycling Magazine's "Top Ten Best Cities for Cycling" award for the City of Tucson, and strive to achieve it in other member jurisdictions.

9. Include bicycling-related questions in motor vehicle driving license tests as a means to raise awareness of bicyclists' rights and responsibilities.

10. As part of PAG's Regional Bicycle Planning and Travel Reduction/Rideshare Programs, develop, update and distribute as needed, an improved, user-friendly bicycle map of the Tucson Region

11. As part of PAG's Regional Bicycle Planning and Travel Reduction/Rideshare Programs publish and distribute a user-friendly Tucson Regional Bicycle Commuter Handbook.

### ◆ Goal 2

#### **ENFORCEMENT— Enforce All Traffic Laws on Bicyclists and Motorists, especially those relating to Bicyclist/Motorist interactions.**

This Plan recommends that the Region develop a targeted multi-modal traffic

enforcement program complemented by the education recommendations above.

1. Update or develop materials for use by law enforcement personnel to support their education and enforcement efforts.

2. Commit appropriate time of police bicycle patrols and motor vehicle patrols to targeted bicyclist and motorist enforcement efforts.

3. Develop and implement a consistent, year-round traffic law education program for law enforcement personnel which focuses on teaching police officers a balanced education and enforcement program for improving motorist and bicyclist compliance with traffic laws.

### ◆ Goal 3

#### **ENGINEERING — Plan, Design, Construct and Maintain Bicycle Facilities That Meet or Exceed Standards and Guidelines.**

This Plan recommends that PAG jurisdictions work with regional staff to ensure that bicycle facilities meet or exceed AASHTO Guidelines, and that the bikeway system is developed and improved into a continuous, connective, safe, and accessible system.

1. Provide dedicated local funding sources for the construction and maintenance of bikeways.

2. Incorporate bicycle-friendly roadway design practices and standards through consistent, routine training of PAG,

ADOT, and all member jurisdiction staff on bicycle transportation planning and design practices.

3. Increase regional bicycle route and bicycle lane miles to 800 by the year 2010 and 1,200 by the year 2020.

4. Develop an interconnected network of bikeways on and between 1) local and collector streets, 2) major arterial roadways, and 3) shared-use paths in linear parks along arroyos. Concentrate bicycle improvements in a three-mile radius (“hub and spoke”) around major employment centers, schools, and activity centers.

5. Plan, program and implement special provisions for mid-block bicycle crossings of high volume streets, at selected locations.

6. Locate new schools, especially elementary and middle schools, only on collector streets, where roadway volumes and speeds are lower, providing safer non-motorized access opportunities for school children.

7. Provide periodic news releases for bicycle planning and bicycle system development and actively solicit public input.

8. Develop land use policies, including zoning and subdivision regulations, that will accommodate and promote bicycle use in and to activity centers, neighborhoods, schools and parks.

9. Require short and long-term bicycle parking for all commercial and business uses, and for multi-family housing.

10. Require motor vehicle parking on the side or rear of the developed lot, not in the front (street-side), where pedestrian and bicycle conflict potential is highest.

11. Monitor the implementation of elements within this Regional Plan for Bicycling and update the Plan at five-year intervals.

12. Periodically conduct community-wide public opinion surveys to assist programs that could improve bicycling in the Tucson metropolitan area.

13. Develop a PAG Bicycle Traffic Counting program on a routine basis that will identify usage levels and help determine progress toward achieving future bicycle mode split goals.

14. Develop a Bikeway Inventory system as part of PAG's Regional Bike Map.

15. Develop a Regional Bicycle Accident Database to assist in educational and roadway improvement efforts.

16. Prioritize implementation of bicycle facilities that connect key linkages to the roadway and Path systems, including interim roadway and Path improvements where needed, and spot safety improvements on existing routes and Paths

17. Re-stripe all collector and arterial roadways to provide maximum outside lane width, based on recommended widths in this Plan.

18. Provide and maintain a striped shoulder of at least four feet on uncurbed

roadways (measured from white edge stripe to edge of shoulder), or bike lane of at least five feet on curbed roadways (measured from white edge stripe to gutter face with at least four feet between the edge stripe and the edge of the gutter pan) on all new, rehabilitated, or reconstructed arterial and collector roadways.

19. Modify existing traffic signal detection equipment or install new equipment, such as loop detectors, video detectors, or safely accessible push-button actuators to make all traffic signals bicyclist responsive.

20. Provide a multi-use auxiliary lane of at least eight feet on all new or reconstructed bridges, underpasses, and overpasses.

21. Plan and design for bicycle travel with all intersection capacity improvements, based on AASHTO Guidelines.

22. Develop smaller radius corners on streets with bikeways to slow right turning traffic.

23. Develop street sweeping programs on designated bike routes, sweeping all bike lanes and bike routes at least every other week.

24. Maintain street surfaces on designated bikeways and key shared-use path linkages to a high standard, including elimination of potholes, and maintenance of bicycle-safe railroad crossings, drain grates and cattle-guards. Avoid use of chip sealing on high-volume bikeways whenever practicable.

25. Routinely (at least monthly) maintain and sweep street surfaces on arterials and collectors not designated as bicycle routes to reduce hazards (e.g., potholes, debris) for bicyclists that must use these roadways.

26. Establish strong jurisdictional responsiveness to maintenance requests from citizens through the use of a telephone “hotline” and other means for citizens to report problems. Establish a regional goal of five working days to address these problems.

27. Seek and support a bottle deposit program in order to reduce littering of roadways, parks, and bikeway facilities with hazardous broken glass.

28. Provide and maintain bikeway detours through construction zones, and maximize outside (curb) lane widths (provide lane widths of at least 15 feet) through construction zones on roadways that do not have bike lanes. Where this is not feasible, provide appropriate bicycle-friendly detours and detour signing.

29. Provide full-time bicycle coordinator or planning staff positions in PAG and PAG member jurisdictions and the Tucson Regional Office of the Arizona Department of Transportation (ADOT).

For other design and traffic control questions, refer to the 1999 American Association of State Highway & Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities or Guidelines* and Chapter 9 on *Bicycle Traffic Control Devices* in the *Manual on Uniform Traffic Control Devices (MUTCD)*.

## ◆ Goal 4

### **ENCOURAGEMENT – Encourage the increased Use of Bicycles for Transportation and Recreation.**

The Tucson Region has an ideal climate and facilities for year-round bicycling. A regional bicycle education program should encourage, enhance, and promote bicycle riding for area residents and visitors. Promotion of bicycling to visitors can enhance their experience, and benefit the local economy.

1. Achieve a Region-wide bicycle commute mode share of 5 percent by the year 2005, 10 percent by the year 2020 and a bicycle mode share of at least 5 percent of ALL trips by the year 2020.

2. Continue and expand the interface between bikes and buses, including such features as bicycle racks on all buses, bicycle racks and lockers, park-and-ride lots, and low-floor buses and signal preemption for buses and bikes at signalized intersections.

3. Encourage wide-spread support of and participation in bicycle awareness programs by bicycle shops, bicycle clubs, the Tucson-Pima County Bicycle Advisory Committee, and other bicycle interest groups in efforts to promote public awareness of bicycling.

4. Continue and expand marketing efforts to promote bicycling as an alternate mode of transportation, especially through cooperative efforts with PAG’s Regional Travel Reduction and Rideshare Programs.

5. Develop and implement specific incentives to encourage existing businesses and other entities to provide support facilities for bicycling, such as racks and bicycle lockers, showers and clothes lockers, parking cash allowances and guaranteed ride home programs.

6. Provide outreach and personal travel cost information that shows how bicycle transportation can be financially beneficial to the low-income work force and students.

7. Construct bicycle facilities where needed, including roadway and parking improvements, in low-income areas.

8. Promote the quantifiable air quality benefits of bicycling through public outreach efforts to major public and private sector employers.

9. Develop and promote local bicycle parking ordinances where they do not currently exist, and monitor and improve existing local bicycle parking ordinances, based in part on bicyclist and business feedback and recommendations.

10. Provide adequate bicycle parking facilities for children at schools, parks, and libraries.

11. Promote organized bicycle racing on regional roadways, in BMX parks and on Paths outside of designated wilderness areas as a means of increasing public awareness of the potentials of bicycling and as a viable sport for public viewing and participation.

12. Support the efforts of the Tucson-Pima County Bicycle Advisory Committee (TPCBAC) to promote bicycling and improve bicycle safety through effective response to TPCBAC concerns.

### **Conclusion**

This Regional Plan for Bicycling has a bold, publicly based and supported Vision. The Goals and Action Plan contained herein provide a strong, supportive context for PAG member jurisdictions to continue and strengthen their accommodation of bicycle travel, through development or update of Bicycle Improvement Plans, and subsequent implementation of bikeway improvements, educational and enforcement programs.

PAG will monitor the implementation of this Plan by member jurisdictions consulting with the Tucson-Pima County Bicycle Advisory Committee. The BAC's voice should be heard and heeded, on matters in or related to this Plan.

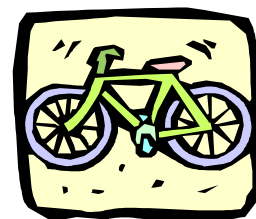
## Appendix A. Jurisdictional Applications

	<b>City of Tucson</b>	<b>Pima County</b>	<b>Town of Oro Valley</b>	<b>Town of Marana</b>	<b>City of South Tucson</b>	<b>Town of Sahuarita</b>	<b>University of Arizona</b>	<b>Pascua Yaqui Tribe</b>	<b>Tohono O'odham Nation</b>	<b>National Park Service - Saguaro National Park, East &amp; West</b>	<b>National Forest - Coronado National Forest</b>	<b>Arizona DOT</b>
<b>Bike lanes and/or shoulders in street standards?</b>	Yes	Yes. Rural & urban streets	Yes. 4-8' Multi-use lane	Yes. Pima County Roadway Standards	Yes. City of Tucson Standard	Yes. Pima County Standard	NA	No	No	No	No	Yes. On all highways, including where bicycles are permitted
<b>Development regulations require trails, bike lane, shoulder, and bicycle parking dedication?</b>	Trails easement, bike lanes, and bicycle parking	Trails fee dedication, roadway shoulder provision	Not currently required but recommended in Town Bicycle and Pedestrian Plan	Pima County Roadway Standards	Yes. City of Tucson Standard	No	Yes. All University Buildings & Shared Use Paths	No	No	Federal Property Bicycle parking & shared use trails developed	Federal Property Bicycle parking & shared use trails developed	Not Applicable
<b>Bicycle Education Program?</b>	Yes. Through Safe-kids, Park & Rec. & Fire Dept	No. COT program available upon request	No. COT program available upon request	No. COT program available upon request	No. COT program available upon request	No. COT program available upon request	During registration	No	No. COT program available upon request	Not Applicable	Not Applicable	Not Applicable
<b>Bicycle Lane or shoulder maintenance program?</b>	Yes. Spot Improvement Program requests	No	Separate Roadway Maintenance Program	No	No	No	Not Applicable	No	No	No	No	Only where needed in the course of normal roadway maintenance
<b>Bicycle riding permitted on sidewalk?</b>	No	Not expressly prohibited	Yes	Yes	Yes.	Yes.	Yes. Shared use paths on campus	Yes	Yes	Yes. Shared Use Paths	Yes. Shared Use Paths	Subject to local ordinances
<b>Designated Bicycle Planner?</b>	Yes. Alternative Modes Program	No	Yes. Public Works Planning Division	No	No	No	In parking office Has other duties besides bicycle planning.	No	No	No	No	Yes. State Bicycle Coordinator in Phoenix
<b>Shared Use Pathway Standards?</b>	Yes. AASHTO Guidelines for the Development of Bicycle facilities	Yes. AASHTO	Yes. AASHTO	Yes. AASHTO	Yes. AASHTO	Yes. AASHTO	Yes. Shared use paths	No	No	Yes. Shared use dirt trails	Yes. Shared use dirt trails	Yes. AASHTO
<b>Roadway Improvements includes bicycle accommodation?</b>	Yes. Overlay & Widening	Yes. Major reconstruction and widening	Yes. Major roadway improvements	Yes. when applicable	Yes. when applicable	Yes. when applicable	Not Applicable	No	No	No	No	Yes. when applicable
<b>Bicycle patrols for Law Enforcement?</b>	Yes. Since 1988	Local and Federal Agencies, i.e., PCC, PC Parks & Rec., INS	No	No	Yes	No	No	No	No	No	No	No
<b>Uses alternative bicycle roadway crossing?</b>	Yes. Pelican & Toucan Design	No	Yes. On a case by case basis	Yes. On a case by case basis	No	No	No	No	No	No	No	No

## Appendix B. Public Input



# Open House



for the  
Metropolitan Tucson  
Bicycle and Pedestrian Plans

Sponsored by City of Tucson & Pima Association of Governments (PAG)

Meet with City and PAG planners to discuss future plans and improvements to bicycle and pedestrian facilities. Give us your ideas for making your city a bicycle and pedestrian-friendly community.

◆ Free bike maps, refreshments, and prizes ◆

### Schedule of Open Houses:

- Saturday, November 7<sup>th</sup>, 4 to 8p.m.  
Armory Senior Citizen Center (downtown), 220 S. 5<sup>th</sup> Avenue
- Saturday, November 14<sup>th</sup>, 8a.m. to 12p.m.  
GABA Bike Swap Meet, Pima Community College (parking lot), 2202 W. Anklam Rd.
- Sunday, November 15<sup>th</sup>, 1 to 5p.m.  
Park Mall Shopping Center (in the mall area), 5870 E. Broadway
- Tuesday, November 17<sup>th</sup>, 4 to 8p.m.  
El Pueblo Neighborhood Center, 101 W. Irvington
- Wednesday, November 18<sup>th</sup>, 4 to 8p.m.  
Foothills Mall (in the mall area), 7401 N. La Cholla
- Thursday and Friday, November 19<sup>th</sup> and 20<sup>th</sup>, 9a.m. to 5p.m.  
El Tour de Tucson Bike Festival, Tucson Convention Center, Grand Lobby

*For more information contact:*

*Dick Schaffer, Pima Association of Governments at 628-5313*

*Or see PAG's website [www.pagnet.org](http://www.pagnet.org)*

*Para información en español, llame a 791-4372 y hable con la recepcionista*

## Metropolitan Tucson Bicycle Questionnaire

Thank you for taking the time to fill out this questionnaire. Your input is very important to us. The purpose of this questionnaire is to find out what we need to do to encourage more travel by bicycle in our community, and where we need to make improvements to the bikeway system.

(Optional)

Name: \_\_\_\_\_

Mailing Address: \_\_\_\_\_

What is your zip code? \_\_\_\_\_

How long have you lived in the Tucson area? \_\_\_\_\_

How do you usually travel to work or school?

a) car b) bus c) bike d) walk e) other \_\_\_\_\_

How do you usually travel to go shopping, out to dinner, or for other personal purposes?

a) car b) bus c) bike d) walk e) other \_\_\_\_\_

Do you ride a bicycle mainly for recreation or for commuting? \_\_\_\_\_

How many days per week? \_\_\_\_\_

Is bicycling important to you? \_\_\_\_\_ Why? \_\_\_\_\_

Do you think your city is a bicycle-friendly community? \_\_\_\_\_ Why? \_\_\_\_\_

Which of the following would encourage you to ride a bicycle to work or school? Rank them according to level of importance. Most important = 1

- If you lived closer to work or school \_\_\_\_\_
- Safer to ride on busy streets/ less perceived risk \_\_\_\_\_
- More bike lanes and multi-use paths \_\_\_\_\_
- Safer and more convenient places to park your bike \_\_\_\_\_
- Facilities at work to shower or dress \_\_\_\_\_
- If you owned or had use of a bicycle \_\_\_\_\_
- Nothing \_\_\_\_\_
- Something else \_\_\_\_\_

What should your local government do to encourage more travel by bicycle?

Rank them according to level of importance. Most important = 1

- Provide more multi-use paths separate from the road \_\_\_\_\_
- Provide more bike lanes on the road \_\_\_\_\_
- Provide more convenient places to park bicycles \_\_\_\_\_
- Educate motorists and bicyclists to share the road safely \_\_\_\_\_
- Provide better bikeway connections between neighborhoods, shopping centers and employment centers \_\_\_\_\_
- Provide better traffic enforcement of bicyclists and motorists \_\_\_\_\_
- Provide safe and convenient street crossings (signals, bridges) \_\_\_\_\_
- Something else \_\_\_\_\_

Where should your local government make improvements to the bikeway system?

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*Please return questionnaires to:  
your local bikeshop, public library  
or*

Pima Association of Governments  
177 N. Church Avenue, #501  
Tucson, AZ 85701

## Bicycle Questionnaire Data

Total surveys returned: 270

### How long have you lived in the Tucson area?

Median: 10 years
Average: 12.6 years

1-2 years	37	14%
3-5 years	40	15%
6-10 years	60	22%
11-15 years	39	14%
16-20 years	40	15%
Over 20 years	49	18%
No response	5	2%
<b>Total responses</b>	<b>270</b>	

### Zip Codes

85629	1	0%	85730	10	4%
85652	1	0%	85731	1	0%
85701	3	1%	85732	1	0%
85702	5	2%	85735	1	1%
85704	14	5%	85737	11	4%
85705	25	9%	85739	1	0%
85706	4	1%	85740	1	0%
85708	1	0%	85741	4	1%
85710	22	8%	85742	9	3%
85711	20	7%	85743	5	2%
85712	11	4%	85745	15	6%
85713	8	3%	85746	3	1%
85714	2	1%	85747	1	0%
85715	5	2%	85748	5	2%
85716	20	7%	85749	2	1%
85717	1	0%	85750	4	1%
85718	10	4%	85752	1	0.00%
85719	36	13%	No response	5	2%
85726	1	0%	<b>Total</b>	<b>270</b>	

### Travel to Work or School

Car	118	44%
Car/bus	3	1%
Car/bike	29	11%
Car/bus/bike/walk	3	1%
Bus	10	4%
Bus/bike	9	3%
Bike	68	25%
Bike/walk	5	2%
Walk	7	3%
Other	10	4%
No response	8	3%
<b>Total</b>	<b>270</b>	

### Travel to Shop/Personal

Car	174	64%
Car/bus	1	0%
Car/bike	23	9%
Car/bike/walk	9	3%
Car/bus/bike/walk	3	1%
Bus	3	1%
Bus/bike	7	3%
Bus/walk	2	1%
Bike	23	9%
Bike/walk	6	2%
Walk	6	2%
Other	5	2%
No response	8	2%
<b>Total</b>	<b>270</b>	

### Ride a Bike for Commuting or Recreation?

Commuting	42	16%
Recreation	120	44%
Both	83	31%
No response	25	9%
<b>Total</b>	<b>270</b>	

### How many days per week do you ride a bike?

0 days	35	13%
1 days	31	11%
2 days	28	10%
3 days	40	15%
4 days	36	13%
5 days	41	15%
6 days	22	8%
7 days	37	14%
<b>Total</b>	<b>270</b>	

### Is bicycling important to you?

No	9	3%
Yes	255	94%
No response	6	2%
<b>Total</b>	<b>270</b>	

**Why?** (Only those that said **Yes** from above)

Numbers based on frequency of response for each category.

Health/fitness	221	58%
Good for the environment	78	20%
Cost effective	32	8%
More efficient than driving	27	7%
No response	27	7%
<b>Total</b>	<b>383</b>	

**Is Tucson Bike-Friendly?**

Yes	116	43%
No	130	48%
Yes and No	10	4%
No response	14	5%
<b>Total</b>	<b>270</b>	

**Why?** (Answers for both **Yes** and **No**)

Numbers based on frequency of response for each category.

**Yes because...**

Many bikeway facilities	78	60%
Relatively safe	10	8%
Good info and education	6	5%
No response	37	28%
<b>Total</b>	<b>131</b>	

**No because...**

Lack of bikeway facilities	62	34%
Poor maintenance of bikeways	13	7%
Not safe	82	45%
Lack of info and education	18	10%
No response	8	4%
<b>Total</b>	<b>183</b>	

**What would encourage you to ride a bike?**

Numbers based on frequency of response for each category.

Lived closer to work	100	15%
Safer streets	163	24%
More bike lanes and paths	170	25%
More bike parking	111	17%
Shower facilities at work	93	14%
Owned a bike	31	5%
<b>Total</b>	<b>668</b>	

**What could local government do to encourage more travel by bike?**

Numbers based on frequency of response for each category.

More off-street bike paths	166	17%
More on-street bike lanes	184	19%
More bike parking	94	10%
More bike/motorist education	171	17%
Better bikeway connections	152	16%
Better enforcement	107	11%
Better street crossings	104	11%
<b>Total</b>	<b>978</b>	

## APPENDIX C

### Neighborhood Stress Indicators

#### Background

The individual data items that comprise the Composite Stress Index were selected after an extensive literature review on social indicators as predictors of community needs. The variables selected reflect the physical and social conditions indicative of dependency and need and are related to economic status, shelter costs and conditions, as well as possible social dependency (i.e., youth, old age, or disability).

This approach is unique to the City of Tucson, so far as we know, as it did not exist in the literature. The City of Tucson planning staff developed this approach 15 years ago. These variables were originally selected in 1983 for their utility in assisting the Community Development Block Grant process, especially in prioritizing needs: that is, variables were limited to information reflective of housing and family needs typically addressed by CDBG programs. Each variable contributed equally to the overall composite score - there was no theoretical basis for differential weighting that we found credible.

Our review of the literature did not reveal any National standards or thresholds upon which neighborhoods might be judged or weighed. We did not find theory or practice, attractive to us, which might tell leaders when an area needed assistance. These decisions are innately political in that they involve the distribution of public monies and goods. We

found no mathematical substitute for human judgement.

Given these facts, staff decided that all one could do was measure the City's "neighborhoods" against the average condition of the City as a whole. Thus, the statistical method used simply measures areas in standard deviation units from the mean of the City. Because of this, it is difficult to say from one decade's census to the next whether or not an area "improved" other than to say that its rank may have changed up or down relative to the City average for these factors.

Individual scores were standardized or normalized to remove differences in scale and variation among the variables. This process created variables whose means are zero and whose standard deviations are +/- 1.0. An overall or composite score was obtained by averaging all 31 scores. The higher the score, the greater the social and housing related "stress" in the area. Areas with scores greater than the average for the City were deemed to be "stressed." The degree of stress is indicated by the score, that is, the standardization process gives scores in standard deviation units. A score of +1.5 indicates that, on average, over 31 measures, the area's composite score was 1.5 standard deviation units greater than the mean score of the City. There is no consideration of whether the City's condition is good, bad, or indifferent. These data reflect only population and housing variables. Highly relevant matters such as nutritional status, health status, recidivism, crime, etc., were not included in this ap-

proach as used in 1983 and 1992 following the release of census data from the sample portion of the census at block group level.

### **Caveats**

Caution must be exercised in the use of these data and interpretations of their meaning. The *indicators of neighborhood stress* are provided to assist in fuller assessments of areas to be supported by community resources. These scores have no agenda. The scores and rankings of “neighborhoods” [actually census block groups which are of neighborhood scale but might not be neighborhoods *per se*] are intended to be used as supporting facts and are not intended to be used as a substitute for human judgment. Areas scored as having very low need or dependency may in fact have serious problems concerning issues or subjects outside the scope of this study. Conversely, areas with very high scores indicative of great need and dependency may have healthy, vital households. These scores are not qualitative assessments of an area’s spirit or vitality; rather, these scores are simple, mathematical indicators of population and housing facets indicative of need. This instrument is only one factor to be considered in evaluation of an area. Depending upon the program in question, other factors should also be considered, such as health, nutrition, crime, other programs in place, and the organizational resources or assets of any neighborhood group.

### **Neighborhood Stress Elements**

Neighborhood Stress scores are based on information obtained from the 1992 City of Tucson Indicators of Neighborhood

Stress report. The Report provides an index of population and housing characteristics that can be used as supporting information in targeting areas for housing rehabilitation and implement programs to support and nourish those in need. The Report identified 31 data items from the 1990 Census, which were judged the best indicators of social dependency and housing need. The specific factors identified in the Report include the following:

#### **1. Minor Population**

Persons 18 years old or less as a percentage of the total population.

#### **2. Elderly Population**

Persons aged 65 years or more a percentage of the total population.

#### **3. Minority Elderly Population**

Persons aged 65 years or more who are not white, non-Hispanic as percentage of the total population.

#### **4. Pre-School Index**

Children 5 years or less as a percentage of the total youth population aged 18 years or less.

#### **5. Dependency Index**

Ratio of youths (18 years or less) and elderly (65 years or more) to working age persons (19 – 64 years).

#### **6. Fertility Index**

Number of children less than 5 years of age per 1,000 women aged 15 to 44 years of age.

### **7. Language Disability**

Persons 18 years and over who do not speak English well or at all as a percentage of the population aged 18 years and over.

### **8. Mobility Disability**

Civilian, non-institutionalized persons 16 years and over with a disability limiting mobility and self-care as a percentage of all civilian, non institutionalized persons 16 years and over.

### **9. Work Disability**

Persons aged 16 to 64 years of age with a work disability as a percentage of all persons 16 to 64 years of age.

### **10. Poverty Status - Persons**

Persons below the poverty level as a percentage of all persons for whom poverty status is ascertained.

### **11. Poverty Status - Families**

The number of families below the poverty level as a percentage of all families for whom poverty status is ascertained.

### **12. Poverty Status - Elderly Persons**

Persons 65 years or over whom are below the poverty level as a percentage of all persons 65 years or over.

### **13. Educational Attainment**

Persons aged 25 years and over that have completed less than 4 years of high school as a percentage of all persons 25 years and over.

### **14. Unemployment Rate**

Unemployed persons 16 years and over whom are in the civilian labor force as a

percentage of all persons 16 years and over in the labor force.

### **15. Not Working in 1989**

(Replaces a variable used in 1980 which is no longer available)

Persons 16 years and over with no employment in 1989 as a percentage of all persons 16 years and over.

### **16. Working Mothers**

Females 16 years and over who are in the labor force and have children under 5 years of age as a percentage of all females 16 years and over with children under 5 years of age.

### **17. Female Householder**

Families who have a female householder with related children under 18 with 18 years of age.

### **18. Family Dependency Index**

Families that have related children under 18 years and families that have

### **19. Crowding**

Housing units which have more than 1.01 persons per room as a percentage of all occupied housing units.

### **20. Sanitation/Crowding**

Housing units that lack plumbing for exclusive use and which have more than 1.01 persons per room as a percentage of all occupied housing units.

### **21. Plumbing**

Housing units that lack plumbing for exclusive use as a percentage of all housing units.

## 22. Housing Age

Housing units built before 1940 as a percent of all housing units.

## 23. Kitchen Facilities

Housing units that lack complete kitchen facilities as a percent of all housing units.

## 24. Sewage Disposal

Housing units that are not connected to either a public sewer or septic tank as a percentage of all housing units.

## 25. Source of Water

(Replaces a variable used in 1980 which is no longer available) Housing units whose source of water is either dug wells or some source other than public/private water companies and drilled wells as a percentage of all housing units.

## 26. Heating Fuel

Occupied housing units lacking adequate heating fuels, (i.e., that use fuel oil or kerosene, wood, coal, or no fuels at all, as a percentage of all occupied housing units.)

## 27. Vacancy Rate

Vacant housing units as a percentage of all housing units.

## 28. Owner Costs

Owner households with incomes less than \$20,000 with owner costs exceeding 34% of their income as a percentage of specified owner-occupied housing units.

## 29. Renter Costs

Renter households with incomes less than \$20,000 with gross rent exceeding 34%

of their income as a percentage of specified renter-occupied housing units.

## 30. Communications

Occupied housing units with no telephone and with a householder aged 65 years or over as a percentage of all occupied units.

## 31. Access

Occupied housing units with no vehicle available as a percentage of all occupied units.

Information about population and housing characteristics is central in the assessment of community needs. These data are necessary but not sufficient in forming a comprehensive strategy for community development and betterment. These data can be used as supporting information in targeting areas for rehabilitation and renewal of the physical housing stock and for implementing programs to support and nourish persons in need.

