Milwaukee by Bike

City of Milwaukee
2010 Bicycle Master Plan
Appendix
September 7, 2010

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Existing Conditions

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The 2010 *Milwaukee by Bike City of Milwaukee Bicycle Master Plan* will guide the development of a world-class on-street and off-street bicycle transportation system for the enjoyment and use of Milwaukee's residents and visitors. With the current popularity of the City's existing bikeways, an increased interest in leading healthy lifestyles, growing concern for the environment and the need for sustainable economic development, these actions will move Milwaukee forward into its third century. In looking to the future, it is important to understand the existing conditions for cycling in the city as well as past bicycle planning efforts.

Previous Bicycle Planning

The city of Milwaukee adopted its first formal bicycle plan in 1993. *Bicycle Milwaukee* set goals and objectives designed to increase the safety and ease of cycling in the city. The major recommendations of *Bicycle Milwaukee* have been achieved in the years since that plan was adopted, including:

- Hiring a full-time bicycle and pedestrian coordinator
- Adding bicycle parking requirements to the zoning code
- Producing studies on bike parking and off-street bicycle facilities within the city
- Assisting with Bike to Work encouragement events
- Adding over 50 miles of bicycle lanes and 65 miles of bicycle routes

The bicycle lanes and routes that currently exist in Milwaukee place 45% of the city's area is within ¼ mile of an on-street bikeway.

The city's efforts to promote cycling and increase its accessibility have paid off, particularly in recent years. According to the U.S. Census Bureau's American Community Survey, Milwaukee's bicycle commuting mode share has grown almost 300% in the last 5 years with a 43% increase in 2008 alone. At the same time, it has become safer to ride a bike in the city: the crash rate has decreased 75% according to city data. The steady annual increase in cycling for transportation and the corresponding decrease in crashes began soon after the city began a concerted effort to paint bike lanes. In the many years prior to those new bike lanes, the Census data showed little or no increase in cycling and a stagnant crash rate.

While much has been accomplished since the Bicycle Milwaukee Plan was adopted, more remains to be done. Milwaukee's bicycle mode share is above the national average, but lags behind the nearby cities of Madison and Minneapolis. The bikeway network has expanded greatly, but some areas of the city still lack easy access to on-street bicycle facilities. Over 100 miles of bike lanes and routes have been added to city streets, but the city lacks newer, innovative facilities such as bicycle boulevards, raised bicycle lanes, and shared lane markings. This plan builds on the successes of the past two decades and makes specific recommendations for facilities, policies, programs, implementation, and branding. These recommendations can result in a city that is more welcoming and accessible to cyclists of all levels and abilities.

Existing Conditions

The city of Milwaukee is designated by the League of American Bicyclists as a "Bronze Level Bicycle Friendly Community." In 1993 the city of Milwaukee adopted its first formal bicycle plan, Bicycle Milwaukee, which stated that "the city of Milwaukee is serious about the bicycle as a means of transportation." The plan introduced goals and objectives to make Milwaukee a safer and easier place to bike through better bicycle infrastructure, policies and programs that would encourage cycling in the city. Most of the major recommendations of *Bicycle Milwaukee* have been achieved:

- Appointment of a full-time bicycle and pedestrian coordinator
- Addition of 51 miles of bike lanes to city streets
- Signage of 65 miles of bike routes throughout the city
- Addition of 12 miles of off-street trails
- Organization of numerous education and encouragement events, including Bike to Work week
- Requiment of bicycle parking in the zoning code
- Addition of bike racks on all Milwaukee County Transit System buses
- Establishment of a standing task force that discusses bicycle and pedestrian issues
- Completion of a detailed bicycle parking inventory and plan
- Completion of a major study of off-street bicycle facilities

These facilities and policies have led Milwaukee's bicycle mode share to grow from 0.47% in 2006 to 1.16% in 2009, well above the national average of 0.50%. According to the 2008 American Community Survey, biking to work in Milwaukee increased greatly over the past few years, rising 43% between 2007 and 2008 alone. The increase in the number of bicycle commuters occurred soon after the city striped 35 miles of new bike lanes in 2005, lending local evidence to the "build it and they will come" philosophy that has been observed in other American cities. It should be noted that this data only counts travel to work data, which represents about 20% of all trips

While adding bike lanes has increased cycling in Milwaukee, many people in Milwaukee report feeling uncomfortable or unsafe in bike lanes and prefer to ride away from busy arterials roads. This is particularly true when taking into account children and less experienced cyclists who may not be comfortable riding in traffic.

Existing Plans

Beginning with the 1993 Milwaukee Bicycle Plan, Bicycle Milwaukee, the city has steadily expanded the number of planning documents that specifically relate to bicycling. These documents guided the development of this plan:

- Milwaukee Bicycle Plan, 1993
- Milwaukee Bike Lane Design Guide, 2002
- Milwaukee by Bike Publicity Plan, 2003
- Off-Street Bikeway Study: Milwaukee's Best Opportunities for Trail Expansion, 2006
- Milwaukee Bicycle Parking Project Report, 2007

Each of these documents is included on the CD accompanying this plan.

Bikeways Facilities Inventory

When people think of bicycle planning, bike lanes are often the first thing that comes to mind. Indeed, bicycle facilities and other infrastructure including off-street paths, bicycle parking racks and bike routes are the most visible, and often most expensive portion of a bicycle plan and network. This section discusses current bicycle facilities in the city of Milwaukee. The existing on-street facilities are displayed in Map 1 of the plan. Approximately 45% of the city's area is within ¼ mile of an on-street bikeway as displayed in Map 2 of the plan.

Bicyclists using the bike lane on 6th Street

The Oak Leaf Trail offers shared use paths and on-street routes throughout Milwaukee

It should be noted that the largest and one of the best bicycling facilities in Milwaukee is not marked for bicycles at all: the neighborhood street network. The majority of Milwaukee streets create a well-connected grid pattern throughout the city, and the majority of these streets are low-traffic, low-speed neighborhood streets that provide a safe, robust network for cyclists of most ages and abilities. These streets form an excellent cycling network, but need to be supplemented with bicycle-specific facilities (including bike lanes on busier streets and off-street paths) to create a fully connected network which will allow users to access all destinations safely and efficiently.

Bike Lanes

The city has approximately 51 miles of roadway striped with bike lanes, with 137 additional miles planned or proposed. Bicycle lanes are primarily installed on roads that have higher traffic volumes and have existing space within the right-of-way (ROW). Under current law, a bicycle lane shall be added on all repaved or reconstructed arterial roads that have room for a lane after a normal vehicle traffic lane (11 to 12 feet wide) and a normal parking lane (eight feet wide) are designated.

Conflicts often arise with bike lanes due to right turning traffic or when bike lanes end and it is unclear to cyclists where they should position themselves to proceed through an intersection. The city should undertake a bike lane network spot improvement study with design and construction funds for recommended improvements at the areas in greatest need of improvement.

Signed Bike Routes

Bicycle routes are streets or paths that have signage indicating they are a bicycle route. These routes are generally lower traffic streets that do not require a full bike lane or busier streets that connect key destinations but do not have room for a separate bike lane. Signing streets as bicycle routes assists cyclists in finding routes through the city, as well as alerts motorists that they may encounter higher than average amounts of bicycle traffic on that street.

Currently, 65 miles of signed bike routes exist in the city, with another ten miles of routes proposed. The current network of bike routes is lacking in both wayfinding bike route signs and the improved bicycle route network signage that meets state and federal standards.

Shared use Paths

A number of shared use off-street paths exist in Milwaukee. These paths are used by cyclists, pedestrians, in-line skaters and other non-motorized users. The paths are extremely popular as they completely separate users from motor vehicle traffic except for occasional street crossings.

The longest shared use path in the area is the Oak Leaf Trail (OLT), owned and managed by Milwaukee County Parks. The trail is a system of over 100 miles of off-street paths, parkway drives and municipal streets through and around Milwaukee County. The trail ties together parks throughout the county, and connects trail systems in surrounding counties to the Milwaukee bicycle network. Many off-street sections of the Oak Leaf Trail are of substandard width, either due to limited right of way or having been constructed before current standards existed.

The Hank Aaron State Trail (HAST) is owned and maintained by the Wisconsin Department of Natural Resources. The trail provides a continuous connection between Miller Park Stadium and the Lake Michigan lakefront. A proposed 5.5-mile addition will extend the trail west from Miller Park to the Milwaukee County line where it will connect to the Oak Leaf Trail.

The city of Milwaukee now has now has two trails of its own: the Beerline Trail and the Kinnickinnic River Trail. These two trails serve as the beginning of a City Trails Program that will expand as new trails in existing off-street corridors within the city are developed. The construction and maintenance of these trails will be funded by the recommended City Bicycle Program Budget.

Bicycle Parking

For bicyclists to run errands or bike to work, secure bicycle parking must be available. Bicycle parking and storage options range from simple sidewalk mounted inverted U-racks to automatic underground bicycle parking elevators. Milwaukee currently has approximately 2,000 Class III bicycle racks and 20 Class I bicycle lockers, or about one rack for every 300 people. These facilities are distributed throughout the city, although they are primarily concentrated downtown, in neighborhood business districts and in busy bicycle corridors.

The Department of Public Works has installed numerous bike racks around the city

Mountain Biking and BMX

The city of Milwaukee does not have any designated mountain bike trails, BMX tracks or pump tracks. With no official places to ride, these popular sports have people creating their own trails wherever they can. This results in illegal, poorly designed and unsustainable trails. This plan recommends the city of Milwaukee work with the local MTB and BMX community to design, build and maintain legal and sustainable trails. This local community of riders has extensive experience and training, and a long history of using volunteers to design, build and maintain sustainable MTB trails, BMX tracks and pump tracks in surrounding communities.

Opportunities for Crossing Major Barriers

At public meetings for this plan, Milwaukee citizens identified numerous barriers to cycling in Milwaukee. The majority of these barriers are interstate highways, rivers and rail corridors that can make bicycle travel difficult. Other barriers identified were pinch points under bridges and high traffic arterials. An example of such a barrier is the prohibition of bicyclists on the Hoan Bridge, which is bookended by the two busiest trails in Milwaukee. Providing bicycle accommodations on the Hoan would eliminate one of the most prominent barriers to cycling in Milwaukee.

Transit Connections

Easy connections to transit are a simple and relatively low-cost way to expand the range of transit users and cyclists. By taking their bikes on trains and buses, cyclists can more easily reach destinations that they could not easily reach using just one of the forms of transportation.

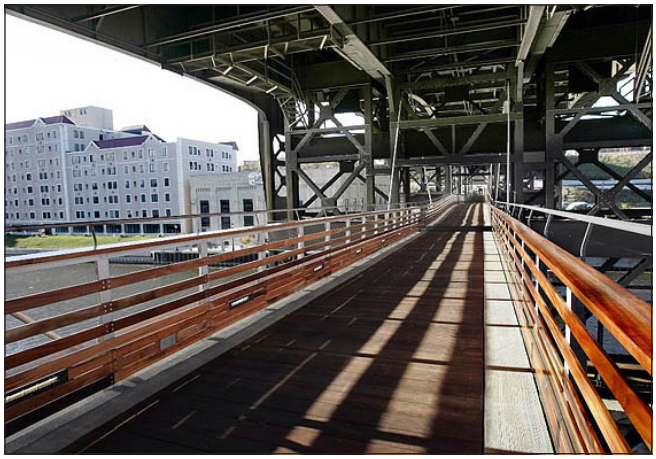
The bike/transit connection received a significant boost in Milwaukee in 2009 when the Milwaukee County Transit System (MCTS) implemented bike racks on buses. Through the efforts of the Bicycle Federation of Wisconsin (Bike Fed) and other local advocates, the Milwaukee County Board of Supervisors approved funding to equip all MCTS buses with front-mounted bicycle racks. These racks hold up to two bicycles that are easily loaded and unloaded by users. All MCTS buses are now equipped with bicycle racks.

Badger Bus provides daily service between Milwaukee and Madison and recently began allowing unboxed bicycles in the cargo section of the bus for a $10.00 fee.

Amtrak provides regular train service to between Milwaukee and Chicago on the Hiawatha Line and Milwaukee and Minneapolis/St. Paul on the Empire Builder Line. Some Amtrak trains accept bicycles in their passenger cars. For those that do not, Amtrak sells large, easy to load boxes for transporting bicycles in its baggage cars. Amtrak should begin allowing bicycles unboxed on all of its trains as well to further improve intermodal connections.

Programs Inventory

Numerous programs in Milwaukee seek to increase bicycling rates while also making bicycling safer. These programs can be broken down into encouragement efforts, education efforts and enforcement efforts.



The Marsupial Bridge provides a key link across the Milwaukee River underneath the Holton Street Bridge

Bike racks were added to all Milwaukee County Transit System buses in 2009

Encouragement Efforts

Bike to Work Week

Bike to Work Week is held in communities across the country, typically in May or June of each year. The purpose of Bike to Work Week is to educate communities on the personal, local and global benefits of commuting to work by bike. Milwaukee's annual Bike to Work Week kicks off with a Bike to Work with the Mayor ride to City Hall. Events throughout the week include free snacks and coffee at commuter stations throughout the city, free bicycle tune-ups for commuters, Bike Trivia Night and a bike ride to a Brewers game. The week often concludes with a Bike-In Movie. This program is primarily organized by the Bike Fed and supported in part by the City.

Bicycle Federation of Wisconsin Encouragement Events

Throughout the year, the Bike Fed hosts various bicycle encouragement events around the city to promote cycling and draw in new participants. Past events have included the annual Love Your Bike Party, the Sew to be Seen Party, the summertime Bike-In Movie Series, and other seasonal gatherings.

City-Owned Bikes

Three city-owned bikes are available to city employees for work-related use. These bikes may be reserved ahead of time and then checked out for work-related travel.

Rideshare

WisDOT operates RideShare, a program primarily designed to match commuters with carpools in their area. However, RideShare participants who commute by bike can choose to be matched with other bike commuters. The program allows participants to rate their bicycle commuting experience level, and the level of commuters they would like to be matched with. The program then matches participants with other bicycle commuters and includes maps of bicycle routes and trails in the area.
http://www.dot.wisconsin.gov/travel/commuter/rs-index.htm

Education Efforts

The City of Milwaukee, through Milwaukee Public Schools and the Bike Fed, offers education opportunities for cyclists. Programs are targeted at educating cyclists in how to properly ride with traffic, the rules of the road, and ways to increase their safety. Additional

Cyclists gather for free Alterra Coffee at Zeidler Park during Bike to Work Day

Bike-in Movies are regularly held at the Marsupial Bridge

programs focus on educating motorists on the rights and responsibilities of cyclists and pedestrians, as well as motorist responsibilities toward these other users of the roadway. While the city has done a reasonable job funding engineering improvements for cyclists, very few resources are put toward education, encouragement and enforcement. All of the E's (education, enforcement, encouragement, enforcement and education) need to be funded to make cycling in Milwaukee attractive, safe and convenient.

Streetshare

The StreetShare program was funded with startup grants provided by the National Highway Transportation Safety Administration and the Wisconsin Department of Transportation's Bureau of Transportation Safety. The program encourages pedestrian safety through motorist awareness and initiatives

encouraging drivers to stop for pedestrians and drive the speed limit. This program is run by the City of Milwaukee.
http://www.streetshare.org/

Safe Routes to Schools – Milwaukee Public Schools

The Bike Fed has an ongoing program through Milwaukee Public Schools and a grant from the Department of Transportation to teach elementary students to bike and walk safely. While the program specifically focuses on trips to and from school, the skills students learn are used during any bicycle or walking trip they make. Since 2004, over 4,500 Milwaukee Public Schools students have successfully completed this program. Among these students, there is a 30% increase in bike safety knowledge. After completion of the program, approximately two-thirds of students surveyed responded that biking or walking was their favorite form of transportation.

Bicycle Safety Education Efforts

The city of Milwaukee hosts a safe biking website with information on how to properly fit helmets, safe lane positioning for cyclists, and hand signals to indicate that a cyclist is stopping or turning.
http://www.city.milwaukee.gov/SafeBiking3729.htm

Proper lane positioning as well as other safety issues for cyclists to be aware of are also listed on the city's website on bike lanes and routes.
http://www.city.milwaukee.gov/router.asp?docid=14143

Using grant funding, the city has printed approximately 30,000 bicycle maps every year in partnership with the Milwaukee County Parks Department. A portion of this map depicts safe rider lane positioning, as well as diagrams from the StreetShare program depicting when motorists should yield to pedestrians. There is no longer any grant funding left to print future city bicycle maps.

The Bicycle and Pedestrian Coordinator teaches Road 101 classes. Road 101 was developed by the League of American Bicyclists and teaches the basics of safe and confident city cycling to adults.

Enforcement Efforts

For cyclists to feel safe on roadways there needs to be adequate enforcement of laws for both motorists and cyclists. Many cyclists do not follow the same laws they insist motor vehicles follow. While motor vehicle speeding and close passing create unsafe conditions

Children learning to ride safely in a Safe Routes to School Bike Camp

for cyclists, cyclists often create unsafe conditions by running stop signs and lights and riding against traffic. To make roadways safer, it is important that the police enforce traffic laws for both motorists and cyclists.

Targeted Bicycle Enforcement

The Milwaukee Police Department receives $4,000 annually for targeted bicycle enforcement through WisDOT Bureau of Transportation Safety grants. These grants pay police officers who volunteer to work overtime for bicycle law enforcement in areas of high bicycle traffic.

Crash Monitoring

TraCs technology and Milwaukee Compass can be used to identify hot zones for bicycle crashes. Currently, data is being collected and this can be queried at any time for analysis of crashes. As part of the Milwaukee Bicycle Plan update, a detailed bicycle crash analysis was conducted by Alta Planning + Design, the results of which will focus attention on particularly dangerous intersections or other areas. This analysis is presented in Appendix H.

Bicycle Police Officers

Milwaukee has approximately 60 bicycle police officers. Each officer in the bike unit receives 32 hours of specialized training and a bicycle. Additionally, at least ten police officers are specially trained for bicycle safety enforcement. Although traditionally thought of primarily as a tool for community policing, the Milwaukee Police Bicycle Unit is very effective at other types of enforcement, such as reactive and proactive

policing, surveillance, night operations and traffic enforcement. Bicycle officers decrease response times and are able to patrol areas inaccessible to cruisers, including the city's growing off-street bicycle network.

Annual Funding for Bike Facilities, Education, and Programs

Consistent funding is critical for developing new bicycle facilities as well as maintaining current facilities. The city of Milwaukee does not currently have a dedicated budget to fund bicycle facilities, maintenance or programs. Milwaukee has traditionally funded bicycle infrastructure and planning using State and Federal transportation grants that typically require a local match of 20%. Once facilities are constructed, they are maintained as part of the city's routine street maintenance. Although this system effectively keeps bicycle funding off the budget chopping block, this plan recommends that the city create an annual bicycle program budget. This budget should be used to match federal grants, construct and maintain bicycle facilities, fund education and encouragement programs, and pay dedicated bicycle staff and interns.

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Appendix B
Policy Inventory and Legal Codes

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Policies Inventory

Numerous policies in the city of Milwaukee directly or indirectly relate to bicycling. These policies are generally designed to increase bicycling in the City by ensuring that adequate parking is provided in new and expanding buildings, that bicyclists adhere to the same rules of the road as other vehicles, and that streets are designed to accommodate bicycle travel. In general, bicyclists are granted the same rights and subject to all the same duties as motorists, and state laws supersede local ordinances in all cases except those regarding sidewalk riding and bicycle registration. Specific policies relating to bicycles are detailed below.

Federal Plans and Policies

Congress firmly established the principle that the safe accommodation for bicycling and walking are the responsibility of state and local transportation agencies. This responsibility extends to the planning, design, operation, maintenance, and management of the transportation system in federal transportation law, including the Intermodal Surface Transportation Efficiency Act (ISTEA) and its reauthorizations, the Transportation Equity Act for the 21st Century (TEA-21), and the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU).
http://www.fhwa.dot.gov/safetealu/

The Federal Highway Administration Program guidance on the federal transportation bills states that "In the planning, design, and operation of transportation facilities bicyclists and pedestrians should be included as a matter of routine and the decision not to accommodate them should be the exception rather than the rule. There must be exceptional circumstances for denying bicycle and pedestrian access either by prohibition or by designing highways that are incompatible with safe, convenient walking and bicycling."
http://www.fhwa.dot.gov/environment/bikeped/Design.htm

The Guide for the Development of Bicycle Facilities by the American Association of State Highway and Transportation Officials (AASHTO) is commonly accepted as the "best practices" for building bicycle facilities.
http://www.sccrtc.org/bikes/AASHTO_1999_BikeBook.pdf

The Manual on Uniform Traffic Control Devices (MUTCD) by the United States Federal Highway Administration (FHWA) contains currently acceptable signage for use on bicycle facilities, as well as experimental signs.
http://mutcd.fhwa.dot.gov/

All bicycle and pedestrian facilities shall meet the requirements of the Americans with Disabilities Act Accessibility Guidelines (ADAAG).
http://www.access-board.gov/adaag/html/adaag.htm

Wisconsin Plans and Policies

The Wisconsin Bicycle Transportation Plan 2020 (WisDOT September 1998) is intended "to establish bicycling as a viable, convenient, and safe transportation choice throughout Wisconsin." The role of the state plan is "ensuring an interconnected transportation system across government boundaries and highway jurisdictions that can work safely for bicyclists…." The two primary goals of the state plan are doubling the number of bicycle trips, and reducing crashes involving bicyclists and motor vehicles by 10% or more by 2010.
http://www.dot.state.wi.us/projects/state/bike2020.htm

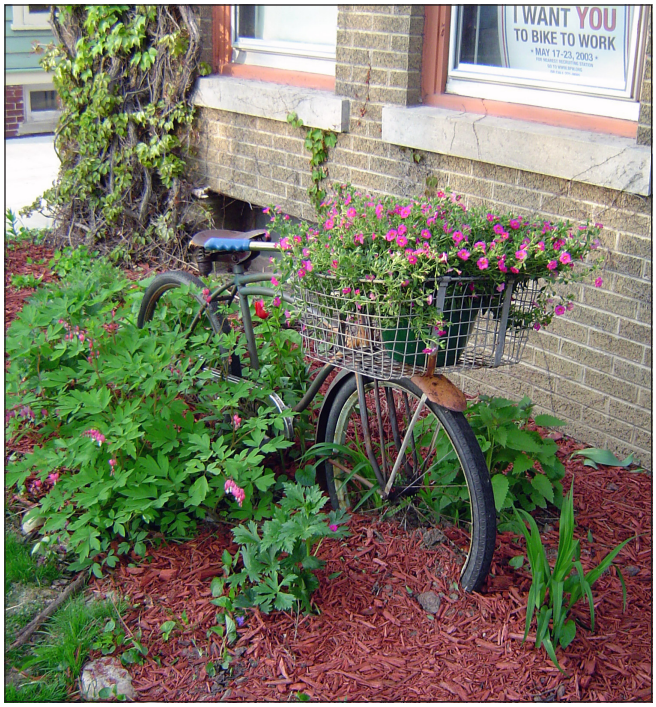
The iconic 6th Street bridge includes popular bicycle lanes

The Wisconsin Department of Transportation Facilities Development Manual (FDM) details bicycle facility design (Chapter 11, Section 45, Subject 10). The manual provides definitive guidance from the State on all facility design standards.
http://roadwaystandards.dot.wi.gov/standards/fdm/index.htm

The Wisconsin Bicycle Facility Design Handbook expands on the FDM and meets or exceeds AASHTO guidelines. The Handbook uses information from the AASHTO Guide for the Development of Bicycle Facilities and is tailored to meets Wisconsin's needs and conditions.
http://www.dot.wisconsin.gov/projects/state/docs/bike-facility.pdf

Intended for larger communities, the Wisconsin Bicycle Planning Guidance: Guidelines for MPOs & Communities in Planning Bicycle Facilities contains useful information about the importance of planning a complete bikeway network.
www.dot.wisconsin.gov/projects/state/docs/bike-guidance.pdf

The Wisconsin Complete Streets Legislation requires that all projects which receive state or federal funds consider the needs of all users and consider them in project design. The text of the statute is reprinted in the following pages.



A recycled bicycle found a second life as a planter outside a local business.

Regional Plans and Policies

A Regional Freeway System Reconstruction Plan for Southeastern Wisconsin produced by SEWRPC includes plans to reconstruct portions of numerous freeways, adjoining roads and access ramps in and around Milwaukee. This work has the potential to sharply impact bicyclist safety, particularly because freeways and their access ramps often serve as significant barriers or safety hazards to bicyclists.
http://www.sewrpc.org/freewaystudy/

The *Regional Transportation System Plan for Southeastern Wisconsin: 2035* (SEWRPC Planning Report No. 49) includes SEWRPC's vision for transportation in the region: "A multimodal system with high quality public transit, bicycle and pedestrian, and arterial street and highway elements which add to the quality of life of Region residents and support and promote expansion of the Region's economy, by providing for convenient, efficient, and safe travel by each mode…."
http://www.sewrpc.org/SEWRPCFiles/Publications/pr/pr-049_regional_transportation.pdf

The *Amendment to the Regional Bicycle and Pedestrian Facilities System Plan for Southeastern Wisconsin: 2020* (SEWRPC) "seeks to remove existing impediments to bicycle travel related to the lack of bicycle paths, the lack of safe accommodation on streets and highways, and the lack of support facilities such as bicycle parking and storage lockers. The Plan recommends that improvements such as extra-wide outside travel lanes or paved shoulders be considered to be provided whenever an arterial street or highway is constructed or reconstructed to better accommodate shared roadway use by bicycles and motor vehicles."
http://www.sewrpc.org/SEWRPCFiles/Publications/pr/2001-12_amendment_bicycle_pede.pdf

SEWRPC has identified several streets in and around the city of Milwaukee for expansion and/or extension. These projects will have significant impacts on bicyclists' ability to move safely and conveniently around the region. Whether those impacts are positive or negative will depend on whether accommodations for bicycles are incorporated into these construction projects. If the goals of the state and SEWRPC's own plans regarding bicyclists are to be realized, it is imperative that the bicyclists be accommodated as an integral part of every project. It is critical that these projects properly accommodate pedestrians and bicycles, particularly since many of these are high-volume roads that are often

Cyclists participating in the Commuter Challenge

difficult for cyclists and pedestrians to negotiate. **http://www.sewrpc.org/SEWRPCFiles/Publications/TIP/TIP_2009-2012.pdf**

City of Milwaukee Zoning Code and Bicycle Ordinance

The City of Milwaukee Zoning Code has a number of references specific to bicycle parking and mandates bicycle parking in new commercial buildings larger than 2,000 square feet. Additionally, Chapter 102 of the Milwaukee Code of Ordinances describes the regulation of bicycles and snowmobiles within the city. In brief, the ordinance states that cyclists have the same rights and duties as motorists when operating on the street. Additionally, the ordinance recommends the registration of bicycles with the city of Milwaukee, bans riding on sidewalks (except by children under 11 or where otherwise signed), and describes other safety and operational requirements. The relevant language from the zoning code and the bicycle ordinance appears later in this appendix.

Milwaukee Street Design Standards

While not specifically tailored for bicycles, the design of city streets and roads greatly impacts the safety and comfort of bicyclists. Chapter 115-14 of the municipal code describes minimum and maximum street widths and issues relating to the design of cul-de-sacs and other roadway treatments that may affect cyclists.

"Complete Streets" Policies

"Complete streets" is a movement to ensure that all new and reconstructed roadways are "complete" in that they meet the needs of all users: motor vehicle drivers, bicyclists, transit users, the disabled and pedestrians. Complete streets are safer, more livable, and welcoming to all users than traditional auto-oriented streets. While a formal complete streets policy has not been adopted in Milwaukee, it is internal Department of Public Works practice to review a map of planned bicycle facilities during the planning phase of all new roadway construction or reconstruction. As streets are reconstructed, the appropriate planned bicycle facilities are added to them, and the Planned Bicycle Network is incrementally implemented.

Wisconsin "Complete Streets" Legislation

The State of Wisconsin passed a formal complete streets policy in 2009 mandating that all road projects funded partially or fully with state or federal funds must adequately accommodate bicycles and pedestrians. Although it will not apply to many local streets, this policy will apply to many larger Milwaukee streets and highway projects. The full text of the state statute is reprinted below.

SECTION 1918gr. 84.01 (35) of the statutes is created to read: 84.01 (35) (a) In this subsection:

1. "Bikeway" has the meaning given in s. 84.60 (1)(a).

2. "Pedestrian way" has the meaning given in s.346.02 (8) (a).
(b) Except as provided in par. (c), and notwithstanding any other provision of this chapter or ch. 82, 83, or 85, the department shall ensure that bikeways and pedestrian ways are established in all new highway construction and reconstruction projects funded in whole or in part from state funds or federal funds appropriated under s. 20.395 or 20.866.
(c) The department shall promulgate rules identifying exceptions to the requirement under par. (b), but these rules may provide for an exception only if any of the following apply:

1. Bicyclists or pedestrians are prohibited by law from using the highway that is the subject of the project.

2. The cost of establishing bikeways or pedestrian ways would be excessively disproportionate to the need or probable use of the bikeways or

pedestrian ways. For purposes of this subdivision, cost is excessively disproportionate if it exceeds 20 percent of the total project cost. The rules may not allow an exception under this subdivision to be applied unless the secretary of transportation, or a designee of the secretary who has knowledge of the purpose and value of bicycle and pedestrian accommodations, reviews the applicability of the exception under this subdivision to the particular project at issue.

3. Establishing bikeways or pedestrian ways would have excessive negative impacts in a constrained environment.

4. There is an absence of need for the bikeways or pedestrian ways, as indicated by sparsity of population, traffic volume, or other factors.

5. The community where pedestrian ways are to be located refuses to accept an agreement to maintain them.

City of Milwaukee Zoning Code Relevant to Bicycling

Parking, Number of Spaces

§295-403-2-c. For a newly-constructed commercial building or commercial building addition with over 2,000 square feet of floor area, a minimum of one bicycle parking space shall be provided for each 2,000 square feet of floor area.

Parking, Standards of Design

§295-403-3-c. Bicycle Parking Spaces. For each required bicycle parking space, a stationary object shall be provided to which a user can secure the frame and both wheels of a bicycle with a 6-foot cable and lock. The stationary object may be either a freestanding bicycle rack or a wall-mounted bracket, shall be located within 60 feet of the main entrance of the building it serves, and may be located between the street curb and the building, subject to the approval of the commissioner of public works. As an alternative, the following alternative bicycle parking facilities may be provided:

c-1. Enclosed bicycle lockers.

c-2. A 3-point bicycle rack which secures the frame and both wheels of each bike.

c-3. A fenced, covered, locked or guarded bicycle storage area. Such area shall be large enough that each of the required bicycle parking spaces can accommodate a bicycle with a 3-foot handlebar width, a height of 3.5 feet from the bottom of the wheel to the top of the handlebar, and a length of 6 feet from the front of the from wheel to the back of the rear wheel.

City of Milwaukee Bicycle Ordinance

CHAPTER 102 – Bicycles and Snowmobiles

SUBCHAPTER 1

BICYCLES

102-1. Adoption of State Laws. The city of Milwaukee adopts chs. 340, 341, 342, 343, 345, 346, 347, 348, 349, 350, Wis. Stats., and all subsequent amendments thereto defining and describing regulations with respect to bicycles for which the penalty is a forfeiture only, including but not limited to provisions for stipulation, conditions of deposit for bail, penalties for violation, unless other provisions for stipulation, conditions of deposit or bail, or penalties for violation are expressly provided in this chapter.

102-3 Definitions. In this subchapter: 1. BICYCLE means any vehicle propelled by the feet acting upon pedals and having 2 or more wheels, any 2 of which are more than 14 inches in diameter.

2. BICYCLE DEALER means any business establishment, shop or store that,, as part of its trade is involved in the retail selling of new or used bicycles.

3. BICYCLE LANE means that portion of a roadway set aside by action of the common council for the exclusive use of bicycles, electric assistive personal mobility devices, and other vehicles specified by the common council under the authority of s. 349.23, Wis. Stats.

4. BICYCLE WAY means any path or sidewalk, or portion of a path or sidewalk, designated by the common council for the use of bicycles.

5. ELECTRIC ASSISTIVE PERSONAL MOBILITY DEVICE means a self-balancing, 2-nontandem-wheeled device that is designed to transport only one person and that has an electric propulsion system that limits maximum speed of the

device to 15 miles per hour or less, the operation of which is accorded the same rights and responsibilities as the operation of bicycles under state statutes.

6. HOURS OF DARKNESS means the period of time from one-half hour after sunset to one-half hour before sunrise and all other times when there is not sufficient natural light to render clearly visible any person or vehicle upon a highway or bicycle way at a distance of 500 feet.

7. JUNK BICYCLE means a bicycle which is incapable of operation or use upon a highway and has no resale value except as a source for parts or scrap and includes any bicycle for which the cost of repairs necessary to make the bicycle operational exceed the estimated fair market value.

8. PEDAL PUSHCART means a bicycle with a container, not including a bicycle basket or bag, that is securely fastened or incorporated at the front of the bicycle for carrying one or more persons or property.

9. RIGHT-OF-WAY means the privilege of the immediate use of the roadway.

10. ROADWAY means that portion of a highway between the regularly established curb lines or that portion that is improved, designed or ordinarily used for vehicular travel, excluding the berm or shoulder.

11. TRAILER means a device designed and manufactured to be securely fastened to a bicycle for the purpose of towing one or more persons or property, but does not include a sled, toboggan, ski or similar device.

12. VEHICLE means every device in, upon, or by which any person is transported or drawn upon a highway, except railroad trains. A snowmobile or electric personal assistive mobility device shall not be considered a vehicle except for those purposes made specifically applicable by state statute.

102-5. License. 1. MANNER OF ISSUANCE. The city clerk shall provide license stickers without fee or charge to be used as evidence of bicycle registration with the city. License stickers may be made available to the public at locations that include city libraries, the department of public works, police district stations, bicycle dealers, public schools and other locations and businesses convenient to the public, and shall be offered together with instructions about placement of the license sticker on the upper portion of the down or seat tube of the bicycle facing forward. Persons wishing to register bicycles shall also be provided with copies of city bicycle regulations or advised that the regulations in this chapter are available on the city website.

2. REGISTRATION. Registration shall be completed on a form provided on the city website and shall include the name and address of the bicycle owner, telephone number or other contact information, the make and color of the bicycle, serial number on the frame of the bicycle, and other information that the city clerk may require.

3. REMOVAL OR ALTERATION. License stickers may only be removed by the owner or with the consent of the owner of the registered bicycle, or by police in the event that the owner of a lost, stolen, abandoned or otherwise recovered bicycle can not be contacted or successfully identified within 30 days of recovery. No person may alter or mutilate a license sticker in a manner that changes or obscures the information on the license sticker except upon removal of the license sticker by the owner or with the consent of the owner.

4. TRANSFER, CONVEYANCE OR SALE. The owner of a registered bicycle shall notify the city clerk within 10 days of transfer, conveyance or sale of the bicycle to a new owner, and shall provide such information as the city clerk may require to appropriately identify the bicycle and the registration.

102-7. Bicycle Regulations. 1. RIDING ON PUBLIC WAYS. No bicycle shall be operated upon any public sidewalk, any pedestrian path in the public parks, or upon any public school grounds or public playgrounds. This subsection shall not apply to bicycles when operated on school grounds or playgrounds when officially sanctioned functions are in progress; bicycles operated by police officers in the necessary discharge of their official duties; or to sidewalks or sidewalk areas designated by the common council and identified by signs or other clear markings as a bicycle way. Children less than 10 years of age who are supervised by an adult may ride on any sidewalk that does not abut a building. When operating a bicycle on a bicycle way every driver shall yield the right-of-way to any pedestrian and shall exercise due care and give an audible signal when passing a bicycle driver or pedestrian proceeding in the same direction.

2. OPERATING 2 OR MORE ABREAST. Persons riding bicycles or electric personal assistive mobility devices may ride 2 abreast in a single lane if the flow of traffic is not impaired, and may ride 2 or more abreast in a substandard width lane if the lane does not allow for safe passing of a single bicycle or electric personal assistive mobility device by an automobile. Persons may ride 2 abreast on a roadway in which 2 or more lanes permit traffic in the same direction but shall ride within a single lane. Persons may ride 2 or more abreast upon any path, trail, lane or other way set aside for the exclusive use of bicycles or electric personal assistive mobility devices including roadways temporarily set aide for racing, touring or similar permitted events.

3. RECKLESS OPERATION OF BICYCLES. The following rules apply to the operation of bicycles on all highways, bicycle lanes and bicycle ways:

a. Full Control. No person operating a bicycle shall remove both hands from the handlebars, or feet from the pedals, or practice any acrobatic or fancy riding on any street.

b. Operating upon or astride seat. No person operating a bicycle shall ride other than upon or astride a permanent and regular seat attached to the bicycle.

c. Passengers. No person operating a bicycle shall transport or carry more persons than the bicycle was designed to carry except a bicycle otherwise designed to carry only the operator may be used to carry or transport a child seated in an auxiliary child's seat designed for attachment to the bicycle if the seat is securely attached to the bicycle according to the directions of the manufacturer of the seat.

d. Attaching to vehicles. No person operating or riding upon a bicycle shall attach himself or herself or his or her bicycle to any vehicle upon a roadway.

e. No parent or guardian of a child shall authorize or knowingly permit the child to violate any provision of this subsection.

4. BICYCLE TRAILERS. No person shall operate a bicycle-trailer combination on any highway or bicycle lane or bicycle way unless such trailer is specifically designed to be attached securely to a bicycle and is attached in the manner recommended by the manufacturer of the trailer.

5. OPERATING WHERE PROHIBITED. No person may operate or use a bicycle on a highway or public path when a sign has been erected indicating that bicycle riding is prohibited.

6. ADDITIONAL RULES OF THE ROAD. a. Right-of-way. Every operator of a bicycle shall, upon entering on a highway, yield the right-of-way to motor vehicles. Every operator of a bicycle crossing a highway at a point other than a marked or unmarked crosswalk shall yield the right-of-way to any vehicle upon the roadway.

b. Exceptions. b-1. At intersections or crosswalks on divided highways or highways provided with safety zones where traffic is controlled by traffic control signals or by a traffic officer, the operator of any vehicle shall yield the right-of-way to bicyclists who have started to cross the roadway from the center strip near curb or shoulder, from the center dividing strip, or in a safety zone in compliance with a green "Walk" signal.

b-2. At intersections or crosswalks that are not controlled by traffic signals or a traffic officer, the operator of any vehicle shall yield the right-of-way to any person operating a bicycle in a manner consistent with the safe use of the crosswalk by pedestrians crossing the highway within a marked or unmarked crosswalk.

c. Traffic Control Signals. Every operator of a bicycle shall comply with all traffic signals with the exception that, upon waiting at a red light for more than 45 seconds, a bicyclist may proceed through the intersection with caution and upon yielding the right-of-way to any other vehicular or pedestrian traffic.

d. Bicycle Signaling. Any person operating a bicycle on the highway or any bicycle way shall signify turns, stops, and significant decreases in speed with an appropriate hand signal and in a manner which permits the safe operation of the bicycle while providing reasonable notice to other vehicle operators and pedestrians.

e. Passing Vehicles. Any person operating a bicycle upon a roadway shall exercise due care when passing a standing or parked vehicle proceeding in the same direction and, when passing a standing or parked vehicle that is a school bus that is displaying flashing red warning lights shall allow a minimum of 3 feet between the bicycle and the school bus.

f. Parking. Where possible without impeding the flow of pedestrian traffic, a bicycle may be parked on a sidewalk or in a bike rack or other similar area designated for bicycle parking.

7. RESPONSIBILITIES OF MOTOR VEHICLE OPERATORS AND PASSENGERS. a. No person may open any door of a motor vehicle located on a highway without first taking due precaution to ensure that his or her act will not interfere with the movement of traffic or endanger any other person or vehicle.

b. The operator of a motor vehicle located on a highway may not permit any person under 16 years of age to open any door of the motor vehicle without the operator first taking due precaution to ensure that opening the door will not interfere with the movement of traffic or endanger any other person or vehicle.

102-9. Equipment on Bicycles. 1. BRAKES. No person shall operate a bicycle on a highway, bicycle lane or bicycle way unless it is equipped with a brake in good working condition, adequate to control the movement of and to stop the bicycle whenever necessary.

2. EQUIPMENT WHILE OPERATING DURING HOURS OF DARKNESS. No person shall operate a bicycle on a highway, bicycle lane or bicycle way during hours of darkness unless the bicycle is equipped with, or the operator is wearing, a lamp emitting a white light visible from a distance of at least 500 feet from the front of the bicycle. The bicycle shall also be equipped with a red reflector that has a diameter of at least 2 square inches of surface area mounted on the rear and maintained in a manner to be visible from all distances from 50 to 500 feet to the rear of the bicycle when directly in front of lawful upper beams of headlamps on a motor vehicle. A red lamp or flashing amber light may be used, but shall not be a substitute for a rear reflector.

3. SIRENS AND COMPRESSION WHISTLES. No bicycle may be equipped with, and no person operating or riding upon a bicycle shall use, any siren or compression whistle.

4. TRAILER EQUIPMENT. No bicycle with an attached trailer shall be operated during hours of darkness if the trailer obscures the rear bicycle reflector unless a reflector meeting the requirements of sub. 2 is attached at the rear of the trailer.

5. BICYCLE DEALERS. All bicycle dealers, including any business that is involved in the retail selling of new or used bicycles, shall provide information to the purchaser of any new or used bicycle setting forth the bicycle equipment requirements of this subchapter.

102-11. Disposition of Lost, Stolen and Abandoned Bicycles.

1. ABANDONMENT PROHIBITED. No person shall abandon any bicycle on any highway or on any public or private property within the city, and no person shall leave any bicycle unattended on any highway or property within the city for such time and under such circumstances as to cause the bicycle reasonably to appear to have been abandoned.

2. PLACARDING. Whenever it should appear that a bicycle has been abandoned or lost on a highway or any public place, the chief of police or commissioner of public works or persons authorized by the chief of police or commissioner of public works shall placard the bicycle with a suitable sign or sticker providing notice that the bicycle may be removed and impounded by the police department after the expiration of 7 days unless otherwise claimed by the owner or owner's representative. Any person placing a placard upon a bicycle on authority of the commissioner of public works shall notify the police department of the time and place of such placarding. The notice shall inform the owner, or person acting on behalf of the owner of the bicycle, the manner in which police may be contacted if the bicycle is not abandoned.

3. REMOVAL AND IMPOUNDMENT WITHOUT PLACARD. If a bicycle is locked or otherwise attached to any item in a manner that impedes vehicular or pedestrian traffic on a public way, or if a bicycle is parked, locked or left on the public way in a manner that blocks or impedes

entrance or exit to a building or lawfully parked motor vehicle, or in a manner that constitutes a threat to public health or safety, the bicycle may be immediately removed in the absence of the bicycle owner or person authorized by the owner to operate or have possession of the bicycle. The bicycle may be removed by persons acting under the authority of the chief of police or the commissioner of public works and shall be impounded in facilities designated by the police department.

4. BICYCLES ABANDONED UPON PREMISES. a. Whenever it appears, based upon condition of disrepair or other circumstances, that a bicycle has been discarded or abandoned upon any premises, any person acting under authority of the commissioner of neighborhood services, the chief of police or the commissioner of public works may treat the discarded or abandoned bicycle in the same manner as is provided in s. 79-12 for litter deposited on any premises and may issue orders and citations to the property owner or other responsible person. Special charges may be assessed if the bicycle is removed by the city due to failure of the owner or responsible party to do so within a reasonable time.

b. If the owner or person responsible for the premises fails to comply with an order to remove a discarded or abandoned bicycle, and if the bicycle is removed by any person authorized to do so by the commissioner of neighborhood services, chief of police or commissioner of public works, a determination will be made whether the bicycle is serviceable or can be made serviceable with reasonable repair. A serviceable bicycle, or a bicycle that could be made serviceable with reasonable repair, shall be impounded by the police department and treated in the same manner as other lost, stolen or abandoned bicycles. All other bicycles removed under this paragraph shall be considered junk bicycles and treated as scrap.

5. PERIOD OF IMPOUNDMENT. a. Upon impoundment by the police department, a bicycle shall be held a minimum of 30 days unless earlier redeemed by the identified owner or person acting on behalf of the identified owner upon payment of the redemption fee provided in s. 81-11.5. The redemption fee may be waived if the bicycle is determined to have been stolen and is redeemed within 10 days of impoundment.

b. During impoundment, the police department shall make reasonable effort to identify and notify the owner utilizing the serial number on the frame of the bicycle, license information, if any, and any other means.

c. If an impounded bicycle is determined to be a junk bicycle by any member of the police department, the bicycle may be scrapped at any time after impoundment.

6. DISPOSITION OF UNREDEEMED BICYCLES. The chief of police may dispose of impounded bicycles that are not redeemed within 30 days in any of the following ways:

a. Public auction or sale.

b. Donation to a suitable nonprofit organization for charitable, educational or other eleemosynary purposes.

c. Maintaining the bicycle for police purposes.

d. Scrapping a bicycle that cannot be disposed of through any other reasonable means.

7. PUBLIC AUCTION OR SALE. The department of public works shall provide assistance as requested by the police department in organizing and implementing any sale or auction of impounded bicycles, and is authorized to accept the proceeds of such sale for deposit in the police bicycle equipment special purpose fund created under s. 304-25.5.

102-13. Penalties. Any person violating any of the provisions of s. 102-1 may upon conviction thereof be subject to a forfeiture within the range of forfeitures provided by statute for violation of the section. For a conviction for violating any of the provisions of s. 102-7-1 to 11, a person may be subject to a forfeiture of not less than $10 nor more than $20. Any person violating the provisions of s. 102-7-13 may upon conviction thereof be subject to a forfeiture of not less than $20 nor more than $40 for the first offense and not less than $50 nor more than $100 for the 2nd or subsequent conviction within a year.

102-15. Bicycle Riding Permitted on Designated Sidewalks, Bicycle Lanes and Bicycle Ways. 1. The common council designates the following sidewalk areas as bicycle ways:

a. All sidewalk areas within the Hank Aaron State Trail.

b. All sidewalks on grated bridges that are not equipped with bicycle surface plate lanes.

c. All sidewalks on the viaducts and roadways over the Menominee River Valley on 6th Street, 16th Street, 27th Street and 35th Street.

d. All sidewalks along Commerce Ave. in areas designated the Beerline Bike Trail.

e. All sidewalks on bridges over the Milwaukee River on East North Avenue and East Locust Street except the sidewalk on the north side of the Locust Street Bridge.

2. The common council may designate additional sidewalks as bicycle ways in the same manner as bicycle lanes within the roadways are designated under s. 101-21.5.

3. Except for those sidewalks set aside for the use of children less than 10 years of age as provided in s. 102-7-1, the commissioner of public works shall cause signs to be erected identifying all bicycle ways designated by the common council after which time bicycles may be operated on the bicycle way. The department of public works shall maintain a listing of all designated bicycle ways.

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Appendix C
Cycle Zone Analysis Framework

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Definition of a Cycle Zone and its Purpose

A cycle zone is defined as an area of the city that possesses similar characteristics for cycling, including traffic levels, barriers, topography and other factors. Generally, a cycle zone is determined by features that represent significant barriers or crossing difficulties, such as a major interstate highway (e.g., Interstate 794). They are also defined by neighborhoods and areas that contain places that are desirable destinations for cyclists, including parks or neighborhood centers. In addition, cycle zone boundaries reflect a change in the character of a neighborhood (e.g. block size or street connectivity).

The cycle zones and their boundaries were delineated by Bicycle Federation of Wisconsin staff familiar with cycling conditions, neighborhoods, and features that represent crossing difficulties for cyclists. This resulted in six zones with boundaries determined by topographical and infrastructure barriers such as highways, rivers, and major roadways, and roughly following US Census tract delineations.. The city of Milwaukee's political limits served as the project extents for this analysis.

The goal of this effort was to use the analysis to project which areas have the greatest potential for cycling by looking at proximity to land uses, permeability of entry-exit barriers (e.g., freeway crossings), topography, connectedness of the street grid, and quantity of available bikeways to understand the relationship between cycling potential and future environmental, health and air quality benefits.

Data Gathering and Synthesis

The analysis was based on existing data provided by the Bicycle Federation of Wisconsin, and the US Census American Community Survey (2006).

The measures that were chosen and the reasoning for their inclusion in the cycle zone analysis equation are discussed in more detail below. In many cases, the selected measures were translated into density units – square acre or linear feet - to account for size variations between zones. In a few cases, such as connectivity, an overall average for the zone was used.

Total Road Network Density (Linear Feet/ Square Acre)

Definition: The density in linear feet per square acre of all roads in the cycling zone. This includes roads of all types: local streets, arterials, highways, and freeways.

Example

Dense network facilitates rider choice

Sparse network limits rider choice

Reasoning: A zone with a greater density of roads will facilitate a better cycling experience. Riders will be able to go more places and have greater route choice.

Methodology: GIS tools were used to determine the overall length of roads falling within each cycle zone. This was divided by the zone's acreage to obtain an average road network density.

Bike Network Density (Linear Feet/Square Acre)

Definition: The density in linear feet per square acre of all the City of Milwaukee's bicycle facilities within a specific cycling zone.

Example

Example bike lane

Reasoning: The presence of facilities designed for cyclists increases their comfort and safety. A greater presence of cycle facilities will improve the cycling experience.

Methodology: The bicycle network layer was intersected with the cycle zone boundary, and then the lengths of each segment or partial segment that fell within a specific zone were summed. The resulting number was divided by acreage to obtain the average density

Barrier (Average Score/Linear Feet Of Boundary)

Definition: Permeability, or ease of passage, from one zone to the next. If there is no barrier, a perfect score of six (best) is given, with a score of one (worst) given to areas that are impassable.

Example

I-405 south of downtown ranks "worst" as a barrier (Portland, OR).

Schuyler Street scores "best" and is not a barrier (Portland, OR).

Reasoning: Areas that allow easy passage and access between zones will create a better cycling experience.

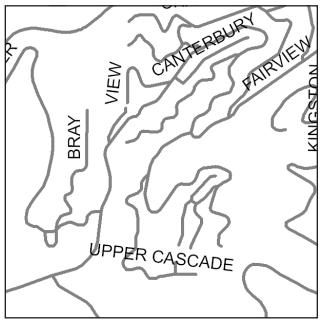
Methodology: Project staff coded approximate barrier divisions around the boundaries of each cycle zone.

The resulting data was entered into a GIS layer. The score for each boundary segment was summed and then divided by the total feet of boundary to get the average score for each zone.

Connected Node Ratio (Four-Way)

Definition: A measure of network connectivity, this number, ranging from 0 – 1, represents the ratio of cul-de-sacs and three-way intersections to four- or more-way intersections. The closer to the value of 1, the more grid-like the street pattern. An overall average score was calculated for each zone.

Example



Many dead-ends and 3-way intersections are indicators of poor connectivity.

Many 4-way intersections are indicators of good connectivity.

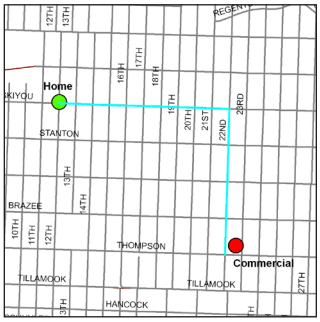
Reasoning: A zone with greater roadway connectivity will facilitate a better cycling experience. Riders will be able to easily go more places and will have greater route choice.

Methodology: GIS was used to determine all points in the city where one road was intersected by at least one other road. The location and number of roads at each intersection point were recorded. For each cycle zone, the overall number of intersections was summed, as well as the number of intersections that were at least four-way intersections. These numbers were used to determine the percentage of intersections that were four-ways or greater.

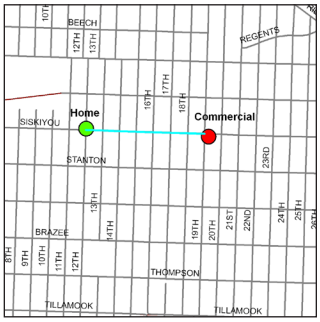
Average Network Distance to Commercial Establishments (Feet)

Definition: The average roadway network distance, measured in linear feet, from a residential tax lot to the nearest tax lot zoned for commercial use.

Example



Longer distance to commercial



Shorter distance to commercial

Reasoning: This is a proxy measure for land use mix. People are more likely to cycle in areas with many available activities. Generally, the shorter the distance from residential to commercial uses, the greater the land-use diversity.

Methodology: GIS was used to find the on-road distance from residential buildings to the nearest tax lot zoned for commercial use. The average distance was used as an overall zone measure.

Model and Zone Scores

The resulting scores for each factor for each zone are then weighted and incorporated into a model where each zone receives a score. A score of 100 is the perfect cycle zone. For this analysis each factor was assumed to have about the same amount of influence, as shown in Table 1. In some cases, such as bikeway network density, the maximum value was set above any of the observed values. The reasoning behind this decision shows that there is no zone is 'perfect' and there is always room for improvement.

Table 1: Cycle Zone Analysis Scores and Percentage Weighting

Factor Scores	Max Value*	Percentage Weight
Barrier Score / Perimeter Foot*	6	20
Road Network Per Acre	160	20
Bike Network Density (per acre)	30	20
Connectivity	1	20
Landuse Mix	742	20
Composite Zone Score		**100**

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Appendix D
Quantifying Current and Future Demand for Bicycling Facilities Through Cyclezone Analysis

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Quantifying current and future demand for bicycling is important for several reasons:

- To provide evidence of use. Showing that rates of use are increasing can be used as evidence for the increased commitment of resources for bicycling-related projects.
- To demonstrate the projected future benefits of increased usage in terms of environmental benefits (e.g., carbon-dioxide emission reductions) or reduced travel times. Reductions in motor vehicle trips translate into reduced congestion and reduced vehicle-miles traveled (VMT).
- To direct future investment. In highlighting areas with a latent demand for bicycle facilities, it is possible to target investments or programs into areas that demonstrate the most need or the greatest potential for increased bicycle usage.
- To choose strategies aimed at increasing cycling. The city can maximize the return on resource investments by understanding how conditions change throughout the landscape and customizing the approach to match existing conditions.

A variety of methodologies are used to measure cycling demand and associated benefits. This combined analysis forms a comprehensive picture of existing demand, potential future demand and the benefits derived from the predicted future use. Several tools are used for this analysis: commute pattern data from the US Census Bureau (2007 American Community Survey), as well as Mode Share/Mode Split Analysis and Air Quality Benefit models. A zonal analysis model, the Cycle Zone Analysis (CZA), is used to further refine the results and look at the specific geographic regions within the city.

Commuters on their way to work downtown

Existing Demand

Infrastructure Analysis – Cycle Zones

A cycle zone is an area of the city that possesses similar characteristics for cycling. Generally, a cycle zone is defined by features that represent significant barriers or crossing difficulties, such as Interstate 794. Cycle zones are also defined by census tracts, neighborhoods and areas that contain desirable destinations for cyclists, such as parks or neighborhood centers. In addition, cycle zone boundaries reflect a change in the character of a neighborhood (e.g. block size or street connectivity).

The goal of this effort was to use the analysis to project which areas have the greatest potential for cycling by looking at proximity to land uses, permeability of entry-exit barriers (e.g., freeway crossings), topography, connectedness of the street grid and quantity of available bikeways. This was done to better understand the relationship between cycling potential and environmental, health and air quality benefits. The Cycle Zone Analysis (CZA) tool allows planners, decision makers and advocates to better understand: (1) which parts of the city are best suited for capturing large numbers of cycling trips; (2) which have greater potential to generate additional trips; (3) which areas are best suited for strategic investments; and (4) which areas may need innovative bikeway treatments to maximize cycling potential. By breaking the city into zones that share similar characteristics, it is possible to capture and compare information. Table 2 shows the raw statistics- for each zone. See Appendix I for a detailed discussion of the analysis factors and methodology.

Table 3 shows the normalized scores for each factor. Normalization is a process that allows factors to be efficiently compared against each other. For many factors, this normalization was necessary due to differences in zone sizes (e.g., the difference in size between Zone 1 and Zone 5 makes it difficult to compare the total length of the roadway network, so a normalized measure of roadway network density, feet of roadway per acre was used). Other measures, such as the connectivity (measured by the Connected Node Ratio) were measured as a single zonal average.

Table 4 shows the normalized score and weighting for each zone. The Cycle Zone Analysis utilizes a number of quantitative measures to arrive at an overall 'potential' score. Factors considered in this analysis include connectivity, proximity to commercial land uses,

permeability of barriers, road network density, and bikeway density.

Currently, zones 1 and 5 are the easiest to access, based on their high zone scores. Zones 3 and 4 scored the lowest, indicating that cyclists face substantial difficulties getting into and out of these areas. While this does not measure the challenges of cycling within a zone, it does suggest that people living within these zones or attempting to travel to destinations within these zones will face difficulties reaching their destination via bicycle. This may incite them to take another form of transportation. Zone 3 received the highest overall score, as well as scored the highest for road network density, bike network density, land use mix and connectivity. This indicates that cyclists have many routes to choose from and decent network connectivity, which increases their ability to select different routes. It should be noted that this analysis does not take facility conditions, such as motor vehicle speed and volumes into account, which may affect cyclist comfort on these facilities. Correspondingly, Zone 3 has the greatest bike network, further increasing its attractiveness to cyclists. The greatest challenge in this zone is traveling into and out of it.

Numerous trails and parks provide great riding in Milwaukee

Table 2: Cycle Zone Factors Raw Data

Cycle Zone Factors - Raw Data	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Acreage	16,253	13,192	5,641	7,230	4,331	15,215
Total Road Network Length (LF)	1,326,919	1,782,968	870,279	1,038,935	506,372	1,601,462
Total Bike Network (LF)	68,907	89,635	132,382	83,926	28,652	132,174
Total Intersections	1,333	2,732	1,295	1,583	883	2,445
4 or more Way Intersections	476	1,582	830	969	367	1,338

Table 3: Normalized Cycle Zone Factor Scores

Normalized Factor Scores	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Barrier Score / Perimeter Foot	6.0	3.0	1.0	1.0	6.0	4.0
Total Road Network Density (Ft/Acre)	81.6	135.2	154.3	143.7	116.9	105.3
Bike Network Density (Ft/Acre)	4.2	6.8	23.5	11.6	6.6	8.7
Connected Node Ratio (4-way)	0.4	0.6	0.6	0.6	0.4	0.5
Average Distance to Commercial (Network Feet)	3,711	1,046	742	813	1,654	1,041

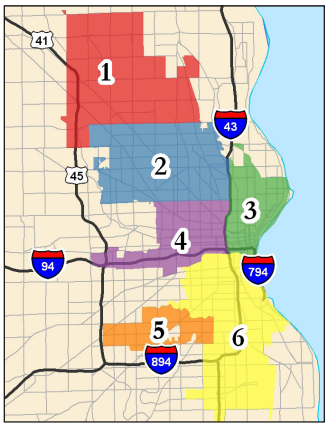
Table 4: Cycle Zone Scores

Factor Scores	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Barrier Score / Perimeter Foot*	20.0	10.0	3.3	3.3	20.0	13.3
Road Network Per Acre	10.2	16.9	19.3	18.0	14.6	13.2
Bike Network Density (per acre)	2.8	4.5	15.6	7.7	4.4	5.8
Connectivity	7.1	11.6	12.8	12.2	8.3	10.9
Land Use Mix	4.0	14.2	20	18.3	9.0	14.3
Composite Zone Score	**44.2**	**57.2**	**71.1**	**59.5**	**56.5**	**57.5**

Zone 1 scored the lowest overall, as well as for land use mix, connectivity and bike network density. However, this zone is very permeable.

Bicycle Commute Demand

A central focus of presenting commute information is to identify the current "mode split" of people that live and work in Milwaukee. Mode split refers to the different choices of transportation a person selects to travel to destinations, be it walking, bicycling, taking a bus or driving. One major objective of any bicycle facility improvement is to increase the percentage of people who choose to bike rather than drive or be driven. Every saved vehicle trip or vehicle mile represents quantifiable reductions in greenhouse gas emissions and can help reduce traffic congestion. The analysis is designed to provide a brief comparison of bicycle commuting in the city of Milwaukee to the surrounding county, as well as to state and national commuting patterns.



Zones 1 and 5 do not have significant barriers to entry while zones 3 and 4 are bounded by Interstate 43 and Interstate 794.

2007 U.S. American Community Survey

Journey to work and travel time to work data were obtained from the 2007 U.S. American Community Survey (ACS) for the City of Milwaukee, Wisconsin; Milwaukee County; the State of Wisconsin; and the United States. Journey to work data is shown in Table 5.

As shown, about 0.7% of all employed Milwaukee residents commute primarily by bicycle. This number is consistent with the percentage of bike commuters reported at the county and state levels, and is slightly higher than the national average. While the number of bicycle commuters in Milwaukee is consistent with other localities, the number of people walking, taking transit, and carpooling is consistently higher, as shown in Table 5. This could indicate an increased potential interest in transportation modes other than driving alone. Lack of increased cycling may be due, in part, to cold winter months, lack of bicycle infrastructure, or a lack of education, encouragement and enforcement programs, which help people to feel safe and excited about bicycle riding.

Census data does not include the number of people who bicycle for recreation or for non-work utilitarian purposes, students who bicycle to school, and bicycle commuters who travel from outside Milwaukee. This limits the analysis and likely undercounts true bicycling rates. Another limitation of this data is that it fails to capture multi-modal trips where bicycling was not the most significant portion of the trip. A more robust demand analysis discussed in the next section aims to more comprehensively measure bicycle travel, both utilitarian and recreational.

Table 5: Journey to Work Data

Mode	United States	Wisconsin	Milwaukee County	City of Milwaukee	
				%	Number of People
Bicycle	0.5%	0.7%	0.6%	0.7%	1,742
Drove Alone	76.1%	79.8%	77.0%	72.0%	179,204
Carpool	10.4%	9.4%	9.7%	11.0%	27,378
Public Transit	4.9%	1.7%	5.7%	8.3%	20,658
Walked	2.8%	3.3%	3.3%	4.6%	11,449
Other	5.3%	5.1%	3.6%	3.1%	7,716

*Includes individuals that work at home
Source: U.S. American Community Survey, 2007 Table S0801

Aggregated Bicycle Demand

The Milwaukee bicycle demand model consists of several variables including commuting patterns of working adults, predicted travel behaviors of area college students and children, as well as a factor to account for other non-commuting bicycle trips that are either utilitarian or recreational. For modeling purposes, the study area included the census tracts within the city of Milwaukee, Wisconsin. The 2007 ACS data for the city was used to obtain the aggregated demand estimates for the entire city and was then broken down based on the percentage of population living in each cycle zone to obtain a measure of zonal demand. It should be noted that the percentage of the population living within each zone was calculated using the population per census tract from the 2000 Census, as this information is not provided with the ACS.

In addition to people commuting to the workplace via bicycle, the model also incorporates a portion of the labor force working from home. Specifically, it was assumed that about half of those working from home would make at least one bicycle trip from home during the workday. The 2007 ACS was also used to estimate the number of children in Milwaukee. This figure was combined with data from National Safe Routes to School surveys to estimate the proportion of children riding bicycles to and from school. College students constitute a third variable in the model, due to

Table 6: Estimates of Existing Daily Bicycling Activity in Milwaukee

Variable	City Wide	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Employed Adults, 16 Years and Older							
a. Study Area Population [1]	602,782	73,238	170,110	77,749	86,845	43,833	151,008
b. Employed Persons [2]	248,894	30,241	70,240	32,103	35,859	18,099	62,353
c. Bicycle Commute Mode Share [2]	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%	0.7%
d. Bicycle Commuters (b*c)	1,742	212	492	225	448	127	436
e. Work-at-Home Percentage [2]	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
f. Work-at-Home Bicycle Commuters [3] [(b*e)/2]	3,111	378	878	401	448	226	779
School Children							
g. Population, ages 6-14 [4]	86,120	10,464	24,304	11,108	12,408	6,262	21,575
h. Estimated School Bicycle Commute Mode Share [5]	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%	2.0%
i. School Bicycle Commuters (g*h)	1,722	209	486	222	248	125	431
College Students							
j. Full-Time College Students [6]	43,106	5,237	12,165	5,560	6,210	3,135	10,779
k. Bicycle Commute Mode Share [7]	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
l. College Bicycle Commuters (j*k)	4,311	524	1,216	556	621	313	1,080
Work and School Trips Sub-Total							
m. Daily Bicycle Commuters Sub-Total (d+f+i+l)	10,866	1,323	3,072	1,404	1,568	792	2,727
n. Daily Bicycle Commute Trips Sub-Total (m*2)	21,773	2,645	6,144	2,808	3,137	1,583	5,455
Other utilitarian and recreational trips							
o. Ratio of "Other" Trips in Relation to Commute Trips [8]	2.73	2.73	2.73	2.73	2.73	2.73	2.73
p. Estimated Non-Commute Trips (n*o)	59,440	7,222	16,744	7,667	6,116	3,087	10,635
Total Estimated Daily Bicycle Trips (n+p)	81,213	9,867	19,847	10,475	9,253	4,670	16,090

Notes:

Census data collected from 2007 U.S. Census, American Community Survey.

(1) As noted by the Mayor's Census Challenge. http://www.ci.mil.wi.us/Nov14CensusChallenge23916.htm (Accessed October 6, 2008)

(2) 2007 ACS, S0801. Commuting Characteristics

(3) Assumes 50% of population working at home makes at least 1 daily bicycle trip.

(4) 2007 ACS, S0801. Commuting Characteristics

(5) Estimated share of school children who commute by bicycle, as of 2000 (source: National Safe Routes to School Surveys, 2003).

(6) 2007 ACS, S1401

(7) Review of bicycle commute mode share in 7 university communities (source: National Bicycling & Walking Study, FHWA, Case Study #1, 1995).

(8) 27% of all trips are commute trips (source: National Household Transportation Survey, 2001).

the presence of several colleges and universities in the region. Data from the Federal Highway Administration regarding bicycle mode share in university communities was used to estimate the number of students bicycling to and from these campuses. Finally, data regarding non-commute trips was obtained from the 2001 National Household Transportation Survey, which estimates the number of bicycle trips not associated with traveling to and from school or work (e.g., running errands).

Table 6 summarizes existing estimated daily bicycling activity in Milwaukee for each zone and citywide. This table indicates that over 77,000 trips are made citywide on a daily basis. Over 10,000 people, or about 1.5% of the existing population, take at least one bicycle trip per day. It is likely this number is greater based on the number of "other" trips taken every day. As the "other" trips are measured as a ratio, it is impossible to know how many additional people are accounted for. Most bicycle commute trips are made by college students, as well as individuals making trips while working at home. School children make the fewest daily bicycle trips. The model also shows that non-commuting trips comprise the vast majority of existing bicycle demand. Zones 2 and 6 have the highest populations and therefore the greatest estimated number of bicycle trips. Zones 3, 4 and 5 have the highest population density and therefore account for the greatest number of trips originating in the smallest geographic space. It should be noted that bicycle trips were allocated based entirely on zonal population estimates and aggregated figures for the city.

Cyclist Attitudes and Ridership Statistics

In 2008, a random citywide survey, sponsored by the City of Milwaukee Department of Public Works and Bike Fed, was undertaken to measure bicycling-related attitudes and behaviors of Milwaukee residents.[1] Many of the survey questions were drawn from the 2002 National Survey of Pedestrian and Bicyclist Attitudes and Behaviors (NSPBAB), which enables a comparison of Milwaukee residents to a representative national sample. This survey provides a snapshot of current attitudes towards cycling, gives information about resident's perceptions of existing cycling conditions and generally estimates the amount of cycling activity during the summer months. A discussion of how this survey could be modified to provide a relative indication of mode share and a more direct comparison to the American Community Survey (ACS) or National Household Transportation Survey (NHTS) is included in Appendix E.

Alterra at the Lake is a popular gathering place for cyclists

While the survey data cannot be directly correlated with the mode share analysis, this survey can augment the estimates from the demand models developed by Alta Planning + Design by highlighting key areas of concern that could be targeted for improvement. Addressing residents' concerns about cycling conditions in the city could lead to increased ridership from both new and existing cyclists by mitigating real and perceived barriers to bicycling in the City.

Key Findings and Statistics

Approximately 39% of Milwaukee residents reported riding a bicycle at least once during the summer months, compared to the national average of 27%. Though the information does not allow a direct integration into the existing model (which is based on mode share) it does support the assumption that people in Milwaukee currently bike more than people in other US cities.

About 92% of Milwaukee residents believe that riding is an enjoyable activity, and 72% responded that they would like to ride more often. Only 55% of residents reported satisfaction with the design of their local community for safe riding.[2] This indicates that the city may gain ridership by promoting bike facilities that increase cyclist safety and comfort. Residents

1 This survey was conducted by telephone and reached 434 city residents. Research was conducted by the Institute for Survey and Policy Research at the University of Wisconsin-Milwaukee.

2 The national survey found that 48 percent of respondents were satisfied with the construction of their community for bicycle safety. The Milwaukee survey report notes that questions on the availability of specific facilities (e.g. bike lanes) were not included in the Milwaukee survey as they were in the national survey. This could have the effect of cuing respondents to think of specific facilities in their local community and create a reporting bias (either positive or negative) in the results.

would also benefit from education and encouragement programs, which would increase their knowledge and confidence about how to ride safely in traffic. Ridership may also be increased by providing bicycle facilities separated from cars and by striping additional bike lanes.

- About 34% of non-riders cited lack of access to a bike as their primary reason for not cycling, which is higher than the national survey result of 26%. This indicates that the city could increase ridership by instituting programs that increase residents' access to bicycles.

Potential Future Bicycle Ridership

Non-motorized travel translates into fewer vehicle trips, which results in a correlated reduction in vehicle miles traveled and auto emissions. The variables used as model inputs generally resemble the variables used in the demand model discussed earlier and represent a realistic, achievable goal of what the daily number of bicycle trips could be with a more complete bikeway system.

Table 7 summarizes data on potential future bicycle demand in the year 2030, assuming a more complete bicycle transportation network and concurrent program

Table 7: Potential Future Bicycle Demand

Variable	City Wide	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6
Employed Adults, 16 Years and Older							
a. Study Area Population [1]	619,838	75,310	174,923	79,949	89,302	45,073	155,281
b. Employed Persons [2]	255,938	31,097	72,227	33,011	36,874	18,611	64,117
c. Bicycle Commute Mode Share [2]	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%	4.5%
d. Bicycle Commuters (b*c)	11,517	1,399	3,250	1,485	1,659	837	2,885
e. Work-at-Home Percentage [2]	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
f. Work-at-Home Bicycle Commuters [3] [(b*e)/2]	3,199	389	903	413	461	233	801
School Children							
g. Population, ages 6-14 [4]	88,558	10,760	24,992	11,422	12,759	6,439	22,185
h. Estimated School Bicycle Commute Mode Share [5]	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
i. School Bicycle Commuters (g*h)	2,657	323	750	343	383	193	666
College Students							
j. Full-Time College Students [6]	44,326	5,385	12,509	5,717	6,386	3,224	11,105
k. Bicycle Commute Mode Share [7]	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%	10.0%
l. College Bicycle Commuters (j*k)	4,433	539	1,251	572	639	322	1,111
Work and School Trips Sub-Total							
m. Daily Bicycle Commuters Sub-Total (d+f+i+l)	21,806	2,649	6,154	2,812	3,142	1,586	5,463
n. Daily Bicycle Commute Trips Sub-Total (m*2)	43,612	5,299	12,307	5,625	6,283	3,171	10,926
Other utilitarian and recreational trips							
o. Ratio of "Other" Trips in Relation to Commute Trips[8]	2.73	2.73	2.73	2.73	2.73	2.73	2.73
p. Estimated Non-Commute Trips (n*o)	119,060	14,466	33,599	15,356	17,153	8,658	29,827
Total Estimated Daily Bicycle Trips (n+p)	162,671	17,115	45,907	18,169	23,437	11,829	40,752

Notes:

Census data collected from 2007 U.S. Census, American Community Survey.

(1) As noted by the Mayor's Census Challenge. http://www.ci.mil.wi.us/Nov14CensusChallenge23916.htm (Accessed October 6, 2008) This number has been vetted by the City and accepted by the US Census Bureau as the official population estimate for Milwaukee. Assumes .07% growth over six years (obtained by looking at population increase between 2000 Census and 2006 ACS).

(2) Assumes same percentage of population in work force from 2007 AC. Mode share based on current mode share observed in Portland, Oregon.

(3) Assumes 50% of population working at home makes at least 1 daily bicycle trip. Assumes same percentage of population works from home (2007 ACS)

(4) 2007 ACS, S0801. Commuting Characteristics. Assumes same percentage of school aged children (2006 ACS)

(5) Assumes Portland bike to school mode share 3% as observed in 2007

(6) 2007 ACS, S1401 Based on same share of population in college (2007 ACS)

(7) Review of bicycle commute mode share in 7 university communities (source: National Bicycling & Walking Study, FHWA, Case Study #1, 1995). Assumes no change in college bike to school mode share.

(8) 27% of all trips are commute trips (source: National Household Transportation Survey, 2001). Assumes no change in ratio of commute trips to non-commute trips.

development to encourage use is implemented. Data for future city of Milwaukee population, employed persons, and commute mode shares were used for this analysis. In terms of daily bicycle trips, assumptions regarding the proportion of persons working at home reflects those used in the current demand model. Due to the unstable nature of vehicle flows during congestion conditions, eliminating even a few drivers from the road during peak commute hours can significantly reduce congestion. This analysis also assumes a proportional increase of "other" trips in relation to commute trips.

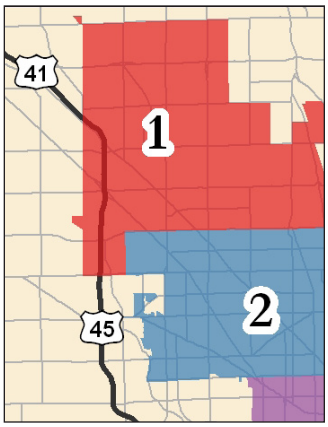
One significant assumption is a future proposed bicycle mode split of 4.5% of workers. While this may seem ambitious, it is certainly achievable with a concerted, strategic effort, as indicated by mode splits observed in Portland, Oregon and Minneapolis, Minnesota. These cities reported mode splits of 3.9% and 3.8% or workers, respectively, according to the 2007 American Community Survey data.

Discussion and Analysis of Future Bicycle Demand

A combination of the Cycle Zone Analysis and the demographic analysis of the Mode Share/Mode Split Analysis results in a robust picture of conditions in each section of the city. The remainder of this section briefly discusses each zone and suggests strategies to increase cycling in each area.

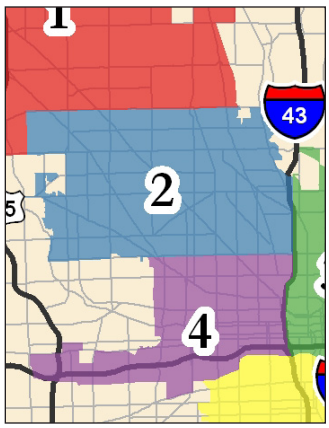
This analysis reflects elements that can be changed fairly easily, such as bikeway density, in addition to elements that may require large investments of time or capital, such as reducing barriers at a zone boundary. Finally, several factors, such as connectivity, only change over many years.

Zone 1



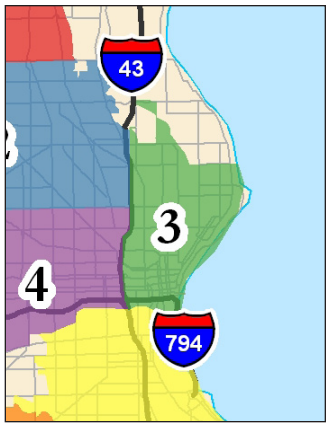
Zone 1 has the lowest overall cycle zone score, as well as the lowest score for all factors except barriers. This area is characterized by long travel distances to commercial destinations, low mode network density, and poor connectivity. This zone has good external access, indicating that improvements made within the zone have the potential to benefit many cyclists. This should be balanced by the internal factors that caused this zone to score poorly. About 70,000 people reside in this zone, which is one of the largest in size. This zone may have excellent long-term potential and may be a good area to target for longer-term improvements. Strategies could include increasing both connectivity and increasing overall destination density in the long-term. Shorter term, land use patterns may make this area a good candidate for bicycle boulevard style facilities.

Zone 2



Zone 2 includes residential areas north of downtown. This zone scored poorly for bike network density, but moderately well for all other factors, with the exception of road network density. The connectivity measure indicates a decent level of choice for cycling routes. This zone holds a significant share of the city population and has the highest average population density. This zone may benefit most from short term improvements, such as increasing the density of bicycle facilities.

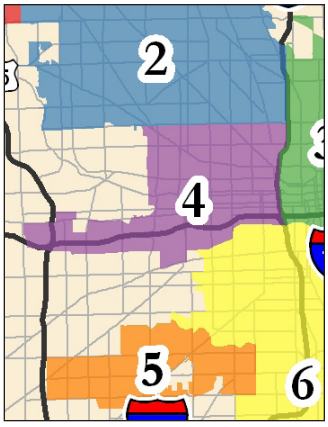
Zone 3



Zone 3 includes the downtown area of Milwaukee. This area contains a moderate portion of the population, but scores the highest for all factors with the exception of barriers. Cycling conditions within this zone are already good, as characterized by this model, with room left for improvement. One strategy to improve this zone is to look at increasing access into this zone across Interstate 43. This may represent a long term strategy of incorporating dedicated facilities into overcrossing or undercrossing projects. One benefit of focusing on reducing barriers is the beneficial effect felt in neighboring zones. Also, reducing barriers allows

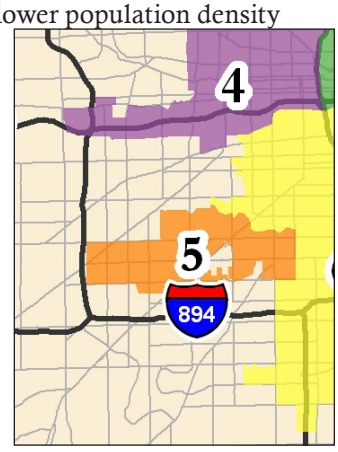
more cyclists greater access to existing amenities and may lead to greater increases in cyclist numbers. Zone 3 may benefit from education and encouragement programs targeting people who work in the downtown area, including working with employers on incentive programs and increasing linkages to transit.

Zone 4



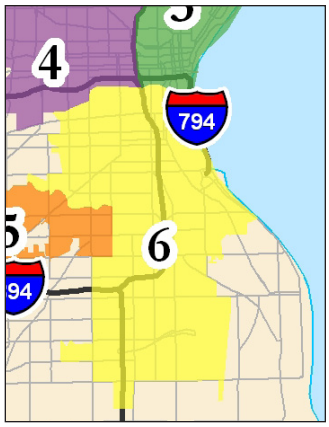
Zone 4 borders downtown Milwaukee. Interstate 43 on the east side of the zone represents a significant barrier to travel and accessibility of amenities in the downtown area. Zone 4 has a moderate population density. Short-term strategies to maximize cycling include options such as increasing facility density. In many cases, this could be as simple as striping bike lanes on existing facilities. Zone 4 is a place where increasing cycling may be fairly easy in a short to moderate timeframe, based on its proximity to downtown, mix of land use, connectivity and road network density. This would be a good zone to target increasing linkages with transit as well as encouragement programs.

Zone 5



Zone 5 is characterized by lower population density and good permeability, with moderate connectivity and road network density and low bike network density. Due to its geographic location within the city, good strategies for this zone could include a focus on travel within the zone by increasing the bike network density and facility improvements designed to increase people's comfort while bicycling. This zone has good permeability along the boundary shared with zone 6.

Zone 6



Zone 6 is a large zone bordering the south side of downtown Milwaukee. This zone holds a significant share of the city's population, with a population density slightly less than that of downtown. This area scored well for land use mix and moderately well for all other factors. Zone 6 is a place where increasing cycling may be fairly easy in a short to moderate timeframe based on its proximity to downtown, mix of land use, connectivity, and road network density. This would be a good zone to target increasing linkages with transit as well as encouragement programs.

Potential Future Reductions in Greenhouse Gas Emissions

Additional assumptions were used to estimate the number of reduced vehicle trips and vehicle miles traveled, as well as vehicle emissions reductions. In terms of reducing vehicle trips, it was assumed that 73% of bicycle trips would directly replace vehicle trips for adults and college students. For school children, the reduction was assumed to be 53%. To estimate the reduction of future vehicle miles traveled, a bicycle roundtrip distance of eight miles was used for adults and college students, and one mile for school children. These distance assumptions are standard and used in various non-motorized benefits models. The vehicle emissions reduction estimates also incorporated calculations commonly used in other models, and are identified in Appendix F: Existing and Potential Future Air Quality Benefits by Cycle Zone.

Table 8: Citywide Potential Future Air Quality Benefits

	Bicycle Network	
Vehicle Travel Reductions	No Expansion	Completed
Reduced Vehicle Trips per Weekday [1]	8,287	15,304
Reduced Vehicle Trips per Year [2]	2,162,946	3,994,289
Reduced VMT per Weekday [3]	56,441	112,948
Reduced VMT per Year [2]	14,731,016	29,479,487
Vehicle Emissions Reductions	No Expansion	Completed
Reduced PM10 (tons per weekday) [4]	1,039	2,078
Reduced NOX (tons per weekday) [5]	28,153	56,339
Reduced ROG (tons per weekday) [6]	4,098	8,200
Reduced CO2 (tons per weekday)	24	48
Reduced PM10 (tons per year) [8]	271,051	542,423
Reduced NOX (tons per year) [8]	7,347,831	14,704,368
Reduced ROG (tons per year) [8]	1,069,472	2,140,211
Reduced CO2 (tons per year) [8]	6,261	12,529

Note: VMT means Vehicle Miles Traveled. This table shows estimated potential future benefits based on two scenarios:

Future population increase assuming no changes to the bicycle network. These benefits are estimated based on existing bicycling mode share

Future population increase assuming a completed bicycle network. These benefits are estimated based on assumed mode share increases

(1) Assumes 73% of bicycle trips replace vehicle trips for adults/college students; 53% reduction for school children.

(2) Weekday trip reduction multiplied by 261 weekdays per year.

(3) Bicycle trips: assumes average roundtrip of 8 miles for adults/college students; 1 mile for school children. Pedestrian trips: assumes average roundtrip of 1.2 miles for adults/college students; 0.5 mile for school children.

(4) PM10 reduction of 0.0184 tons per mile.

(5) NOX reduction of 0.4988 tons per mile.

(6) ROG reduction of 0.0726 tons per mile

(7) C02 reduction of 0.000425 tons per mile.

(8) Weekday emission reduction multiplied by 261 weekdays per year.

Estimating future benefits required additional assumptions regarding Milwaukee's population and anticipated commuting patterns. According to the 2006 ACS, approximately 245,000 people are currently employed in the region. A future workforce population of 253,000 was used to reflect projected population changes. Regarding commuting patterns, bicycling mode share was increased to address higher use potentially generated by the addition of new bikeway facilities and enhancements to the existing system. The estimated proportion of residents working from home was also not changed. These assumptions were discussed in the previous section.

Table 8 summarizes potential future air quality improvements associated with bicycling in the City of Milwaukee. This table shows estimated potential future benefits based on two scenarios:

- Future population increase assuming no changes to the bicycle network. These benefits are estimated based on existing bicycling mode share noted in Table 5.
- Future population increase assuming a completed bicycle network. These benefits are estimated based on assumed mode share increases noted in Table 7.

Based on population growth and no expansion of the bicycle network, cycling will remove about 7,900 weekday vehicle trips, eliminating over 53,000 vehicle miles traveled. Given a complete network, it is estimated that bicycling will remove about 15,000 trips and eliminate over 112,000 vehicle miles traveled. Bicycling prevents over 30,000 tons of vehicle emissions from entering the ambient air each weekday. Bikeway network enhancements are expected to generate more bicycling trips in the future. This growth is expected to improve air quality by further reducing the number of vehicle trips, vehicle miles traveled and associated vehicle emissions.

It should be noted that this model only addresses commute-related trips. Unlike the demand models, this model does not account for air quality improvements associated with recreational non-motorized travel, as the greatest impacts to air quality are generated from commute trips.

Off-street trails can provide access across barriers such as major roadways

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Appendix E: Safety Analysis

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Safety is a major concern of both existing and potential bicyclists. For those who ride, safety is typically an ongoing concern. For those who do not ride, it is one of the most cited reasons for avoiding cycling. A 2004 survey conducted by the National Highway Traffic Safety Administration (NHTSA) documents national bicycle and pedestrian injury and crash trends. The numbers show that, nationwide, the total number of reported cyclist fatalities has dropped dramatically since 1994, with 802 fatalities reported in 1994 and 725 fatalities reported in 2004. In comparison, total traffic fatalities have increased by 5% over this ten-year period.[3] It should be noted that bicycle crashes are generally underreported as many crashes result in any minor injuries, do not involve other vehicles, are not self-reported and do not involve the police. Crash data does not take into consideration "near misses," which characterize conditions at many high-risk locations without reported incidents.

The same NHTSA study shows that in 2004, of all Wisconsin traffic fatalities 1.8% were cyclist fatalities. This is slightly lower than the nationwide average of 2.0%.[4]

A Summary of Frequencies and Common Crash Types

Although more than half of cyclist fatalities in the U.S. are adults (age 25 and older), children under the age of 16 are more likely to be killed or injured while riding a bicycle. In 2004, adult cyclists (25 and older) accounted for more than half of the cyclist fatalities in the U.S., and cyclists under the age of 16 accounted for 21% of the fatalities and 32% of the injuries. However, cyclists under the age of 16 have higher fatality and injury rates than other age groups (2.5 fatalities per million population, about 24% higher than the overall cyclist fatality rate, and 286 injuries per million population, more than twice the injury rate for cyclists of all ages).

According to a 1990 study of 3,000 bicycle crashes in six states, the most common type of bicycle-vehicle crash involved a motorist failing to yield right-of-way at a junction (21.7% of all crashes).[5] More than one-third of these types of crashes involved a motorist violating the sign or signal and driving into the crosswalk or intersection and striking the bicyclist. The next most common types of vehicle-bicycle crash involved a bicyclist failing to yield right-of-way at an intersection (16.8%), a motorist turning or merging into the path of a cyclist (12.1%), and where a bicyclist failing to yield right-of-way at a midblock location.

Sidewalk Riding

Though riding on the sidewalk may feel safer than riding with motor vehicle traffic in the street, it is often more dangerous and is illegal in many locations. Wisconsin State Statute 346.94(1) prohibits sidewalk bicycle riding, unless specifically permitted through local ordinances. In the city of Milwaukee, it is illegal to ride on public sidewalks, however, this ordinance does make an exception for on-duty police officers and children under the age of 10.[6] Reasons why sidewalk riding is less safe than street riding include:

- Cyclists riding on sidewalks can be obstructed from view by cars parked along the street and landscaping.
- Motorists and pedestrians do not expect to encounter cyclists on sidewalks. The unexpected appearance of a cyclist can surprise all of the involved parties and result in reduced reaction times and increased likelihood of a crashes.
- Cyclists riding on the sidewalk encounter more potential conflict points. Generally, these conflict points are driveways and intersections, but they can also include areas where street furniture creates pinch points, and areas where people congregate (e.g., bus stops).

Participants in a bike education course gearing up for a ride in the rain

3 Traffic Safety Facts, 2004 Data. "Pedalcyclists" NHTSA, DOT # HS 809 912

4 Ibid.

5 Pedestrian and Bicycle Crash Types of the Early 1990's, Publication No. FHWA-RD-95-163, W.H. Hunter, J.C. Stutts, W.E. Pein, and C.L. Cox, Federal Highway Administration, Washington, DC, June, 1996.

6 Additional details can be found at http://www.city.milwaukee.gov/ImageLibrary/User/milbtf/ch102.pdf.

- Cyclists riding on the sidewalk often travel 2 to 3 times faster than pedestrians (8 to 10 MPH versus 2-3 MPH) which can be difficult for sidewalk and roadway users to see and respond to.

If cyclists choose to ride on the sidewalk, they should ride slowly and with the flow of traffic, and should be aware of motorists entering and exiting driveways and side streets. Children should be closely supervised by adults and encouraged to ride in the street as they get older and their riding skills improve.

Wrong-way riding is a widespread, yet unsafe, cyclist behavior. Though wrong-way riding accounts for only 2.5% of all bicycle crashes, it has been shown to be a contributing factor in several other types of crashes.[7] According to a 1996 FHWA study, wrong-way bicycling is involved in:

- 24% of crashes where motorists drive through an intersection
- 67% of crashes where motorists drive out of an alley or driveway
- 57% of crashes where motorists drove out of a stop sign
- 23% of crashes where a bicyclist rode out of a stop sign
- 44% of crashes where a bicyclist rode out with no stop sign
- 78% of all crashes where a motorist turned left in front of a cyclist

Data Collection for Milwaukee, Wisconsin

Bicycle-related crash data was collected for six years in Milwaukee, from 2002 through 2007. This data was provided by the Traffic Operations and Safety Laboratory at the University of Wisconsin-Madison as a service to the Wisconsin Department of Transportation Bureau of Highway Operations. A crash is defined as "reportable" if the incident results in injury or death, or if property damage exceeds $1,000 for any single person involved and occurs between a cyclist and a motor vehicle. Crashes that occurred on private property or in parking lots were not included in this analysis. Information on fault and contributing crash factors were not considered in this analysis due to a lack of available data.

Crash Analysis

Table 9 shows the distribution of crashes by year. From 2002 through 2006 the annual number of crashes shows a steady decline from 204 in 2002, to 136 in 2006. In 2007 the data show an increase of 20 crashes over the prior year. It appears that the number of crashes is decreasing annually. A spike in a single year is not sufficient evidence to indicate sustained increases or decreases in the number of bicycle related crashes.

The six-year time span shows an average of 163 crashes occurring each year.

Table 9: Bicycle Related Crashes in Milwaukee

Year	Total Crashes	% of Bicycle Crashes
2002	217	21%
2003	169	17%
2004	162	17%
2005	154	16%
2006	136	14%
2007	156	16%
Total: 981 crashes		

The average annual bicycle crash rate for the city is 0.25 per thousand residents. As shown in Table 9, there were 981 bicycle-related crashes reported in Milwaukee from 2002 to 2007, with 69 collisions resulting in property damage only, 906 resulting in injuries, and six resulting in fatalities. From 2002 to 2007 Milwaukee averaged

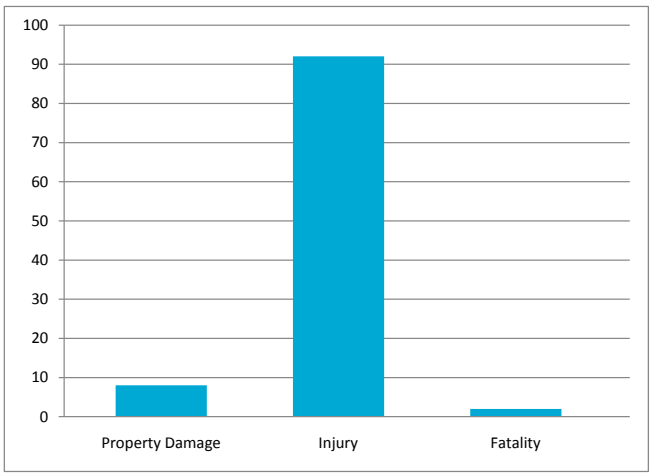


Figure 1: Crash Severity

7 Pedestrian and Bicycle Crash Types of the Early 1990's, Publication No. FHWA-RD-95-163, W.H. Hunter, J.C. Stutts, W.E. Pein, and C.L. Cox, Federal Highway Administration, Washington, DC, June, 1996.

152 injury collisions per year. Additionally, compared with statewide bicycle fatality rates (2.5 fatalities per 1 million population), Milwaukee falls slightly below the expected range with six reported cyclist fatalities between 2002 and 2007.[3]

Age and Gender

The majority of cyclists that were involved in crashes in Milwaukee were children under the age of 15. This is consistent with trends noted by the FHWA that a greater percentage of crashes involve individuals under 16 years of age. The Milwaukee data show that older cyclists are less likely to be involved in crashes. The majority of cyclists involved in crashes were male. This likely reflects the typically higher cycling rate among males.

Table 10: Cyclist Crashes by Age and Gender

Age Group		Female	Male	Total
7-14	Total Number	119	265	384
	% of Sample	12.8%	28.5%	41.3%
15-24	Total Number	66	191	257
	% of Sample	7.1%	20.6%	27.3%
25-34	Total Number	26	66	92
	% of Sample	2.8%	7.1%	9.9%
35-44	Total Number	16	64	80
	% of Sample	1.7%	6.9%	8.6%
44-55	Total Number	16	56	72
	% of Sample	1.7%	6.0%	7.8%
55 +	Total Number	6	38	44
	% of Sample	0.6%	4.1%	4.7%
Total	Total Number	249	680	929
	% of Sample	26.8%	73.2%	100.0%

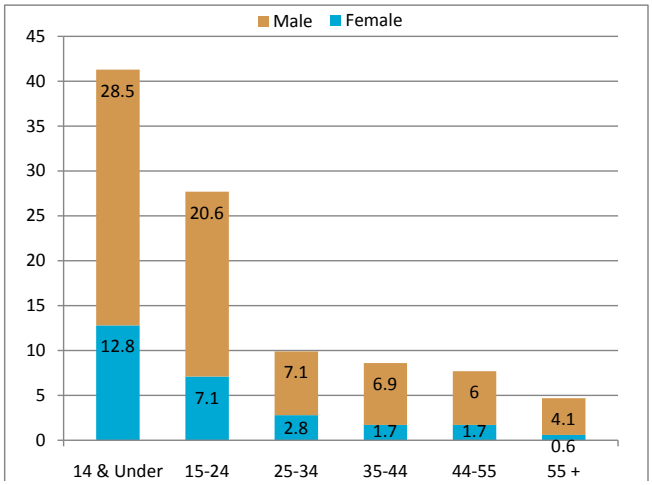


Figure 2: Total Percent of Cyclist Crashes by Age and Gender

Crash Location

All crashes in this analysis occurred within an urban setting. Of the 981 recorded crash locations, 646 (66%) occurred in intersections. About 35% (335 crashes) occurred mid-block.

Alcohol Involvement

Alcohol involvement was noted in 27 (2.8%) of all reported instances. This is lower than rates reported by the FHWA, which reported about 5% of all crashes.[8] Alcohol was involved in 2 of the 6 reported crash fatalities in Milwaukee. These numbers are consistent with fatality rates reported by the NHSTA.[9]

Crash Month

Table 11: Month of Crash Event

Month	Total Crashes	% Crashes
January	16	1.6%
February	12	1.2%
March	18	1.8%
April	59	6.0%
May	91	9.3%
June	141	14.4%
July	197	20.1%
August	200	20.4%
September	123	12.5%
October	79	8.1%
November	33	3.2%
December	12	1.2%
	981	100.0%

The pattern of crashes follows seasonal weather fluctuations, with greater numbers of crashes occurring April through September and peaking in July and August. It is possible that some crashes are attributed at least in part to winter conditions, but greater influence is exerted by the greater numbers of people cycling during warmer months.

8 Pedestrian and bicycle Crash Types of the Early 1990's FHWA-RD-95-163

9 Injury rates from Traffic Safety Facts, 2004 Data. "Pedalcyclists" NHTSA, DOT # HS 809 912

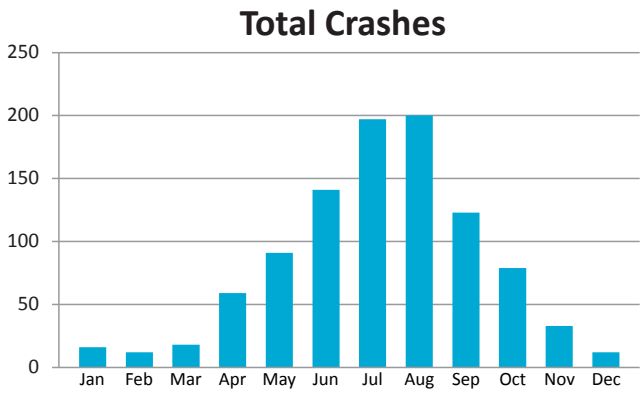


Figure 3: Month of Crash Event

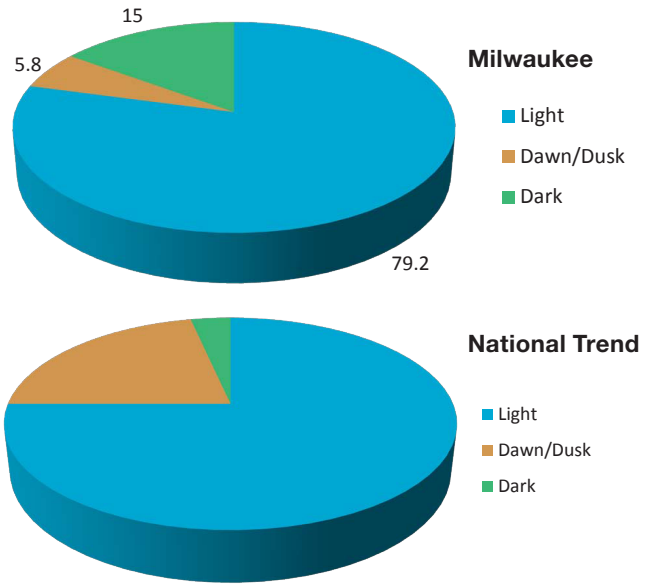
Time of Day

Table 12: Time of Day

Light Condition	Total Crashes	% Crashes
Dark	8	3.4
Dawn	6	2.5
Dusk	45	19.1
Light	177	75.0
	236	100.0%

Table 12 shows lighting conditions, which were only reported for 236 of 981 crashes. This data is fairly consistent with patterns reported in other areas, though crashes occurred with less frequency during daylight or in dark conditions and more frequently at dawn and dusk. Figure 4 compares lighting conditions in Milwaukee to reported national trends. It appears that a disproportionate number of reported crashes (19.1%) occurred during dusk. Generally, lighting conditions at dusk and dawn are recognized as the most difficult times to see cyclists and represent higher numbers of injury and fatality related crashes. More instances occur during dusk due to the numbers of drivers and cyclists commuting during this time. These results may not represent a clear picture of the effect lighting plays in crashes within Milwaukee due to a lack of reported information.

Figure 4: Crashes by Time of Day and National Trend[s1]



1 Pedestrian and bicycle Crash Types of the Early 1990's FHWA-RD-95-163

Day of Week

Crashes occurred on every day of the week, with a slightly higher percentage of crashes occurring on Tuesday and Friday. As this data does not take into account the difference in numbers of people biking each day, it is not possible to determine if the rate of crashes differs between weekdays and weekends. This data is consistent with trends observed in other areas.[10]

Table 13: Day of Week

Day of Week	Total Crashes	% Crashes
Sunday	135	14.7
Monday	131	14.2
Tuesday	153	16.6
Wednesday	143	15.5
Thursday	123	13.4
Friday	158	17.2
Saturday	138	15.0
	981	100.0%

10 Pedestrian and bicycle Crash Types of the Early 1990's FHWA-RD-95-163

Action at Time of Crash

Table 14: Cyclist Action at Time of Crash

Cyclist Action*	Total Crashes	% Total
Going Straight	807	82.9
Other	64	6.6
Left Turn	46	4.7
Right turn	16	1.6
Action not Noted	14	1.4
Stopped	5	0.5
U-Turn	5	0.5
Slowing or stopped	3	0.3
Merging	3	0.3
Changing Lane	2	0.1
Legally Parked	1	0.1
Stopped	1	0.1
U-Turn	1	0.1
Grand Total	968*	100
*Not all crashes list a cyclist as driver involved in the crash		

Table 14 shows cyclist action at the time of the crash event. In the majority of crashes, the cyclist was going straight. The second most common action at the time of a crash was making a left-hand turn. The right-hand turn is the third most common cyclist action. Milwaukee crashes related to cyclists making left hand turns is close to the national average of 4.3% of all bicycle crashes, according to research performed by the Highway Safety Center at the University of North Carolina and published by the FHWA.[11]

Table 15 shows the non-cyclist action at the time of the crash. This analysis includes all vehicles except bicycles. The most common non-cyclist actions at the time of the crash were traveling in a straight line (55.9%), making a right-hand turn (22.8%), or making a left-hand turn (11.4%). This data suggests that the number of crashes occurring in conjunction with left- and right-hand turns in Milwaukee is significantly higher than it was in studies performed by the FHWA where motorists were typically turning left in only about 6% of crashes and turning right in about 5% of all crashes.

Table 15: Non-Cyclist Action at Time of Crash

Non-bicycle driver action at time of crash	Total Crashes	% Crashes
Going straight	151	55.9
Right turn	210	22.8
Left turn	105	11.4
Slowing or stopped	43	4.7
Backing	11	1.2
Other	10	1.1
U-Turn	6	0.7
Legally parked	4	0.4
Merging	4	0.4
Changing lane	3	0.3
Parking	3	0.3
Right-turn on red	3	0.3
Over taking right turn	2	0.2
Illegally parked	1	0.1
Over taking left turn	1	0.1
Total*	922	100
*Excludes records where vehicle type was not noted		

11 FHWA Course on Bicycle and Pedestrian Transportation, Chapter 4.

Crash Corridors

Top Eleven Crash Corridors

Crashes were concentrated along eleven corridors during the study timeframe. These eleven locations represent 2.4% of all corridors with reported crashes, but account for 135 individual incidents, or 15.6% of all crashes reported on roadways. These corridors should be analyzed in greater detail to understand the specific crash causes and contributing factors. Care should be taken when interpreting this data. A street with a high number of crashes and a significant amount of bicycle traffic is likely less dangerous than a street that has the same number of crashes and less bicycle traffic. If possible, the amount of bicycle traffic along each of these streets should be validated with counts, or the expert knowledge of frequent cyclists who can help gauge the relative level of bicycle traffic. Streets with higher crash rates and less bicycle traffic may represent a greater safety risk. The City of Milwaukee should consider these key corridors as potential targets for future physical improvements aimed at reducing crashes and increasing cyclist safety and comfort.

Table 16: Top 11 Crash Corridors

Top Crash Corridors	Total Crashes
W National Avenue	16
N 27 ST	15
N 35 ST	15
W Capitol Drive	14
W Center St	13
S 20 ST	11
W North Ave	11
N Oakland Ave	10
N Teutonia Ave	10
N Water St	10
S Howell Ave	10

Corridors with Five or More Crash Locations

Over the six-year period, crashes were reported in 467 locations. Of these corridors, 47 (10%) had been the site of five or more incidents, for a total of 367 (36%) crashes over six years. These corridors may carry more bicycle and motor vehicle trips or possess more areas where roadway configurations create bicycle/vehicle conflicts. These corridors should be considered for more detailed analysis of physical conditions or targeted education campaigns.

Table 17: Frequent Crash Corridors

Corridor Name	No. Crashes	Corridor Name	No. Crashes
W National Ave	16	W Oklahoma Ave	7
N 27 St	15	N 60 St	6
N 35 St	15	N 76 St	6
W Capitol Dr	14	N 8 St	6
W Center St	13	S Kinnickinnic Ave	6
S 20 St	11	W Fond Du Lac Ave	6
W North Ave	11	W Greenfield Ave	6
N Oakland Ave	10	W Lincoln Ave	6
N Teutonia Ave	10	W Morgan Ave	6
N Water St	10	E Brady St	5
S Howell Ave	10	E Locust	5
E Locust St	9	N 38 St	5
N 6 St	9	N Green Bay Ave	5
S 27 St	9	S 13 St	5
S 6 St	9	S 16 St	5
W Vliet St	9	S 84 St	5
N 20 St	8	W Appleton Ave	5
N 7 St	8	W Bluemound Rd	5
S Layton Blvd	8	W Burleigh St	5
W Hadley St	8	W Hampton Ave	5
W Locust St	8	W Mitchell St	5
W Wright St	8	W State St	5
N Sherman Blvd	7	W Wisconsin Ave	5
S 35 St	7		

Crash Reduction: Education, Enforcement, and Outreach Efforts

The city of Milwaukee has identified bicycle crash reduction as a priority of the Bicycle Master Plan Update. Education and outreach programs are designed to increase bicyclists' safety by raising awareness of bicycling, connecting current and future cyclists to existing resources, educating them about their rights and responsibilities, and encouraging residents to bicycle more often (thus reducing crash risk via the well-researched "Safety in Numbers" principle). Successful measures to reduce crashes will lessen the perception that bicycling is a dangerous activity, thereby increasing the number of bicyclists on Milwaukee's roadways. Key target audiences of these programs include drivers, law enforcement personnel, current and potential (interested) cyclists, students, children and families, and school personnel.

Analysis of existing crash data for the city of Milwaukee demonstrates that the following deficiencies exist in the area of crash reduction:

Table 18: Education, Enforcement, and Outreach Conclusions and Recommendations

Trend	Recommendation
Children are over-represented in bicycle-vehicle crashes	Safe Routes to School programs that teach bicycle safety skills will reduce youth crash risk
66 percent of crashes occurred at intersections	Motorists and bicyclists need more information about intersection safety and cyclist rights and responsibilities. Possible approaches include enforcement actions and diversion classes, creating channels to get bicycling information to cyclists, and media campaigns.
Dusk was a time when bicyclists were more likely to be involved in a crash	Bicyclist lighting programs are needed
More crashes occur in the summer months	Less-experienced cyclists may be on the road during warmer weather; they would benefit from safety training Motorists may not have the information they need to avoid crashes with cyclists Possible approaches include enforcement actions and diversion classes, creating channels to get bicycling information to cyclists, and media campaigns.
While bicyclist and motorist crash behavior is not complete enough to provide a full analysis of common crash types, Milwaukie crash data and national trends seem to indicate that common crash types include crashes where the bicyclist is proceeding straight and the motorist turns (right or left) across the path. Another common crash pattern is motorists proceeding straight at point of crash, which may indicate a failure to yield error (on the part of the motorist or bicyclist).	Motorists and bicyclists need more information about intersection safety and cyclist rights and responsibilities. Possible approaches include enforcement actions and diversion classes, creating channels to get bicycling information to cyclists, and media campaigns.
The number of crashes is decreasing annually even as ridership increases. (Note: this finding is consistent with national research that indicates that crash rate decreases as more people ride bicycles.)	Milwaukie residents may not be aware that safety is improving. Promoting bicycling as a safe and accessible activity will encourage more people to bicycle, thus increasing safety on the road through the "safety in numbers" principle.
Insufficient crash data made it difficult to complete a thorough crash analysis.	It is recommended that crash reporting and data tracking be improved.

In addition, general crash reduction principles based on national best practices include:

- Route planning and wayfinding assistance as a way to direct cyclists to facilities that have been specifically enhanced to increase safety
- Helmet promotion
- Enforcement best practices
- Cycling promotion as a way to increase awareness and road safety
- Websites as an effective way to share cycling information with the public

In addition, there are numerous existing efforts that can be enhanced to increase crash reduction messaging, such as Safe Routes to School, Bike to Work Week and the Bike Licensing program. Program details can be found in Appendix L.

Appendix F: Existing and Potential Future Air Quality Benefits by Cycle Zone

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Existing and Potential Future Air Quality Benefits

Alta Planning + Design modeled the potential future air quality benefits based on maintaining the current bicycle network and a complete bicycle network. Tables 19 – 24 display the results of this modeling for each cycle zone defined for this plan. More detailed descriptions of the modeling and the assumptions that were included are provided in Appendix D: Quantifying Current and Future Demand for Bicycling Facilities.

Table 19: Zone 1 Potential Future Air Quality Benefits

	Bicycle Network	
Vehicle Travel Reductions	No Expansion	Complete
Reduced Vehicle Trips per Weekday[1]	958	1,869
Reduced Vehicle Trips per Year [2]	250,058	487,936
Reduced VMT per Weekday [3]	6,866	13,758
Reduced VMT per Year [2]	1,792,082	3,590,915
Vehicle Emissions Reductions	No Expansion	Complete
Reduced PM10 (tons per weekday) [4]	126	253
Reduced NOX (tons per weekday) [5]	3,425	6,863
Reduced ROG (tons per weekday) [6]	498	999
Reduced CO2 (tons per weekday)	3	6
Reduced PM10 (tons per year) [8]	32,974	66,073
Reduced NOX (tons per year) [8]	893,890	1,791,149
Reduced ROG (tons per year) [8]	130,105	260,700
Reduced CO2 (tons per year) [8]	762	1,526

Note: VMT means Vehicle Miles Traveled. This table shows estimated potential future benefits based on two scenarios:

Future population increase assuming no changes to the bicycle network. These benefits are estimated based on existing bicycling mode share

Future population increase assuming a completed bicycle network. These benefits are estimated based on assumed mode share increases

(1) Assumes 73% of bicycle trips replace vehicle trips for adults/college students; 53% reduction for school children.

(2) Weekday trip reduction multiplied by 261 weekdays per year.

(3) Bicycle trips: assumes average roundtrip of 8 miles for adults/college students; 1 mile for school children. Pedestrian trips: assumes average roundtrip of 1.2 miles for adults/college students; 0.5 mile for school children.

(4) PM10 reduction of 0.0184 tons per mile.

(5) NOX reduction of 0.4988 tons per mile.

(6) ROG reduction of 0.0726 tons per mile

(7) C02 reduction of 0.000425 tons per mile.

(8) Weekday emission reduction multiplied by 261 weekdays per year.

Table 20: Zone 2 Potential Future Air Quality Benefits

	Bicycle Network	
Vehicle Travel Reductions	No Expansion	Complete
Reduced Vehicle Trips per Weekday[1]	2,206	4,342
Reduced Vehicle Trips per Year [2]	575,824	1,133,329
Reduced VMT per Weekday [3]	15,795	31,956
Reduced VMT per Year [2]	4,122,59	8,340,63
Vehicle Emissions Reductions	No Expansion	Complete
Reduced PM10 (tons per weekday)[4]	291	588
Reduced NOX (tons per weekday)[5]	7,879	15,940
Reduced ROG (tons per weekday)[6]	1,147	2,320
Reduced CO2 (tons per weekday)	7	14
Reduced PM10 (tons per year) [8]	75,856	153,468
Reduced NOX (tons per year) [8]	2,056,350	4,160,309
Reduced ROG (tons per year) [8]	299,300	605,530
Reduced CO2 (tons per year) [8]	1,752	3,545

Note: VMT means Vehicle Miles Traveled. This table shows estimated potential future benefits based on two scenarios:

Future population increase assuming no changes to the bicycle network. These benefits are estimated based on existing bicycling mode share

Future population increase assuming a completed bicycle network. These benefits are estimated based on assumed mode share increases

(1) Assumes 73% of bicycle trips replace vehicle trips for adults/college students; 53% reduction for school children.

(2) Weekday trip reduction multiplied by 261 weekdays per year.

(3) Bicycle trips: assumes average roundtrip of 8 miles for adults/college students; 1 mile for school children. Pedestrian trips: assumes average roundtrip of 1.2 miles for adults/college students; 0.5 mile for school children.

(4) PM10 reduction of 0.0184 tons per mile.

(5) NOX reduction of 0.4988 tons per mile.

(6) ROG reduction of 0.0726 tons per mile

(7) C02 reduction of 0.000425 tons per mile.

(8) Weekday emission reduction multiplied by 261 weekdays per year.

Existing and Potential Future Air Quality Benefits

Table 21: Zone 3 Potential Future Air Quality Benefits

	Bicycle Network	
Vehicle Travel Reductions	No Expansion	Complete
Reduced Vehicle Trips per Weekday[1]	1,008	1,985
Reduced Vehicle Trips per Year [2]	263,173	517,977
Reduced VMT per Weekday [3]	7,219	14,605
Reduced VMT per Year [2]	1,884,184	3,812,018
Vehicle Emissions Reductions	No Expansion	Complete
Reduced PM10 (tons per weekday) [4]	133	269
Reduced NOX (tons per weekday) [5]	3,601	7,285
Reduced ROG (tons per weekday) [6]	524	1,060
Reduced CO2 (tons per weekday)	3	6
Reduced PM10 (tons per year) [8]	34,669	70,141
Reduced NOX (tons per year) [8]	939,831	1,901,434
Reduced ROG (tons per year) [8]	136,792	276,752
Reduced CO2 (tons per year) [8]	801	1,620

Note: VMT means Vehicle Miles Traveled. This table shows estimated potential future benefits based on two scenarios:

Future population increase assuming no changes to the bicycle network. These benefits are estimated based on existing bicycling mode share

Future population increase assuming a completed bicycle network. These benefits are estimated based on assumed mode share increases

(1) Assumes 73% of bicycle trips replace vehicle trips for adults/college students; 53% reduction for school children.

(2) Weekday trip reduction multiplied by 261 weekdays per year.

(3) Bicycle trips: assumes average roundtrip of 8 miles for adults/college students; 1 mile for school children. Pedestrian trips: assumes average roundtrip of 1.2 miles for adults/college students; 0.5 mile for school children.

(4) PM10 reduction of 0.0184 tons per mile.

(5) NOX reduction of 0.4988 tons per mile.

(6) ROG reduction of 0.0726 tons per mile

(7) C02 reduction of 0.000425 tons per mile.

(8) Weekday emission reduction multiplied by 261 weekdays per year.

Table 22: Zone 4 Potential Future Air Quality Benefits

	Bicycle Network	
Vehicle Travel Reductions	No Expansion	Complete
Reduced Vehicle Trips per Weekday[1]	1,126	2,217
Reduced Vehicle Trips per Year [2]	293,971	578,593
Reduced VMT per Weekday [3]	8,064	16,315
Reduced VMT per Year [2]	2,104,673	4,258,106
Vehicle Emissions Reductions	No Expansion	Complete
Reduced PM10 (tons per weekday) [4]	148	300
Reduced NOX (tons per weekday) [5]	4,022	8,138
Reduced ROG (tons per weekday) [6]	585	1,174
Reduced CO2 (tons per weekday)	3	7
Reduced PM10 (tons per year) [8]	38,726	78,349
Reduced NOX (tons per year) [8]	1,049,811	2,123,943
Reduced ROG (tons per year) [8]	152,799	309,138
Reduced CO2 (tons per year) [8]	894	1,810

Note: VMT means Vehicle Miles Traveled. This table shows estimated potential future benefits based on two scenarios:

Future population increase assuming no changes to the bicycle network. These benefits are estimated based on existing bicycling mode share

Future population increase assuming a completed bicycle network. These benefits are estimated based on assumed mode share increases

(1) Assumes 73% of bicycle trips replace vehicle trips for adults/college students; 53% reduction for school children.

(2) Weekday trip reduction multiplied by 261 weekdays per year.

(3) Bicycle trips: assumes average roundtrip of 8 miles for adults/college students; 1 mile for school children. Pedestrian trips: assumes average roundtrip of 1.2 miles for adults/college students; 0.5 mile for school children.

(4) PM10 reduction of 0.0184 tons per mile.

(5) NOX reduction of 0.4988 tons per mile.

(6) ROG reduction of 0.0726 tons per mile

(7) C02 reduction of 0.000425 tons per mile.

(8) Weekday emission reduction multiplied by 261 weekdays per year.

Table 23: Zone 5 Potential Future Air Quality Benefits

	Bicycle Network	
Vehicle Travel Reductions	No Expansion	Complete
Reduced Vehicle Trips per Weekday[1]	569	1,119
Reduced Vehicle Trips per Year [2]	148,387	292,040
Reduced VMT per Weekday [3]	4,070	8,235
Reduced VMT per Year [2]	1,062,398	2,149,275
Vehicle Emissions Reductions	No Expansion	Complete
Reduced PM10 (tons per weekday) [4]	75	152
Reduced NOX (tons per weekday) [5]	2,030	4,108
Reduced ROG (tons per weekday) [6]	296	598
Reduced CO2 (tons per weekday)	2	3
Reduced PM10 (tons per year) [8]	19,548	39,547
Reduced NOX (tons per year) [8]	529,924	1,072,058
Reduced ROG (tons per year) [8]	77,130	156,037
Reduced CO2 (tons per year) [8]	452	913

Note: VMT means Vehicle Miles Traveled. This table shows estimated potential future benefits based on two scenarios:

Future population increase assuming no changes to the bicycle network. These benefits are estimated based on existing bicycling mode share

Future population increase assuming a completed bicycle network. These benefits are estimated based on assumed mode share increases

(1) Assumes 73% of bicycle trips replace vehicle trips for adults/college students; 53% reduction for school children.

(2) Weekday trip reduction multiplied by 261 weekdays per year.

(3) Bicycle trips: assumes average roundtrip of 8 miles for adults/college students; 1 mile for school children. Pedestrian trips: assumes average roundtrip of 1.2 miles for adults/college students; 0.5 mile for school children.

(4) PM10 reduction of 0.0184 tons per mile.

(5) NOX reduction of 0.4988 tons per mile.

(6) ROG reduction of 0.0726 tons per mile

(7) C02 reduction of 0.000425 tons per mile.

(8) Weekday emission reduction multiplied by 261 weekdays per year

Table 24: Zone 6 Existing and Potential Future Air Quality Benefits

	Bicycle Network	
Vehicle Travel Reductions	No Expansion	Complete
Reduced Vehicle Trips per Weekday[1]	1,959	3,855
Reduced Vehicle Trips per Year [2]	511,177	1,006,081
Reduced VMT per Weekday [3]	14,022	28,369
Reduced VMT per Year [2]	3,659,775	7,404,192
Vehicle Emissions Reductions	No Expansion	Complete
Reduced PM10 (tons per weekday) [4]	258	522
Reduced NOX (tons per weekday) [5]	6,994	14,150
Reduced ROG (tons per weekday) [6]	1,018	2,060
Reduced CO2 (tons per weekday)	6	12
Reduced PM10 (tons per year) [8]	67,340	136,237
Reduced NOX (tons per year) [8]	1,825,496	3,693,211
Reduced ROG (tons per year) [8]	265,700	537,544
Reduced CO2 (tons per year) [8]	1,555	3,147

Note: VMT means Vehicle Miles Traveled. This table shows estimated potential future benefits based on two scenarios:

Future population increase assuming no changes to the bicycle network. These benefits are estimated based on existing bicycling mode share

Future population increase assuming a completed bicycle network. These benefits are estimated based on assumed mode share increases

(1) Assumes 73% of bicycle trips replace vehicle trips for adults/college students; 53% reduction for school children.

(2) Weekday trip reduction multiplied by 261 weekdays per year.

(3) Bicycle trips: assumes average roundtrip of 8 miles for adults/college students; 1 mile for school children. Pedestrian trips: assumes average roundtrip of 1.2 miles for adults/college students; 0.5 mile for school children.

(4) PM10 reduction of 0.0184 tons per mile.

(5) NOX reduction of 0.4988 tons per mile.

(6) ROG reduction of 0.0726 tons per mile

(7) C02 reduction of 0.000425 tons per mile.

(8) Weekday emission reduction multiplied by 261 weekdays per year

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Appendix G: Current Usage and User Needs Assessment

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Significant numbers of residents bicycle in Milwaukee on a regular basis. It is clear that the number of cyclists is increasing, and the demand and benefits model presented in Appendix D attempts to quantify the number of people regularly cycling within the city. In October of 2004, the Bike Fed set up infrared counters and performed manual counts on the Oak Leaf Trail near the Brady Street Bridge, as well as in Cupertino Park. Those counts recorded about 30,000 cyclists on the trail. In order to better gauge the number of people riding in Milwaukee, as well as the attitudes of residents toward cycling, two surveys were conducted. These surveys specifically evaluated bicyclist behaviors and attitudes in Milwaukee.

- The Milwaukee Survey of Bicyclist Attitudes and Behaviors was conducted by the Institute for Survey and Policy Research at the University of Wisconsin-Milwaukee. This was a formal survey that is statistically representative of Milwaukee residents and was conducted so as to be comparable to national statistics and surveys.
- The Milwaukee Bike Plan Survey was an informal qualitative survey targeted at existing cyclists in the Milwaukee area to learn about their opinions about bicycling in Milwaukee.
- The American Community Survey is conducted annually by the United States Census Bureau. This data relies heavily on statistical sampling, and therefore is not very precise. However, since the survey is conducted in the same manner each year for different cities, it provides comparable data that is good for trend analysis.

The Brady Street bicycle and pedestrian bridge connects to a popular path

When combined with the bicyclist demand and benefits model developed, a clearer picture of current and future bicycle usage in Milwaukee emerges.

Milwaukee Survey of Bicyclist Attitudes and Behaviors

The 2008 Milwaukee Survey of Bicyclist Attitudes and Behaviors (MSBAB) was sponsored by the City of Milwaukee Department of Public Works and the Wisconsin Bicycle Federation. The survey established benchmark measures of the behavior and attitudes of Milwaukee residents age 16 and over regarding bicycling. Many of the questions used in the survey were drawn from the 2002 National Survey of Pedestrian & Bicyclist Attitudes and Behaviors (NSPBAB) conducted by The Gallup Organization for the U.S. Department of Transportation's National Highway Traffic Safety Administration and the Bureau of Transportation Statistics. By presenting findings from the MSBAB in conjunction with national benchmarks, this survey shows how the sample of Milwaukee city residents compares to a nationally representative sample of individuals 16 years of age and older, with regard to the frequency of bicycling, the reasons for not biking, the distance and purpose of the most recent bike trip, and perceptions of biking safety. The MSBAB also asked city residents, both riders and non-riders, about their attitudes regarding bicycling, including their views on how well their communities are designed to make bike riding safe.

The MSBAB was administered during August 2008, and respondents were asked specifically about the frequency of their bike riding during the summer months (May through September) as well as during the past 30 days. The results of the MSBAB cannot be used to estimate year-round bicycling behavior, but the findings should accurately measure biking activity in Milwaukee during the summer of 2008. Although the size of the survey (434 respondents) does not provide reliable estimates of the frequency of bicycling within neighborhoods, the figures that follow show how the frequency of bike riding varies by gender and age group. The methodology for the survey, including sample selection, response rates, and sampling error, is detailed in Appendix H.

Frequency of Bicycling

Milwaukee residents ride their bikes more than the national average. Of residents reporting that they had

access to a bicycle, nearly half (49%) reported riding at least once during the summer months, whereas only 43% of people in the national survey reported riding at least once during the summer. Additionally, Milwaukee residents appear to ride more frequently, with 27% reporting they ride at least once a week compared to 19% nationally.

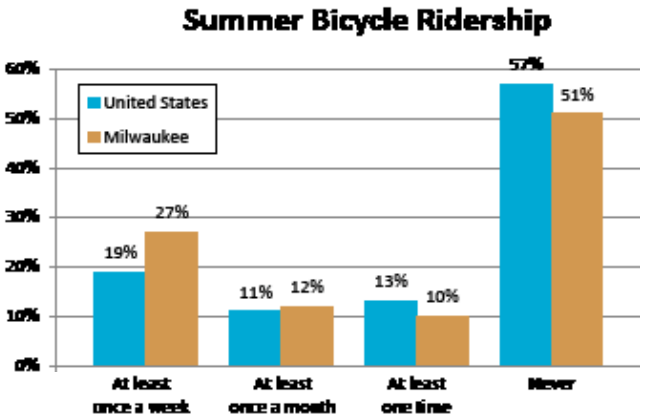

Figure 5: Frequency of Bicycling Reported by Those with Regular Access to a Bicycle

When bicycle ridership is examined for those reporting riding in the last 30 days, the differences between Milwaukee and the nation as a whole becomes more apparent. Among riders over 16 years of age, 39% of Milwaukee residents reported riding at least once in the last 30 days, compared to 27% nationally. While males in Milwaukee ride more frequently than males nationally (43% versus 34%), females in Milwaukee ride dramatically more than females nationally (36% versus 21%).

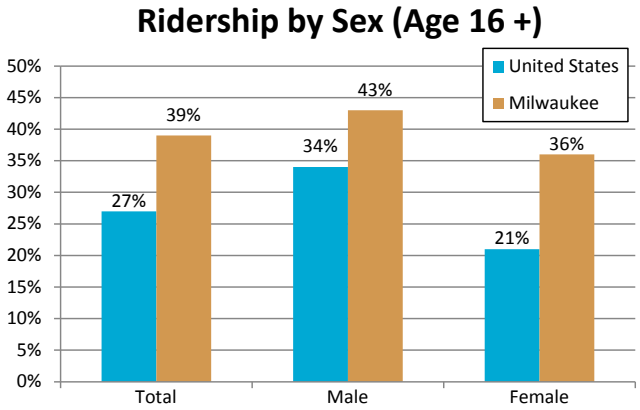

Figure 6: Bicycle Ridership by Sex

When looking at ridership by age, Milwaukee residents again beat out their national peers, with considerably higher ridership levels in every age category, other than those 65 years old and older. While not all of these differences are statistically significant, due to relatively small numbers of people in certain age groups, the pattern of higher ridership in Milwaukee is clear.

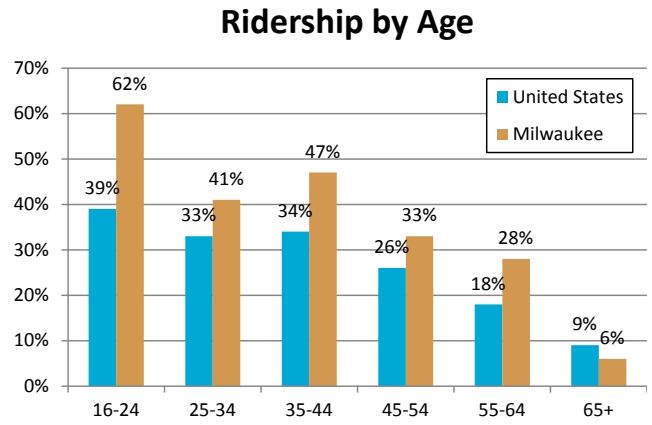

Figure 7: Bicycle Ridership by Age

Milwaukee residents report riding their bikes on more days in the preceding month than the national sample. On average, Milwaukee residents reported using their bikes on 8.5 of the past 30 days, with males using their bikes on more days (10.5 days) than females (6.4 days). Nationally, the average is 5.0 days for all riders, with males reporting 5.8 days and females reporting 3.9 days on average.

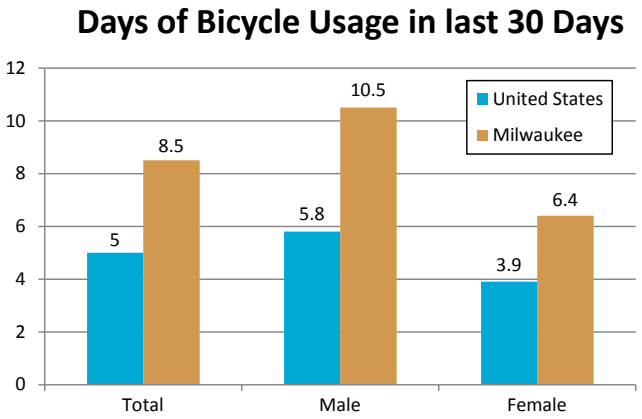

Figure 8: Days of Bicycle Usage in Last 30 Days

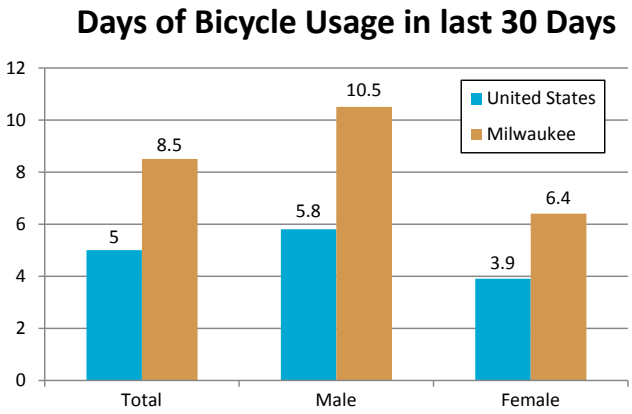

Figure 9: Primary Reasons Given for Not Bicycling

In summary, Milwaukee residents of all ages and sexes appear more likely than Americans in general to bicycle not only during the summer months, but also to bicycle more regularly in generally. In addition, among those who ride regularly, Milwaukee residents ride more frequently than their counterparts nationwide.

Reasons for Not Bicycling

Approximately 51% of the Milwaukee respondents reported that they had not ridden a bicycle during the summer and that they had not ridden a bike during the previous 30 days. These respondents were asked to state their main reason for not bicycling. Approximately one-third of respondents reported that they did not have access to a bicycle, while one-quarter of respondents reported that they were too old or had health issues that prevented them from cycling. The remaining respondents were nearly evenly split between not enjoying cycling, preferring to walk or drive, and not having the time or opportunity to ride.

The Distance, Purpose, and Safety of Bicycle Trips

The majority of bicycle trips in Milwaukee are short: 75% of people reported that their last ride was less than five miles, and one-third which stated their last ride was under a mile. These distances are comparable to the distribution of automobile trip distances.

Over two-thirds of Milwaukee residents reported that the primary purpose for their last ride was recreation or exercise, with just over two-thirds reporting that purpose. Utilitarian trips, such as running errands and commuting to school or work accounted for another 28% of responses by residents.

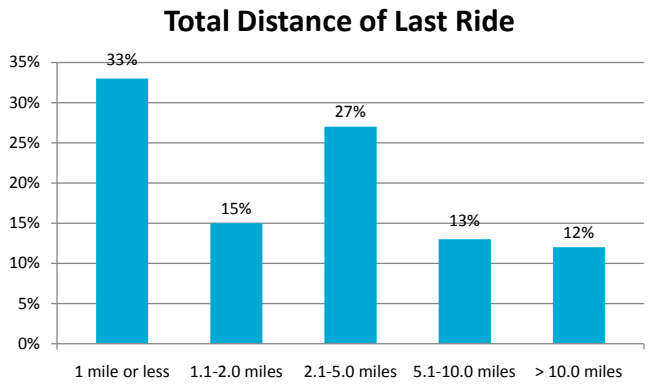

Figure 10: Total Distance of Last Ride

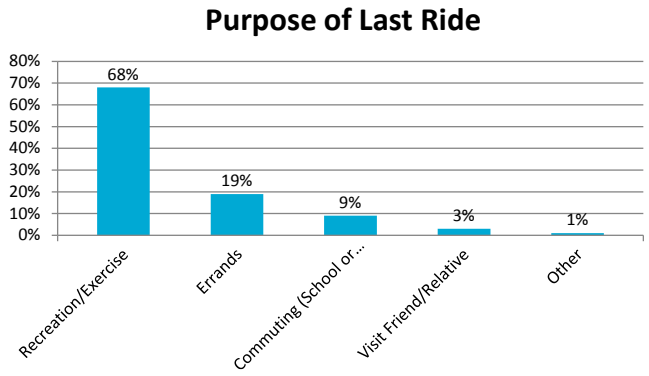

Figure 11: Purpose Given for Last Bicycle Ride

One quarter of Milwaukee riders (24.6%) reported that they felt concerned for their personal safety while riding, and of those, 90% cited the behavior of motorists as their reason for concern. Nationally, 13% of riders reported feeling concern for their personal safety, with 88% of those riders citing the behavior of motorists as the reason for their concern. The actions of motorists are clearly the primary concern of bicycle riders nationwide, but a greater percentage of cyclists in Milwaukee have this concern than a similar sample of riders nationwide.

Opinions on Bicycling and Design of Communities for Safety

Milwaukee residents hold favorable opinions about bicycling. When asked if they agreed with a series of statements about bicycling, they agreed "strongly" or "somewhat" at a higher rate than their peers nationwide. While the responses of Milwaukee residents were similar to their nationwide counterparts on most statements, it is notable that Milwaukee residents agree with the statement "biking is a great form of transportation

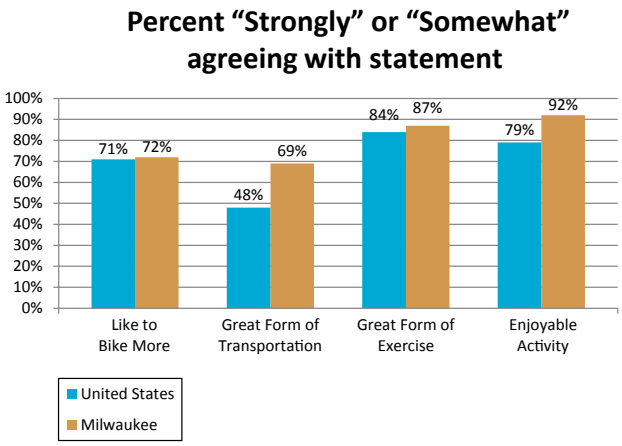

Figure 12: Respondents Agreeing with Positive Statements About Bicycling

in the area where I live" at a far higher rate than nationwide (69% versus 48%). While this may reflect the fact that urban trips are often shorter than suburban or rural trips, it also reflects a particularly favorable view of the utility of cycling in Milwaukee.

Survey respondents were also asked to rate their satisfaction with "how your local community is designed for making bike riding safe." Overall, 55% of Milwaukee residents were "very" or "somewhat" satisfied, while 63% of respondents who had ridden a bike in the last 30 days were "very" or "somewhat" satisfied. While these numbers are above the national numbers, they show that there is considerable work to do to ensure that all Milwaukee residents feel safe bicycling around their city.

Milwaukee Bike Plan Survey

The Milwaukee Bike Plan Survey was an informal qualitative survey targeted at existing cyclists in the Milwaukee area to learn about their opinions about bicycling in Milwaukee. The survey was administered online and was available to anyone, not just Milwaukee residents. Because the survey was heavily promoted within the cycling community and participants were not selected randomly, the opinions collected may not accurately reflect those of all Milwaukee residents as a whole. However, with 689 respondents as of August 31, 2009, the opinions expressed in the survey do reflect a wide cross section of cyclists and other road users in the greater Milwaukee area.

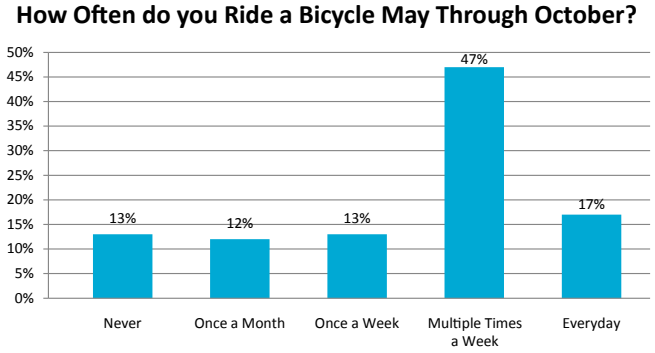

Figure 13: Frequency of Bicycle Ridership During Warm-Weather Months

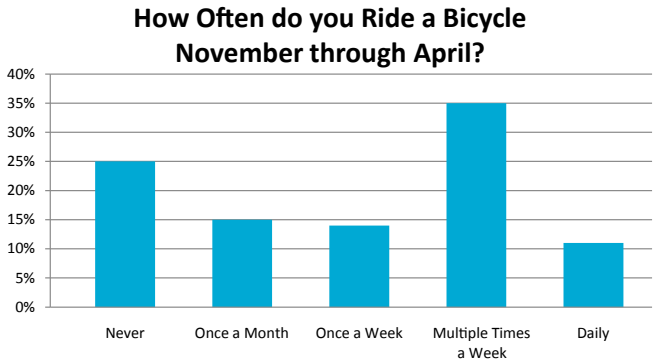

Figure 14: Frequency of Bicycle Ridership During Cold-Weather Months

Frequency of Bicycling

As would be expected, respondents to this survey reported higher rates of riding their bikes and a greater frequency of riding than the general public as represented by the MSBAB. Nearly half (47%) of the survey respondents reported that they rode multiple times a week between May and November, and over three quarters (77%) reported riding at least once a week.

This survey also showed that a significant number of cyclists ride year round in Milwaukee. Over one third (35%) of respondents reported riding multiple times a week from October through April, and 60% reported riding at least once a week. Even given the bias of the survey toward frequent cyclists, this demonstrates that a large number of cyclists ride year round in Milwaukee.

Survey respondents reported that they used their bicycles for both transportation and recreation on a regular basis. Just over two thirds (69%) of the respondents reported using their bikes at least once a week for transportation purposes, while 85% reported using their bikes that frequently for recreation or exercise.

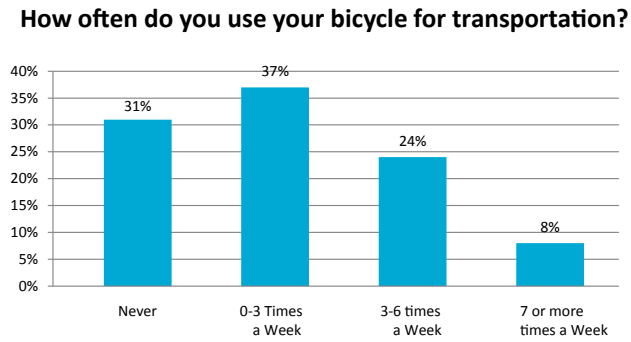

Figure 15: Bicycle Use for Transportation

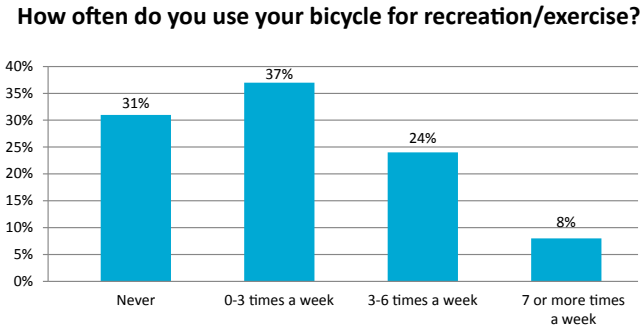

Figure 16: Bicycle Use for Recreation or Exercise

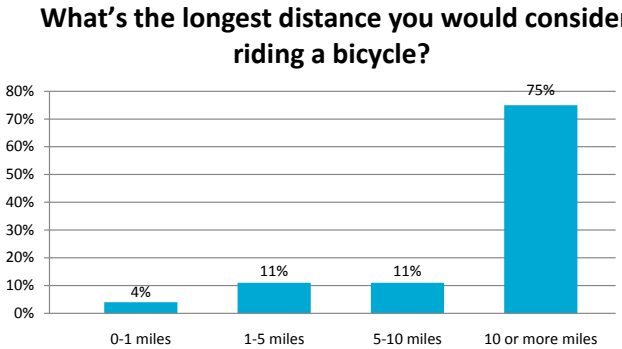

Figure 17: Longest Distance Cyclists Would Consider Riding

Additionally, the survey group reported that they would consider biking significant distances: 75% stated they would consider riding ten or more miles at a time.

Factors Affecting Bicycling

Survey respondents strongly agree with the Wisconsin law that bicycles are considered legal vehicles on the road and have the same rights and responsibilities as motor vehicles.

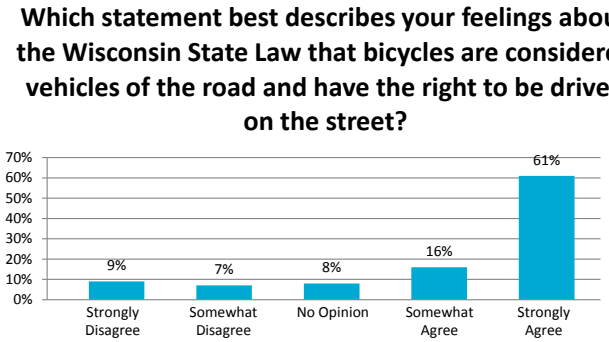

Figure 18: Agreement with State Law Designating Bicycles as Legal Vehicles

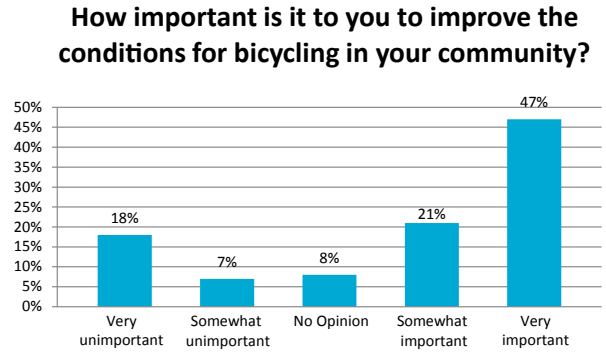

Figure 19: Importance of Improving Bicycling Conditions

Although most survey respondents feel that bicycles should be legally operated in the roadway, they also believe that improvements are needed in conditions for bicycling in their communities. Nearly half of the survey respondents reported that it was "very important" for the community to improve the conditions for cycling. This may imply a strong belief that even though cyclists are legal users of the road, current street design and other facilities are not particularly safe or conducive for cycling.

This is further supported when respondents were asked what factors discourage them from bicycling. Just under half of respondents reported that "unfriendly bicycle roadways" strongly discouraged them from bicycling, while one-third of respondents reported that "motorists not following the laws of the road" strongly discouraged them from bicycling. Not having adequate bicycle parking available at destinations and a lack of off-street greenway trails were also cited as factors discouraging people from bicycling.

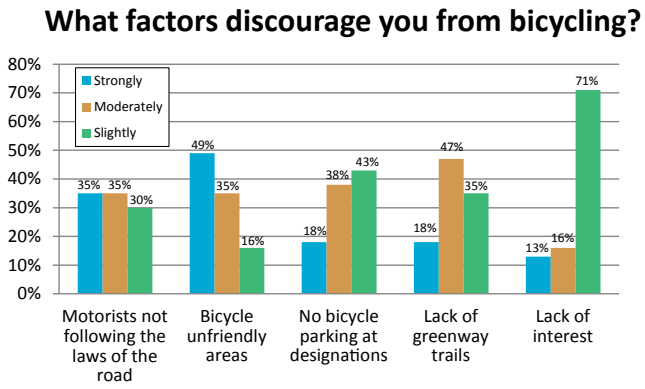

Figure 20: Factors Discouraging Bicycling

When asked what factors would affect their decision to bicycle more, respondents strongly supported the addition of more on- and off-street bicycle facilities, including bike lanes and bike paths. 92% of respondents reported that more on-street facilities would strongly or moderately affect their decision to bicycle more, while 88% made the same statement about additional greenway (off-street) trails. Notably, education and outreach efforts as well as increased enforcement of traffic laws would also strongly or moderately affect respondents' decision to bicycle more. This demonstrates that although more bicycle facilities are desired, relatively inexpensive education, enforcement and outreach efforts could also significantly increase the number of people bicycling in Milwaukee.

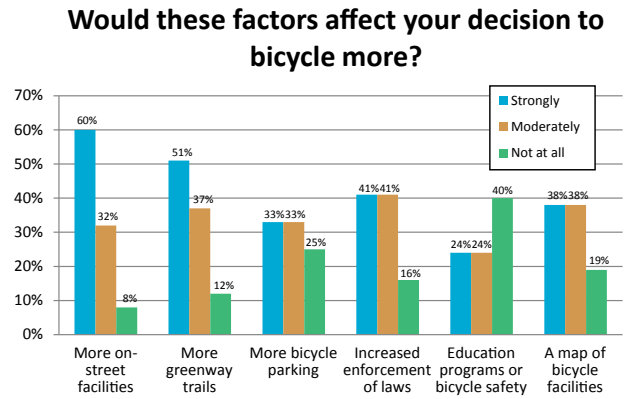

Figure 21: Factors that Would Encourage More Bicycling

Logically following the question about the factors that would affect their decision to bicycle more, the vast majority of respondents reported that they felt comfortable riding on designated bicycle facilities including bike lanes, bike routes and greenway trails. Nearly all respondents also reported they were comfortable riding on low-traffic neighborhood streets like those that make up the majority of the Milwaukee street network. The only facilities that significant numbers of respondents reported not being comfortable bicycling on were main village/city thoroughfares and rural thoroughfares, although in both cases it was still a minority of respondents stating they were not comfortable with such facilities.

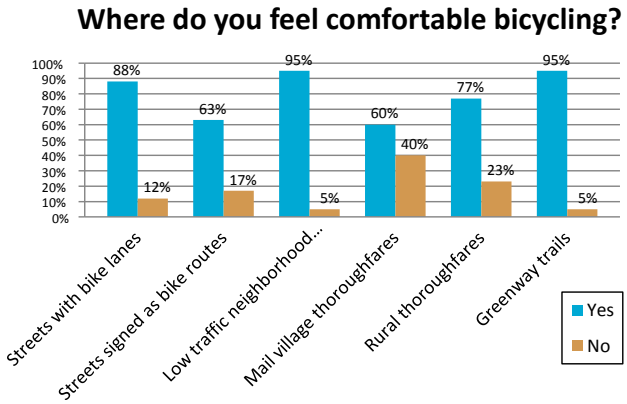

Figure 22: Comfort Level Bicycling on Specific Facilities and Streets

When asked where they would ride, survey respondents overwhelmingly reported that they would ride to recreational areas such as parks and greenway trails. However, they also reported that they were likely to use their bikes for more utilitarian trips including commuting, connecting with transit, and as transportation to shopping, restaurants and other entertainment venues.

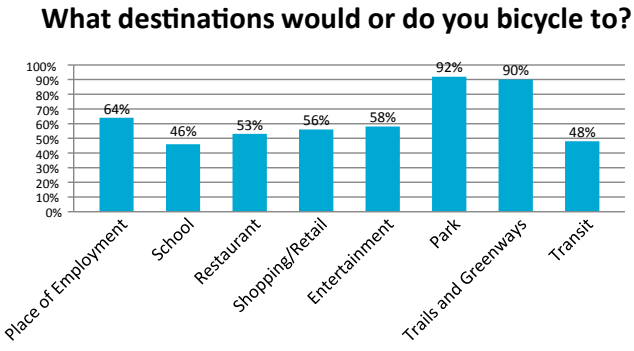

Figure 23: Destinations Reached by Bicycle

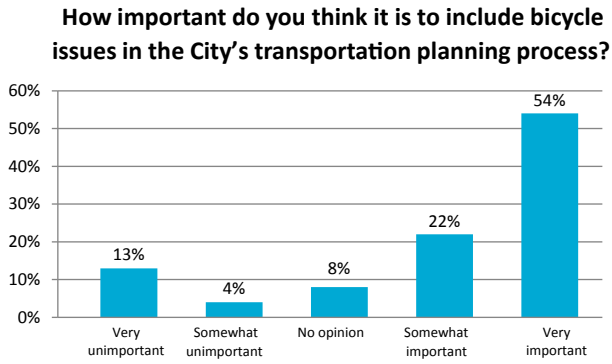

Figure 24: Importance of Including Bicycle Planning in Milwaukee Plans

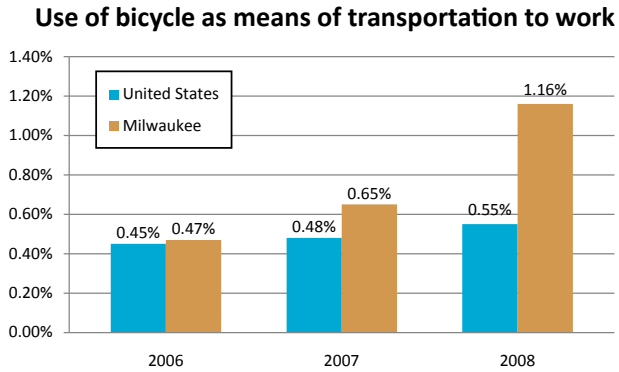

Figure 25: Bicycle Use as Means of Transportation to Work

Given the high rate and frequency of reported bicycling by respondents, it should not be a surprise that a majority (54%) also think that including bicycle issues in the city of Milwaukee's transportation planning process is very important. Fully 76% of respondents feel that such a step is "very" or "somewhat important," while only 17% of respondents felt that it was "unimportant."

American Community Survey

The American Community Survey (ACS) is a nationwide survey that collects and produces population and housing information every year instead of every ten years. Approximately three million housing unit addresses are sampled annually throughout the United States and Puerto Rico including nursing homes, correctional facilities, military barracks and college/university housing.

Beginning with the 2005 ACS, and continuing every year thereafter, annual estimates of demographic, social, economic and housing characteristics are available for geographic areas with a population of 65,000 or more. This includes the nation, all fifty states, the District of Columbia, all congressional districts, approximately 800 counties, and 500 metropolitan and micropolitan statistical areas.

In 2008, the ACS released its first multi-year estimates based on ACS data collected from 2005 through 2007. These three-year estimates of demographic, social, economic and housing characteristics are available for geographic areas with a population of 20,000 or more. For areas with a population of less than 20,000, five-year estimates will be available. The first five-year estimates, based on ACS data collected from 2005 through 2009, will be released in 2010.

The portion of the ACS most relevant to bicycle planning in Milwaukee is the section surveying participants on their mode of travel to work. Because the survey uses statistical sampling to estimate totals for the entire population, there is a significant margin of error for responses. However, the survey and its sampling methods remain consistent from one year to the next and across surveyed regions, which means that the data are useful for trend analysis and comparison to other regions.

Information on the methods and procedures of the ACS is presented in ACS Design and Methodology.
http://www.census.gov/acs/www/Downloads/tp67.pdf

Milwaukee Bicycle Commute Mode Share

According to the ACS, the use of bicycles for commuting to work has risen significantly over the past few years. In 2006, 1,154 people commuted to work by bicycle; representing 0.47% of all trips to work. By 2008, the number of people commuting by bicycle was 2,809, or 1.16% of all commuters. This gain represented a 143% gain in only two years. Notably, the bicycle facility network did not dramatically increase during that time.

It is also notable that in 2006, Milwaukee had a bicycle mode share that was virtually identical to the national average. However, in 2008, the Milwaukee bicycle mode share was more than double the national average.

Conclusion

The three surveys about bicycling in Milwaukee demonstrate that there is strong interest in bicycling and in improving conditions for biking throughout the city. Milwaukee has consistently higher bicycling rates than the national average, and these numbers could be increased through a concerted effort to improve bicycling conditions. While some of these efforts are relatively expensive infrastructure projects, others are simple enforcement and education efforts targeted at both motorists and bicyclists. By providing better bicycling facilities including on-street lanes and routes, off-street paths, and adequate parking, in addition to stepping up traffic enforcement laws and working to educate motorists and bicyclists about appropriate and safe road behavior, the city stands to increase the number of bicyclists significantly.

Appendix H: MSBAB Selection and Methodology

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Sample Selection

The survey was conducted based upon a random sample of telephone numbers for the city of Milwaukee. This sample was purchased from Genesys Sampling Systems of Fort Washington, Pennsylvania. The telephone numbers were called by interviewers working in a supervised facility at the Institute for Survey & Policy Research at the University of Wisconsin-Milwaukee. If the number called is determined not to be a residential number, it is discarded and another number is randomly selected from the remaining sample. If the number called is a residence, the interviewer randomly selects a respondent by asking to speak with the person living in the household who is age 16 or older and who had the most recent birthday. This selection process ensures that every member of the household who is age 16 or older has an equal chance of being included in the survey. No substitutions are allowed. If the randomly selected person is not at home when the household is first contacted, the interviewer cannot substitute someone else who happens to be available at the time. Instead, attempts are made to call back when the randomly selected person is at home. In this way, respondent selection bias is minimized.

Response Rates and Sampling Error

Interviewing for the Milwaukee Survey of Bicyclist Attitudes and Behaviors (MSBAB) was conducted from August 11, 2008 to August 26, 2008. Calling times were Monday through Thursday evenings from 4:30 to 8:00 P. M. and Saturday and Sunday afternoons from 1:30 to 5:30 P.M. in order to maximize participation by all demographic subgroups. A total of 3,919 phone numbers were called from the Milwaukee sample. Table 25 displays the frequency of each type of outcome for the contact attempts.

Table 25: Dialing Outcomes for the MSBAB

Type of Outcome	Frequency
Completed Interviews	434
Disconnected/Non-working Numbers	333
Non-Residential Numbers	422
Not Appropriate Geographic Area	143
Unable to Reach Household/Respondent	1,225
Unable to Interview Due to Language, Hearing or Illness	118
Refusals	1,244
TOTAL	3,919

There are different ways of calculating the response to a telephone survey, but they all require that ineligible numbers be excluded from the total number of attempted contacts. These ineligible numbers include disconnected/non-working numbers, non-residential numbers, and numbers that are not within the appropriate geographic area. The remaining (presumed eligible) numbers include those that the interviewers were unable to contact as well as actual contacts. The contact rate is the ratio of the number of actual contacts to the number of presumed eligible contacts. The contact rate for this survey was 0.59. A second way of measuring response is to calculate the cooperation rate, the ratio of completed interviews to the number of actual contacts. The cooperation rate was 0.24. Finally, the refusal rate is the ratio of the number of refusals to the number of presumed eligible contacts. For this survey, the refusal rate was 0.41.

To minimize the number of refusals and increase participation, the most experienced interviewers attempted to re-contact those who initially refused to participate in the study to see if they would agree to be interviewed. Altogether, 39 of these "refusal conversion" interviews (9% of the total 434 interviews) were conducted after an initial refusal. The responses of these "refusal conversions" were compared to the responses of all other respondents on the measures of bicycle access, bicycling frequency, and attitudes regarding bicycling. On all of these measures the differences between the two groups of respondents were small and statistically insignificant. It is generally assumed that "refusal conversions" are similar to non-respondents and that we can estimate the extent of nonresponse error by comparing those who initially agree to be interviewed to those who initially refuse. Based upon this assumption, it appears that the survey respondents are closely comparable to the rest of the sample with regard to the key measures of bicycling attitudes and behaviors. The MSBAB, like all sample surveys, is also subject to random sampling error. For an interview sample of this size (n = 434), the margin of error is less than + 5% at the 95% confidence level.

Weighting of the Data

The sample of Milwaukee residents interviewed here was weighted to reflect the number of adults relative to the number of telephone lines in each household. In addition, the samples were weighted to adjust for the over- or under-representation of various gender and age groups due to non-response to the telephone survey and

to the fact that some households do not have a listed telephone number. To adjust for this over- and under-representation the sample was weighted to reflect the gender and age composition of the city of Milwaukee, based on the Census Bureau's 2006 American Community Survey which was released on July 1, 2007.

Appendix I: Recommendations for Survey Modifications

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Recommendations for Survey Modifications

The 2008 Milwaukee Survey of Bicyclist Attitudes and Behaviors contains questions drawn primarily from the 2002 National Survey of Pedestrian and Bicyclist Behaviors. As the Milwaukee survey does not include questions about the number and mode of trips taken by respondents, it is difficult to use this data to obtain a clear picture of bicycle use in relation to other modes. The following list of strategies can help retool the survey to capture information about cycling mode split and trip purpose, should this survey be conducted again. The suggestions range from small changes aimed at gathering a minimal amount of new data to a trip diary that would provide additional data about each trip taken by an individual. Increasing the amount of data gathered will add to the time required to conduct each survey and analyze the completed results. The city could consider conducting this survey in partnership with another entity looking for similar or related information in order to decrease the overall investment of time and resources.

- Add a question about the number of trips taken during the day the respondent last rode their bike. This would provide a way to measure the amount of bicycle travel in the city.
- Ask questions about overall travel behavior drawn from the National Housing Travel Survey (NHTS). This survey contains questions about the overall number of trips taken by each user. Information about the total number of all trips taken and the total number of bike trips taken within a specific timeframe would provide the information necessary to calculate bike mode share. This could be further refined by asking questions about the number of trips taken by other modes (e.g., car, public transit and by foot) to create a more comprehensive picture bike use in relation to other uses. Mode split characteristics could then be compared by people who cycle with varying levels of frequency.
- Include a trip diary component to the survey. Travel surveys can include a trip log or trip diary to obtain a picture of respondents travel patterns. Trip logs capture:
  - Trip start and end point
  - Trip mode
  - Trip purpose
  - Trip length (in length or duration)

Trip logs are not 100% accurate as the user may forget to record trips, purposely omit trips from the record or record a day of completely atypical travel resulting in skewed data results. Trip logs most often capture 1-3 days of travel. Distinction should be made between weekday/weekend trips as travel patterns frequently differ. This suggestion would provide more information about travel patterns but would require greater reporting time than questions taken from the NHTS.

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Appendix J:
Project Cost Opinions

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Individual Project Cost Opinions

Tables 26 through 29 list the recommended projects by category and include planning-level cost opinions.

Table 26: Planning-Level Cost Opinions for Bicycle Routes[1]

Street	From	To	Miles	Cost
N 107TH ST	W Appleton Ave	W Mill Rd	0.49	$2,400
S 13TH ST	W Layton Ave	W Grange Ave	1.00	$5,000
N 27TH ST	W Clybourn St	W Highland Ave	0.58	$2,900
N 35TH ST	W Hope Ave	W Congress St	0.25	$1,300
N 45TH ST	W Blue Mound Rd	W Wisconsin Ave	0.09	$500
N 68TH ST	W Center St	W Burleigh St	0.51	$2,500
W AIR CARGO WA	S Howell Ave	S 6th St	0.50	$2,500
W BLUE MOUND RD	N 45th St	N Story Pkwy	0.17	$800
W BURNHAM ST	S 20th St	S Muskego Ave	0.10	$500
S HOWELL AV	E Citation Way	E College Ave	0.56	$2,800
N HUMBOLT AV	E Kane Pl	N Commerce St	0.15	$800
E LINCOLN AV	S Kinnickinnic Ave	S Bay St	0.43	$2,200
E OKLAHOMA AV	S Howell Ave	S Clement Ave	0.51	$2,600
W PIERCE ST	W Reynolds Pl	S 26th St	0.05	$300
W ROOSEVELT DR	W Capitol Dr	W Burleigh St	1.81	$9,100
W STATE ST	N 27th St	N 35th St	0.51	$2,500
N TERRACE AV	E North Ave	N Wahl Ave	0.07	$400
N TEUTONIA AV	S of W Mill Road Ct	W Mill Road Ct	0.04	$200
N WAHL AV	N Terrace Ave	N Lake Dr	0.62	$3,100
E WATER TOWER RD	N Terrace Ave	N Lincoln Memorial Dr	0.30	$1,500

[1] Additional route details are included in Chapter 3.

Table 27: Planning-Level Cost Opinions for Bicycle Lanes

Street	From	To	Miles	Cost
N 107TH ST	W Hampton Ave	W Silver Spring Dr	1.00	$39,000
S 11TH ST	W Bruce St	W Grant St	1.43	$55,000
N 12TH ST	W Wisconsin Ave	W State St	0.11	$4,000
N 12TH ST	W Jeneau Ave	W Cherry St	0.31	$12,000
N 12TH ST	W Walnut St	W North Ave	0.50	$19,000
N 13TH ST	W Mount Vernon Ave	W Clybourn St	0.14	$5,000
S 13TH ST	W Arthur Ave	W Layton Ave	2.76	$106,000
N 16TH ST	W Canal St	W Clybourn St	0.32	$12,000
S 16TH ST	W Canal St	W Pierce St	0.50	$19,000
S 16TH ST	W Mitchell St	S Amy Pl	0.18	$7,000
S 16TH ST	W Forest Home Ave	W Windlake Ave	0.63	$24,000
N 20TH ST	W St Paul Ave	W Wisconsin Ave	0.27	$10,000
N 20TH ST	W Jeneau Ave	W Cherry St	0.29	$11,000
N 20TH ST	W Meinecke Ave	W Clarke St	0.25	$10,000
N 20TH ST	W Hadley St	W Villard Ave	2.88	$111,000
S 20TH ST	W Pierce St	S Muskego Ave	0.83	$32,000
S 20TH ST	W Burnham St	W Becher St	0.24	$9,000
S 20TH ST	W Hayes Ave	W Layton Ave	2.86	$110,000
S 20TH ST	W Klein Ave	City Border (~ W Aspen St)	1.47	$57,000
N 27TH ST	W Jeneau Ave	W Galena St	0.38	$15,000
N 27TH ST	W Lisbon Ave	W Fon du Lac	0.96	$37,000
S 2ND ST	Menomonee River	W Maple St	1.46	$56,000
N 35TH ST	W Wisconsin Ave	W State St	0.40	$15,000
S 35TH ST	W Scott St	W Pabst Ave	1.50	$58,000
S 3RD ST	W National Ave	W Maple St	0.84	$32,000
S 43RD ST	W Lincoln Ave	South	0.18	$7,000
N 43RD ST	W Silver Spring Dr	N Sherman Bl	0.36	$14,000
N 51ST ST	W Capitol Dr	W Silver Spring Dr	2.03	$78,000
N 64TH ST	W Silver Spring Dr	W Mill Rd	1.01	$39,000
N 68TH ST	W Fairview Ave	City Border (~W Mt Vernon Ave)	0.19	$7,000
N 68TH ST	W Lisbon Ave	North	0.02	$1,000
N 68TH ST	W Vienna Ave	W Florist Ave	2.81	$108,000
S 68TH ST	W Fairview Ave	W Dickinson St	0.47	$18,000
S 68TH ST	City Border (~W Arthur Ave)	W Forest Home Ave	1.96	$76,000
N 6TH ST	W Michigan St	W State St	0.38	$15,000
N 6TH ST	W Juneau St	W Court St	0.32	$12,000
N 6TH ST	W Vine St	W Brown St	0.18	$7,000
S 6TH ST	W Oregon St	S Chase Ave	1.65	$63,000
S 6TH ST	W Hayes Ave	W Rosedale Ave	0.45	$17,000
S 6TH ST	W Euclid Ave	W Air Cargo Way	2.99	$115,000
S 76TH ST	W Oklahoma Ave	City Border (~W Waterford Ave)	1.27	$49,000
S 84TH ST	W Oklahoma Ave	W Howard Ave	1.00	$39,000
S 92ND ST	W Oklahoma Ave	W Howard Ave	1.00	$39,000
N 91ST ST	W Mill Rd	W Good Hope Rd	1.10	$42,000
N 92ND ST	W Congress St	W Grantosa Dr.	0.18	$7,000
S ALEXANDER ST	Roundabout	W Virginia St	0.05	$2,000
E BAY ST	S Kinnickinnic Ave	S Lenox St	0.46	$18,000
S BAY ST	S Lenox St	E Russell Ave	0.61	$24,000
E BRADFORD AV	N Farwell Ave	N Downer Ave	0.18	$7,000
W BRADLEY RD	N Green Bay Rd	City Border	0.37	$14,000
W BRADLEY RD	N 51st St	N 124th St	4.51	$174,000

Street	From	To	Miles	Cost
N BROADWAY	Milwaukee River	E Erie St	0.08	$3,000
W BROWN DEER RD	City Border	N 124th St	3.52	$135,000
W BRUCE ST	S 9th St	S 17th St	0.60	$23,000
E BUFFALO ST	N Water St	N Jefferson St	0.22	$8,000
E BUFFALO ST	N Jackson St	N Van Buren St	0.06	$2,000
W BURLEIGH ST	N 5th St	N Teutonia Ave	0.75	$29,000
W BURLEIGH ST	N 68th St	W Lisbon Ave	0.20	$8,000
W BURLEIGH ST	N Menomonee River Pkwy	City Border	0.15	$6,000
S CESAR E CHAVEZ DR	W Pierce St	W Mitchell St	0.82	$32,000
E CHERRY ST	N Riverwalk Way	N Water St	0.05	$2,000
W CHERRY ST	N Riverwalk Way	N 6th St	0.40	$16,000
W CONGRESS ST	N 51st Blvd	N 92nd St	2.63	$101,000
E CORCORAN AV	E Erie St	N Jackson St	0.15	$6,000
W COUNTY LINE RD	City Border	N 124th St	3.56	$137,000
N DOWNER AV	N Lake Dr	E Locust St	0.59	$23,000
N DOWNER AV	E Hampshire St	E Edgewood Ave	0.43	$17,000
N EMMBER LA	W Canal St	W Mt Vernon Ave	0.20	$8,000
W FLAGG AV	W Fon du Lac Ave	W Florist Ave	0.09	$3,000
W FLORIDA ST	S 1st St	S 5th St	0.29	$11,000
E FLORIDA ST	S 1st St	S Water St	0.25	$10,000
W FLORIST AV	N Teutonia Ave	N Sherman Blvd	0.72	$28,000
W FLORIST AV	W Flagg Ave	N 60th St	1.76	$68,000
W FLORIST AV	W Appleton Ave	N 124th St	1.00	$38,000
W FOREST HOME AV	S 54th St	City Border	0.06	$2,000
W FOREST HOME AV	City Border	City Border	0.93	$36,000
W GRANGE AV	S Howell Ave	I-94	1.33	$51,000
W GRANGE AV	S 25th St	S 27th St	0.13	$5,000
W GRANTOSA DR	N 68th St	N 92nd St	1.92	$74,000
W GRANTOSA DR	W Congress St	W Marion St	0.26	$10,000
W GRANTOSA DR	City Border	W Capitol Dr	0.38	$15,000
W GREENFIELD AV	S Layton Blvd	S 36th St	0.56	$21,000
E HAMPTON AV	W Hampton Ave	N Santa Monica Blvd	0.19	$7,000
W HAMPTON AV	E Hampton Ave	N Port Washington Rd	0.31	$12,000
W HAMPTON AV	Milwaukee River	N Milwaukee River Pkwy	0.18	$7,000
W HAMPTON AV	N Green Bay Ave	N Teutonia Ave	0.78	$30,000
W HAMPTON AV	N 107th St	N 124th St	1.02	$39,000
W HISTORIC MITCHELL ST	S 5th St	S 13th St	0.54	$21,000
W HOLT AV	S Chase Ave	S 6th St	0.50	$19,000
N HOLTON ST	E Hadly St	E Hope Ave	1.64	$63,000
W HOPKINS ST	N 13th St	N 31st St	1.87	$72,000
N HOPKINS ST	W Congress St	W Sheridan Ave	1.47	$57,000
W HOWARD AV	W Forest Home Ave	S 96th St	2.02	$78,000
S HOWELL AV	E Wilson St	E Gauer Cir	0.76	$29,000
S HOWELL AV	E Bradley Ave	E Citation Way	2.71	$104,000
N HUMBOLDT AV	N Commerce St	E Garfield Ave	0.05	$2,000
E JUNEAU ST	N Prospect Ave	N Riverwalk Way	0.87	$34,000
W JUNEAU ST	N Riverwalk Way	N 35th St	2.16	$83,000
E KNAPP ST	E of N Edison St	N Milwaukee St	0.27	$11,000
N LAKE DR	E North Ave	N Downer Ave	0.20	$8,000
E LAYTON AV	S Howell St	S Ahmedi Ave	1.22	$47,000
W LAYTON AV	S Howell St	I-94	1.26	$48,000
W LINCOLN AV	S 31st St	City Border	0.79	$30,000

Project Cost Opinions

Street	From	To	Miles	Cost
W LISBON AV	W Center St	W Capitol Dr	3.03	$117,000
W MAPLE ST	S 2nd St	S 6th St	0.30	$12,000
E MASON ST	N Water St	N Prospect Ave	0.50	$19,000
E MENOMONEE ST	E Erie St	N Jackson St	0.26	$10,000
E MICHIGAN ST	East end	N Riverwalk Way	0.68	$34,000
W MICHIGAN ST	N Riverwalk Way	N 6th St	0.46	$18,000
W MILL RD	E City Border	W City Border	5.78	$223,000
N MILWAUKEE ST	N Water St	E Erie St	1.40	$54,000
W MITCHELL ST	S 1st St	S 5th St	0.29	$11,000
W MITCHELL ST	S 14th St	S 26th St	0.86	$33,000
W MORGAN AV	S 6th St	S 43rd St	2.53	$98,000
W MORGAN AV	S 56th St	W Beloit Rd	2.67	$103,000
S MUSKEGO AV	W Greenfield Ave	W Grant St	1.00	$38,000
E NEWBERRY BL	N Cramer St	N Lake Park Rd	0.74	$29,000
W NICHOLAS ST	W Florida St	Roundabout	0.04	$2,000
E NORTH AV	N 1st St	N Buffum St	0.23	$9,000
E NORTH AV	N Summit Ave	N Lake Dr	0.09	$3,000
W NORTH AV	N 1st St	W Monroe St	1.32	$51,000
W NORTH AV	N 26th St	N 40th St	0.87	$34,000
W NORTH AV	W Lisbon Ave	N 50th St	0.15	$6,000
W OKLAHOMA AV	S 45th St	S 100th St	3.39	$131,000
E PITTSBURGH AV	S Water St	N Broadway	0.03	$1,000
N PLANKINTON AV	S 2nd St	N Plankinton Ave	0.07	$3,000
E PLEASANT ST	N 1st St	N Riverwalk Way	0.20	$8,000
W PLEASANT ST	N 1st St	N Martin Luther King Jr Dr	0.15	$6,000
N PROSPECT AV	N Maryland Ave	E Bradford Ave	0.25	$10,000
W REYNOLDS PL	S 17th St	W Pierce St	0.16	$6,000
E RUSSELL AV	S Bay St	S Lincoln Memorial Dr	0.33	$13,000
N SHERMAN BL	N 43rd St	W Mill Rd	0.66	$25,000
W SILVER SPRING DR	N 13th St	City Border	0.06	$2,000
W SILVER SPRING DR	E of N Green Bay Ave	W of N Long Island Dr	0.30	$12,000
W SILVER SPRING DR	E of N Teutonia Ave	N 33rd St	0.29	$11,000
W SILVER SPRING DR	N 68th St	N 124th St	3.55	$137,000
E ST PAUL AV	N Riverwalk Way	N Van Buren St	0.40	$15,000
W ST PAUL AV	N Riverwalk Way	N 27th St	1.84	$71,000
E STATE ST	N Market St	N Waverly Pl	0.64	$25,000
W STATE ST	N Riverwalk Way	N 15th St	0.93	$36,000
N TEUTONIA AV	W North St	W Calumet Rd	6.82	$263,000
W VILLARD AV	N Green Bay Ave	N Hopkins St	1.54	$59,000
W VIRGINIA ST	S 2nd St	S 9th St	0.54	$21,000
W VLIET ST	N 12th St	W of N 15th St	0.28	$11,000
W VLIET ST	N 20th St	N 39th St	1.24	$48,000
W WALNUT ST	N Martin Luther King Jr Dr	N 5th St	0.15	$6,000
E WASHINGTON ST	S 1st St	S Water St	0.13	$5,000
W WASHINGTON ST	S 1st St	S Cesar E Chavez Dr	1.10	$42,000
S WATER ST	E Pittsburgh Avee	E Washington St	0.76	$29,000
E WELLS ST	N Riverwalk Way	N Prospect Ave	0.63	$24,000
W WELLS ST	N Riverwalk Way	N 15th St	1.02	$39,000
W WELLS ST	N 28th Pl	N 37th St	0.49	$19,000
S WHITNALL AV	E Burdick Av	S Quincy Ave	1.19	$46,000
W WINDLAKE AV	W Grant St	S 13th St	0.02	$1,000
N YOUNG ST	E Erie St	N Milwaukee St	0.08	$3,000

Table 28: Planning-Level Cost Opinions for Bicycle Boulevard Corridors[1]

Route	Miles	Cost
N 14th St - N 15th St	1.68	$52,000
S 21st St	0.5	$15,000
S 23rd St	2.01	$62,000
N 26th St	0.92	$28,000
S 26th St - S 29th St	2.5	$77,000
N 32nd St - N 31st St	0.39	$12,000
N 35th St	0.38	$12,000
S 37th St	1.42	$44,000
N 42nd St	2.25	$69,000
N 42nd St - N Grant Blvd	0.97	$30,000
N 52nd St - N 54th St	2.24	$69,000
N 53rd St - W Glendale Ave	1.39	$43,000
N 66th St	0.76	$23,000
N 84th St - N 86th St	2.2	$68,000
N 86th St	1.14	$35,000
E Brown St - W Brown St	3.21	$99,000
N Cambridge Ave	0.72	$22,000
W Chambers St	1.52	$47,000
W Cherry St	0.31	$9,000
W Congress St	0.84	$26,000
W Courtland Ave - W Cornell St	1.39	$43,000
W Custer Ave	1.18	$36,000
W Fairmount Ave - W Camero Ave	1.33	$41,000
W Fairview Ave - W Dixon St	1.65	$51,000
N Fratney St - E Meinecke - N Brement St	2.06	$63,000
E Hartford Ave	0.97	$30,000
N Hopkins St - N Sherman Blvd	1.73	$53,000
W Locust St - N 72nd St	1.4	$43,000
W Manitoba St	0.84	$26,000
W Mc Kinley Ave	1.25	$38,000
W Nash St - W Vienna Ave	1.32	$41,000
N Palmer St	1.54	$47,000
W Pierce At - W Bruce St - W Virginia St	2.66	$82,000
E Reservoir Ave	0.24	$8,000
W Ruby Ave - W Baldwin St	0.45	$14,000
W State St	0.59	$18,000
E Waterford Ave - W Bolivar Ave	1.52	$47,000
E Wright St - W Wright St	4.26	$131,000

1 Route details are included in Chapter 3 and the maps and GIS data accompanying this plan

Table 29: Planning-Level Cost Opinions for Raised Bike Lanes

Street	From	To	Miles	Cost
N 16TH ST	W Canal St	W Clybourn St	0.32	$71,000
S 16TH ST	W Canal St	W Pierce St	0.50	$111,000
N 27TH ST	W Canal St	W St Paul St	0.23	$51,000
S 27TH ST	W Canal St	S Layton Blvd	0.28	$62,000
S LAYTON BLVD	S 27th St	W Pierce St	0.23	$51,000
N LAKE DR	E Bradford Ave	E Edgewood Ave	1.36	$303,000
N 35TH ST	I94 Ramps	W Park Hill Ave	0.08	$18,000
S 35TH ST	I94 Ramps	W National Ave	0.68	$151,000
E BAY ST	S Kinnickinnic Ave	S Bay St	0.46	$102,000
S BAY ST	E Bay St	E Russell Ave	0.61	$136,000

Maintenance Costs

On-street bikeways require regular maintenance and repair as previously discussed in Chapter 4. In Milwaukee on-street bikeways are maintained as part of standard roadway maintenance programs. Extra emphasis should be placed on keeping bike lanes and roadway shoulders clear of debris and keeping vegetation overgrowth from blocking visibility or creeping into the roadway as bicycle riders are more susceptible to poor roadway conditions than motorists. Typical maintenance costs for each proposed facility type of on-street bikeway facilities are shown in Table 30.

Table 30: Maintenance Cost Opinions by Facility Type

Item Description	Unit	QTD.	Unit Price	Notes
Bike Route				
Sign replacement	EA	25	$250	every 10 years
Patching	LF	10,560	$0.04	2 times/year
Cost per Mile			$1,025	
Annual Maintenance Cost per LF:			$0.19	
Bike Lane				
Re-striping	LF	10,560	$0.02	2 lanes
Sign replacement	EA	25	$250	every 10 years
Patching	LF	10,560	$0.04	2 times/year
Cost per Mile			$6,861	
Annual Maintenance Cost per LF:			$1.30	
Bicycle Boulevard				
Sign replacement	EA	25	$250	every 10 years
Patching	LF	10,560	$0.04	2 times/year
Cost per Mile			$6,650.00	
Annual Maintenance Cost per LF:			$1.26	
Raised Bike Lane				
Re-striping	LF	10,560	$0.02	2 lanes
Sign replacement	EA	25	$250	every 10 years
Patching	LF	10,560	$0.04	2 times/year
Sweeping	LF	5,280	$0.02	Both sides of street
Cost per Mile			$6,971	
Annual Maintenance Cost per LF:			$1.32	
Shared Use Path (12')				
Patching	LF	10,560	$0.04	2 times/year
Repaving	LF	264	$9.47	$50,000 every 20 years
Landscaping	SF	21,120	$1.25	Shoulders
Restriping	LF	5,280	$1.00	6" Annually
Cost per Mile			$34,580	
Annual Maintenance Cost per LF:			$6.55	

Table 31: Current and Future Annual Estimated Bikeway System Maintenance Costs

	Existing Facilities (MI)	Existing Facility Maintenance	Planned & Proposed Facilities (MI)	Proposed Facility Maintenance	Total (MI)	Total System Maintenance
Bike Lanes	52.47	$360,000	153.36	$1,052,000	205.83	$1,404,000
Bike Routes	65.45	$67,000	9.11	$10,000	74.56	$77,000
Bike Boulevards	0.00	$0	54.07	$360,000	54.07	$360,000
Raised Bike Lanes	0.00	$0	4.77	$33,000	4.77	$33,000
Shared Use Paths	3.10	$107,000	14.38	$497,000	17.48	$604,000
Total	**121.02**	**$534,000**	**235.67**	**$1,952,000**	**356.72**	**$2,486,000**

Table 31 shows the expected annual maintenance cost for the entire on-street bikeway system. Items included in the annual cost estimate include restriping bikeways, sign repair and replacement, and a small additional cost for additional spot patching, sign movement and sweeping as necessary. Items not included in this estimate are regular street sweeping, snow removal and regular pavement resurfacing, which occurs approximately every 20 years. Based on the activities included in Table 30, the City currently spends about $534,000 annually on bikeway maintenance. It is estimated that the annual maintenance budget for the City must increase by about $1,952,000 dollars when the bikeway system is completely constructed in order to keep the on-street bikeway network in good repair.

Estimated Annual Bikeway Spending and System Completion Costs

Though funding for annual bikeway maintenance and the salary of the bicycle and pedestrian coordinator is provided as part of the annual city budget, funding for expansion of the bikeway system and related programs has been accomplished through grants. Table 32 (next page) shows a summary of citywide bicycle related grant funds spent by Milwaukee between 2003 and 2009. The city has spent about ten million dollars on bicycle related projects. About one-tenth of this money, about $160,000 annually, has been spent on the installation of on-street facilities.

Completing the bikeway system laid out in Chapter 3 within the proposed ten-year time-frame will require about $688,000 annually in the investment of on-street bikeways. Based on the historic average grant funding allocated to on-street bikeways, the City may need to allocate as much as $2.5 million dollars in additional funding. Table 33 (next page) illustrates four funding scenarios based on historic low, medium and high levels of grant funding.

Based on the amount of grant funding received over the next ten years, the City of Milwaukee will need to spend between $7,150,000 and $4,430,000 to complete the on-street bikeway network proposed in this Plan. One important factor to consider in this analysis is the high cost of dedicated bridge facilities. Table 32 shows that about $3.5 million or 30% of bikeway funding has been dedicated to the construction and improvement of the Marsupial Bridge. It is possible that grants the City will continue to receive as much money in the future as they have in previous years, if they allocated all of this money to construction of on-street facilities the funding scenarios presented in Table 33 could look significantly different.

Project Cost Opinions

Table 32: Bikeway Facility and Program Spending 2003 - 2009

Project Description	Project Category	Program	Year	Total Award
Beer Line Bike/Recreational Trail	Off-Street Trail*	TE/STP-D[1]	2008	$170,000
Bike Lane CMAQ #2	Bike Lanes	CMAQ[2]	2009	$20,000
Bike Lane CMAQ #2	Bike Lanes	CMAQ	2009	$330,000
Bike Lanes CMAQ #1	Bike Lanes	CMAQ	2006	$20,000
Bike Lanes CMAQ #1	Bike Lanes	CMAQ	2009	$480,000
Bike Map	Bike Map*	STP-D	2005	$75,000
Bike Map	Bike Map Reprint / Design*	STP-D	2008	$75,000
Bike Parking	Bicycle Racks*	TE/STP-D		$335,000
Bike Route Spot Improvements	Bicycle Racks*	CMAQ	2003	$395,000
Bike Route Spot Improvements	Bike Lanes	CMAQ	2005	$395,000
Holton Streetscape	Bump-outs & Bike Lanes	CMAQ/DCD/BID	2005	$100,000
Kinnickinnic River Trail2.675	Off-Street Trail*	CMAQ		$2,675,000
Kinnickinnic River Trail Bridge removal/rehab	Off-Street Trail*	ARRA[3]	2008	$430,000
Marsupial Bridge	Bike/Pedestrian Bridge*		2004	$330,000
Marsupial Bridge	Bike/Pedestrian Bridge*		2004	$2,884,000
Marsupial Bridge Improvements	Bike/Pedestrian Bridge*	HPP[4]	2009	$800,000
Off Street Bikeway Study	Bike Plan*		2005	$100,000
Publicity Plan	Bike Plan*	TDM	2004	$30,000
Southpoint Streetscape (Greenfield Ave)	Bump-outs & Bike Lanes	CMAQ	2005	$100,000
Update bike plan	Bike Master Plan*	STP-D	2008	$150,000
	Total City Bike Projects Funding			$9,894,000
	Total On-Street Facility Spending			$1,125,000
	Average Annual On-Street Spending			$160,000

** Denotes spending not allocated to the expansions of the on-street bikeway network*

(1) Transportation Enhancement (TE) /Surface Transportation Program-Discretionary (STP-D)

(2) Congestion Mitigation and Air Quality

(3) American Recovery and Reinvestment Act

(4) SAFETY-LU High Priority Project

Table 33: Bikeway Network Funding Scenarios 10-Year Build-Out

Funding Scenario	Percentage of Historic Funding	Average Annual Grant Allocation	Annual Grant Deficit/ Surplus	Net Grant Deficit/ Surplus	Annual City Allotment	Net City Allotment
Low	30%	$48,000	-$715,005	-$7,150,048	$715,005	$7,150,048
Medium-Low	50%	$80,000	-$683,005	-$6,830,048	$683,005	$6,830,048
Average	100%	$160,000	-$603,005	-$6,030,048	$603,005	$6,030,048
High	200%	$320,000	-$443,005	-$4,430,048	$443,005	$4,430,048

Appendix K: Recommended Complete Streets Policy

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Recommended Complete Streets Policy

There is a growing movement in the U.S. to integrate non-motorized transportation in the planning, design and operation of roads, bridges and transit projects called "Complete Streets." At the national level, the US Department of Transportation (USDOT) developed a model bicycle and policy framework in 2001. The policy is based on the principle that bicyclists and pedestrians have the right to move along or across all roadways unless specifically prohibited from doing so. The national policy has served as guidance for state DOTs and public works agencies throughout the United States. It has recently evolved into the idea that streets are only complete when they address the needs of all modes of transportation, including walking and bicycling. This approach includes providing for transit, ADA compliance and facilities for people of all ages and abilities.

In 2009 the State of Wisconsin passed a Complete Streets law that mandates the inclusion of bicycle and pedestrian accommodations on most new and expanded roads that receive State or Federal funding for construction. The Wisconsin Department of Transportation expects to have legislative rules defining the Complete Streets regulations complete by the end of 2010.

Complete Streets principles are "federal, state, local, or regional level transportation laws, policies, or principles which ensure that the safety and convenience of all users of a transportation system, including pedestrians, bicyclists, public transit users, children, older individuals, motorists, and individuals with disabilities, are accommodated in all phases of project planning and development." This section provides guidance for Complete Streets policy elements.

Elements of Complete Streets Policies

1. The Principle

- Complete streets are designed and operated to enable safe access for all users. Pedestrians, bicyclists, motorists and transit riders of all ages and abilities must be able to safely move along and across a complete street.
- Creating complete streets means changing the policies and practices of transportation agencies.
- A Complete Streets policy ensures that the entire right of way is routinely designed and operated to enable safe access for all users.
- Transportation agencies must ensure that all road projects result in a complete street appropriate to local context and needs.

2. Elements of a Good Complete Streets Policy

A good Complete Streets policy:

- Specifies that 'all users' includes pedestrians, bicyclists, transit vehicles and users, and motorists of all ages and abilities.
- Aims to create a comprehensive, integrated, connected network.
- Recognizes the need for flexibility: that all streets are different and user needs will be balanced.
- Is adoptable by all agencies to cover all roads.
- Applies to both new and retrofit projects, including design, planning, maintenance, and operations for the entire right of way.
- Makes any exceptions specific and sets a clear procedure that requires high-level approval of exceptions.
- Directs the use of the latest and best design standards.
- Directs that complete streets solutions fit in with context of the community.
- Establishes performance standards with measurable outcomes.

3. Implementation

An effective complete streets policy should prompt transportation agencies to:

Students and an adult biking home from Golda Meier School

- Restructure their procedures to accommodate all users on every project.
- Re-write their design manuals to encompass the safety of all users.
- Re-train planners and engineers in balancing the needs of diverse users.
- Create new data collection procedures to track how well the streets are serving all users.

Benefits of Complete Streets

Complete streets improve safety. Complete streets reduce crashes through safety improvements. One study found that designing for pedestrian travel by installing raised medians and redesigning intersections and sidewalks reduced pedestrian risk by 28%.[1] Complete streets also improve safety indirectly by increasing the number of people bicycling and walking. A recently published international study found that as the number and proportion of people bicycling and walking increases, deaths and injuries decline.[2]

Complete streets encourage more walking and bicycling. Public health experts are encouraging walking and bicycling as a response to the obesity epidemic, and complete streets can help. One study found that 43% of people with safe places to walk within ten minutes of home met recommended activity levels, while just 27% of those without safe places to walk were active enough.[3] Residents are 65% more likely to walk in a neighborhood with sidewalks.[4] A study in Toronto documented a 23% increase in bicycle traffic after the installation of a bike lane.[5]

Complete streets can help ease transportation woes. Streets that provide travel choices can give people the option to avoid traffic jams, and increase the overall capacity of the transportation network. Several smaller cities have adopted Complete Streets policies to increase the overall capacity of their transportation network and reduce congestion as an alternative to expensive street expansion projects. An analysis by the Victoria Transportation Policy Institute found that non-motorized transportation

1 M.R. King, J.A. Carnegie, and R. Ewing, "Pedestrian Safety Through a Raised Median and Redesigned Intersections" Transportation Research Board 1828 (2003): 56-66.

2 Jacobsen, PL, "Safety in Numbers: More Walkers and Bicyclists, Safer Walking and Biking," Injury Prevention 9 (2003): 205-209.

3 Powell, K.E., Martin, L., & Chowdhury, P.P. (2003). Places to walk: convenience and regular physical activity. American Journal of Public Health, 93, 1519-1521.

4 Giles-Corti, B., & Donovan, R.J. (2002). The relative influence of individual, social, and physical environment determinants of physical activity. Social Science & Medicine, 54 1793-1812.

5 St. George Street Revitalization. www.tc.gc.ca/programs/environment/UTSP/st.georgestreetrevitalization.htm

Participants in the Sherman Multicultural School Safe Routes to School program practice their road skills

options can replace some vehicle trips, and in urban areas where more people commute by foot or bicycle, people drive fewer miles overall.[6] In Portland, Oregon, a Complete Streets approach has resulted in a 74% increase in bicycle commuting in the 1990s.[7]

Complete streets help children. Streets that provide room for bicycling and walking help children get physical activity and gain independence. More children walk to school where there are sidewalks. Also, children who have and use safe walking and bicycling routes have a more positive view of their neighborhood.[8] Gaining in popularity across the country, Safe Routes to School programs will benefit from Complete Streets policies that help turn all routes into safe routes.

Complete streets make fiscal sense. Integrating sidewalks, bike lanes, transit amenities, and safe crossings into the initial design of a project spares the expense of retrofits later. Jeff Morales, the Director of Caltrans when the state of California adopted its complete streets policy in 2001, said, "*By fully considering the needs of all non-motorized travelers (pedestrians, bicyclists, and persons with disabilities) early in the life of a project, the costs associated with including facilities for these travelers are minimized*."

Policy Recommendations

America Bikes requests that Congress establish a series

6 Littman, Todd TDM Encyclopedia (ADONIS, 1999; Mackett, 2000; Socialdata Australia, 2000; Cairns et al, 2004).

7 City of Portland, Office of Sustainable Development. Local Action Plan on Global Warming, 2005 Progress Report.

8 Ewing, R. Will Schroeer, William Greene. School location and student travel: Analysis of factors affecting mode choice. Transportation Research Record: Journal of the Transportation Research Board, No. 1895, TRB, National Research Council, Washington, D.C., 2004, pp. 55–63.

of performance measures for state and local agencies to ensure that bicycling and walking become safe and convenient options throughout the transportation network.

Policy 1. As an element of good roadway design, all projects involving new construction or reconstruction of roadways shall consider accommodation of bicyclists and pedestrians. This principle shall apply to all federal, state and local recipients of funds authorized under Titles 23 and 49, including federal land management agencies.

Exceptions to this requirement would be possible where:

- Bicyclists and/or pedestrians are not permitted to operate (e.g., on limited access highways).
- There is a demonstrable lack of need (e.g., in cul-de-sacs).
- Provisions would exceed a reasonable percentage of the overall costs of the project (e.g., 20%).

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Appendix L:
Crash Reduction Education and Encouragement Programs

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Recommendations to Enhance Existing Efforts

The city of Milwaukee, in conjunction with various teaming partners, has produced a number of valuable educational programs and materials aimed at bicyclists, motorists and pedestrians.

Bike to Work Week	
Target	Cyclists (especially would-be cyclists)
Primary agency	Bicycle Federation of Wisconsin
Partners	City of Milwaukee
Key elements	Media events, Biking with the Mayor to City Hall, Bike-In-Movie, plus smaller events throughout the week at different locations such as a bike ride to a Brewers game
Time frame	May, annually
Cost	$$ - $$$ (depends on scope of program)
Potential funding sources	Bike shops (in-kind donations); transit agencies and local news outlets (donated ad space); traffic safety foundations and grant programs; hospitals and insurance companies
Program websites	http://bfw.org/coordination/index.php?category_id=3946
Program Recommendations	Continue Bike to Work Week Include enhanced safety information booklet in packet to companies that register Kick off a "LOOK" campaign aimed at motorists in conjunction with Bike to Work Week (see page 96)

Bike to Work Week is an excellent opportunity to get more cyclists on the street and raise awareness of their presence to motorists. It is recommended that the city of Milwaukee and the Bike Fed continue their efforts. It is suggested that Bike to Work Week be enhanced through including safety information in the "Bike to Work" packets that companies receive and kicking off a "LOOK" safety campaign aimed at motorists and cyclists (see page 96).

Streetshare and Pedestrian Awareness Week	
Target	Motorists
Primary agency	City of Milwaukee
Partners	National Highway Transportation Safety Administration Wisconsin Department of Transportation Bureau of Transportation Safety
Key elements	Media event to highlight crosswalk safety demonstrations Education materials for motorists Increased number of "Yield to Pedestrian" signs at crosswalks Increased enforcement of speeding near schools Drivers pledge forms and yard signs
Time frame	October, annually
Cost	$$ - $$$ (depends on scope of program)
Potential funding sources	FHWA and NHTSA safety grants, Hospitals with rehabilitation clinics
Program websites	http://www.streetshare.org/ http://www.streetshare.org/Pedestrian-Safety-Week.html
Program Recommendations	Increase Streetshare program to include education to motorists and cyclists about the rights and responsibilities of cyclists Include targeted enforcement of motorist behavior that endangers cyclists such as failure to yield, dooring, and passing too closely Create a Bicycle Awareness Week that kicks off in the spring in order to increase visibility of cyclists' safety

Streetshare and Pedestrian Awareness Week are important initiatives to bring consideration of pedestrian safety issues to the forefront of motorists' consciousness. It is recommended that the city of Milwaukee continue their Streetshare and Pedestrian Awareness Week programs, but enhance them through the inclusion of safety issues regarding cyclists. Specifically, Streetshare should include information aimed at motorists that educates them on the rights and responsibilities of cyclists. This should be coupled with enforcement at high crash corridors that targets motorist behavior that

endangers cyclists. Such actions include failure to yield to a cyclist, opening their door into oncoming cyclists and passing too closely. Further, the city of Milwaukee could create a Bicycle Awareness Week (similar to the Pedestrian Awareness Week) that kicks off in the spring prior to Bike to Work Week.

Bicycle Safety Website	
Target	Cyclists
Primary agency	City of Milwaukee
Key elements	Safe bicycling website that provides information on helmet fitting, lane positioning, hand signals
Time frame	On-going
Cost	$$
Potential funding sources	FHWA and NHTSA safety grants, hospitals with rehabilitation clinics, local bike shops
Program websites	http://www.milwaukeebybike.org http://www.city.milwaukee.gov/SafeBiking3729.htm http://www.city.milwaukee.gov/router.asp?docid=14143
Program Recommendations	Maintain site properly and ensure links work properly Enhance content by adding more graphics (example: http://www.biketraffic.org/safebicycling/) Translate information into Spanish

An information center on bicycling safety is very important for new and would-be cyclists. The City of Milwaukee understands the importance of an information center and has created an easy to find website devoted to bicycle safety (http://www.milwaukeebybike.org).

It is recommended that the city of Milwaukee expand the existing website to improve the usability of the information. Adding more graphics will visually demonstrate the safety techniques of ensuring that a bicycle is safe to ride, taking the lane when necessary, avoiding road obstacles, and riding in the direction of traffic. Graphics will also increase comprehension of the subjects. It is also recommended that the information be published in Spanish and other commonly spoken foreign languages. The Active Transportation Alliance has an excellent example of a Safe Cycling website, http://www.biketraffic.org/safebicycling/.

Milwaukee SR2S	
Target	5th and 6th grade Milwaukee Public School students
Primary agency	Bicycle Federation of Wisconsin
Partners	Milwaukee Public Schools City of Milwaukee Wisconsin Department of Transportation
Key elements	Bicycle safety education training for Milwaukee Public School 5th and 6th graders 10 hours of in-classroom and on-bike time with qualified instructors that trains students on safe bicycling
Time frame	During the school year
Cost	$$-$$$
Potential funding sources	National Safe Routes to School Funding
Program websites	http://www.bfw.org/education/index.php?category_id=3880&subcategory_id=5312
Program Recommendations	Seek additional funding to bring annual SRTS programs to all Milwaukee Public Schools and private schools

The city of Milwaukee and the Bicycle Federation of Wisconsin realize that teaching students the basics of bicycling safety will increase their likeliness of practicing safe bicycling. Therefore, the Milwaukee Safe Routes to School program focuses on improving the skills of 5th and 6th graders through a two-week bicycle safety intensive. It is recommended that the program be expanded to bring an annual training to all Milwaukee Public Schools.

Bike Licensing	
Target	Cyclists (especially new cyclists)
Primary agency	City of Milwaukee
Key elements	Database of registered bicycles with information on their current owner
Time frame	Ongoing
Cost	$-$$
Potential funding sources	Motorist licensing fees, parking fees
Program websites	http://itmdapps.ci.mil.wi.us/bicyclelicenseweb/bike.jsp
Program Recommendations	Continue requiring Bicycle Licenses for cyclists Use bicycle licensing structure to improve education on bicyclists' rights and responsibilities Require those registering for a bicycle license to undergo a short rules of the road exam

The city of Milwaukee offers a licensing service to residents. The license is obtained through an online application process or from local libraries or police stations. It is suggested that the city of Milwaukee use this existing structure to increase education efforts for cyclists. An abbreviated version of essential bicycle safety information should be posted on the bicycle licensing website along with links to the *Milwaukee by Bike* website. The person seeking the license will then be required to undergo a short bicycle safety information competency exam in order to be approved for the license.

Additional Program Recommendations

Promote Proper Crash Reporting	
Target	Milwaukee Police Department and Cyclists
Primary agency	City of Milwaukee
Partners	Bicycle Federation of Wisconsin, Wisconsin Department of Transportation
Key elements	Required training to Police and media outreach to cyclists
Time frame	Spring, summer
Cost	$$ - $$$ (depends on scope of program)
Potential funding sources	FHWA and NHTSA
Sample programs	Encourage proper crash reporting through trainings with the Milwaukee Police Department. Encourage crash reporting by cyclists and the Police Department in order to create a more complete record of actual crashes

Accurate crash data is essential in determining the cause of the crash. Correct crash data will assist the Milwaukee Department of Transportation in determining if the root cause of the crash was an issue with infrastructure, a lack of education on the part of a bicyclist or motorist, or another factor. It is recommended that the City of Milwaukee host trainings with the Police Department to educate officers on proper reporting when a cyclist is involved in the crash. The training will also include education on the most common crash types for cyclists and motorist behavior that endangers cyclists.

It is also recommended that the Milwaukee Department of Public Works create a communication plan to educate cyclists on what type of crash requires reporting, as well as information on where to report a crash. This will allow better analysis of the types of crashes cyclists are experiencing and will assist in identifying high crash corridors.

Diversion Class	
Target	Motorists, cyclists, and pedestrians
Primary agency	City of Milwaukee
Partners	Bicycle Federation of Wisconsin
Key elements	A Share the Road class is tailored to first-time offenders of certain bicycle and pedestrian-related traffic violations, including running a stop sign/light on a bike. In lieu of the citation, cyclists, motorists and pedestrians can take the class instead. In Marin County, interested citizens can take the class even if they did not receive a ticket.
Time frame	Anytime; on-going
Cost	$$
Potential funding sources	Federal and state traffic safety funding
Sample programs	http://www.marinbike.org/Campaigns/ShareTheRoad/Index.shtml#StreetSkills http://www.legacyhealth.org/body.cfm?id=1928

Cyclists and motorists receive citations when they participate in unsafe behavior that endangers other road users. If a ticket is issued for behavior by a motorist or cyclist that jeopardizes the safety of the bicyclist, then there is an opportunity for education. It is recommended that the city of Milwaukee allow motorists and bicyclists to partake in a diversion class in lieu of a citation. A diversion class is a Share the Road class aimed at traffic violations that put cyclists and pedestrians in harm's way. The city of Milwaukee can partner with the Bicycle Federation of Wisconsin to hold such classes. Further, the diversion class will be an appropriate compliment to the increased enforcement held during Streetshare initiatives.

Bicycle Legal Clinics	
Target	Cyclists (beginners and advanced)
Primary agency	City of Milwaukee
Partners	Bicycle Federation of Wisconsin, Wisconsin Department of Transportation
Key elements	Clinic where cyclists learn about their rights and responsibilities of the road
Time frame	Monthly
Cost	$-$$
Potential funding sources	Traffic Safety funds, in-kind donation from a local law firm
Sample programs	Bicycle Transportation Alliance's Bicycle Legal Clinic: http://bta4bikes.org/resources/legal.php

A bicycle legal clinic serves as an in-depth education opportunity for cyclists interested in learning more about their legal rights to the road. Oftentimes it is difficult for cyclists to determine what exactly their rights and responsibilities are. Also, since cyclists do not undergo a comprehensive education process before being awarded a bicycle license, a clinic about bicycle laws will fill in the gap for cyclists wanting more information about their liability on the roadway.

It is recommended that the city of Milwaukee partner with the Bicycle Federation of Wisconsin to host such legal clinics. The clinics can be held monthly at different locations in Milwaukee. It is also suggested that the educator be a Wisconsin bar approved attorney who preferably has experience with bicycle litigation issues.

Lights On Campaign	
Target	Cyclists (especially students and low-income bicycle commuters)
Primary agency	City of Milwaukee
Partners	Bicycle Federation of Wisconsin, Wisconsin Department of Transportation
Key elements	Media outreach, enforcement, bike light giveaways or subsidies
Time frame	Fall, annually
Cost	$$ - $$$ (depends on scope of program)
Potential funding sources	Bike shops (in-kind donations); transit agencies and local news outlets (donated ad space); traffic safety foundations and grant programs; hospitals and insurance companies
Sample programs	Portland's "See & Be Seen" campaign: http://www.portland-online.com/transportation/index.cfm?&c=deibb&a=bebfjh Dutch "Lights On" campaign: http://www.fietslichtaan.nl/

While Milwaukee law requires bicyclists to use lights at night, cyclists riding without lights are common. Many cyclists, especially students, are unaware that lights are required by law, or they have simply not taken the trouble to purchase or repair lights. Research shows that cyclists who do not use lights at night are at much greater risk of being involved in car crashes. For these reasons, increasing bicycle light usage is a top priority for Milwaukee, and a successful effort will reduce crash risk for bicyclists.

Every fall in the Netherlands, as days get shorter, a national Lights On campaign reminds cyclists to use bicycle lights. This Lights On campaign focuses several complementary strategies into a short timeframe for maximum impact, pairing media messages (ads, posters, radio spots and TV ads) with police enforcement of 'fix it' tickets.

A similar Lights On campaign is recommended for Milwaukee. This multi-pronged outreach effort should take place every September, as the days are getting shorter and as kids and university students are returning to school.

The City of Milwaukee Lights On campaign should include the following elements:

- Well-designed **graphic ads**, to be placed on transit benches, transit vehicles, and local newspapers, as well as around universities. Ad space may be purchased or donated. Small-format ads can be placed on bike handlebars if desired.

This poster from Portland, OR uses simple graphics to communicate the importance of using bicycle lights

- Police **enforcement of bike light laws**. This enforcement will most likely to result in a behavior change if the cyclist is able to avoid penalty if they obtain a bike light. Ideally, the police would give a warning, explain the law and then install a bike light on the spot. If this is not possible, the cyclist should receive a 'fix it ticket' along with a coupon for a free or discounted light at a local bike shop; once the cyclist shows proof that they have purchased a bike light, their fine will be waived.
- **Partnership with local cycling groups** to get the word out to their members and partners. These groups can be counted as campaign partners at no cost to them, enhancing the campaign's credibility and community exposure. Groups should be supplied with key campaign messages to distribute to their constituents, along with coupons for free or discounted bike lights.
- **Earned media outreach**: The city of Milwaukee should distribute media releases with statistics about the importance of using bike lights, relevant legal statutes, and the campaign's goal, timing, activities and partners. If possible, a meeting with local media editorial boards should be sought.

Depending on partners, volunteer capacity and interest, the City of Milwaukee Lights On campaign may also include the following:

- **In-school presentations** about bike lights, including reflective material giveaways
- A community bike light parade with prizes

- Discounts on bike lights and reflective gear at local bike shops during September (publicized through the campaign outreach)
- Volunteers stationed at key intersections, trails and on university campuses who thank bicyclists using bike lights and reward them with a small gift

Helmet Give-Away	
Target	Children and youth
Primary agency	The City of Milwaukee
Partners	Bicycle Federation of Wisconsin, local hospitals and rehabilitation clinics
Key elements	Drop-in event aimed at teaching kids basic skills, safety rules and giving away free helmets.
Time frame	Fall and spring, annually
Cost	$
Potential funding sources	Bike shops (in-kind donations); transit agencies and local news outlets (donated ad space); traffic safety foundations and grant programs; hospitals and insurance companies
Sample programs	http://www.cdc.gov/mmwr/preview/mmwrhtml/00036941.htm

Cyclists under the age of sixteen account for a disproportionate number of fatalities for their age group. One effort to combat this trend is to give helmets away, as well as to ensure that the helmets are properly fitted to the individual. It is recommended that the City of Milwaukee host an annual helmet give-away in the fall (in conjunction with Walk and Bike to School month) and spring. The location of the helmet give-away can be coordinated near locations with the highest crash rates for cyclists under the age of sixteen. Further education on bicycling can be coordinated at an event such as a bicycle rodeo or bicycle and pedestrian safety fair.

"LOOK" Safety Campaign	
Target	General public
Primary agency	City of Milwaukee
Partners	Bicycle Federation of Wisconsin, Wisconsin Department of Transportation
Key elements	Bicycling Safety campaign with billboard, radio and TV spots
Time frame	Late spring or early summer, in conjunction with Bike to Work Week or Bicycle Awareness Week
Cost	$ - $$$ (depending on whether as space is purchased or donated)
Potential funding sources	Local transit agencies (for donated airtime), traffic safety foundations and grant programs; hospitals and insurance companies
Sample programs	New York City Department of Transportation "Look" Safety Campaign: www.looknyc.org

A marketing campaign that highlights cyclists' safety is an important part of creating awareness of bicycling. They are an effective way to reach the general public and reinforce other education and outreach messages.

A well-produced safety campaign will be memorable and effective. The New York City Department of Transportation has produced a high-quality safety campaign that couples compelling ads with an easy-to-use website aimed at motorists and cyclists.

Example of NYC's LOOK Bicycle Safety Campaign

It is recommended that the City of Milwaukee create a "LOOK" safety campaign that places safety messages along high traffic corridors. It also suggested that this campaign be kicked off in conjunction with Bike to Work Week or the proposed Bicycle Awareness Week.

Appendix M: FHWA Experiments

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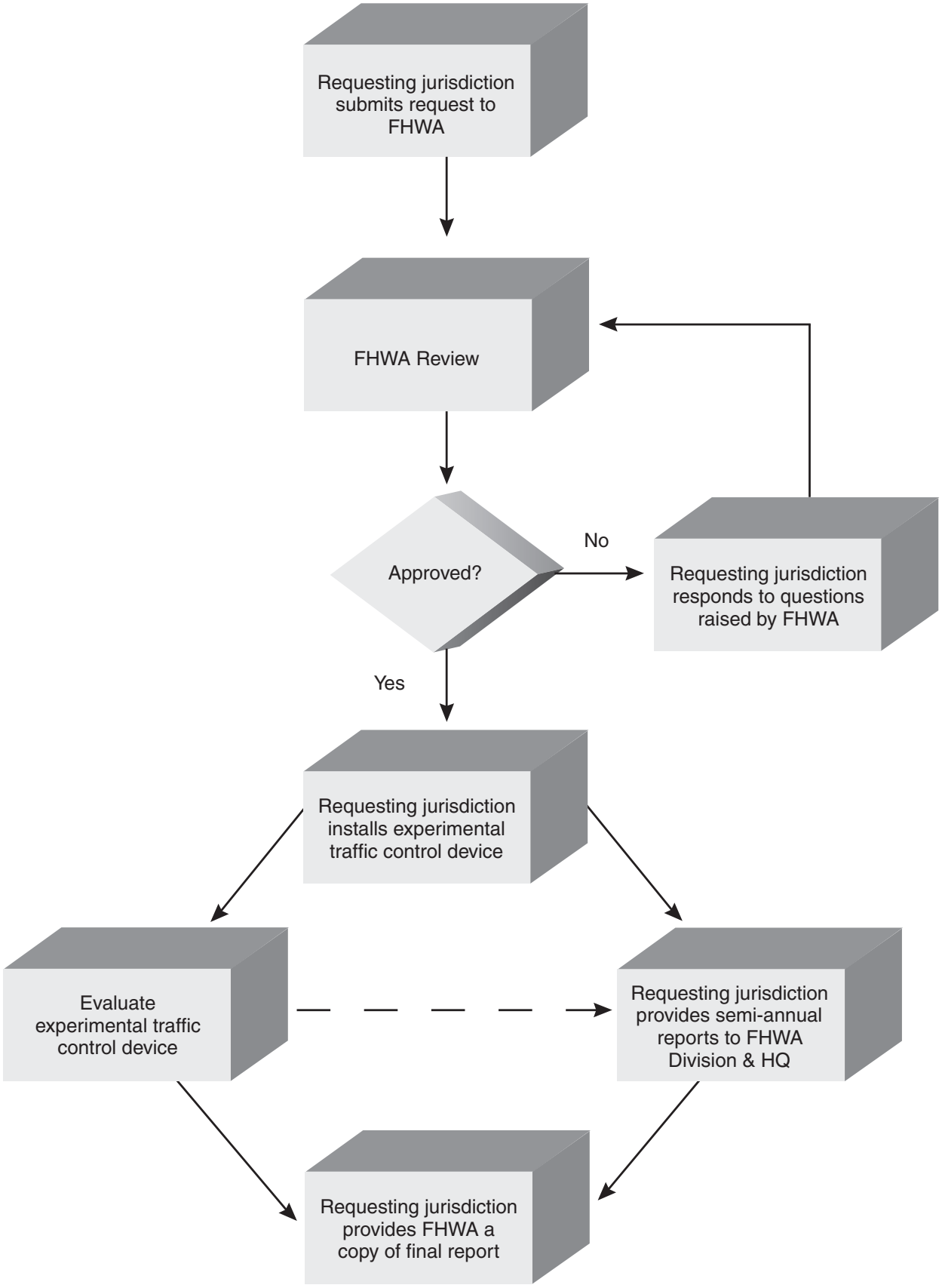
The treatments discussed in the following section may be in the existing MUTCD. Any application of these experimental treatments should follow the processes outlined by the Federal Highway Administration (FHWA) guidance on the following pages.

The following is a summary of the FHWA experimentation procedure:

"All requests for experimentation should originate with the State/local highway agency or toll operator responsible for managing the roadway or controlled setting where experiment will take place. That organization forwards the request to the FHWA - with a courtesy copy to the FHWA Division Office. The FHWA must approve the experiment before it begins. Requests may also be forwarded directly to the FHWA Division Office, and the Division Office can submit the request to the FHWA Headquarters Office. All requests must include:

1. *A statement of the nature of the problem, including data that justifies the need for a new device or application.*
2. *Describe the proposed change, how it was developed, how it deviates from the current MUTCD.*
3. *Any illustration(s) that enhance understanding of the device or its use.*
4. *Supporting data that explains how the experimental device was developed, if it has been tried, the adequacy of its performance, and the process by which the device was chosen or applied.*
5. *A legally binding statement certifying that the concept of the traffic control device is not protected by a patent or copyright (see MUTCD Section IA.10 for additional details.)*
6. *The proposed time period and location(s) of the experiment.*
7. *A detailed research or evaluation plan providing for close monitoring of the experimentation, especially in the early stages of field implementation. The evaluation plan should include before and after studies as well as quantitative date enabling a scientifically-sound evaluation of the performance of the device.*
8. *An agreement to restore the experimental site to a condition that complies with the provisions of the MUTCD within 3 months following completion of the experiment. The agreement must also provide that the sponsoring agency will terminate the experiment at any time if it determines that the experiment directly or indirectly causes significant safety hazards. If the experiment demonstrates an improvement, the device or application may remain in place as a request is made to update the MUTCD and an official rulemaking action occurs.*
9. *An agreement to provide semiannual progress reports for the duration of the experimentation and to provide a copy of the final results to the Office of Transportation Operations (HOTO) within three months of the conclusion of the experiment. HOTO may terminate approval of the experimentation if these reports are not provided on schedule."*

FHWA Experiments



Appendix N: Funding Sources

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Acquiring funding for projects and programs is considerably more likely if it can be leveraged with a variety of local, state, federal, and private sources. This section identifies existing and potential matching funding sources available for bicycle projects and programs as well as their associated criteria. Several of these sources, such as Transportation Enhancement (TE) grants are already used by Milwaukee. Potential revenue sources that do not require a match and can be implemented and managed at the local level are discussed at the end of this section.

Federal Funding Sources

Federal funding is primarily distributed through a number of different programs established by the Federal Transportation Act. The latest act, The Safe, Accountable, Flexible, Efficient Transportation Equity Act – a Legacy for Users (SAFETEA-LU) was enacted in August 2005 as Public Law 109-59. SAFETEA-LU authorizes the Federal surface transportation programs for highways, highway safety, and transit for the five-year period 2005-2009.

In Wisconsin, federal funding is administered through the State (WisDOT). Most, but not all, of these funding programs are oriented toward transportation versus recreation, with an emphasis on reducing auto trips and providing inter-modal connections. Federal funding is intended for capital improvements and safety and education programs, and projects must relate to the surface transportation system.

Biking and walking to school is popular with Cooper Elementary School students

H.R. 1, The American Recovery And Reinvestment Act Of 2009

The *American Recovery and Reinvestment Act* is commonly referred to as the 'Stimulus Bill' and was signed into law on February 13, 2009. The Act provides $64.1 billion for transportation and infrastructure investment *"to enhance the safety, security and efficiency of our highway, transit, rail, aviation, environmental, inland waterways, public buildings and maritime transportation infrastructure."*

Local governments can use highway program funds for projects eligible for Surface Transportation Program funding (described later), including bicycle and pedestrian infrastructure. In addition, three percent or $10 million of the highway program funds are allocated to Transportation Enhancements (TE), including bicycle and pedestrian infrastructure. These funds will be administered through the TE committee and will go through TE or similar grant processes.

SAFETEA-LU

There are a number of programs identified within SAFETEA-LU that provide for the funding of bicycle and pedestrian projects, described in the following section.

Surface Transportation Program (STP)

The Surface Transportation Program provides states with flexible funds which may be used for a wide variety of projects on any federal-aid highway including the National Highway System, bridges on any public road,

Portions of the Oak Leaf Trail are of substandard width and need pavement repairs

The Santa Rampage promotes cycling when many residents may not think about riding

and transit facilities.

Bicycle and pedestrian improvements are eligible activities under the STP. This covers a wide variety of projects such as on-street facilities, off-road trails, sidewalks, crosswalks, bicycle and pedestrian signals, bike parking, and other ancillary facilities. SAFETEA-LU also specifically clarifies that the modification of sidewalks to comply with *Americans with Disabilities Act* requirements is an eligible activity.

As an exception to the general rule described above, STP-funded bicycle and pedestrian facilities may be located on local and collector roads which are not part of the federal-aid highway system. In addition, bicycle-related non-construction projects such as maps, coordinator positions, and encouragement programs are also eligible for STP funds.

Highway Safety Improvement Program (HSIP)

This program funds projects designed to achieve significant reductions in traffic fatalities and serious injuries on all public roads, bikeways and walkways. This program includes the Railway-Highway Crossings Program and the High Risk Rural Roads Program and replaces the Hazard Elimination Program from TEA-21.

Transportation Enhancements (TE)

Administered by WisDOT, this program is funded with dedicated STP funds. Ten percent of STP funds are designated for Transportation Enhancement Activities (TEAs), which includes the *"provision of facilities for pedestrians and bicycles, provision of safety and educational activities for pedestrians and bicyclists," and the "preservation of abandoned railway corridors (including the conversion and use thereof for pedestrian and bicycle trails."* (23 USC Section 190 (a) (35)). The Local Transportation Enhancement Program provides funding for community-based projects that "expand travel choices and enhance the transportation experience by improving the cultural, historic, aesthetic and environmental aspects of our transportation infrastructure." These programs are funded through the Statewide Multi- modal Improvement Program (SMIP).

WisDOT provides 80% reimbursement for project costs to project sponsors. Projects must provide a mode of transportation or make a facility more accommodating for pedestrians or bicyclists, be included in a local, regional or statewide plan, and include signing in bikeway projects for directions, permitted users and rules. These funds can be used to build a variety of pedestrian, bicycle, streetscape and other improvements that enhance the cultural, aesthetic, or environmental value of transportation systems. Projects must have a local government or state agency sponsor, and the statewide grant process is competitive.

Safe Routes to School (SR2S)

Under the SR2S Program, Federal funds are administered by WisDOT. The grants can be used to identify and reduce barriers and hazards to children walking or bicycling to school (70% to 90% of funds) or for non-infrastructure encouragement and education programs (10% to 30%). Eligible projects are fully funded with no local match requirement. One infrastructure and/or non-infrastructure application will be accepted, with three projects maximum that can be funded per school district. There is a $250,000 funding limit for the total infrastructure project application and $100,000 maximum for non-infrastructure projects.

Community Development Block Grants

The Community Development Block Grants program provides money for streetscape revitalization, which may be largely comprised of pedestrian improvements. Federal Community Development Block Grant grantees may "*use Community Development Block Grants funds for activities that include (but are not limited to): acquiring real property; reconstructing or rehabilitating housing and other property; building public facilities and improvements, such as streets, sidewalks, community and senior citizen centers and*

recreational facilities; paying for planning and administrative expenses, such as costs related to developing a consolidated plan and managing Community Development Block Grants funds; provide public services for youths, seniors, or the disabled; and initiatives such as neighborhood watch programs."

Transportation, Community and System Preservation Program

The Transportation, Community and System Preservation Program provides Federal funding for transit-oriented development, traffic calming and other projects that improve the efficiency of the transportation system, reduce the impact on the environment, and provide efficient access to jobs, services and trade centers. The program is intended to provide communities with the resources to explore the integration of their transportation system with community preservation and environmental activities. The Transportation, Community and System Preservation Program funds require a 20% match.

State Funding Sources

Surface Transportation Programs-Urban (STP-U)

This program, operated at the Metropolitan Planning Organizational (MPO) level, allocates funding to complete improvements eligible for federal funding on urban highways. Traditionally, MPOs have used this funding to integrate bicycle and pedestrian improvements into larger roadway projects. This program operates on a two-year funding cycle.

A winter art bike on display

Highway Safety Improvement Program

Formally known as the Hazard Elimination Program, this program targets projects in areas that have a documented history of previous crashes. Bicycle projects are eligible for this funding source.

Bicycle And Pedestrian Facilities Program (BPFP) And STP-Discretionary (STP-D) Programs

Funded as under the Statewide Multi- modal Improvement Program (SMIP), the BPFP and STP-D address projects falling into 12 categories. Typically, bicycle and pedestrian programs account for nearly 2/3 of the funding awarded. The STP-D program funded projects are designed to reduce single occupancy vehicle trips while the BPFP projects generally focus on bicycle planning related activities, such as bicycle and pedestrian facilities that foster alternatives to single-occupancy vehicle travel. Since 1993, $72.3 million in Federal funds have been committed to 320 projects through SMIP-related programs.

Potential Local Funding Sources

In addition to these potential State and Federal funding sources, the city of Milwaukee should consider allocating funding for bicycle infrastructure and programs as part of the annual city revenue stream. This funding could come through many sources, including a dedicated allotment from the General Fund, local sales tax, or other funding mechanisms. The following are potential sources of local bicycle funding.

Tax Increment Financing/Urban Renewal Funds

Tax Increment Financing (TIF) is a tool to use future gains in taxes to finance the current improvements that will create those gains. When a public project (e.g., sidewalk improvements) is constructed, surrounding property values generally increase and encourage development or redevelopment in the area. The increased tax revenues are then dedicated to finance the debt created by the original public improvement project. Tax Increment Financing typically occurs within designated Urban Renewal Areas (URA) that meets certain economic criteria and are approved by a local governing body. To be eligible for this financing, a project (or a portion of it) must be located within the URA. The city of Milwaukee has used TIF financing since its introduction in the state in 1975. As of 2007, the city created 69 TIF districts.

Funding Sources

Transportation User Fees

Transportation user fees are any group of additional fees that could be used to fund maintenance and improvement projects for non-motorized uses. Properties would be assessed fees based on the traffic generation by land use or business activity as published in the Institute of Transportation Engineers (ITE) Trip Generation Manual.

The fee could be a Street Maintenance Fee to fund maintenance of the existing roadway system to free up dollars from the state gasoline tax for capital projects.

Local Bond Measures

The city could issue bonds to fund bicycle improvements. This would spread the cost of the improvements over the life of the bonds. Certain types of bonds would require voter approval. The debt would have to be retired, so funding for repayment on the bond and the interest would be required. A bond issued in Denver, Colorado funded $5 million for trail development and also funded the city's bike planner for several years. The city of Albuquerque, New Mexico and Bernalillo County have a five percent set-aside of street bond funds for trails and bikeways. This has amounted to approximately $1.2 million for the city every two years.

Street User Fees

The city of Milwaukee could administer street user fees through residents' monthly water or other utility bills. The revenue generated by the street user fee is used for operations and maintenance of the street system, and priorities are established by the Public Works Department. Revenue from this fund could be used to maintain on-street bicycle and pedestrian facilities, including routine sweeping of bicycle lanes and other designated bicycle routes. Additionally, this type of fee may free up more general fund money for off-street projects. Implementation of street user fees would require a public vote.

Local Gas Tax

Milwaukee could use revenues from a local gasoline tax to provide for on-street bikeways and shared use path improvements. Such a tax would likely require voter approval, which is an uncertainty, especially with the ever increasing costs of gas. However, once established the tax would be a relatively stable funding source for improvements.

A family getting ready for a ride home

Sales Tax

Bicycle and pedestrian projects can be funded by a portion of local sales tax revenue or from a voter-approved sales tax increase. This approach has been used successfully in several states. For example, much of the Pinellas Trail system was built with a portion of a one cent sales tax increase voted in by residents of Pinellas County, Florida.

TOPS-Style Sales Tax

Trails, Open Space and Parks (TOPS) is the process used by the city of Colorado Springs to administer an ordinance passed by voters in April of 1997. The ordinance authorized a 1/10 of one percent sales tax that generates about $6 million annually for trails, open space and parks.

The process, administered by the Parks and Recreation Department of Colorado Springs, provides for the prudent acquisition, development and preservation of Trails, Open Space and Parks (TOPS) in the Pikes Peak region. More information on the TOPS program, including maps of trails, open space and parks, as well as funding of projects is available at the TOPS web site. To fund a project, an application is submitted to the City of Colorado Springs. Implementation of a TOPS-style Sales Tax would require a public vote.

Property Tax Levy

A specific property tax levy can be implemented to fund transportation projects. Seattle, Washington is receiving $5 million a year for nine years for bicycle and pedestrian projects as a result of a levy (property tax)

approved by voters in 2006. Such a levy would generally have to be placed on an election ballot as a referendum.

Bike Tax

The city of Colorado Springs has a $4.00 per bike tax to provide funding for bikeway improvements. The tax generates nearly $100,000 annually and has been used for both on- and off-street projects. It is used primarily to provide a local match for other grants such as the Colorado State Trails Program or SAFETEA-LU grants. A bike tax is an annual fee; implementation would require a public vote.

RCW Chapter 35.75 of Washington State law clarifies legal interpretation and uses of such funds:

> *RCW 35.75.030 - Every city and town by ordinance may establish and collect reasonable license fees from all persons riding a bicycle or other similar vehicle within its respective corporate limits, and may enforce the payment thereof by reasonable fines and penalties.*
>
> *RCW 35.75.050 - The city or town council shall by ordinance provide that the whole amount or any amount not less than seventy- five percent of all license fees, penalties or other moneys collected under the authority of this chapter shall be paid into and placed to the credit of a special fund to be known as the "bicycle road fund." The moneys in the bicycle road fund shall not be transferred to any other fund and shall be paid out for the sole purpose of building and maintaining bicycle paths and roadways authorized to be constructed and maintained by this chapter or for special police officers, bicycle tags, stationery and other expenses growing out of the regulating and licensing of the riding of bicycles and other vehicles and the construction, maintenance and regulation of the use of bicycle paths and roadways.*

Developer Impact Fees

Another potential local source of funding is developer impact fees, typically tied to trip generation rates and traffic impacts produced by a proposed project. A developer may reduce the number of trips (and hence impacts and cost) by paying for on- and off-site bikeway improvements that will encourage residents to bicycle rather than drive. Establishing a clear nexus or connection between the impact fee and the project's impacts is critical in avoiding a potential lawsuit.

Business Improvement Districts

Pedestrian improvements can often be included as part of larger efforts aimed at business improvement and retail district beautification. Business Improvement Districts collect levies on businesses in order to fund area-wide improvements that benefit businesses and improve access for customers. These districts may include provisions for pedestrian and bicycle improvements, such as wider sidewalks, landscaping, and ADA compliance.