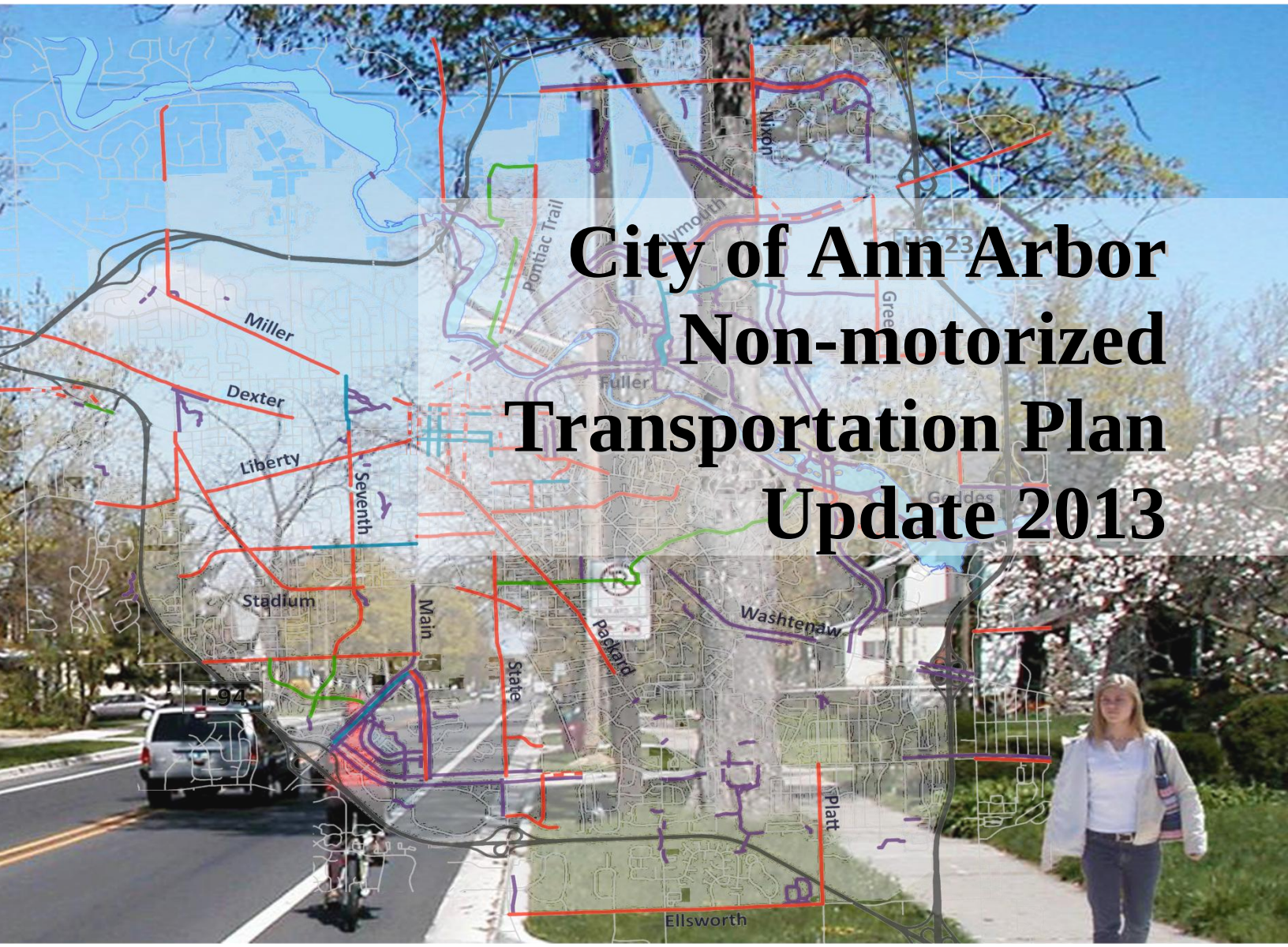

City of Ann Arbor Non-motorized Transportation Plan Update 2013

Prepared for:

City of Ann Arbor Planning and Development Services
and the Alternative Transportation Program

November 18, 2013

The City of Ann Arbor 2013 Update to the Non-motorized Transportation Plan contained herein was adopted by Resolution R-13-369 of the Ann Arbor Council on November 18, 2013

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Project Advisory Committee

The composition of the Project Advisory Committee includes representatives of key City departments, City advisory committees, affected public agencies, and the general citizenry.

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- City of Ann Arbor, Public Services, Project Management – Don Todd
- City of Ann Arbor, Community Services, Parks and Recreation– Amy Kuras
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- City of Ann Arbor Planning Commission - Braxton Blake, Jennifer Hall and Eric Lipson
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Contents

1. Introduction

Tremendous opportunities exist in the City of Ann Arbor for non-motorized transportation. A large number of pedestrians and bicyclists currently rely on non-motorized modes of travel to commute to work, school, recreation amenities and other places. A strong commitment by policy makers, staff and local residents to improving the non-motorized system will help ensure that progress continues to be made to the system. Although some non-motorized facilities currently exist, many more opportunities to improve the system have been identified in this plan.

This document is intended to help Ann Arbor once again become a national leader in high quality non-motorized transportation and contribute to keeping Ann Arbor one of the best places to live and work in the country.

The document is divided into four main segments:

Planning and Design Guidelines
Provides a background on non-motorized transportation issues and defines current best practices for bicycle and pedestrian facility design.

Proposed Policies and Programs
Describes the support system necessary for a successful pedestrian and bicycle network.

Existing Conditions
Assesses the state of the existing pedestrian and bicycle facilities.

Proposed Facilities
Covers the specific long and near term improvement recommendations to the transportation system to establish a non-motorized transportation network.

Why Are Walking and Bicycling Important?

A comprehensive non-motorized transportation system based on best practices is of paramount importance to the health, safety and general welfare of the citizens of Ann Arbor. The benefits of a comprehensive non-motorized transportation system extend beyond the direct benefits to the users of the system to the public as a whole. A well-implemented non-motorized transportation system will reap rewards by:

- Providing viable transportation alternatives for individuals who are capable of independent travel yet do not hold driver's license or have access to a motor vehicle at all times.
- Improving safety, especially for the young and old who are at most risk due to their dependence on non-motorized facilities and their physical abilities.
- Improving access for the 20% of all Americans who have some type of disability and the 10% of all Americans who have a serious disability.[1]
- Improving the economic viability of a community by making it an attractive place to locate a business while simultaneously reducing public and private health care costs associated with inactivity.
- Encouraging healthy lifestyles by promoting active living.
- Reducing the water, air, and noise pollution associated with automobile use by shifting local trips from automobiles to walking or bicycling .
- Improving the aesthetics of the roadway and community by adding landscaping and medians that improve the pedestrian environment and safety.
- Providing more transportation choices that respect an individual's religious beliefs, environmental ethic, and/or uneasiness in operating a vehicle.
- Reducing the need for downtown parking spaces and parking decks.
- Creating a stronger social fabric by fostering the personal interaction that takes place while on foot or on bicycle.
- Reducing dependence on and use of fossil fuel with the resulting positive impact on climate change.

Improvements to non-motorized facilities touch all individuals directly, as almost all trips begin and end as a pedestrian.

Where We Are Now

There is little question that the most significant influence on the design of American communities is the automobile. About eighty percent of America has been built in the last fifty years.[2] Intuitively, this figure holds true for Ann Arbor as well. During those years, the design of everything from homes, neighborhoods, shopping center, schools, workplaces and churches have been profoundly shaped around the car. This is true not only for the site-specific placement of driveways and parking lots, but also the distribution and mixing of land uses.

Accommodations to the automobile came not simply as the logical outgrowth of an additional mode of travel, but often at the expense of bicycling, walking and transit. Increases in automobile volumes and

[1] Disability Status: 2000 - Census 2000 Brief.
[2] Jim Kunstler, *Geography of Nowhere.*

speeds have made sharing a roadway uncomfortable and often unsafe. Also, the need for additional rights-of-way to accommodate added vehicle lanes has regularly come at the expense of space typically set aside for sidewalks, if not space occupied by sidewalks.

The pattern of public investment in motor vehicle transportation above all other modes has resulted in an overall reduction in transportation options for the average citizen. Communities are now weighing the convenience of the automobile against the consequences of its use at current levels and trying to strike a balance. The direct and indirect consequences include:

- Current guidelines for exercise call for one hour of activity daily. Physical inactivity is a primary factor in at least 200,000 deaths annually and 25% of all chronic disease-related deaths.[3] Forty percent of adults do not participate in any leisure time physical activity;[4] of those who do participate in exercise, 66.1% use their local streets.[5]
- About 40% of all trips are estimated to be less than two miles which is an easy distance for walking or bicycling, provided appropriate facilities are available. In practice, automobiles are used for 76% of all trips under one mile and 91% of all trips between one and two miles.[6]
- While money for bicycle and pedestrian projects has increased dramatically since 1989 with the passage of federal transportation programs known as ISTEA and TEA-21, in Michigan, only $0.16 per person is spent on pedestrian facilities vs. $58.49 per person on highway projects annually.[7]
- The nation is experiencing an obesity epidemic; 61% of Michigan's adults are considered overweight, which is the second highest rate in the country.[8] While there may be other significant factors, the increase in obesity nationally over the past fifteen years corresponds with an increase in the number of miles driven and a decrease in the number of trips made by walking and bicycling. This epidemic is estimated to result in $22 billion a year in health care and personal expenses.[9]
- In southeast Michigan, people spend on average 18.8% of their income on transportation, second only to shelter at 19.1%.[10]
- The number of children that walk or bike to school has dropped 37% over the last twenty years.[11] The increase in traffic caused by parents taking their children to and from school and other activities has been estimated to be 20 to 25% of morning traffic. Half of the children hit by cars while walking or bicycling to school were hit by parents of other children.[12] Today only about 8% of children walk to school.

[3] Ibid.
[4] W.C. Wilkinson, et. al. Increasing Physical Activity through Community Design: A Guide for Public Health Practitioners. Washington: National Center for Bicycling and Walking. May 2002.
[5] Brownson, Dr. Ross, et.al. "Environmental and policy determinants of physical activity in the United States", American Journal of Public Health, Dec 2001.
[6] Chicago Department of Transportation
[7] Surface transportation Policy Project, "Mean Streets 2000", 2000.
[8] Michigan Governor's Council on Physical Fitness, Health, and Sports.
[9] Ed Pavelka, "Can Commuting Help You Lose Weight?", League of American Bicyclists, Summer 2002.
[10] Surface Transportation Policy Project, "Driven to Spend", 2000.
[11] W.C. Wilkinson, et. al. Increasing Physical Activity through Community Design: A Guide for Public Health Practitioners. Washington: National Center for Bicycling and Walking. May 2002.
[12] Michigan Governor's Council on Physical Fitness, Health, and Sports.

- The result of automobile emissions on public health is just beginning to be understood. In Atlanta during the 1996 Olympics, there was a 22.5% reduction in automobile use; during the same period of time admissions to hospitals due to asthma decreased by 41.6%.[13]In Michigan, non-motorized trips account for about 7% of all trips, but make up about 12% of all traffic fatalities and severe injuries. Non-motorized modes are not inherently dangerous; communities have been able to significantly increase the non-motorized mode-share while simultaneously decreasing the number of non-motorized crashes. Emerging research is showing the single most important factor for improving bicycle and pedestrian safety is increasing the number of bicyclists and pedestrians.

Despite these circumstances, pedestrians account for over sixteen percent of all trips and bicycling accounts for over two percent of all trips in Ann Arbor.[14] Local public demand for improved facilities is significant as evident by support for trail millages and the recent allocation of 5% of the transportation dollars towards pedestrian and bicycle improvements. Nationally, a 1997 survey of voters by Sosin Snell and Associates found that 65% of all voters supported using money from federal gasoline taxes for items such as bike trails, bike lanes, and sidewalks. Seventy six percent of those surveyed found the following statement convincing, "Bike trails and lanes are important to creating safe communities for our children."

The Intention of This Plan

The purpose of this plan is to provide a general background on the issues of non-motorized transportation as well as to present a proposal on how to address the issues through policies, programs, and design guidelines for facility improvements. This is not intended to be a replacement for the *AASHTO Guide for the Development of Bicycle Facilities*, *AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities, AASHTO Guide for Achieving Flexibility in Highway Design,* USDOT's *Designing Sidewalks and Trails for Access – Part II, Best Practices Design Guide*, the pending *Guidelines for Accessible Public Rights-of-Way*, MUTCD, MMUTCD or any other applicable federal, state, or local guidelines. Rather, it is intended as a synthesis of key aspects of those documents to provide an interpretation on how they may be applied in typical situations in the City of Ann Arbor. Given the evolving nature of non-motorized transportation planning, these guidelines should be periodically reevaluated to determine their appropriateness.

The specific facility recommendations within this plan represent a Master Plan level evaluation of the suitability of the proposed facilities for the existing conditions. Prior to proceeding with any of the recommendations in this report through, a corridor level assessment should be done in order to fully investigate the appropriateness of the proposed roadway modifications and/or proposed bicycle or pedestrian facilities. Where proposals call for sub-11' motor vehicle lanes, issues such as current traffic volumes, amount of truck and bus traffic, operating speed and crash history should be looked at on a case-by-case basis.

This plan is intended to replace City of Ann Arbor's 1992 Bicycle Plan as well as complement and be integrated with the City's Transportation Update. It is also intended to complement the City's Park, Recreation and Open Space Plan and Northeast Area Plan. Many of the recommendations in the Northeast Area Transportation Plan have been incorporated in this plan although where there are

[13] Friedman, Michael S., et. al. Impact of Changes in Transportation and Commuting Behaviors During the 1996 Summer Olympic Games in Atlanta on Air Quality and Childhood Asthma, Journal of the American Medical ssociation, Febuary 21, 2001.

[14] Urban and Regional Research Collaborative, A. Alfred Taubman College of Architecture and Urban Planning The University of Michigan. "Successful Bike Planning: Adapting Lessons from communities with High Bicycle Use to Ann Arbor and Wastenaw County". September, 2001.

discrepancies between the two plans the recommendations in this plan should be utilized. The plan also complements the joint City and County work on the Border-to-Border trail, although as that is an ongoing project the current recommendations of that working group should be utilized over those in this report.

The recommendations of this plan reflect the values of the community of a safe, comprehensive non-motorized system in Ann Arbor.

1.1 Project Goals and Objectives

The following Vision, Goals and Objectives were developed to guide the development of the master plan. They evolved through an extensive public involvement process that began with a visioning process. Members of the Project Advisory Committee and the participants of two public workshops were asked to individually and collectively prioritize their desired outcomes for the project as well as their places of concern that they felt the plan should address.

From this visioning process the project team found that desired "outcomes" of the plan fell into three general categories:

- Planning and policy
- Network components
- Education

Using these categories as a guide, the project team developed goals and objectives for the plan that would deliver these outcomes. The project advisory committee reviewed the draft goals and objectives first, offered suggestions, and developed an overall vision for the master plan.

This vision and the revised goals and objectives were then presented at each of the four area public workshops that were held throughout the City, and the public was asked to indicate their agreement or disagreement, and offer modifications to improve them. Public input was incorporated as appropriate, and the following final vision, goals and objectives resulted.

Vision

The purpose of the plan is to identify the means to establish a physical and cultural environment that supports and encourages safe, comfortable and convenient ways for pedestrians and bicyclists to travel throughout the City and into the surrounding communities.

It is further envisioned that this environment will result in a greater number of individuals freely choosing alternative transportation modes (walking, bicycling, mass transit, etc.), which will lead to healthier lifestyles, improved air and water quality, and a safer, more sustainable transportation system.

Policy and Planning Integration

Goal
Incorporate non-motorized best practices into all relevant policies, and all aspects and stages of planning available to the City and its partner organizations.

Objectives:

1. Develop best practices guidelines that define a true multi-modal perspective for transportation planning.
2. Identify changes to planning processes, City policies and regulations that will further non-motorized transportation.
3. Define a sustainable financing mechanism for non-motorized transportation policy development, policy implementation, construction and maintenance of facilities, education, and other needs that may arise to implement the City's non-motorized transportation plan.
4. Encourage and provide a framework for coordination between the City of Ann Arbor, the public school system, the University of Michigan, surrounding communities and regional agencies to facilitate connecting the non-motorized network to the region.
5. Define the process for prioritizing and implementing improvements.

Complete System

Goal
Provide a comprehensive, easy to implement non-motorized network as an integral component of the City's transportation system.

Objectives:

1. Provide convenient and safe non-motorized connections between destinations in every part the community, such as residential, commercial, school, recreational, and other areas.
2. Integrate non-motorized transportation into existing transportation infrastructure.
3. Eliminate obstacles in the current non-motorized network.
4. Minimize conflict between modes of travel while still accommodating all modes.
5. Link the City's network to the regional non-motorized network.

Education

Goal
Increase awareness of the opportunities for, and benefits of, non-motorized transportation, as well as provide information to all users on safe ways to integrate motorized and non-motorized modes of transportation.

Objectives:

1. Develop strategies to educate the general public, the school system, and the University of Michigan on the available non-motorized transportation network and encourage its use, including promotion of Safe Routes to School.
2. Develop strategies to educate the general public, the school system, and the University of Michigan community on the personal and community wide benefits of non-motorized transportation modes of travel.
3. Develop strategies to educate all transportation system users (motorists, cyclists, pedestrians, etc.) on key safety issues related to integrating walking, bicycling and motorized travel to create an atmosphere of respect among all travelers.
4. Develop strategies to emphasize the benefits of and opportunities for non-motorized transportation into public schools, including promotion of Safe Routes to School.

1.1 Glossary of Terms

Within this document there are a number of terms that may be unfamiliar to many people. The following is a brief glossary of some of the transportation terms that are found in this document:

AASHTO – American Association of State Highway & Transportation Officials.

Bicycle Quality/Level of Service (Bike Q/LOS) – a model for evaluating the perceived safety and comfort of bicycling in a roadway based on conditions within the road (not surrounding land uses) expressed as a letter grade with "A" being best and "F" being worst.

Bike Lane – a portion of the roadway designated for bicycle use. Pavement striping and markings sometimes accompanied with signage are used to delineate the lane. Examples can be found on portions of Packard Road and State Street.

Bike Route – is a designation that can be applied to any type of bicycle facility. It is intended as an aid to help bicyclists find their way to a destination where the route is not obvious.

Bulb-outs – See Curb Extensions

Clear Zones – area free of obstructions around roads and Shared-use Paths, and Walkways.

Clearance Interval – is the flashing "Don't Walk" or flashing "Red Hand" phase of pedestrian signals. It indicates to pedestrians that they should not begin to cross the street. A correctly timed clearance interval allows a pedestrian who entered the crosswalk during the "Walk" phase to finish crossing the street at an unhurried pace.

Crossing Islands – a raised median within a roadway typically set between opposing directions of traffic that permits pedestrians to cross the roadway in two stages. A crossing island may be located at signalized intersections and at unsignalized crosswalks. These are also known as **Refuge Islands.**

Crosswalk – the area of a roadway that connects sidewalks on either side at an intersection of roads (whether marked or not marked) and other locations distinctly indicated for pedestrian crossings by pavement markings.

Curb Extensions – extending the curb out at intersections in order to minimize pedestrian crossing distance, also known as **Bulb-outs**.

Dispersed Crossing – where pedestrians typically cross the road at numerous points along the roadway, rather than at an officially marked crosswalk.

Fines – finely crushed gravel 3/8" or smaller. The fines may be loosely applied or bound together with a stabilizing agent.

E-Bike – a bicycle that is propelled by an electric motor and/or peddling.

Inside Lane – the travel lane adjacent to the center of the road or the Center Turn Lane

Ladder Style Crosswalk – a special emphasis crosswalk marking where 1' to 2' wide white pavement markings are placed perpendicular to the direction of a crosswalk to clearly identify crosswalk

Lateral Separation – horizontal distance separating one use from another (pedestrians from cars, for example) or motor vehicles from a fixed obstruction such as a tree

Leading Pedestrian Interval – is a traffic signal phasing approach where the pedestrian "Walk" phase precedes the green light going in the same direction by generally 4 to 5 seconds.

Level of Service (LOS) – a measurement of the motor vehicle flow of a roadway expressed by a letter grade with "A" being best or free flowing and "F" being worst or forced flow/heavily congested. Also see Bicycle Level of Service and Pedestrian Level of Service.

Long-term Plan – reflects the vision of the completed non-motorized system. Some improvements may require the reconstruction of existing roadways, the acquisition of new right-of-way, or significant capital investments.

Mid-block Crossings – locations that have been identified based on land uses, bus stop locations and the difficulty of crossing the street as probable candidates for Mid-block Crosswalks. Additional studies will need to be completed for each study to determine the ultimate suitability as a crosswalk location and appropriate solution to address the demand to cross the road.

Mid-block Crosswalk – a crosswalk where motorized vehicles are not controlled by a traffic signal or stop sign. At these locations, pedestrians wait for a gap in traffic to cross the street, motorists are required to yield to a pedestrian who is in the crosswalk (but not if the pedestrian is on the side of the road waiting to cross).

MMUTCD – Michigan Manual of Uniform Traffic Control Devices. This document is based on the National Manual of Uniform Traffic Control Devices (MUTCD). It specifics how signs, pavement markings and traffic signals are to be used. The current version is the 2005 MMUTCD, it was adopted on August 15, 2005 and is based on the 2003 National MUTCD.

Mode-share / Mode split – the percent of trips for a particular mode of transportation relative to all trips. A mode-share / mode split may be for a particular type of trip such as home-to-work.

Mode – distinct types of transportation (cars, bicycles and pedestrians are all different modes of travel).

MVC – Michigan Vehicle Code, a state law addressing the operation of motor vehicles and other modes of transportation. Ann Arbor recently adopted the MVC.

Near-term Opportunities – are improvements that may generally be done with minimal changes to existing roadway infrastructure. They include road re-striping projects, paved shoulders, new sidewalks and crossing islands. In general, existing curbs and drainage structures are not changed.

Out-of-Direction Travel – travel in an out-of-the-way, undesirable direction.

Outside Lane – lane closest to the side of the road.

Pedestrian Desire Lines – preferred pedestrian direction of travel.

Pedestrian Quality/Level of Service (Ped. Q/LOS) – a model for evaluating the perceived safety and comfort of the pedestrian experience based on conditions within the road ROW (not surrounding land uses) expressed as a letter grade with "A" being best and "F" being worst.

Refuge Islands – see Crossing Islands

Roundabouts – yield-based circular intersections that permit continuous travel movement.

Shared Roadway – where bicycles and vehicles share the roadway without any portion of the road specifically designated for the bicycle use. Shared Roadways may have certain undesignated accommodations for bicyclists such as wide lanes, paved shoulders, and/or low speeds.

Shared Use Path – a wide pathway that is separate from a roadway by the minimum an open unpaved space or barrier or located completely away from a roadway. A Shared Use Path is shared by bicyclists and pedestrians. There are numerous sub-types of Shared Use Paths including Sidewalk Bikeways that have unique characteristics and issues. An example of a Shared Use Path would be the Gallup Park Path.

Shy Distance – the distance that pedestrians, bicyclists and motorists naturally keep between themselves and a vertical obstruction such as a wall or curb.

Sidewalk Bikeways – a specific type of Shared Use Path that parallels a roadway generally within the road right-of-way. This is also known as a **Sidepath**. Examples include the pathways along Huron Parkway and Plymouth Road.

Signalized Crosswalk – a crosswalk where motor vehicle and pedestrian movements are controlled by traffic signals. These are most frequently a part of a signalized roadway intersection but a signal may be installed solely to facilitate pedestrians crossings. Signalized crosswalks installed solely for pedestrians must meet MMUTCD warrants.

Speed Table – raised area across the road with a flat top to slow traffic.

Splitter Islands – crossing islands leading up to roundabouts that offer a haven for pedestrians and that guide and slow the flow of traffic.

UTC – Uniform Traffic Code, is a set of laws that can be adopted by municipalities to become local law that address the operation of motor vehicles and other modes of transportation. The UTC is a complementary set of laws to the MVC. Ann Arbor has not adopted the UTC but bases a number of its traffic related codes on the UTC.

Yield Lines – a row of triangle shaped pavement markings placed on a roadway to signal to vehicles the appropriate place to yield right-of-way. This is a new pavement marking that is used in conjunction with the new "Yield to Pedestrians Here" sign in advance of marked crosswalks.

2. Planning and Design Guidelines

These planning and design guidelines should be consulted when planning new facilities or reconstructing or modifying existing facilities. This section includes some background information on pedestrians and bicyclists to support the guidelines.

Topics:

Planning for pedestrian and bicycle travel is significantly different than planning for motor vehicle travel. In measurements of age, uniform education, licensing, physical abilities, and even the speed range on a given facility, pedestrians and bicyclists are tremendously diverse groups as compared to motor vehicle operators. A wide range of abilities must be planned and accommodated for, since there is no such thing as a typical pedestrian or bicyclist.

2.1 Understanding Pedestrian Travel

Approximately 1/3 of the US population does not hold a driver's license. There are clearly a substantial number of people for whom walking (or perhaps bicycling) is their only transportation choice. For those who use public transportation, the connections to the pedestrian network are critical. The same holds true for all motor vehicle operators, because with the exception of a trip to a drive-through, all drivers begin and end their trips as pedestrians.

The Importance of Place in Pedestrian Travel

Pedestrian travel varies greatly based on the setting in the community. The setting includes the number of fellow pedestrians as well as many qualitative measures. Walking in and around Ann Arbor's downtown area is enjoyable for most, and dramatically different than walking along busy suburban arterials such as Washtenaw Avenue or in the primarily residential neighborhoods near the City's edge. Walking in the downtown area is facilitated by a system of generally continuous wide sidewalks, attractive street furniture and furnishing, and interesting buildings with a variety of activities housed within the structures themselves Care and attention is evident in the environment, as pedestrian activity is afforded with berth in, pavement markings and location of building entrances opening onto the sidewalk. Blocks are relatively short, providing pedestrians choice in paths to satisfy their travel needs. Pedestrians in this environment rarely feel alone, as there is a generous amount of street life creating a sense of safety and comfort offered by the activity in the Downtown district.

Walking along side a high-speed arterial in a suburban part of the City has a much different feel. The sidewalk itself, although still constructed of durable materials, is generally not as wide or as interesting. There is a limited amount of street furniture and an intrusion of noise, smell and rushing air created by passing cars, trucks and buses. There are limited opportunities to cross busy streets as distances between traffic signals were planned to facilitate traffic flow. The pedestrian signal interval allows for safe crossing, but the signals are timed to meet the minimum pedestrian time, minimize the affect on traffic flows. A pedestrian is treated and feels much like an outsider in this auto-dominated landscape. Adding to this feeling are buildings that are set back, behind parking lots, increasing the distance between building entrances and the sidewalk.

Similar auto dominant features are found in suburban neighborhoods. The ability to meet needs other than visiting a neighbor are challenged by the great distances from the home to commercial areas. Sidewalks are available, but contain no street furniture and are less interesting. The pedestrian landscape is varied and depends on the care and attention offered by adjacent residents. Traffic speeds in neighborhoods are generally slower than arterials, although sidewalks may be right up to the curb line or non-existent within some subdivisions. Houses are sometimes oriented with garage doors facing the street; intrusive driveways and their aprons create a less than level surface for the pedestrian.

Clearly, place matters. In designing policies and programs for pedestrians, the City of Ann Arbor must support the best elements of a safe, efficient, attractive pedestrian system and an environment that invites and celebrates human activity. Ann Arbor is well served by the vibrant downtown district; priority must be given to maintaining the special qualities of this part of the community. We must also plan to meet the needs of other parts of the City and create an attractive system of sidewalks that provides access to local activities. We must strive to create first class linkages assuring all residents the opportunity to comfortably meet their travel needs using non-motorized ways to travel.

Key factors for pedestrians

Travel time and continuity of travel path are key factors that influence the likelihood of a person attempting a trip on foot, versus in the car or on a bike. The average speed for a pedestrian is 3 to 4 mph. This speed varies greatly according to age, trip purpose and fitness level. Pedestrians, like drivers, are significantly affected by the number of traffic signs and signals encountered. The number of traffic signs and signals significantly affect travel time for pedestrians as well as motor vehicles.

The buffer between the sidewalk and the street as well as the degree of exposure in the crosswalks has a significant impact on the pedestrian's experience

Because walking is such a comparatively slow method of transportation, most trips that are taken by pedestrians are limited to short distances. Nationally 44% of trips taken by foot are for personal or family business, with social and recreational trips close behind at 35%. Earning a living only counts for 7% of pedestrian trips. The percentage of people who will choose walking as a form of transportation drops off significantly for trips of over a mile-and-a-half and is negligible for trips over 3 miles. Pedestrians generally take the shortest possible route available, and are not willing to go far out of their way. For example, many pedestrians will make a dash across a busy street if they must walk more than a typical downtown city block to a signalized intersection.

Perhaps the most important factor affecting a pedestrian trip is exposure to motor vehicles and the speed at which the motor vehicles are moving. For both safety and aesthetic reasons, the quality of a pedestrian's journey is much different when walking along a tree-lined path versus along a busy five-lane road with heavy truck traffic and no vegetation for shade. Also, it is much safer and more pleasant to walk along a street where the speed limit is 25 mph versus a street where the speed limit is 40 mph. National statistics show that a pedestrian's probability of death if hit by a motor vehicle increases from 15% when the car is going 20 mph to 85% if the car is going 40 mph.

Most likely, for a trip of any length, a pedestrian will need to cross a roadway. Are pedestrian crossing facilities available? Is there a signalized intersection conveniently placed? Do the busy roads have crossing islands? Will the pedestrian have to make a mid-block dash in order to avoid going significantly out of their way? All of these factors influence the quality and safety of a pedestrian's journey, and may well determine whether or not they will attempt the journey in the first place—or, whether they will attempt that same journey again.

2.2 Understanding Bicycle Travel

One of the most controversial issues with regard to accommodating bicyclists within the road right-of-way is whether they are better accommodated in the roadway itself or on a path along side the road. Also, if bicycles are to be accommodated within the roadway, should a portion of the roadway be officially designated for bicycles? When addressing these issues, legal rights, safety, travel efficiency, nationally accepted guidelines and conflicts with pedestrians need to be considered.

Legal Rights

Bicyclists, for the most part, are granted the same rights and subject to the same regulations as motorists. There are some exceptions, such as their use being restricted from freeways, and some special rules regarding their operation.

Safety

While it may seem that bicyclists would be safer on a Sidewalk Bikeway than riding in the roadway, the inverse is actually true in most cases for experienced adult cyclists. This is due primarily to the bicycles traveling at a high rate of speed in an area where the drivers of turning vehicles are not looking. This is illustrated in Fig. 2.2A *Bicycle Lane visibility Vs. Sidewalk Visibility* illustration on the next page. The more frequent and busy the road and driveway intersections are the more chances there are for conflicts.

Travel Efficiency

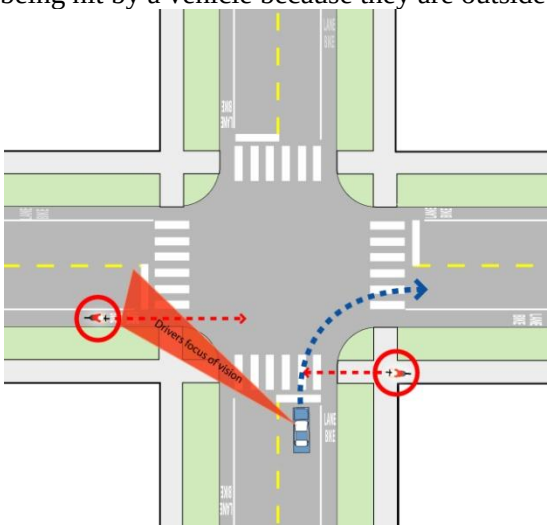
One of the most significant drawbacks to bicycling on sidewalks as opposed to bicycling in the roadway is the loss of right-of-way when traveling along collectors and arterials. When riding in the roadway of a major road, the vehicular traffic on side streets that do not have a traffic light generally yield to the bicyclists on the main road. If riding on a sidewalk, the bicyclist must yield to vehicles in those same side streets. In addition, the cyclist must approach every driveway with caution due to the visibility issues cited in the previous section and the fact that drivers rarely give right-of-way to a bicyclist on sidewalks. As well, the placement of many push-buttons used to trigger walk signals are often inconveniently placed for a cyclist.

Bicyclists are also required by law to yield to all pedestrians when riding on a sidewalk and provide an audible signal of their approach. As the number of pedestrians increase, a bicyclist's progress can be impeded.

The location of sidewalks is often such that when a vehicle on an intersecting driveway or roadway is stopped and waiting for traffic to clear on the through road, their position blocks the sidewalk. This requires difficult and often dangerous maneuvering to ride around the stopped vehicle. As a result of all of the above factors, bicyclists who are using their bike for utilitarian purposes infrequently use sidewalks because they essentially have to yield to all other users in the road corridor. Although separate facilities are appropriate in most cases, shared facilities will continue to be a preferred facility by some bicyclists in some cases.

Fig. 2.2A. Bicycle Lane Visibility Vs. Sidewalk Visibility

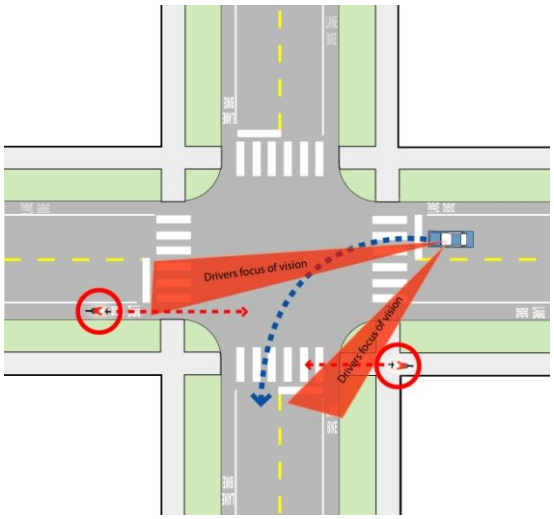
Bicycles traveling in the opposite direction of traffic on sidewalks have significantly greater chance of being hit by a vehicle because they are outside of the driver's typical field of view.



Car turning right

Bicyclist in Bike Lane is in the driver's focus of vision as they scan oncoming traffic and is easily seen.

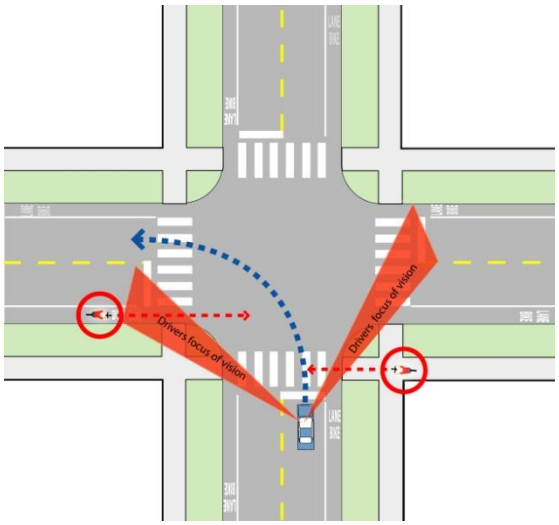
Bicyclist on Sidewalk Bikeway/Sidewalk is not in the driver's focus of vision and can't easily be seen until just before impact.



Car turning left

Bicyclist in Bike Lane is in the driver's focus of vision as he/she scans oncoming traffic and is easily seen.

Bicyclist on Sidewalk Bikeway/Sidewalk is not in the driver's focus of vision and can't easily be seen until they are in crosswalk.



Car turning left

Bicyclist in Bike Lane is in the driver's focus of vision and is easily seen.

Bicyclist on Sidewalk Bikeway/Sidewalk is not in the driver's focus until just before impact.

Graphics based on those prepared by Richard Moeur, P.E. for his Good Bicycle Facility Design Presentation available at http://www.richardcmoeur.com/docs/bikepres.pdf

Pedestrian Conflicts

As the number of bicyclists and pedestrians increase on a shared facility, the number of conflicts increase and pedestrians' comfort decreases. Pedestrians typically travel 2 to 4 miles per hour and bicyclists travel between 8 and 20 miles per hour. The speed difference is significant and the stealthy nature of a bicycle means that pedestrians generally have little to no audible warning of a bicycle approaching from behind. Pedestrians and bicyclists can both be severely injured in bicycle / pedestrian crashes.

Nationally Accepted Guidelines

The American Association of State Highway and Transportation Officials (AASHTO) publishes *A Policy on Geometric Design of Highways and Streets* that is also known as "The Green Book." This set of guidelines is the primary reference for street design used by federal, state, county and local transportation agencies. For guidance on how to accommodate bicycles, The Green Book references AASHTO's *Guide for the Development of Bicycles Facilities*. Federal and most state sources of funding require that bicycle projects conform to these guidelines. AASHTO's guidelines specifically discuss the undesirability of Sidewalks as Shared Use Paths. Sidewalk Bikeways are considered unsatisfactory for the all of the reasons listed above. Only under certain limited circumstances do the AASHTO guidelines call for Sidewalk Bikeways to be considered. On page 20 of the guidelines these circumstances are spelled out as:

a) *To provide bikeway continuity along high speed or heavily traveled roadways having inadequate space for bicyclists, and uninterrupted by driveways and intersections for long distances.*

b) *On long, narrow bridges. In such cases, ramps should be installed at the sidewalk approaches. If approach bikeways are two-way, sidewalk facilities also should be two-way.*

Additional Considerations

Children Riding on Sidewalks – Young children will most likely continue to ride bicycles on sidewalks even if on-road facilities are provided. The risks previously mentioned still hold true, but factors such as unfamiliarity with traffic and the limited depth perception typical of young children should also be considered when choosing the most appropriate facility to use. Also, young children, in general, may be riding at lower speeds than adults.

Adults Riding on Sidewalks – Even with the presence of on-road bicycle facilities, many adults will not feel comfortable riding in the roadway in some or all situations. It should be recognized that the choice to ride in the road or on a sidewalk will vary with each individual's skills, weather and roadway conditions.

Transition Points – One of the difficulties in creating a system where bicycle travel is accommodated within a patchwork of on- and off-road facilities is the transition from one facility to the other. The point where the bicyclist leaves the sidewalk to join the roadway is especially difficult at intersections.

Consistent Expectations – One of the overall goals in transportation planning is to improve safety through clear and consistent expectations between road users. Educating bicyclists to ride in different manners from place to place or region to region causes confusion for all of the users.

Redundancy of Facilities – Bicyclists are not restricted from riding in most roadways, nor is it likely that bicyclists will ever be required to ride on a Sidewalk Bikeway given their known safety issues. Therefore, the presence of bicycles in the roadway should be anticipated. Any off-road facilities that are constructed should be viewed as supplemental to accommodations within the roadway.

Driver and Bicyclist Behavior – There is ample room for improvement to the behavior of bicyclists and motorists alike in the way they currently share (or don't share) the roadway. Community education programs coupled with enforcement programs are the best approach for addressing this issue.

Passing on the Right – In a shared roadway scenario, it is dangerous for a bicyclist to pass a line of cars on the right. Bike lanes have the important advantage of allowing bicyclists to safely pass a line of cars waiting at an intersection. Much like the rewards for carpoolers traveling in a high occupancy vehicle lane, a bike lane gives bicyclists preference in moving through congested areas. Bikes can move to the front of an intersection more easily, allowing for better visibility and safer integration among motor vehicles, as well faster travel.

2.3 Travel Along Road Corridors

Ann Arbor's roadway network has been designed primarily to move motor vehicles safely, efficiently, and with minimal disruption. This network includes major arterial streets that place motor vehicles in multiple lanes moving at high speeds for long distances. These major transportation corridors usually present tremendous challenges when trying to retrofit them with non-motorized facilities. There are two primary types of non-motorized movements related to road corridors:

- Travel Along the Road Corridor (Axial Movements) that utilizes sidewalks, paved shoulders, bike lanes and bikeways.
- Travel Across the Road Corridor (Cross-corridor Movements) that utilizes intersections, crosswalks, and grade-separated crossings such as bridge overpasses or tunnel underpasses.

Pedestrian travel along road corridors is accommodated by sidewalks or shared-use paths.

Bicycle travel along road corridors is accommodated by bike lanes, shared roadways, and shared-use paths.

Evaluating Alternative Scenarios for Accommodating Bicycle and Pedestrian Travel Along Road Corridors

There is no single solution for handling bicycle traffic along road corridors that will be the most appropriate facility in all cases. But the City should still strive to establish a consistent approach as possible so that motorists and bicycles have clear and consistent expectations of each other.

Restricting bicycles to a path along the side of a roadway—while potentially a legal option—is fraught with safety concerns. This diminishes the attractiveness of using a bicycle for transportation for many adult cyclists. On the other hand, there exists a great diversity of bicycling skills and comfort levels and the system should attempt to safely accommodate all users to the degree possible. Also, where a bicyclists chooses to ride has an impact on the pedestrian's experience.

Quality and Level of Service Evaluation of Alternative Scenarios

In order to evaluate the alternative approaches to accommodating bicycle and pedestrian travel along the roadway, quality/level of services models were used. The Bicycle and Pedestrian Level of Service Models are statistically reliable methods for evaluating the quality and effectiveness of pedestrian and bicycle conditions of a given roadway environment. Various models have been developed over the past decade. The Bicycle and Pedestrian Level of Service Models used for this plan, developed by Bruce Landis, PE, AICP of Sprinkle Consulting, Inc., models bicycle and pedestrian environments based on data gathered from a wide cross section of users who evaluated numerous real world scenarios. Simplified versions of these models have been incorporated in the Florida Department of Transportation's Multi-modal Quality/Level of Service Model, which is the only LOS analysis that FDOT currently accepts. The Quality/Level of Service score is a measurement of the perceived safety and comfort of pedestrians and bicyclists.

It should be noted that the Bicycle Quality/Level of Service model applies only to bicycle environments *within* the roadway. There currently are not any well-researched models for Bicycle Quality/Level of Service for Shared Use Paths. The Pedestrian Quality/Level of Service Model also does not account for the increased conflicts with bicyclists that are likely to occur on a Shared-use Path.

Pedestrian Quality/Level of Service - Key Factors (in order of statistical significance):

1. Presence of a sidewalk
2. Amount of lateral separation between pedestrians and motor vehicles
3. Presence of physical barriers and buffers (including parking) between pedestrians and motor vehicles
4. Motorized vehicle volume
5. Motorized vehicle speed

Bicycle Quality/Level of Service - Key Factors (in order of statistical significance):

1. Presence of bicycle lane or paved shoulder
2. Proximity of bicyclists to motorized vehicles
3. Motorized vehicle volume
4. Motorized vehicle speed
5. Motorized vehicle type (percent truck/commercial traffic)
6. Pavement condition
7. The amount of on-street parking

The key factors for both modes are the existence of their own space, how far that space is from the traffic, and the nature of the traffic. The Bicycle and Pedestrian Quality/Level of Service score system has been developed using the same letter grading system with the same connotations as the letter grades used in schools: A being the best and F being the worst.

Because letter-grade Level of Service assessments are typical for vehicular traffic, there may be a desire to compare Vehicular Level of Service to that of Bicycle and/or Pedestrian Level of Service. However, the two evaluation systems are quite different and should not be directly compared. One illustration of the difference is that a Pedestrian Level of Service of "E" is likely the result of there not being any accommodations for a pedestrian. A Vehicular Level of Service "E" is defined as a point along an existing facility in which operations are at or near capacity and are quite unstable.

Three Scenarios for Providing Multi-modal Road ROW's

There are three typical scenarios for accommodating pedestrians, bicycles and motorists within a road Right-of-Way:

- Sidewalk (for pedestrians) and a Shared Roadway (for bicyclists and motorists). An example would be Dexter Road between Maple Road and Huron Street.
- Sidewalk (for pedestrians) and a Bike Lane (a separate bike-only lane in the roadway). An example would be Liberty Street between Maple Road and First Street.
- Shared Use Path (for pedestrians and some cyclists) and a Shared Roadway (for other bicyclists and motorists). An example would be Ann Arbor-Saline Road between Main Street and Eisenhower Parkway.

The following section looks at these three different scenarios for accommodating bicyclists, pedestrians and motorists. To evaluate each of these scenarios, a generalized cross section was prepared for each scenario along three different classifications of primary roadways: Principal Arterials (e.g. Plymouth

Road), Minor Arterials (e.g. Maple Road), and Urban Collectors (e.g. 7th Avenue). While there are significant variances among different road classifications, the generalized input used for each covers most roadway situations.

The following table summarizes the input used in this analysis: along the road corridor have been explored using a Quality/Level of Service Analysis to determine which combination is the most beneficial for users

Table 2.3A. Generalized Road Conditions and Existing AASHTO Guidelines

Criteria		**Urban Principal Arterial**	**Urban Minor Arterial**	**Urban Collector**
ADT motor vehicles	Generalized Average Daily Traffic Volumes for Both Directions	30,000	20,000	10,000
Number of Lanes	Generalized Average	4 Total (2 each way)	4 Total (2 each way)	2 Total (1 each way)
Posted Speed	Generalized Average	40 MPH	35 MPH	30 MPH
Sidewalk Width	AASHTO Pedestrian Guidelines	5' Minimum 6 – 8' Preferred 10 – 15'in CBD & High Use Areas	5' Minimum 6 – 8' Preferred 10 – 15'in CBD & High Use Areas	5' Minimum
Buffer Width	AASHTO Pedestrian Guidelines (from edge of road to sidewalk)	5' Minimum 6' Preferred	5' Minimum 6' Preferred	2' Minimum 4' Preferred
Bike Lane Width	AASHTO Bicycle Guidelines	3.5' minimum (5' total width including gutter)	3.5' minimum (5' total width including gutter)	3.5' minimum (5' total width including gutter)
Shared Outside Lane	AASHTO Bicycle Guidelines	14' recommended 15' maximum	14' recommended 15' maximum	14' recommended 15' maximum

Notes:

- 4' minimum walks may be used if 5' wide passing spaces for wheelchair users are provided at reasonable intervals.
- AASHTO also provides guidelines for curb-attached sidewalks (no buffer is provided between the sidewalk and roadway). The minimum width is 6', 8 – 10' is recommended along busy Arterials.
- There are many variables that AASHTO considers that are not articulated in this simplified chart.

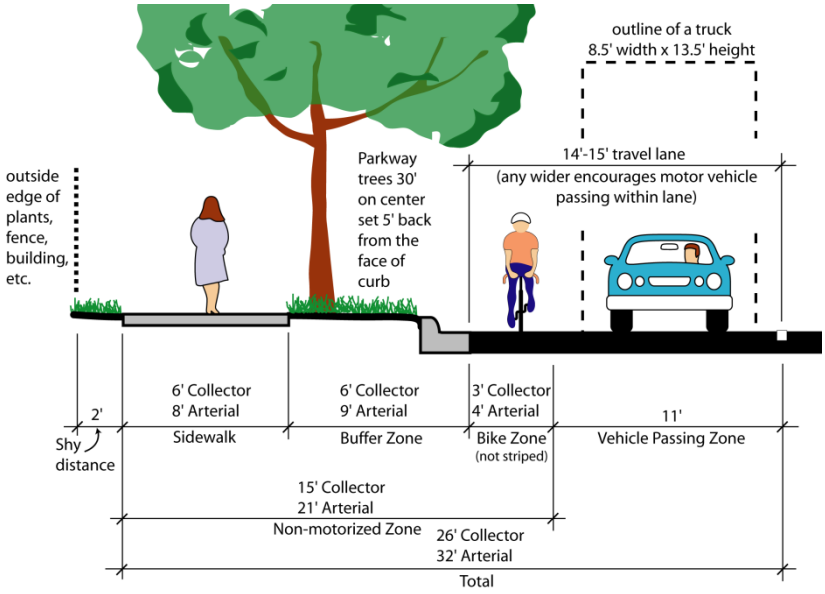
Refining the Scenarios

In comparing the different scenarios, the following design criteria were taken into consideration:

- **Widening the Buffer to Accommodate Trees** – As noted in the Pedestrian Quality /Level of Service – Key Factors, the lateral separation of pedestrians from the roadway and the presence of physical barriers such as trees, are the most important factors after the existence of a sidewalk. While trees provide benefits for pedestrian and roadway aesthetics, they are considered hazards to motorists. To minimize vehicular crashes with fixed roadside objects such as trees and light poles, current guidelines recommend placing the fixed objects at least 5' from the face of curb on urban arterials and 2' on collectors. Trees should be setback from the sidewalk at least 2' to allow for root growth and to provide a clear zone for the sidewalk users. To determine the total minimum desirable buffer with for Arterials, 6" is allocated for the width of a new tree trunk and the 18" from the face of curb to the edge of road is included. The result is that the minimum desirable buffer for Arterials is set at 9' wide. For Collectors, 4' is considered the minimum width for a planting strip that could support trees. This results in the total minimum desirable buffer for Collectors being set at 6' wide. As a general rule, the buffer should be as wide as reasonable for the conditions to minimize vehicular crashes with fixed objects, allow optimum planting conditions for trees, and improve the pedestrian environment.
- **Guidelines and Precedents for Narrow Lanes** - AASHTO guidelines and the MDOT Road Design Manual indicate that 12' lanes are most desirable and should be used where practical. They both indicate that in urban areas on low-speed roads (45 mph or less) 11' lanes are often used, and that 10' lanes may be used in restricted areas where there is little or no truck traffic. Ann Arbor has Principal Arterial roadways with 10' lanes on stretches of Jackson Road, Huron Street, and Washtenaw Avenue where ROW is limited. The use of lanes narrower than 12' must be evaluated on a case by case basis considering the many factors involved including the desired vehicle design speed.
- **Preserved Capacity with Narrower Lanes** - an 11' vehicular lane with an adjacent bike lane likely operates at near the same capacity as a 12' vehicular lane adjacent to a curb.
- **Narrow Turn Lanes -** AASHTO guidelines note that continuous two-way left-turn lanes may be as narrow as 10'.
- **Vehicle Widths** - A generalized sport utility vehicle is 6'- 4" wide, City buses and trucks are 8'- 6" wide.
- **Working Within Existing ROW** - Typical ROW Widths are 66' and 99', which means that the combined width of the sidewalk, buffer zone (space between the road and the sidewalk), bike lane (if any), and outside vehicle lane should be no wider than 33' in order to avoid the need for additional ROW. Using inside and continuous two-way left-turn lanes of 11', a four-lane road can be accommodated in 88' and a five-lane road can be accommodated in 99'.
- **Maximizing Bicycle and Pedestrian Level of Service** - Three scenarios were initially designed based on AASHTO guidelines. The scenarios were then refined by adjusting variables within the parameters of AASHTO guidelines such as the sidewalk width, the width of the buffer between the road, sidewalk and tree spacing, the bike lane width, and right lane width, all to achieve the most desirable Quality/Level of Service score possible within the typical ROW's.

The following pages include an overview of the three scenarios, their general advantages and disadvantages, and the results of the Quality and Level of Service analyses for the three road classifications.

Fig. 2.3B. Scenario A – Sidewalk and Shared Roadway



In this scenario, there are no specifically designated bicycle facilities within the roadway. Bicycles are accommodated through increased right-hand lane width (14' to 15') and reduced traffic speeds. Education and enforcement programs along with signage and potential pavement markings, such as the Shared-use Arrow, are utilized to alert motorists to the bicyclist's presence in the roadway.

Evaluation Results:

Road Classification	Pedestrian Q/LOS	On-road Bike Q/LOS	Notes
Principal Arterial	3.05 = C	4.55 = E	Extremely poor Bicycle Q/LOS
Minor Arterial	2.32 = B	4.23 = D	
Collector	2.47 = B	4.22 = D	Tied for worst Bike Q/LOS w/ scenario C

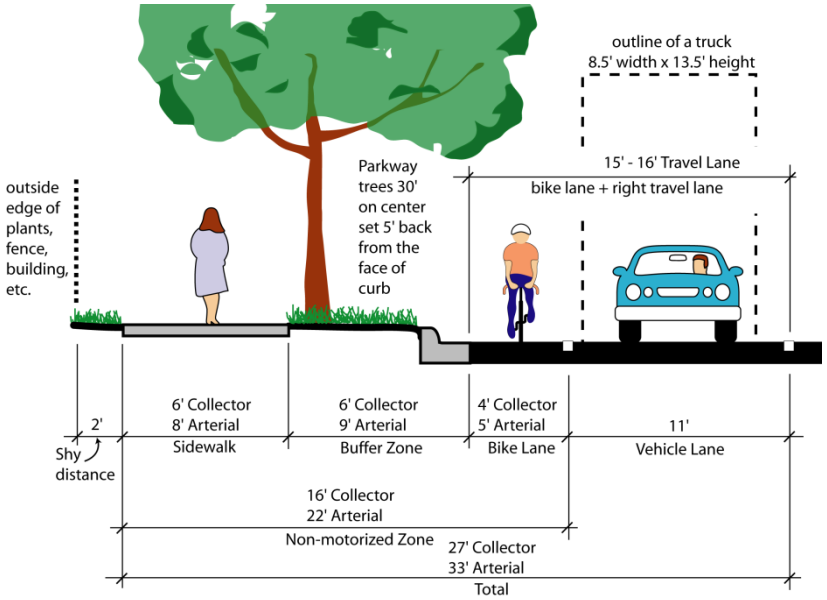
Advantages:

- Simple treatment at intersections.
- Considered by some to be the safest way to integrate bicyclists and motorized vehicles.
- Wide curb lane vs. bicycle lane studies have shown no significant safety differences in separation distances between the bicyclist and motorist.
- Appeals to experienced bicyclists who are often commuters.

Disadvantages:

- Unlikely to attract many new cyclists.
- May be viewed as a do nothing approach by many.
- Many bicyclists will still ride on the sidewalk.
- Cars tend to move further to the left and encroach into adjacent travel lanes when passing a cyclist with wide curb lanes than with bicycle lanes.
- Wider lanes may encourage higher speeds and may require traffic calming measures.

Fig. 2.3C. Scenario B – Sidewalk and Bike Lane (Preferred Option)



In this scenario, striped bicycle lanes or designated paved shoulders are provided on all collectors and minor arterials. Principal Arterials may have bike lanes or widened curb lanes, as determined most prudent for specific situations. The width of the bicycle lanes or shoulders should increase in areas with poor sight lines and/or higher vehicular speeds and volumes.

Evaluation Results:

Road Classifications	Pedestrian Q/LOS	On-road Bike Q/LOS	Notes
Principal Arterial	3.04 = C	3.47 = C	Best Bike Q/LOS, only Scenario with a C rating
Minor Arterial	2.31 = B	3.15 = C	Best Bike Q/LOS, only Scenario with a C rating
Collector	2.46 = B	3.39 = C	Best Bike Q/LOS, only Scenario with a C rating

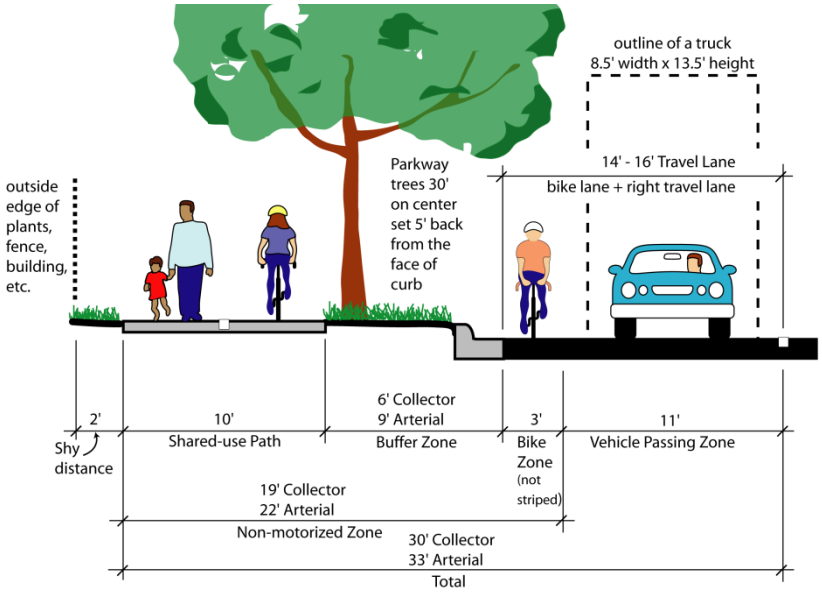
Advantages:

- Highly visible, designated facilities encourage increased bicycle use.
- Designated facilities alert motorists of the presence of bicyclists in the roadway.
- May have a slight traffic calming impact in some situations.
- Concurrent with AASHTO guidelines for most situations.
- Motorists are much less likely to encroach into the adjacent lane when passing a bicyclist.
- Motorists have less variation in their lane placement.

Disadvantages:

- Bicycle lanes require supplemental maintenance to be kept free of debris.
- Intersections must be designed carefully to minimize conflicts with turning movements.
- Presence of lanes may attract less experienced bicyclists to busier roadways.
- Some bicyclists will still ride on the sidewalk.

Fig. 2.3D. Scenario C – Shared-use Path



In this scenario, off-road shared-use paths are provided on Principal and Minor Arterials. Bicycle lanes or designated paved shoulders are provided on Collectors. Some collectors may also have shared-use paths. Driveways crossing shared use paths are modified to improve bicyclist and pedestrian safety.

Evaluation Scenarios:

Road Classifications	Pedestrian Q/LOS	On-road Bike Q/LOS	Notes
Principal Arterial	3.05 = C	4.69 = E	Worst Bike Q/LOS
Minor Arterial	2.32 = B	4.38 = D	Worst Bike Q/LOS
Collector	2.39 = B	3.89 = D	Tied for worst Bike Q/LOS w/ Scenario A

The analysis does not account for increased conflicts between bikes and pedestrians

Advantages:

- Similar to many of Ann Arbor's existing non-motorized facilities.
- Do not have to modify existing roadways.
- Facilities separate from busy roads appeal to novice users and those with slower reflexes.

Disadvantages:

- Off-road facilities such as sidewalks and pathways are statistically the most dangerous places to bike due to conflicts with motor vehicles at intersections and driveways.
- Increased number of conflicts between bicyclists and pedestrians on pathways.
- Some bicyclists will still choose the roadway rather than a Shared-use Path.
- Few of the City's existing shared-use paths meet current AASHTO guidelines.
- Off-road facilities will need to be cleared of snow and have a higher maintenance standard than is currently in place to be considered a transportation facility.
- Transition between Shared-use Paths and Bike Lanes are awkward.

Scenario Observations

After reviewing the Quality/Level of Service (Q/LOS) analysis and testing alternative inputs for the alternative scenarios, a number of observations were made. These include:

- AASHTO minimum guidelines in many cases do not result in a Q/LOS grade of "C" or better.
- The Sidewalk and Bike Lane scenarios were the only scenarios that consistently achieved a Q/LOS of C or better for bicyclists and pedestrians. The other scenarios consistently had at least one mode rated a Q/LOS of D or worse.
- An 8' wide Bike Lane would be required to achieve a Bicycle Q/LOS higher than C on a typical Principal Arterial due to the traffic volumes and speeds. At that width, the Bike Lane may be misinterpreted as a travel lane and would be difficult to fit in most road ROW's.
- A 21' wide buffer would be required to achieve a Pedestrian Q/LOS higher than C on a typical Principal Arterial due to the traffic volumes and speeds. This would be difficult to accommodate in most road ROW's.
- The non-motorized zone does not vary in width much and all of the scenarios can be accommodated in standard ROW widths.
- While Bike Lanes provide additional buffer space between the vehicular travel way and the sidewalks, the difference in the Q/LOS is not significant.
- The Average Daily Traffic Volume for a 2 Lane Urban Collector would have to be below 3,500 to achieve a Bicycle Q/LOS of C.
- A Bike Lane provides an additional 4 to 5' of lateral separation between fixed objects such as trees and street lights and the motorized travel lanes increasing motorized safety.
- A Bike Lane provides a benefit to trees planted in the buffer by providing an additional 4' to 5' between the canopy of the tree and trucks that may hit the lower branches.

Conclusion

Based on these observations **Scenario B – Sidewalk and Bike Lane** is the preferred alternative for all road classifications under most circumstances. Scenario A – Sidewalks and Shared Roadway may be appropriate for lower volume (<3,500 ADT) and lower speed (<= 30 MPH) Collectors. Scenario C – Shared-use Path may be appropriate for Parkway situations where intersecting roadways and driveways are widely spaced (typically father apart than 1/2 mile). In addition, there should be little need to get to destinations on the other side of the road between intersecting roadways and marked mid-block crosswalks.

While Scenario B – Sidewalk and Bike Lane, is the preferred alternative, the City should not restrict bicycling on most sidewalks. Bicyclists will choose to ride in the road or on a sidewalk based on their individual skills and comfort riding in traffic and current conditions. Thus an individual who may typically ride in the road may choose to ride on a sidewalk if the road is icy or slushy. Also, some individuals may be comfortable riding in bike lanes on some roads but not others. It is not the City's place to dictate where a bicyclist should ride but rather provide new facilities in accordance with current best practices and retrofit existing facilities as best as possible.

The City though needs to underscore that when bicyclists ride on sidewalks they need to always yield to pedestrians. Six to eight foot wide sidewalks can accommodate moderate slower paced bicycle traffic in suburban settings. Thus Scenario B – Sidewalk and Bike Lane provides that option for both on-road and off-road bicycling in many situations. Given that some bicyclists will choose to ride on the sidewalks, the

sidewalks should be designed and maintained such to accommodate these users. This is not to say that they need to meet AASHTO Guidelines for shared-use pathways, but that sightlines at intersecting driveways and roadways should be open so that motorists and bicyclist can see each other. Sidewalk and ramp alignments should take into consideration bicycle travel. Obstructions within and immediately adjacent to the sidewalk should be avoided. Also, the sidewalk surfaces and adjacent overhanging vegetation need to be maintained with bicycle travel in mind.

There will be places in the downtown or other high density mixed use areas where the combination of high pedestrian volumes and limited sidewalk widths will dictate that bicyclists should walk their bikes when on the sidewalk. There may also be places where sidewalk bicycling may be hazardous and likewise require that bicyclists walk their bicycle. Whenever bicycles are restricted from riding on the sidewalk every effort should be made to improve bicyclists accommodations within the roadway.

Notes on the Application of the Conclusions

It should be noted that traffic volumes and speed, rather than road classifications, should determine whether to use a 4' or 5' wide bike lane. As a general rule, where volumes are expected to be over 25,000 trips per day and/or speeds are posted at 40 MPH or above, a 5' bike lane is preferred. 5' bike lanes are also preferable in situations where the vertical and horizontal curves limit sight lines.

Multi-Modal Corridor Width Requirements

While primary roads are classified as Principal Arterials, Minor Arterials, and Collectors, there is not in practice a direct relationship between a road's classification and the number of lanes or lane width. Factors such as the available right-of-way, existing infrastructure and context have a significant influence in a road's design.

Multi-Modal Roadway Widths

There are various configurations of overall road widths depending on individual lane widths. For instance, a road may have anywhere from ten to twelve foot travel lanes and three-&-one-half to five-&-one-half foot bicycle lanes. Variation in any or all of these widths has an impact on overall road width.

Also affecting roadway widths are:

- Parking--adds approximately seven feet to each side of the road and increases roadway width requirements.
- Speed – wider motor vehicle lanes generally encourage increased speed of motor vehicles. Wider bicycle lanes are desirable with faster motor vehicle speeds to increase the distance between motor vehicles and bicycles.

Multi-modal ROW Widths

In addition to the road, the ROW contains sidewalks or shared-use paths, the buffer area between the sidewalk and the road and space for a median if any. There is tremendous variation within some variables such as the buffer and the median distance. Also a small portion of a road's ROW may be used for actual road improvements.

It is not always preferable to go to the maximum allowable ROW width. The best width will depend on contextual circumstances in a given a situation. Special circumstances, however, may make it necessary to make maximum use of the ROW.

Other issues that have a bearing on ROW widths include:

- Parking – parallel on-street parking adds approximately seven feet to each side of the road and may increase ROW requirements, though in some circumstances the space would be obtained from the buffer.
- Speed – as noted under Multi-Modal Roadway Widths, higher speeds generally increase the width of a road. Higher speeds also make a wider buffer more desirable.

Multi-modal Roadway Design Guidelines

The following pages provide guidance on typically required road width, ROW width and cross section elements for the following typical roadway types:

- Urban Two-lane
- Urban Three-lane
- Urban Four-lane
- Urban Five-lane
- Urban Four-lane Parkway

Fig 2.3E Urban Two-lane Multi-Modal Roadway Design Guidelines

Typical Roadway Width Range:

27' – Minimum 29' – Minimum Desirable 35' – Upper Range

Typical Right-of-Way Width Range:

51' – Minimum 54' – Minimum Desirable 74' – Upper Range

Sidewalk, Buffer and Bike Lane Width Guidelines:

	Sidewalk Width	Buffer Width	Bike Lane Width
Collectors	5' AASHTO Minimum 6' Preferred Minimum	2' AASHTO Minimum 6' Preferred Minimum	3.5' AASHTO Minimum 4' Preferred Minimum
Arterials	5' AASHTO Minimum 8' Preferred Minimum	5' AASHTO Minimum 9' Preferred Minimum	3.5' AASHTO Minimum 5' Preferred Minimum

Notes:

- AASHTO guidelines indicate that 4' wide sidewalks may be used if 5' wide passing spaces for wheelchair users are provided at reasonable intervals.
- AASHTO guidelines indicate that curb-attached sidewalks should be a minimum of 6' wide on Collectors and 8 to 10' wide along busy Arterials.
- Bike Lane widths noted are based on the bike lane being adjacent to the City's standard 1.5' wide gutter. AASHTO minimum width Bike Lanes are 5' from face of curb to the bike lane stripe. The gutter must be flush with the adjacent roadway to be able to count the width of the gutter in the overall width of the bike lane.
- Bike Lanes over 5.5' may encourage illegal use as parking lanes.

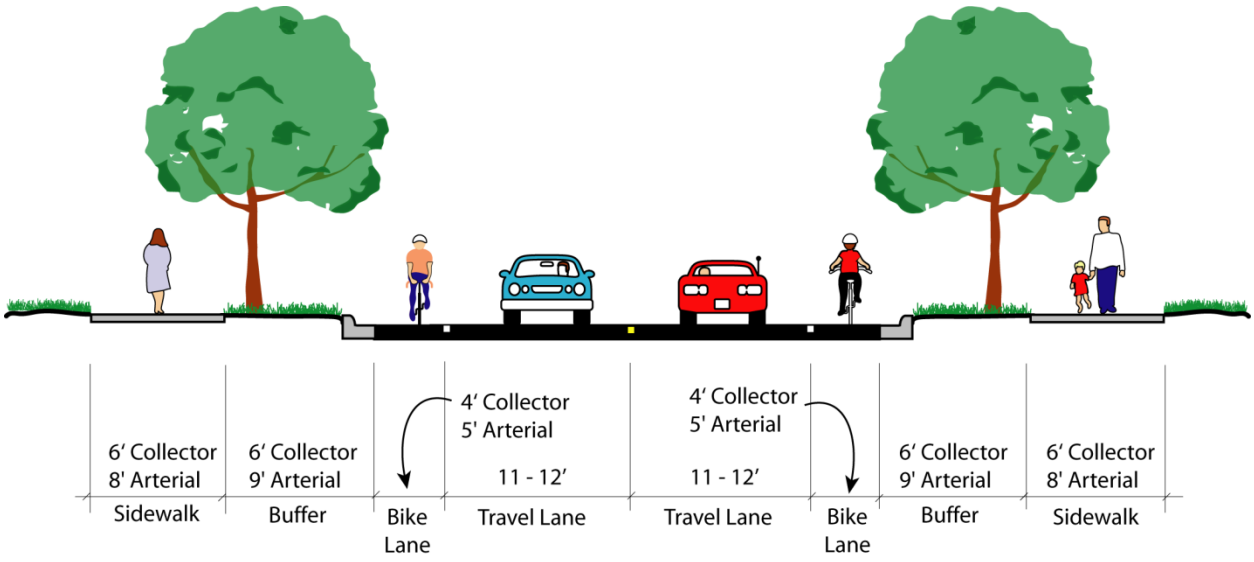
Typical Roadway Cross-Section Guidelines:[1]

Road Width[2]	**27'**	**28'**	**29'**	**30'**	**31'**	**32'**	**33'**	**34'**	**35'**
Bike Lane	3.5'	3.5'	3.5'	4'	4.5'	5'	5.5'	5.5'	5.5'
Travel Lane	10'	10.5'	11'	11'	11'	11'	11'	11.5'	12'
Travel Lane	10'	10.5'	11'	11'	11'	11'	11'	11.5'	12'
Bike Lane	3.5'	3.5'	3.5'	4'	4.5'	5'	5.5'	5.5'	5.5'

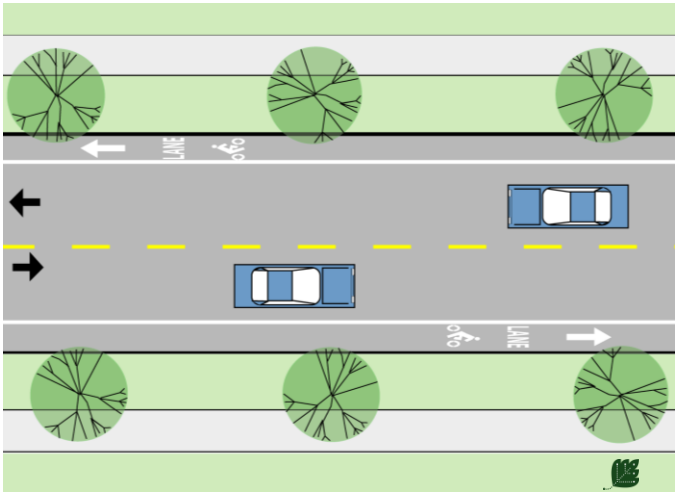
Highlighted cross sections should only be used in specific locations that meet certain conditions for which sub-11' travel lanes are appropriate.

[1] For retrofitting existing streets as well as new street construction or street reconstruction projects.
[2] The distance is from edge-of-metal to edge-of-metal and assumes a standard 18" gutter.

Urban Two-lane Multi-modal Roadway Typical Cross Section



Two-lane Road Typical Plan View



Bike Lanes
On roads with lower speed limits, bicycle lanes may be reduced to the 3.5' minimum (5' total from face of curb). In rural cross sections, the paved shoulder should be a minimum of 4' wide. Bike Lanes over 5.5' may encourage illegal use a parking lanes.

Trees
Tree spacing should be approximately 30' on center. Trees should be placed a minimum 5' back from the face of curb on Arterials and a minimum of 2' back from the face of curb on Collectors. The trees should also be placed a minimum of 2' back from the edge of sidewalk. Tree spacing/alignment should be varied as necessary to permit good visibility at crosswalks and intersections.

Fig 2.3F Urban Three-lane Multi-modal Roadway Design Guidelines

Typical Roadway Width Range:

37' – Minimum 39' – Minimum Desirable 47' – Upper Range

Typical Right-of-Way Width Range:

53' – Minimum 63' – Minimum Desirable 95' – Upper Range

Sidewalk, Buffer and Bike Lane Width Guidelines:

	Sidewalk Width	Buffer Width	Bike Lane Width
Collectors	5' AASHTO Minimum 6' Preferred Minimum	2' AASHTO Minimum 6' Preferred Minimum	3.5' AASHTO Minimum 4' Preferred Minimum
Arterials	5' AASHTO Minimum 8' Preferred Minimum	5' AASHTO Minimum 9' Preferred Minimum	3.5' AASHTO Minimum 5' Preferred Minimum

Notes:

- AASHTO guidelines indicate that 4' wide sidewalks may be used if 5' wide passing spaces for wheelchair users are provided at reasonable intervals.
- AASHTO guidelines indicate that curb-attached sidewalks should be a minimum of 6' wide on Collectors and 8 to 10' wide along busy Arterials.
- Bike Lane widths noted are based on the bike lane being adjacent to the City's standard 1.5' wide gutter. AASHTO minimum width Bike Lanes are 5' from face of curb to the bike lane stripe. The gutter must be flush with the adjacent roadway to be able to count the width of the gutter in the overall width of the bike lane.

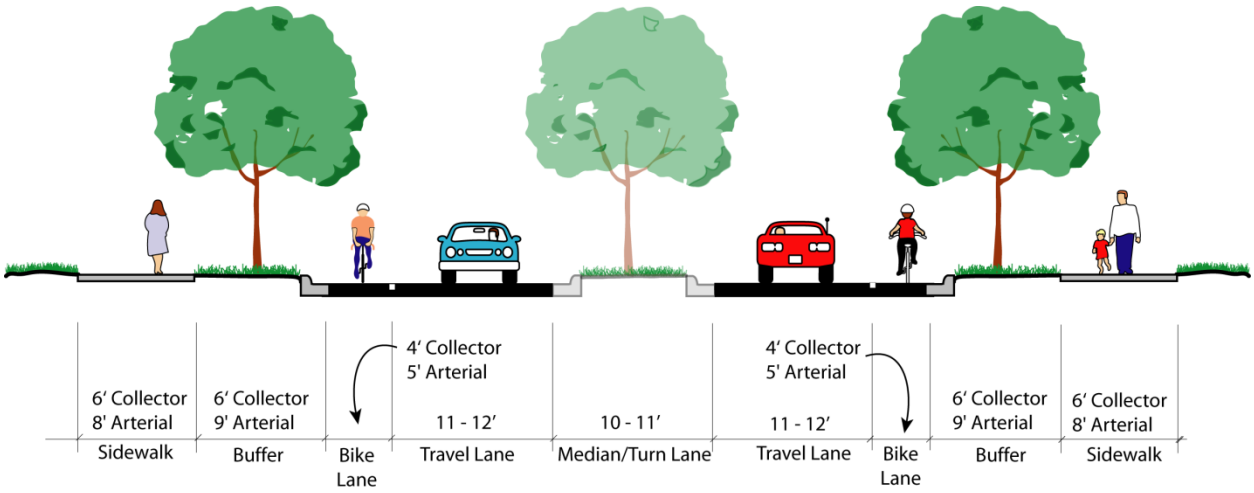
Typical Roadway Cross-Section Guidelines:[1]

Road Width[2]	**37'**	**38'**	**39'**	**40'**	**41'**	**42'**	**43'**	**44'**	**45'**	**46'**	**47'**
Bike Lane	3.5'	3.5'	3.5'	4'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'
Travel Lane	10'	10.5'	11'	11'	11'	11'	11'	11'	11.5'	12'	12'
Center Left Turn Lane	10'	10'	10'	10'	11'	11'	11'	11'	11'	11'	12'
Travel Lane	10'	10.5'	11'	11'	11'	11'	11'	11'	11.5'	12'	12'
Bike Lane	3.5'	3.5'	3.5'	4'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'

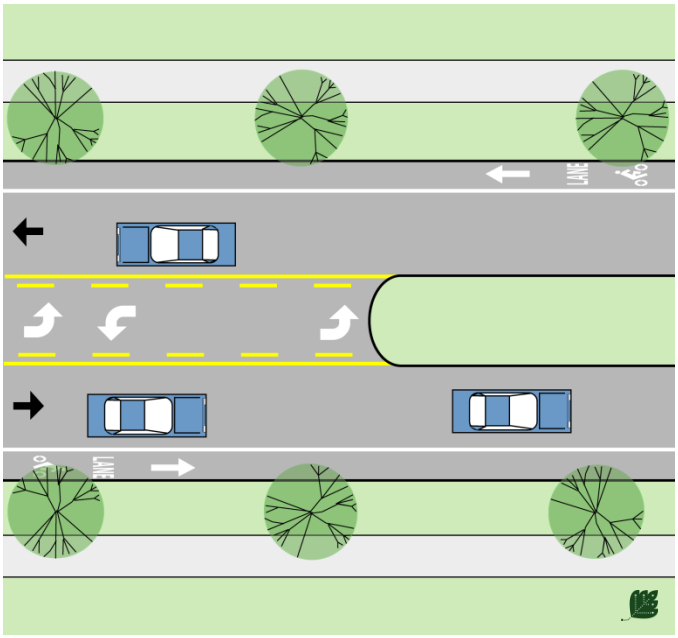
Highlighted cross sections should only be used in specific locations that meet certain conditions for which sub-11' travel lanes are appropriate.

[1] For retrofitting existing streets as well as new street construction or street reconstruction projects.
[2] The distance is from edge-of-metal to edge-of-metal and assumes a standard 18" gutter.

Urban Three-lane Multi-Modal Roadway Typical Cross Section



Urban Three-lane Multi-Modal Roadway Typical Plan View



Median
A planted median should be considered whenever there is no need for a turn lane. The planted median improves the aesthetics of the roadway, reduces the impervious surfaces and can act as an informal crossing island for dispersed mid-block crossings. Medians have also been shown to be less expensive to construct and maintain than paving in the long run. The crossing island may also be constructed in a manner that will mitigate storm water run-off.

Bike Lanes
On roads with lower speed limits, bicycle lanes may be reduced to the 3.5' minimum (5' total from face of curb). In rural cross sections the paved shoulder should be a minimum of 4' wide. Bike Lanes over 5.5' may encourage illegal use a parking lanes.

Trees
Tree spacing should be approximately 30' on center. Trees should be placed a minimum 5' back from the face of curb on Arterials and a minimum of 2' back from the face of curb on Collectors. The trees should also be placed a minimum of 2' back from the edge of sidewalk. Tree spacing/alignment should be varied as necessary to permit good visibility at crosswalks and intersections.

Fig 2.3G Urban Four-lane Multi-modal Roadway Design Guidelines

Typical Roadway Width Range:

47' – Minimum 51' – Minimum Desirable 59' – Upper Range

Typical Right-of-Way Width Range:

63' – Minimum 75' – Minimum Desirable 107' – Upper Range

Sidewalk, Buffer and Bike Lane Width Guidelines:

	Sidewalk Width	Buffer Width	Bike Lane Width
Collectors	5' AASHTO Minimum 6' Preferred Minimum	2' AASHTO Minimum 6' Preferred Minimum	3.5' AASHTO Minimum 4' Preferred Minimum
Arterials	5' AASHTO Minimum 8' Preferred Minimum	5' AASHTO Minimum 9' Preferred Minimum	3.5' AASHTO Minimum 5' Preferred Minimum

Notes:

- AASHTO guidelines indicate that 4' wide sidewalks may be used if 5' wide passing spaces for wheelchair users are provided at reasonable intervals.
- AASHTO guidelines indicate that curb-attached sidewalks should be a minimum of 6' wide on Collectors and 8 to 10' wide along busy Arterials.
- Bike Lane widths noted are based on the bike lane being adjacent to the City's standard 1.5' wide gutter. AASHTO minimum width Bike Lanes are 5' from face of curb to the bike lane stripe. The gutter must be flush with the adjacent roadway to be able to count the width of the gutter in the overall width of the bike lane.
- Bike Lanes over 5.5' may encourage illegal use as parking lanes.

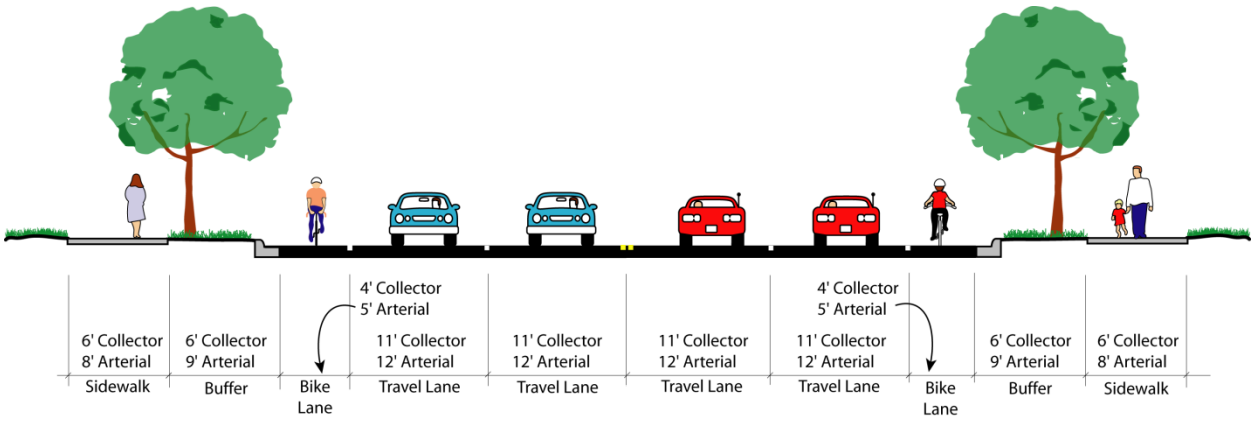
Typical Roadway Cross-Section Guidelines:[1]

Road Width[2]	**47'**	**48'**	**49'**	**50'**	**51'**	**52'**	**53'**	**54'**	**55'**	**56'**	**57'**	**58'**	**59'**
Bike Lane	3.5'	3.5'	3.5'	3.5'	3.5'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'	5.5'
Travel Lane	10'	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11.5'	12'	12'	12'
Travel Lane	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11'	11'	11.5'	12'
Travel Lane	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11'	11'	11.5'	12'
Travel Lane	10'	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11.5'	12'	12'	12'
Bike Lane	3.5'	3.5'	3.5'	3.5'	3.5'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'	5.5'

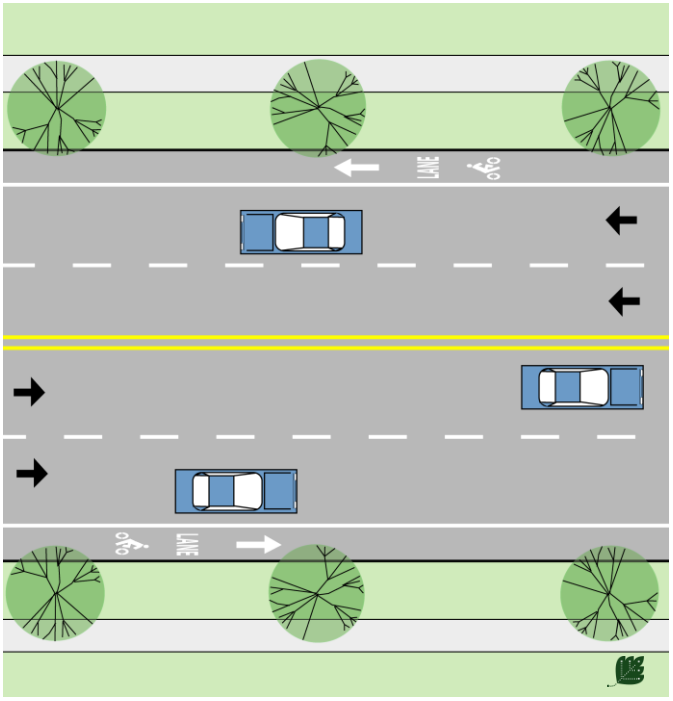
Highlighted cross sections should only be used in specific locations that meet certain conditions for which sub-11' travel lanes are appropriate.

[1] For retrofitting existing streets as well as new street construction or street reconstruction projects.
[2] The distance is from edge-of-metal to edge-of-metal and assumes a standard 18" gutter.

Urban Four-lane Multi-modal Roadway Typical Cross Section



Urban Four-lane Multi-modal Roadway Typical Plan View



Bike Lanes
On roads with lower speed limits, bicycle lanes may be reduced to the 3.5’ minimum (5’ total from face of curb). In rural cross sections the paved shoulder should be a minimum of 4’ wide. Bike Lanes over 5.5’ may encourage illegal use a parking lanes.

Trees
Tree spacing should be approximately 30’ on center. Trees should be placed a minimum 5’ back from the face of curb on Arterials and a minimum of 2’ back from the face of curb on Collectors. The trees should also be placed a minimum of 2’ back from the edge of sidewalk. Tree spacing/alignment should be varied as necessary to permit good visibility at crosswalks and intersections.

Fig 2.3H Urban Five-lane Multi-modal Roadway Design Guidelines

Typical Roadway Width Range:

57' – Minimum 61' – Minimum Desirable 71' – Upper Range

Typical Right-of-Way Width Range:

73' – Minimum 85' – Minimum Desirable 119' – Upper Range

Sidewalk, Buffer and Bike Lane Width Guidelines:

	Sidewalk Width	Buffer Width	Bike Lane Width
Collectors	5' AASHTO Minimum 6' Preferred Minimum	2' AASHTO Minimum 6' Preferred Minimum	3.5' AASHTO Minimum 4' Preferred Minimum
Arterials	5' AASHTO Minimum 8' Preferred Minimum	5' AASHTO Minimum 9' Preferred Minimum	3.5' AASHTO Minimum 5' Preferred Minimum

Notes:

- AASHTO guidelines indicate that 4' wide sidewalks may be used if 5' wide passing spaces for wheelchair users are provided at reasonable intervals.
- AASHTO guidelines indicate that curb-attached walks should be a minimum of 6' wide on Collectors and 8 to 10' wide along busy Arterials.
- Bike Lane widths noted are based on the bike lane being adjacent to the City's standard 1.5' wide gutter. AASHTO minimum width Bike Lanes are 5' from face of curb to the bike lane stripe. The gutter must be flush with the adjacent roadway to be able to count the width of the gutter in the overall width of the bike lane.

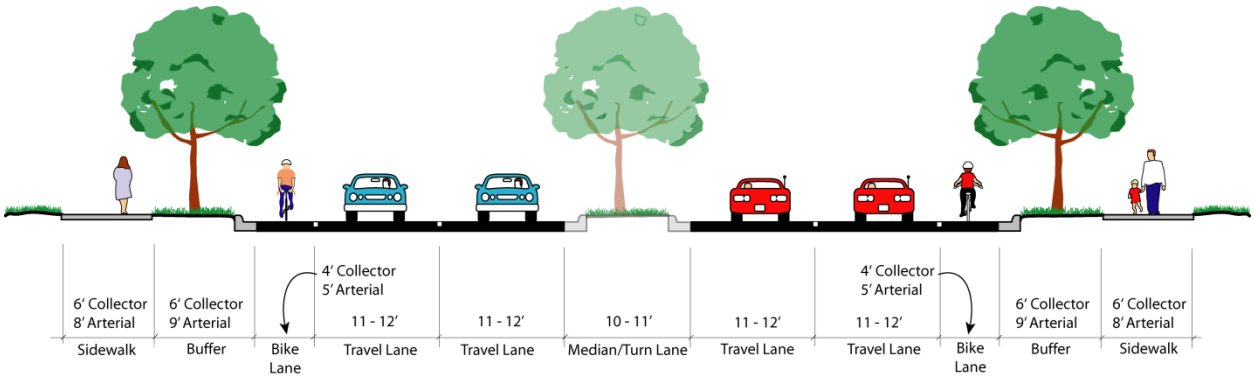
Five-Lane Road with Bike Lane Cross-Section Guidelines[1]

Road Width[2]	57'	58'	59'	60'	61'	62'	63'	64'	65'	66'	67'	68'	69'	70'
Bike Lane	3.5'	3.5'	3.5'	3.5'	3.5'	4'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'	5.5'
Travel Lane	10'	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11.5	11.5	12	12
Travel Lane	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11'	11'	11.5	12	12
Center Lane	10'	10'	10'	10'	10'	10'	11'	11'	11'	11'	11'	11'	11'	12'
Travel Lane	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11'	11'	11.5	12	12
Travel Lane	10'	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11.5'	11.5	12	12
Bike Lane	3.5'	3.5'	3.5'	3.5'	3.5'	4'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'	5.5'

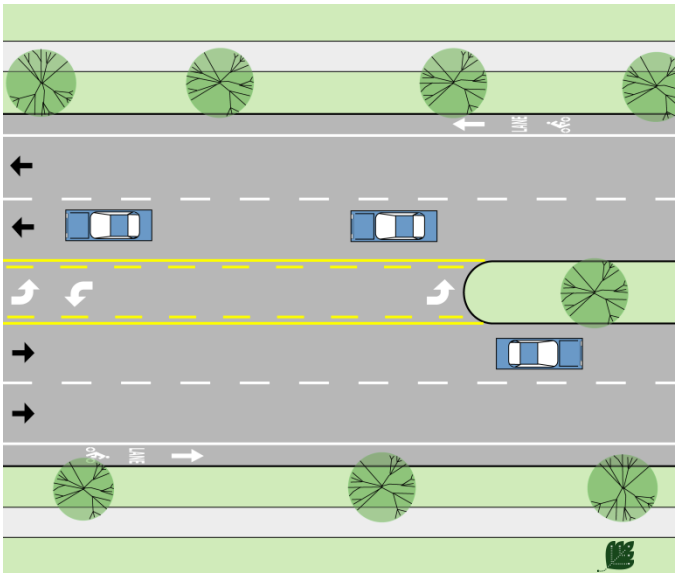
Highlighted cross sections should only be used in specific locations that meet certain conditions for which sub-11' travel lanes are appropriate.

[1] For retrofitting existing streets as well as new street construction or street reconstruction projects.
[2] The distance is from edge-of-metal to edge-of-metal and assumes a standard 18" gutter.

Urban Five-lane Multi-modal Roadway Typical Cross Section



Five-lane Multi-modal Roadway Typical Plan View



Lane Width
As 5-lane roads are typically higher volume and higher speed facilities, the minimum width indicated should only be considered in extenuating circumstances. Such situations would include areas with numerous driveway and roadway intersections. Where a 5-lane road is a lower speed facility, 57' minimum road width may be considered.

Bike Lanes
On roads with lower speed limits, bicycle lanes may be reduced to the 3.5' minimum (5' total from face of curb). In rural cross sections the paved shoulder should be a minimum of 4' wide. Bike Lanes over 5.5' may encourage illegal use a parking lanes.

Trees
Tree spacing should be approximately 30' on center. Trees should be placed a minimum 5' back from the face of curb on Arterials and a minimum of 2' back from the face of curb on Collectors. The trees should also be placed a minimum of 2' back from the edge of sidewalk. Tree species/spacing/alignment should be varied as necessary to permit good visibility at crosswalks and intersections.

Median
A planted median should be considered whenever the there is no need for a turn lane. The planted median improves the aesthetics of the roadway, reduces the impervious surfaces and can act as an informal crossing island for dispersed mid-block crossings. Medians have also been shown to be less expensive to construct and maintain than paving in the long run. The crossing island may also be constructed in a manner that will mitigate storm water run-off.

Fig 2.3l Urban Four-lane Parkway Multi-modal Design Guidelines

Typical Roadway Width Range:

47' – Minimum 51' – Minimum Desirable 59' – Upper Range

Typical Right-of-Way Width Range:

63' – Minimum 75' – Minimum Desirable 107' – Upper Range

Sidewalk, Buffer and Bike Lane Width Guidelines:

	Sidewalk Width	Buffer Width	Bike Lane Width
Collectors	5' AASHTO Minimum 6' Preferred Minimum	2' AASHTO Minimum 6' Preferred Minimum	3.5' AASHTO Minimum 4' Preferred Minimum
Arterials	5' AASHTO Minimum 8' Preferred Minimum	5' AASHTO Minimum 9' Preferred Minimum	3.5' AASHTO Minimum 5' Preferred Minimum

Notes:

- AASHTO guidelines indicate that 4' wide sidewalks may be used if 5' wide passing spaces for wheelchair users are provided at reasonable intervals.
- AASHTO guidelines indicate that curb-attached sidewalks should be a minimum of 6' wide on Collectors and 8 to 10' wide along busy Arterials.
- Bike Lane widths noted are based on the bike lane being adjacent to the City's standard 1.5' wide gutter. AASHTO minimum width Bike Lanes are 5' from face of curb to the bike lane stripe. The gutter must be flush with the adjacent roadway to be able to count the width of the gutter in the overall width of the bike lane.
- Bike Lanes over 5.5' may encourage illegal use as parking lanes.

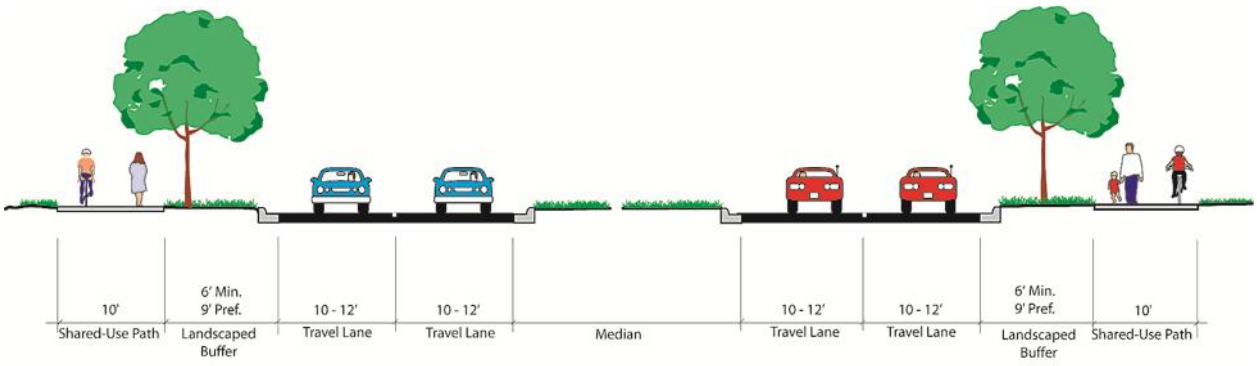
Typical Roadway Cross-Section Guidelines:[1]

Road Width[2]	**47'**	**48'**	**49'**	**50'**	**51'**	**52'**	**53'**	**54'**	**55'**	**56'**	**57'**	**58'**	**59'**
Bike Lane	3.5'	3.5'	3.5'	3.5'	3.5'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'	5.5'
Travel Lane	10'	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11.5'	12'	12'	12'
Travel Lane	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11'	11'	11.5'	12'
Travel Lane	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11'	11'	11'	11.5'	12'
Travel Lane	10'	10'	10.5'	10.5'	11'	11'	11'	11'	11'	11.5'	12'	12'	12'
Bike Lane	3.5'	3.5'	3.5'	3.5'	3.5'	4'	4.5'	5'	5.5'	5.5'	5.5'	5.5'	5.5'

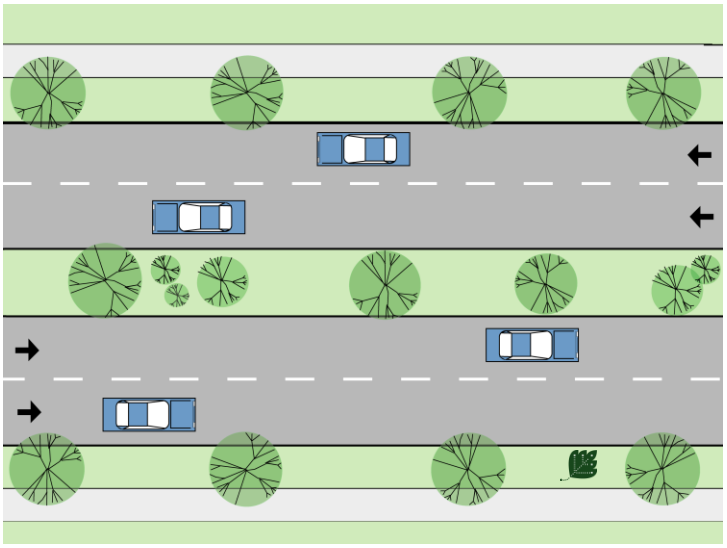
Highlighted cross sections should only be used in specific locations that meet certain conditions for which sub-11' travel lanes are appropriate.

[1] For retrofitting existing streets as well as new street construction or street reconstruction projects.
[2] The distance is from edge-of-metal to edge-of-metal and assumes a standard 18" gutter.

Urban Four-lane Parkway Multi-modal Typical Cross Section



Urban Four-lane Multi-modal Roadway Typical Plan View



Shared-use Paths
This cross-section may be appropriate for Parkway situations where intersecting roadways and driveways are widely spaced (typically father apart than 1/2 mile) and there is little need to get to destinations on the other side of the road between intersecting roadways and marked mid-block crosswalks.

Care should be taken not to excessively meander the path. Even when on a recreational trip, few bicyclists will travel far out-of-direction unless there is a compelling reason.

The grade of the Shared-use Path should match as close as possible the grade of the road. Excessively steep grades on pathways discourage bicycle travel and may present safety issues. The *AASHTO Guide for the Development of Bicycle Facilities* provides guidelines on the geometric design of Shared-use Paths.

Trees
Tree spacing should be approximately 30' on center. Trees should be placed a minimum 5' back from the face of curb on Arterials and a minimum of 2' back from the face of curb on Collectors. The trees should also be placed a minimum of 2' back from the edge of sidewalk. Tree spacing/alignment should be varied as necessary to permit good visibility at crosswalks and intersections.

Median
The planted median improves the aesthetics of the roadway, reduces the impervious surfaces and can act as an informal crossing island for dispersed mid-block crossings. Medians have also been shown to be less expensive to construct and maintain than paving in the long run. The median may also be constructed in a manner that will mitigate storm water run-off.

On-Street Parking Guidelines

When adding parking the parking lane should be set at 5.5' (7' total including gutter) and the bike lane width should be a minimum of 5' wide. Additional width for bike lanes is desirable due to opening doors of parked cars infringing on the bike lane width. Bike Lanes wider than 5' should have the door zone cross-hatched to encourage bicyclists to ride a safe distance away from the parked cars.

A 4" stripe should mark the edge of the parking lane to encourage parking as close to the curb as possible. The parking lane should always remain at 5.5'. Any additional room should be allocated toward the Bike Lane first, then to the travel lane adjacent to the bike lane.

Multi-modal One-Way Road Design Guidelines

Bike Lanes may be located on either side of a one-way road. For consistency sake, the right hand side should be the default choice. If, however there are numerous bus stops with frequent bus service the left hand side of the road may be preferable. If there is on-street parking on one side of the road, the bicycle lane should generally be located on the opposite side of the road than the on-street parking.

Fig 2.3J. Signed Bike Route Design Guidelines

Purpose

Bike Route signs are guide signs, rather than indicating that a particular facility exists. Bicycle Routes are intended to mark routes that may not be obvious to users unfamiliar with the area. They are typically used on local streets and may ~~utilize~~ incorporate pathway connections that link local streets. They are likely to be used by cyclists who are uncomfortable bicycling on the main roads, students bicycling to school or by recreational cyclists.

Directional Signage

The key aspect of a bicycle route is the destination sign that should call out points of interest along the route such as schools, shopping centers or parks (e.g. "To Downtown").

Route Characteristics

Routes signed as a Bike Route should be roads that have a relatively high Quality/Level of Service for bicyclists. The route should not have any known hazards to bicyclists and should be maintained in a manner that is appropriate for bicycle use. While many local roads may meet these criteria, the key is that the road is part of a specific route to a particular place. Obvious routes need not be marked. Bike Routes should be used judiciously to identify obscure routes to key destinations that avoid travel along major roadways.

Where a bicycle route on a local road intersects a busy multi-lane primary road and continues on the other side of the road, a traffic signal or appropriately design mid-block crossing should be provided.

Bike Routes generally do not include specific bicycle improvements such as Bike Lanes. Bike Lane pavement markings and signs already indicate that a road segment is designed to specifically accommodate bicycles. Bike Route signs are to be used where no obvious bicycle facility exists yet the route is advantageous to bicyclists. Thus road segments with Bike Lanes should generally not be marked as a Bike Route.

Frequency of Sign Placement
The signs should be placed at every turn, signalized intersection and approximately every ¼ mile along the route.

Transitions between Sidewalk Bikeways and Bike Lanes Design Guidelines

The recommended approach to accommodating bicycles along arterials and collectors is with a bicycle lane. However, there will be places, especially in the near-term, where that may not be possible. This presents a situation where some bicyclists will prefer to continue bicycling in the roadway and others will prefer to leave the roadway and use a sidewalk bikeway. Given the significant variances in bicyclist's abilities, trip purposes, and cycling speeds, forcing all cyclists into a single solution is inappropriate. The solution then is to accommodate both preferences.

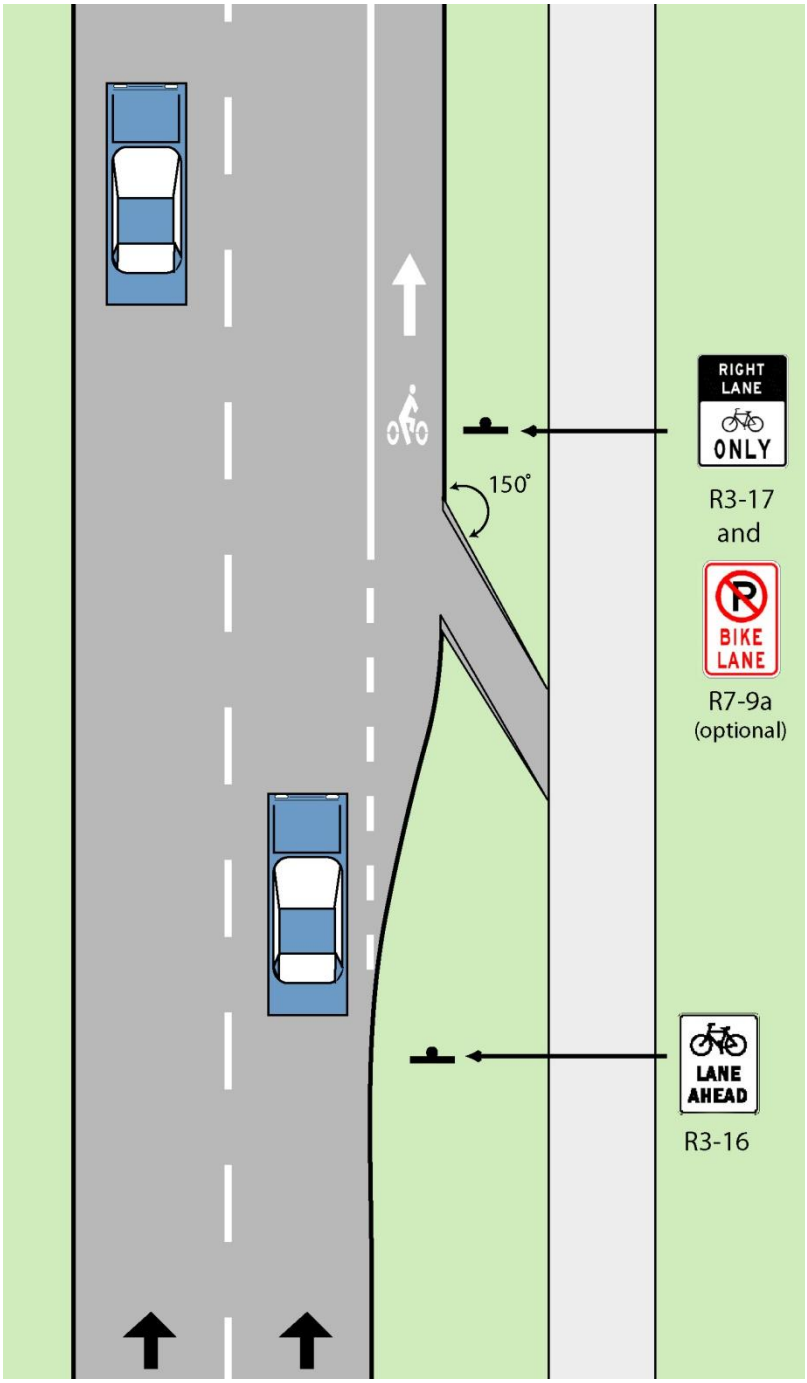
The transition points between sidewalk bikeways and bike lanes, presents a number of challenges. This underscores the importance of making the non-motorized system as consistent as possible. When bringing bicyclists into the roadway as shown in Fig 2.3K (next page), the entrance point needs to be protected. Unlike merging points between motor vehicles, the speed differential between bicyclists and motor vehicles may be significant with the potential for hit-from-behind crashes if the merging area is not protected.

When bringing bicycles onto a pathway, there is the potential for conflicts with pedestrians and bicyclists already on the pathway. Trying to segregate bicycles and pedestrians on a single 8' – 10' wide path is not feasible. Each direction for bicycle use requires 4'. Some busy shared-use paths have a dashed yellow line down the center to separate path users by direction of travel. While these tend to work to a degree in busier off-road pathways they are rarely used in sidewalk bikeway situations.

The solution does not differentiate between the sidewalk bikeways that are adjacent to a bike lane from a typical sidewalk. A sign along the pathway can instruct bicyclists to yield to pedestrians per City code. The approach is based on the assumption that the fastest bicyclists will remain in the roadway and share the lane with the motor vehicles rather than leave the roadway and have their travel impeded by pedestrians and driveway crossings.

A ramp that eases the transition from a Bike Lane to a Shared-use Path is provided where the Bike Lane ends.

Fig. 2.3K. Bicycle Entrance Ramp from Sidewalk Bikeway to Bike Lane Design Guideline:



Applications

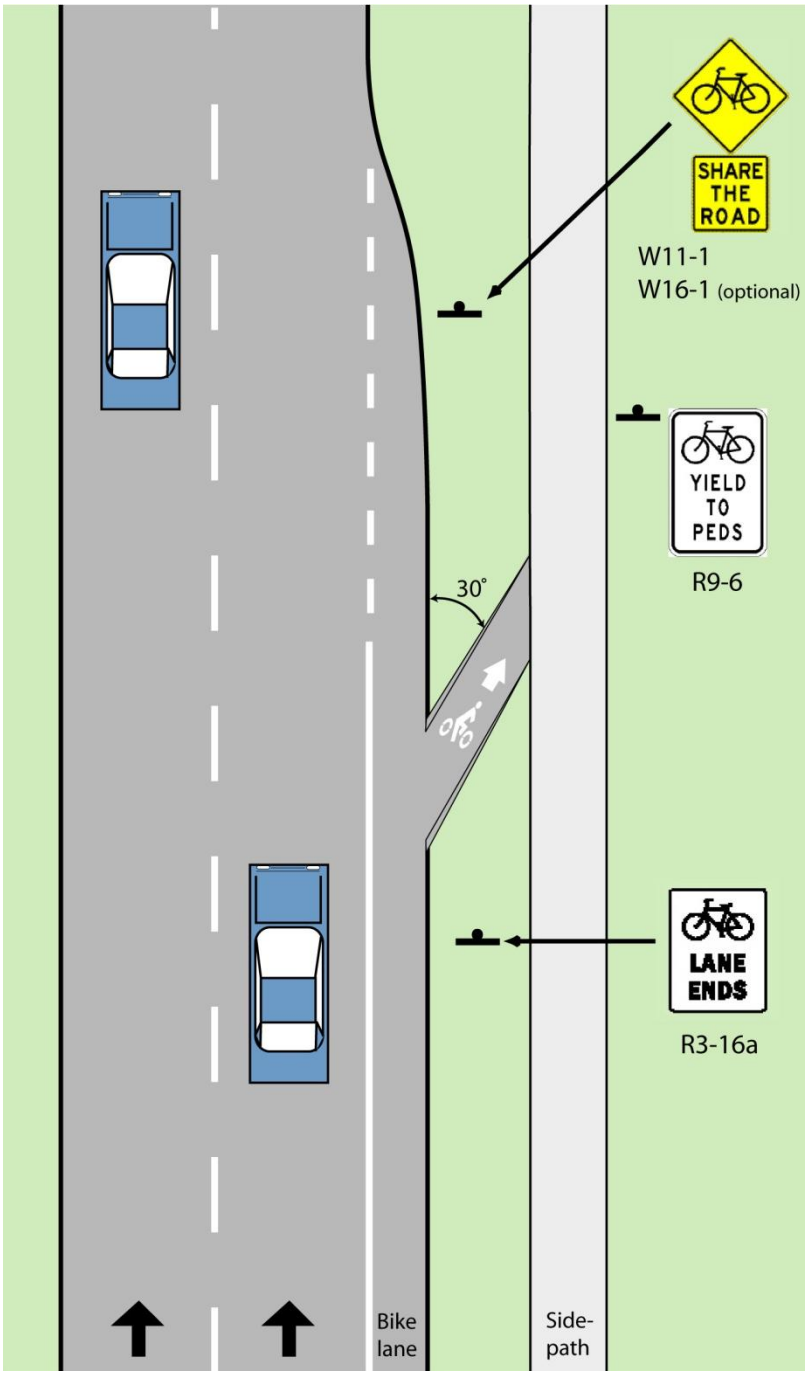
The bike entrance ramp is used to provide easy transition from a sidewalk bikeway to a bike lane or to allow a bicyclist to enter the roadway to make a turn as a vehicle.

The ramp may be used where a bike lane begins or periodically along a sidewalk bikeway that parallels a bike lane.

Key Elements:

1. Bicyclists have an option to bike either in the bike lane or along the sidewalk bikeway.
2. The ramp should resemble a curb ramp with flared sides and a flush edge with the road grade.
3. The mouth of the ramp (not including the flared sides) should be 5’ wide or sized to fit maintenance vehicles designed for sweeping and snow removal.
4. When used at the beginning of a bike lane, the road should be widened to accommodate the bike lane and protect bikers entering roadway from the sidewalk bikeway given the sharp angle of entry. As the road is flared, dashed pavement markings should be used indicate the beginning of the bike lane and an area where bikers in the roadway can merge into the bike lane.

Fig. 2.3L. Bicycle Exit Ramp from Bike Lane to Sidewalk Bikeway Design Guideline



Applications

The bike exit ramp is used to provide easy transition from a bike lane to a sidewalk bikeway.

The ramp may be used where a bike lane ends or periodically along a sidewalk bikeway that parallels a bike lane.

Key Elements:

1. Bicyclists have the option of bicycling in the roadway or on a sidewalk bikeway.
2. The exit ramp should resemble a curb ramp with flared sides and a flush edge with the road grade.
3. The mouth of the ramp (not including the flared sides) should be 5’ wide or sized to fit maintenance vehicles designed for sweeping and snow removal.
4. Where a bike lane ends, dashed pavement markings indicate the end of the bike lane and an area where bikers are merging back into the roadway. Dashed lines should begin well in advance of the end of the bike lane to ensure adequate warning and a large transition zone.
5. A bike symbol and arrow on the ramp to discourage bicyclists on the sidewalk bikeway to enter the roadway going the wrong way.

Modifying Existing Facilities to Incorporate Bicycle Lanes

Ann Arbor's existing road infrastructure must be considered when looking at how bicycle lanes may be added. Waiting for a complete road reconstruction at which time the "ideal" scenario may be applied would result in unnecessary delay in implementing a bicycle lane system. Also, in many cases, existing development, historic districts and natural features dictate that the roadway width will change little if at all even in the long run. Hence, approaches to modifying facilities that work within existing curb lines and with existing storm sewer systems need to be employed.

In some cases, existing travel lanes may need to be narrowed to accommodate bicycle lanes. In other cases there may be excess road capacity that permits eliminating a lane in order to accommodate bicycle lanes. There may be cases where an alternative road configuration that includes bicycle lanes will work equally as well if not better than the existing conditions for motorists, such as a four to three lane conversion. In most cases though, incorporating bicycle lanes is a compromise between the ideal motorized transportation facility and the ideal bicycle facility in order to establish a true multi-model facility within existing infrastructure limitations. The following guidelines illustrate various techniques for modifying existing facilities in order to incorporate bicycle lanes.

Adding Bike Lanes to High Speed Four and Five-Lane Roads

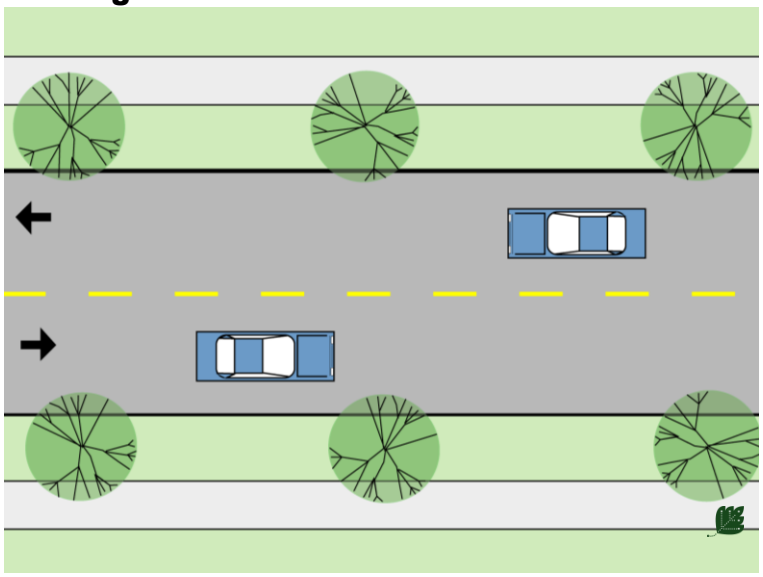
The narrowing of high speed four and five-lane roads to accommodate bike lanes has some specific conversion issues. Given the higher volumes of traffic, higher speeds and higher number of heavy vehicles on many of these roadways, it is desirable to keep the motor vehicle lane widths as close to an 11' minimum as possible. On some of Ann Arbor's four and five-lane roads, this may mean that it is not possible to accommodate a bike lane on both sides of the roadway.

As an interim measure for roads less than 60' wide, a bike lane on one side may be considered in conjunction with a shared lane/side path option on the other side. The bike lane should be located on the side with the most driveways and intersecting roads. The other option to consider if there are numerous intersecting roads and driveways on both sides to lower the speed of the roadway so that sub-11' lanes are more appropriate. This is best accomplished with changes to the physical roadway with such things as planted medians and/or crossing islands. These in combination with the narrow lanes will naturally slow traffic.

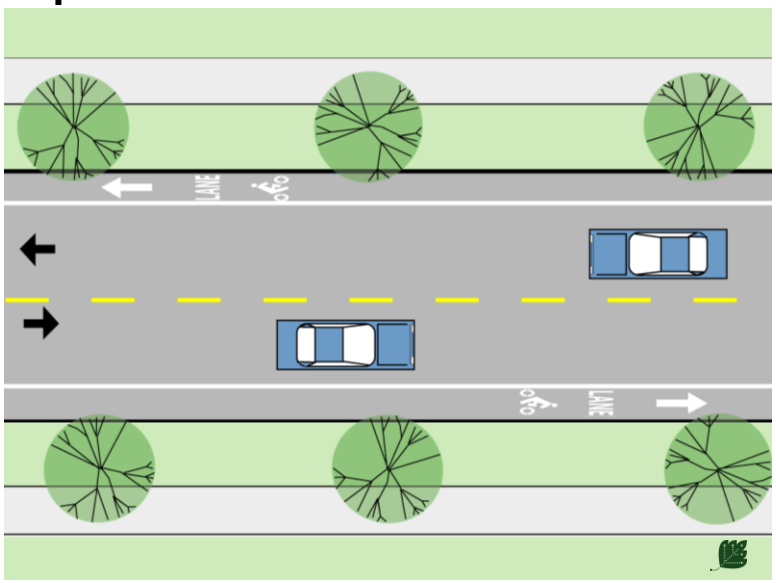
When there is not a bike lane in the road, the bicyclist should be provided the option to use a sidewalk bikeway or to bike in the road. Exit and entrance ramps should be used to ease the transition between on-road and off-road facilities.

Fig. 2.3M. Providing Bicycle Lanes Through Lane Narrowing Design Guidelines

Existing Conditions



Proposed Condition



Description

The travel lanes are narrowed allowing room for the inclusion of a bike lane. The bicycle lane has the additional advantage of providing a buffer between the travel lane and the curb.

AASHTO guidelines specifically discuss narrowing travel lanes in order to accommodate bicycle travel, although there are some situations where narrowing lanes may not be appropriate.

Application

In general, lane narrowing to provide for bicycle lanes may be considered in the following situations:

- 27’ or wider, 2 lane road
- 37’ or wider, 3 lane road (2 lane road with a center turn lane)
- 41’ or wider, 2 lane road with parking on both sides
- 47’ or wider, 4 lane road
- 52’ or wider, 3 lane road with parking on both sides
- 57’ or wider, 5 lane road

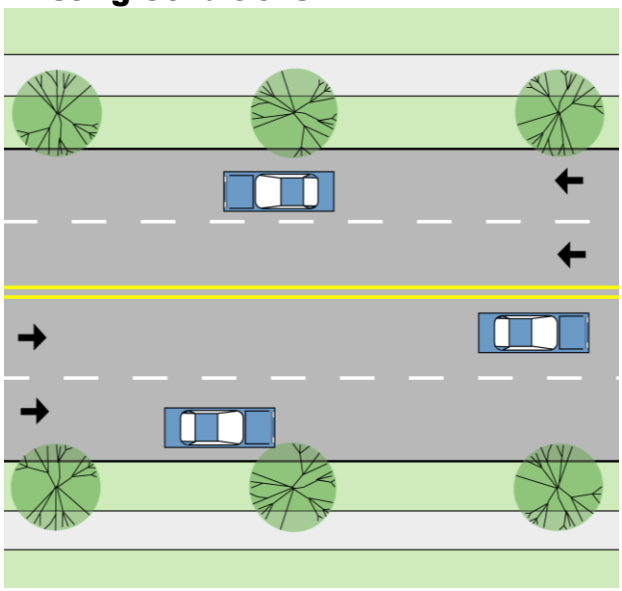
Higher speed roads may require additional width; see notes on multi-modal roadway design guidelines.

Example

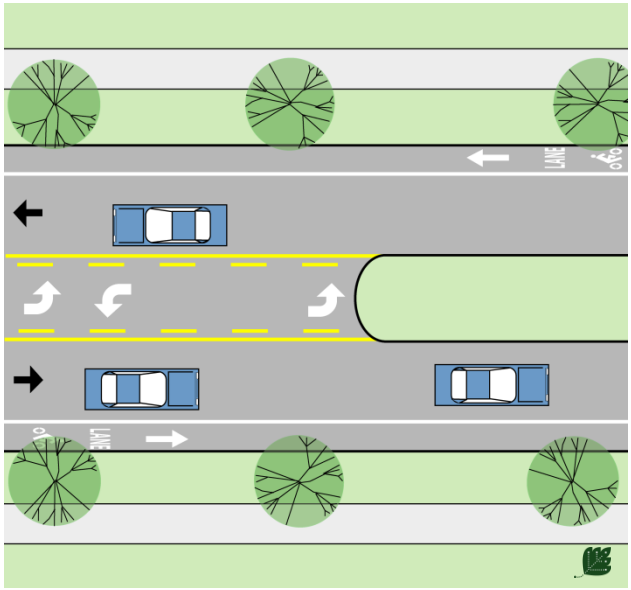
Lanes on parts of Miller Road and 7th Street were narrowed in 2004 to accommodate Bike Lanes.

Fig. 2.3N. Four-Lane to Three-Lane Road Conversions Design Guidelines

Existing Conditions



Proposed Conditions



Application statistics are referenced from:

Guidelines for the Conversion of Urban Four-lane Undivided Roadways to Three-lane Two-way Left-turn Lane Facilities, April 2001, Sponsored by the Office of Traffic and Safety of the Iowa Department of Transportation, CTRE Management Project 99-54

Description

Four-lane roads present several operational difficulties to motorists. Traffic is often weaving from lane to lane to avoid vehicles that are stopped in the left lane while waiting for a gap in oncoming traffic to make a left turn, or those slowing down in the right lane to make a right turn. The presence of a bicycle in the curb lane also adds to the weaving of traffic if there is not sufficient lane width to pass the bicycle while staying within the lane.

This constant weaving of traffic also makes judging when to enter the road from a driveway or side street difficult as lane positions are changing frequently. This is especially the case for left turns. To address the operational difficulties of 4-lane roadway, the roadway is reconfigured to two through lanes, a center shared left turn lane and/or median and two bike lanes.

Application

This type of conversion has been used on roadways with up to 24,000 vehicles per day (VPD). Modeling research has shown that there is no loss in Vehicular Level of Service until about 1,750 vehicles per hour (approximately 17,500 VPD) compared to a four-lane configuration. In addition to a significant improvement in the Bicycle Level of Service, these conversions have been also shown to provide a:

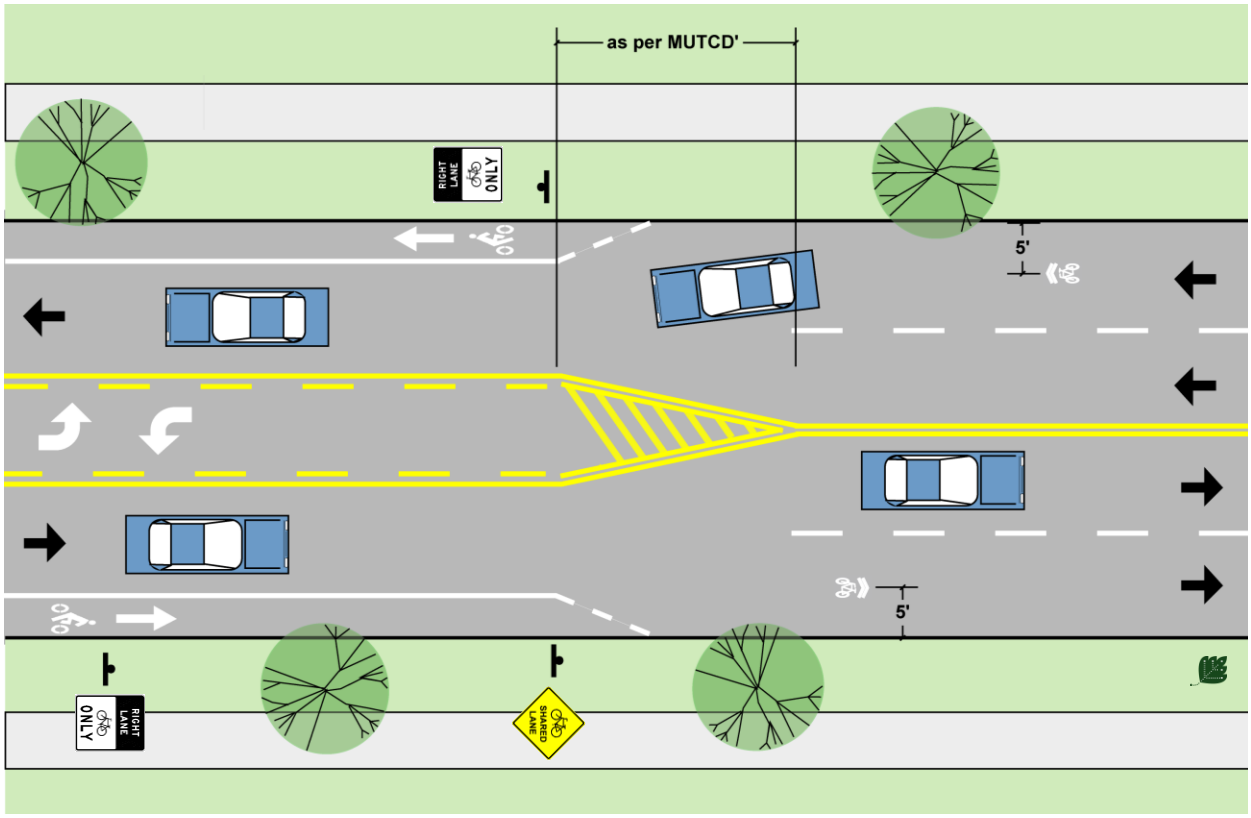
- Reduction of the 85% speed by about 5 MPH
- Dramatic reduction in excessive speeding (60-70%) of vehicles going greater than 5 MPH over the posted speed limit.
- Dramatic reduction in the total number of crashes (17-62%).

Conversions though must be evaluated on a case-by-case basis as numerous factors influence the appropriateness of 4 to 3 lane conversion.

Example

Main Street between Ann Arbor-Saline Road and Eisenhower Parkway was converted from 4 lanes to 3 lanes in 2004.

Fig. 2.30. Near-term Opportunities – Transition From Three Lanes to Four Lanes at Signals



Description

Where two motor vehicle lanes are needed to accommodate motor vehicle stacking at signalized intersections the bicycle lane may be dropped and replaced with the Shared-Use Arrow.

Application

This is an interim approach to accommodating vehicle stacking needs to be used where a bike lane is interrupted in the vicinity of a signal. The long-term solution would expand the intersection to accommodate bicycle lanes. The length of the four-lane segment should be minimized.

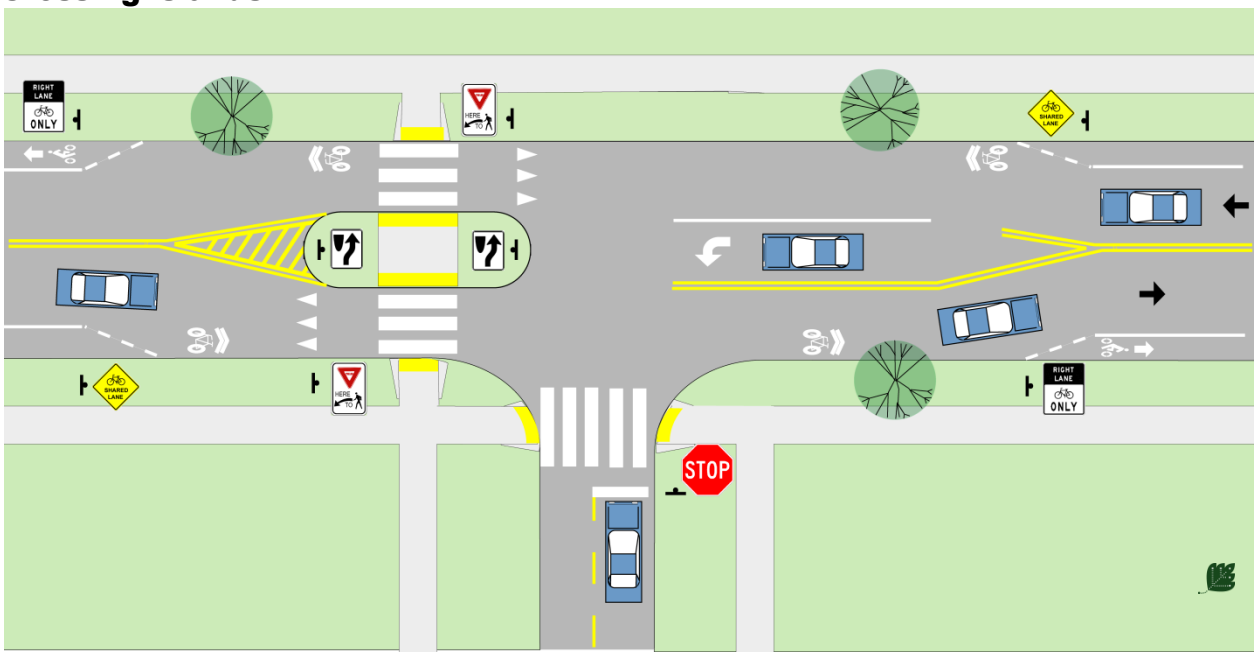
Example

While there is currently no exact example of this design in Ann Arbor, on Packard Road, Bike Lanes were dropped to allow for vehicular turn lanes.

Three to Two-Lane Road Conversions

There are cases where a three-lane cross section is used consistently when the need for turn lanes is only intermittent. In these cases a bike lane may be added in places where the turn lane is not warranted. The bike lane then may be dropped when the turn lane is introduced.

Fig. 2.3P. Near-term Opportunities – Accommodation of Turn Lanes and Crossing islands



Description

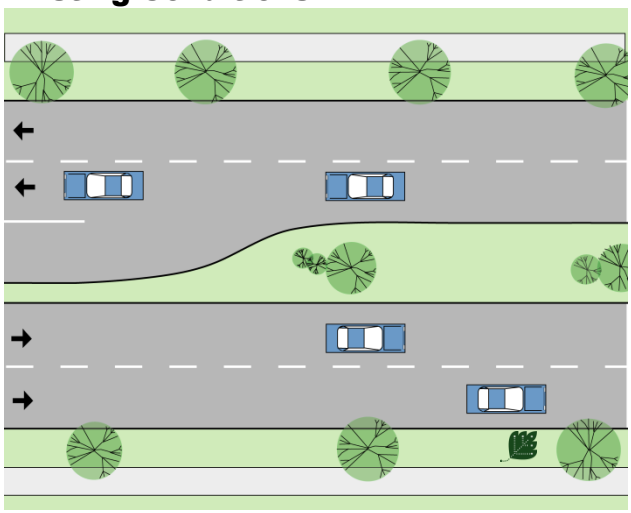
Where a designated left-turn lane is warranted and/or a pedestrian crossing island is appropriate, the bicycle lane may be dropped and replaced with the Shared-Use Arrow.

Application

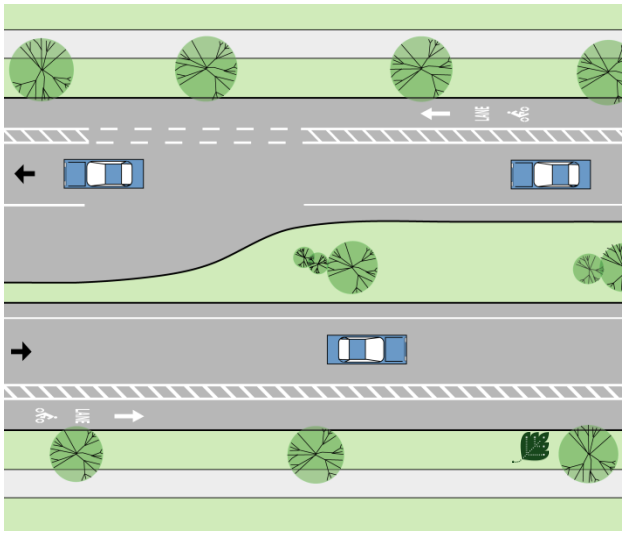
This is an interim approach to accommodating the turn lane and the crossing island. The long-term solution would expand the intersection to accommodate bicycle lanes. The length of the left-turn lane should only be as long as it needs to be to accommodate the conditions of each specific site.

Fig. 2.3Q. Four to Two-Lane Boulevard Conversions Design Guidelines

Existing Conditions



Proposed Conditions



Description

The existing condition is a four-lane boulevard with designated turn lanes. These roads have tremendous traffic volume capacity. There are some situations where this road design exceeds the needs of the roadway.

In the proposed condition, two lanes of through traffic are eliminated and bicycle lanes are added. As bicycle lanes are considerably more narrow than travel lanes, a striped buffer is added between the vehicular travel lane and the bike lane and an edge line is placed a few feet from the inside curb. This allows emergency vehicles to pass.

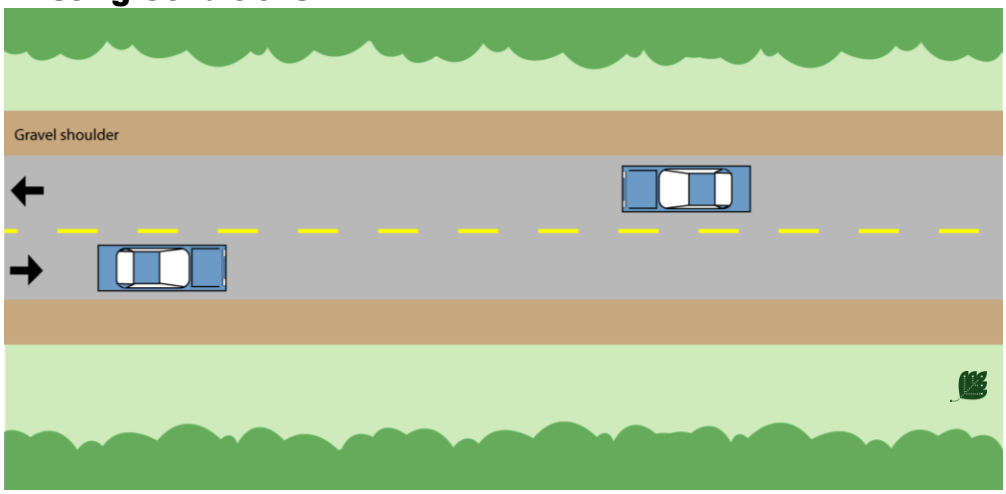
This striped buffer is replaced with a dashed line where bicycle-merging movements are expected.

Application

Where the existing and expected traffic volumes do not warrant four lanes of traffic with extended designated turn lanes. Earhart Road is the primary candidate in Ann Arbor for such a conversion.

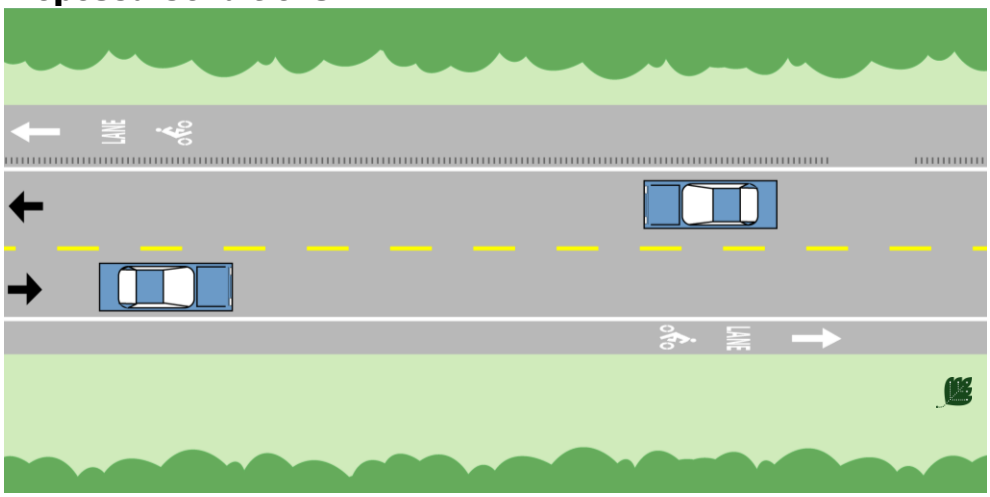
Fig. 2.3R. Paving Shoulders

Existing Conditions



A rural cross-section (no curbs) with gravel or grass shoulder. The existing roadway travel lanes are not of a sufficient width to accommodate bicycle lanes by lane narrowing.

Proposed Conditions



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Description

Paving the shoulder provides a separate bicycle facility and improves roadway conditions from a motor vehicle and maintenance standpoint. The use of rumble strips is discouraged as they may cause a bicyclist to lose control when they leave the bicycle lane to make a turn or to avoid an obstacle. If extenuating circumstances call for the use of rumble strips, breaks should be provided where appropriate to allow for a bicycle to safely leave the bike lane.

Application

Paved shoulders should be provided on all rural cross section roadways within the City. Where appropriate, bicycle lane pavement markings may be applied.

Sub-standard Bicycle Lanes and Edge Striping

There will be places where it will be impossible to reconfigure a roadway to accommodate even the minimum width of bicycle lane as described in AASHTO. In such cases it may be desirable to place a bike lane of a slightly narrower width in order to provide continuity of on-road facilities. At an absolute minimum, a bicycle lane next to a standard curb and gutter should have 3' of ridable surface (measured to the centerline of the lane stripe). In a case where that is not possible, a standard 4" edge stripe may be considered without the standard bicycle lane markings and signs.

Designation of Sidewalks or Sidewalk Bikeways as Bicycle Facilities

Since numerous studies have shown sidewalk bikeways to be a more dangerous place to bicycle than in the roadway, the City should not designate any new sidewalk bikeways as a designated bicycle facility. Rather, the choice of riding on a sidewalk or in the street should be up to the cyclist based on their experience, comfort level and current conditions. The sidewalk/sidewalk bikeway should be considered first and foremost for pedestrians. Bicyclists who choose to bicycle on a sidewalk/sidewalk bikeway (when permitted by law) must yield to pedestrians.

Routes currently signed as sidewalk bicycle routes should be reviewed on a case-by-case basis and should be removed as soon as practical. The sidewalk bicycle routes are non-standard signs that do not comply with MMUTCD standards. Also, none of the sidewalk bicycle routes that were evaluated meet AASHTO guidelines for designating sidewalks as signed bikeways. The sidewalk bicycle routes falsely indicate to motorists that bicyclists should not be expected in the roadway.

Completing and Repairing the Sidewalk System

Sidewalks should exist along both sides of all transit routes whenever feasible and most of Ann Arbor's primary roads serve as transit routes. The sidewalks should be constructed with concrete and should be a minimum of 6' wide along primary roads. While this plan focuses on the primary road system, the neighborhood sidewalk system is key to the City's non-motorized system. Commuters with disabilities, parents with strollers, seniors and small children need safe pedestrian routes within neighborhoods. In most neighborhoods there are gaps in the sidewalk system. Some neighborhoods are intentionally without sidewalks. Others have minor gaps that may be due to issues such as parcels that have been annexed into the City that were built with different requirements. Also, in some of the City's oldest neighborhoods the infrastructure has deteriorated to such a point where many of the sidewalks are not passable to individuals with even minor mobility impairments.

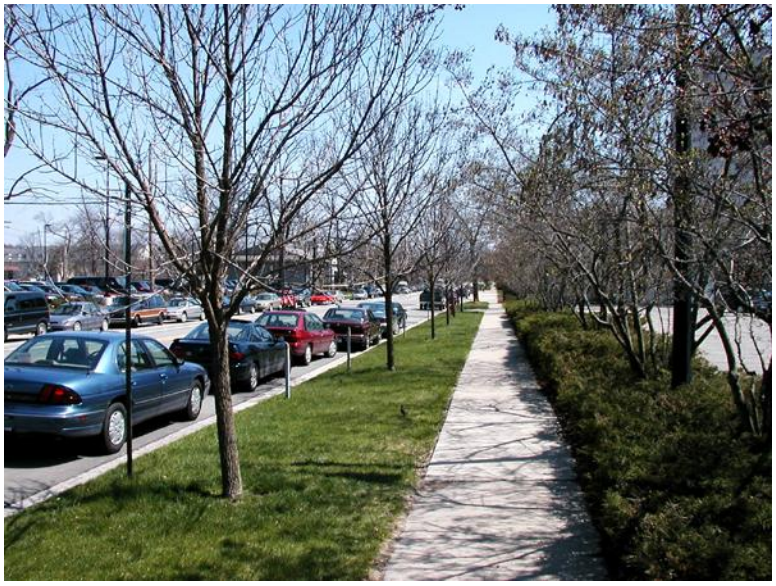
In the past, property owners with sidewalk gaps and sidewalks in poor repair have had little incentive beyond civic duty to remedy the situation as they bear the cost of the improvements. Enforcement was based on complaints from neighbors and made property owners feel singled out. In response to these issues, the City recently established a program to evaluate sidewalk conditions throughout the City. Property owners are notified through a variety of means of their requirement to keep the sidewalk in good condition, general costs of repair, and options to repairing deficient sidewalks. The City should also explore the potential when property changes ownership, sidewalks should be required to be installed within a set period of time, if sidewalks exist on adjacent properties.

Concrete sidewalks, a minimum of 5' wide and compliant with ADA standards, should be provided on both sides of all public and private streets in existing and proposed residential neighborhoods. Sidewalks are particularly important near schools, parks and other public venues. There may be cases though where sidewalks on both sides may not be feasible and/or desirable due to physical and/or natural feature constraints.

For neighborhoods or streets currently without sidewalks, a uniform approach should be developed that considers not only the sentiment of the majority of residents along the street, but also the importance of the sidewalk in a broader context. Given that sidewalks provide access beyond the households immediately adjacent to them, a cost share program should be explored to determine the most equitable way to fund projects that have significance beyond the immediate residences.

Improving the Landscape Buffer Zone

Through funding from the Elizabeth Dean Fund, the City's general fund and millages, many sidewalks are buffered from the roadway with trees which is a key factor in determining the quality of the pedestrian experience. Other sidewalks have no trees at all or in some cases are paved up to the back of the curb. With the onset of the Emerald Ash Borer, the City is losing many street trees. The City should use this as an opportunity to prioritize the planting of street trees. Streets with high traffic volumes should receive extra consideration as the street trees will help improve the pedestrian environment the most. The trees should be planted 30' on center along the roadway.



The presence of on-street parking, street trees and a landscape buffer improve the pedestrian experience.

Providing Seating

Providing benches and other seating options along collectors and arterials help make longer trips manageable for some pedestrians. The seating should be located in as pleasant a place as possible and shaded from the summer sun. Businesses and residents should be encouraged to provide and maintain benches for use by the general public.

2.4 Travel Across Road Corridors

Despite the dangers or inconveniences that exist, at some point in a pedestrian's or bicyclist's journey they will be required to cross a road. Crossing roadways pose challenges to safe navigation for pedestrians and bicyclists on their journeys. Ways to get across a road (including railroads) include intersections, mid-block crosswalks, bridges and tunnels. All pose unique challenges to pedestrians and bicyclists.

Bicyclists and pedestrians in many cases, cross the road in very different fashions. Bicyclists in the roadway most likely will make left turns just like a vehicle, merging across lanes as necessary. Their restrictions to crossing the road are primarily based on their comfort level of riding with traffic and the volumes, speed and gaps that exist. Some bicyclists, depending on the traffic conditions, choose to make left turns as pedestrians. They leave the roadway and cross the road at a crosswalk.

For pedestrians, and bicyclists who choose to cross the road as a pedestrian, crossing a road can be an intimidating experience. There are often limited safe and legal crossing options. Pedestrians are directed to cross roads at either intersections or at mid-block crosswalks. Each of those options has their own set of issues.

Intersection Issues

While generally, intersections are the safest place for pedestrians and bicyclists to cross the road, there are a number of issues to consider. Intersections are the most common places of conflict for automobiles, bikes and pedestrians. Even at a simple four way stop, there can be up to twelve different possible movements from the cars alone. Add in more lanes of traffic, and it can quickly get overwhelming. In 1999, 46% of non-motorized crashes in Southeast Michigan were intersection related[1]. However, if designed correctly, intersections can facilitate convenient and safe interactions for all users.

Signalized intersections are the hubs of activity on the roadway. It is a place with conflicting demands from many different users. For the most part, a roadway's vehicular capacity is determined at signalized intersections. From a pedestrian's standpoint, they often face a sea of left turning vehicles, right turning vehicles, and through traffic from four directions. When crosswalk signals require activation by a push button, pedestrians often ignore them because of their inconvenience. Even when pedestrians push the button, in most cases there is no feedback to the pedestrian that they have indeed activated the signal. Often when the signal phases are long, they will assume that the button is broken and cross the road at an inappropriate time.

Vehicles turning right-on-red also pose dangers to pedestrians. The driver of a vehicle is focused on the traffic to the left, looking for a gap. Frequently drivers do not look right for pedestrians beginning to cross the street before beginning their turn. Another problem occurs in situations where the view of the oncoming traffic is obstructed if the vehicle is behind the stop bar. Often times the driver of the vehicle will advance over the crosswalk to improve their sightline. If they are unable to proceed they completely block the crosswalk with their vehicle. This is a common occurrence especially in the downtown area where right-on-red is permitted even when clear sight lines do not exist from behind the stop bar.

Vehicles turning left at busy intersections with few gaps in traffic can also be problematic to pedestrians. The driver of a left turning vehicle in such cases is often focused primarily on finding a suitable gap in oncoming traffic and may commit to turning left before noticing a pedestrian in the crosswalk.

[1] Department of State Police Michigan Accident Location Index, 1997-1999.

Ann Arbor also has many intersections where the roads meet at odd angles. This results in wider than typical intersections. When the pedestrian "Walk" phase is triggered concurrent with a red light signal for the cross traffic, motorized vehicles are often moving through the far crosswalk at the same time the pedestrian "walk" phase begins.

From a bicyclist standpoint, one of the most frustrating circumstances is not being able to trigger a traffic signal. Many traffic signals in Ann Arbor are activated by detector loops placed in the pavement that sense a change in the magnetic field. Depending on how the detectors are adjusted, the position of the bicycle and the nature of the bicycle's frame and wheel, a bicycle may not be able to trigger a signal. As a result, a bicyclist must either leave the turn lane and cross as a pedestrian, ignore the signal, or position themselves forward of the detector into the intersection and wait for a vehicle behind them to trigger the signal.

Unsignalized intersections are also key points where pedestrians and bicyclists want to cross the road corridor. When the crosswalks are left unmarked, pedestrian travel is often discouraged.

The aforementioned issues are addressed throughout the following guidelines and in *Section 3 – Proposed Policies and Programs*. In addition, special attention has been paid to addressing crossings at points other than signalized intersections.

General Crosswalk Design

Marking a crosswalk serves two purposes: (1) it clarifies that a legal crosswalk exists at that location and (2) it tells the pedestrian the best place to cross .[1] Several issues should be considered when designing safe crosswalks, including visibility, communicating the pedestrian's intent, minimizing crossing distance, snow obscuring the road surface, and accommodating persons with special needs.

[1] AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities (Draft).* August 2001.

Visibility

Increasing the visibility of all users crossing the road is a key issue for pedestrian safety. The ability of pedestrians to see motorists is equally as important as their own visibility in the roadway. Marked crosswalks should be included only where sight distance is adequate for both pedestrians and motorists. Obstructions in sight lines should be minimized. Visibility can be improved with the following design treatments:

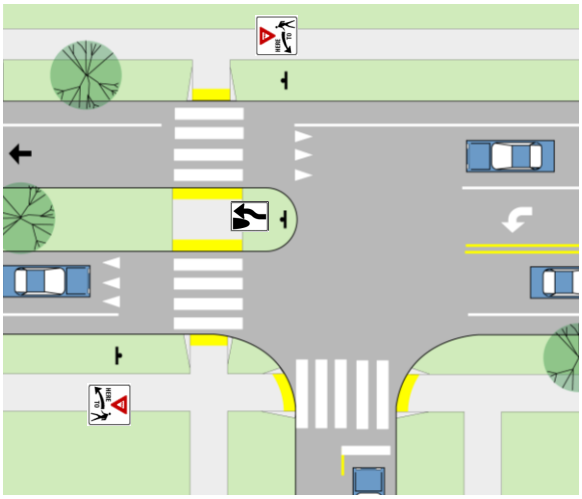
- Wide white ladder crosswalks.
- Stop lines or yield lines that are set back from the crosswalk a sufficient distance to increase visibility from all lanes of traffic.
- Signage directing motorists to yield to the pedestrians.
- Placement of signage that does not obstruct the visibility of the pedestrians.
- Curb extensions (bulb outs), extending the curb out at intersections, also minimize pedestrian crossing distance.
- Removal of low hanging branches and minimal planting between the oncoming vehicles and the sidewalk approaches to the crosswalk such that sight distances are in accordance with AASHTO guidelines.
- Lighting of the crosswalk and the sidewalk approaches.

Understanding the Pedestrian's Intent

Road users should be able to discern if a pedestrian is planning to cross the road so that they may take appropriate measures. If a crosswalk is located where a sidewalk directly abuts the roadway, the road users cannot tell if someone is simply going to walk by the crosswalk or abruptly turn and attempt to cross the street. Also, places where pedestrians may typically congregate, such as bus stops, may cause road users to needlessly stop. To help clarify the pedestrian's intent to cross the road, intersections should incorporate the following features:

- A short stretch of sidewalk perpendicular to the roadway where only pedestrians planning to cross the street would typically stand.
- Placing bus stops past the crosswalk to avoid blocking the crosswalk.
- Distancing the crosswalk from places where pedestrians may congregate adjacent to the roadway without the intent to cross the road.
- Installing curb extensions to reduce the crossing distance for pedestrians and to slow traffic, (see Fig. 2.4B)

Figure 2.4A. Pedestrian Crossing island



Crossing islands

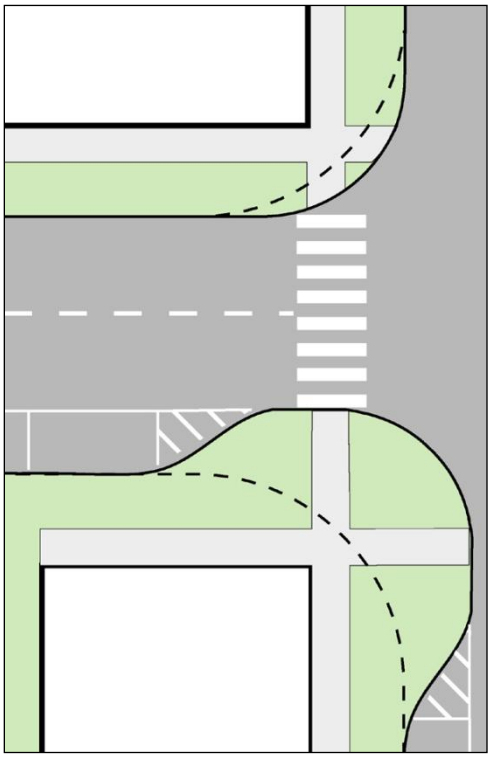
Crossing islands are raised areas that separate lanes of opposing traffic and eliminating the need for pedestrians to cross more than one direction of traffic at a time (see the figure to the left).

Crossing islands allow the pedestrian to undertake the crossing in two separate stages. This increases their comfort level and opens up many more opportunities to safely cross the road.

Crossing islands increase the visibility of the crosswalk to motorists and reduce pedestrian crossing distances.

Crossing islands should be considered for all unsignalized marked crosswalks that traverse three or more lanes.

Fig. 2.4B. Effect of curb extensions and smaller curb radii on pedestrian crossing distances



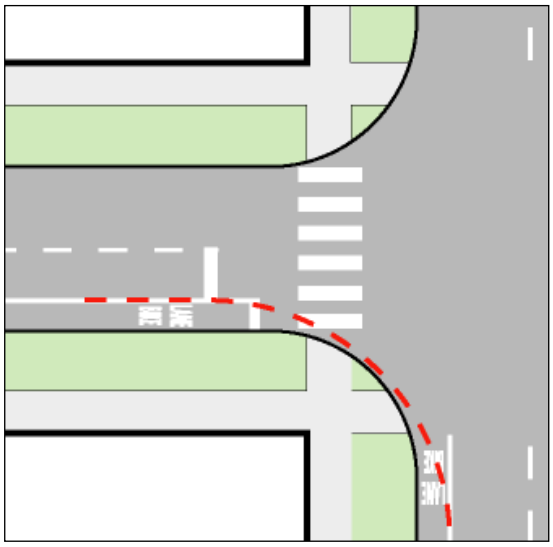
Minimizing Crossing Distances

Minimizing the distance that pedestrians need to cross the street is another critical safety issue. As crossing distances increase, the comfort and safety of a pedestrian decreases. Simple design solutions such as reducing curb radii, and adding curb extensions, shorten crosswalk distances. As well they reduce the potential for pedestrian-vehicle conflict. Larger corner radii promote higher turning speeds and increase pedestrian crossing distances. See the figure to the left.

In addition to increasing visibility and shortening crossing distances for pedestrians, curb extensions increase the space available for directional curb ramps and prevent parked cars from encroaching on the crosswalk. Curb extensions also serve to make a pedestrian's intent to cross the road known to motorists before they have to step into the roadway.

For signalized intersections, shorter crosswalks mean more time for the pedestrian "Walk" phase and a shorter clearance interval "Flashing Don't Walk" phase.

Fig 2.4C. Effect of Bike Lanes on Turning Radius



Minimizing Turning Radius When Bike Lanes are Present

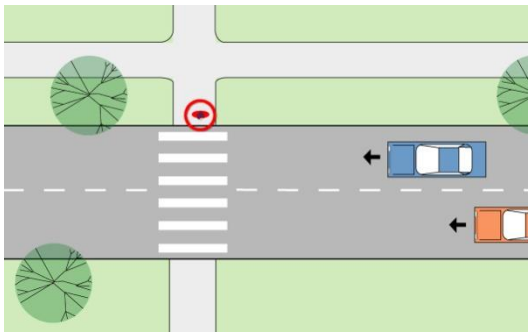
Bicycle lanes provide an added advantage of effectively increasing the turning radius for motor vehicles. This is especially the case where both intersecting roads have bike lanes as shown in the figure to the left.

This also applies to driveways. When a sidewalk is close to the road, the curb radius of an intersecting driveway is typically quite small. In these cases, a bicycle lane can significantly improve the ease of entering and exiting the driveway. For example a 5' curb radius adjacent to a 3.5' bike lane has an effective turning radius of 10' (including the gutter).

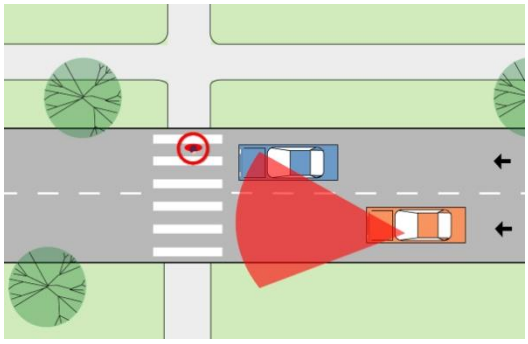
The increased effective turning radius means that motorists are less likely to encroach on adjacent motor vehicle lanes during the turning movements.

Fig. 2.4D. Multiple Threat Crashes Issues

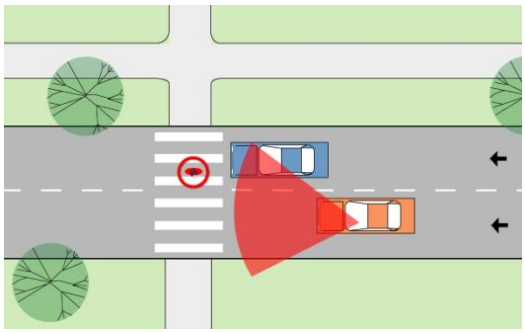
Whenever a crosswalk traverses multiple lanes of traffic traveling in the same direction, there is a potential for what is known as a multiple-threat crash. The crash unfolds as follows:



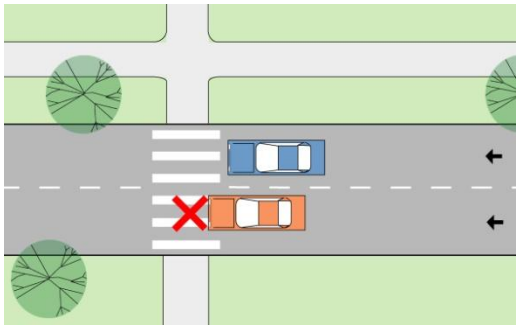
1. The driver in the lane closest to the pedestrian sees the pedestrian approaching the ramp or just entering the roadway and begins to slow down



2. The driver closest to the pedestrian lane stops, yielding the right-of-way to the pedestrian. The car is stopped immediately adjacent to the crosswalk, therefore blocking the sightlines between the pedestrian and the driver of the other car.



3. The driver of the other car fails to see the pedestrian and continues towards the crosswalks without slowing down.



4. The driver of the second car does not see the pedestrian until it is too late to come to a complete stop and hits the pedestrian.

A combination of high visibility crosswalks, yield lines set back from the crosswalk, and crosswalk signage on both sides of the street can help provide better visibility of pedestrians in the crosswalk. See Fig. 2.4Y for recommended countermeasures.

Accessibility

Providing accessible options for all users crossing the street is required by law. Keeping up-to-date on changing accessibility guidelines is critical to the safety and success of all new intersection and mid-block crosswalk construction. Crosswalk locations that are only identifiable by sight, have blocked sight lines, have short signal timings or signals without accessible information, act as barriers of information and barriers to movement for people with visual or mobility impairments. Several treatments of the crosswalk can increase accessibility for impaired users and many of them are required by ADA and are MMUTCD standards:

- Audible pedestrian signals indicate when the pedestrian signal has changed and the traffic has come to a stop. This prevents a person with a visual impairment from having to discern traffic flow solely through the traffic sounds, which can be difficult at busy intersections and not always reliable.
- Pedestrian activated locator-tone signal buttons placed in a consistent location at every intersection will aid the visually impaired. Even more helpful, passive pedestrian detection technology eliminates the need for pushbuttons, yet maintains the traffic optimizing advantages of pedestrian activated signals.
- Directional curb ramps guide people with visual impairments to the crosswalk.
- Detectable warning strips at the ends of the crosswalk warn the visually impaired when they are leaving the sidewalk and entering the roadway.
- Median crossing islands should also include detectable warning strips, curb ramps with a level landing or full cut-throughs at road grade for accessibility.
- Pedestrian triggered mid-block control signals aid those with mobility impairments, as well as anyone trying to judge the safest time to cross between gaps in traffic.

Tactile and contrasting color detectable warning strips provide pedestrians with vision impairments and important queue that they are leaving the sidewalk and entering a street.

Including the options listed above in new crosswalk design makes the pedestrian environment safer for all users. Consistent design treatment of crosswalks will help users of all abilities feel more comfortable and more able to navigate road crossings. Continuity in design will not only allow pedestrians to feel more at ease, but motorists too, will know what to expect and where to look for it.

Fig. 2.4E. Blue Bike Lanes – Experimental Marking

Description

These are used to increase the visibility of bike lanes at potential conflict points such as where a vehicle would have to cross over a bicycle lane to access a right turn lane.

Application

This is an experimental marking. The City should evaluate existing installations around the country and apply to FHWA to test the marking in an appropriate location in the City.

Fig. 2.4F. Countdown Signals


"Walk" Phase

Clearance Interval


"Don't Walk" Phase

Description

These operate in the same manner as typical pedestrian signals, with one addition. At the onset of the Clearance Interval (flashing "Don't walk" or red hand), the signal counts down the remaining time until the "Don't Walk" phase (solid "Don't Walk" or red hand).

Pedestrians find these very intuitive to use and they can help clear up many misunderstandings as to the purpose of the Clearance Interval. Studies have shown that fewer pedestrians remain in the street at the end of the Clearance Interval with countdown signals than with standard pedestrian signals. These signals have been very well received by pedestrians and have reduced complaints in some communities regarding pedestrian signal timing.

Application

The City should consider using the pedestrian signals with an integrated countdown clock for all new and replacement pedestrian signals. The City should consider adding countdown clocks to existing signals at high pedestrian volume signalized crosswalks and locations where the crosswalk is longer than 50'.

Fig. 2.4G. Portable Speed and Traffic Detectors

Description

These portable detectors have the ability to perform traffic counts, speed studies and indicate a driver's speed on a LED display. Some models have a strobe light that may be activated when the speed limit is exceeded. They have been shown to reduce speed in before and after studies.

Application

These may be moved into an area where speeding is of concern to residents. The device may be used without displaying the speed to get a baseline speed study and traffic count in an unobtrusive manner. It may then be set to display the speed. Numerous inexpensive mounting plates may be put in place around the City and the detector can be easily and economically moved from place to place. These would be ideal for school zones where speed is a concern.

Fig. 2.4H. Active Crosswalk Warning Systems

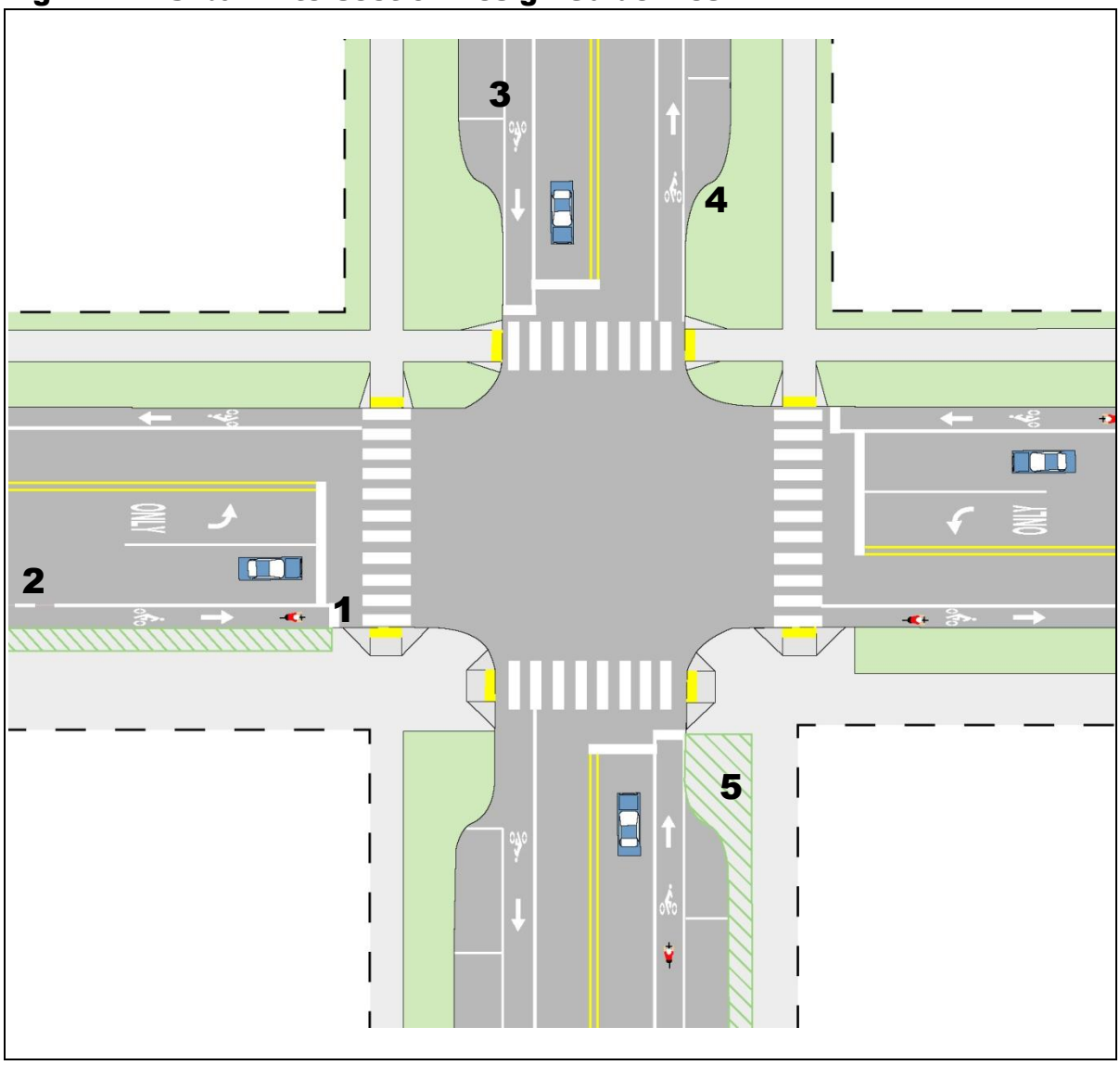
Description

A flashing beacon and/or in-pavement flashing LED's are activated when a pedestrian is present. The signals may be passively activated through a number of methods or activated via a standard push button. The pedestrian approach can also be set to flash a red light with a sign indicating to cross after traffic clears. Various manufacturers have solar powered models with radio controls to activate flashers on advance warning signs and on signs on the opposite side of the street. This significantly reduces the cost of installation and operation.

Application

These systems are best located at pathway and major road intersections, or mid-block crosswalks on major roadways where pedestrian traffic is sporadic. Passive activation works best when there is a long pedestrian approach such as pathway.

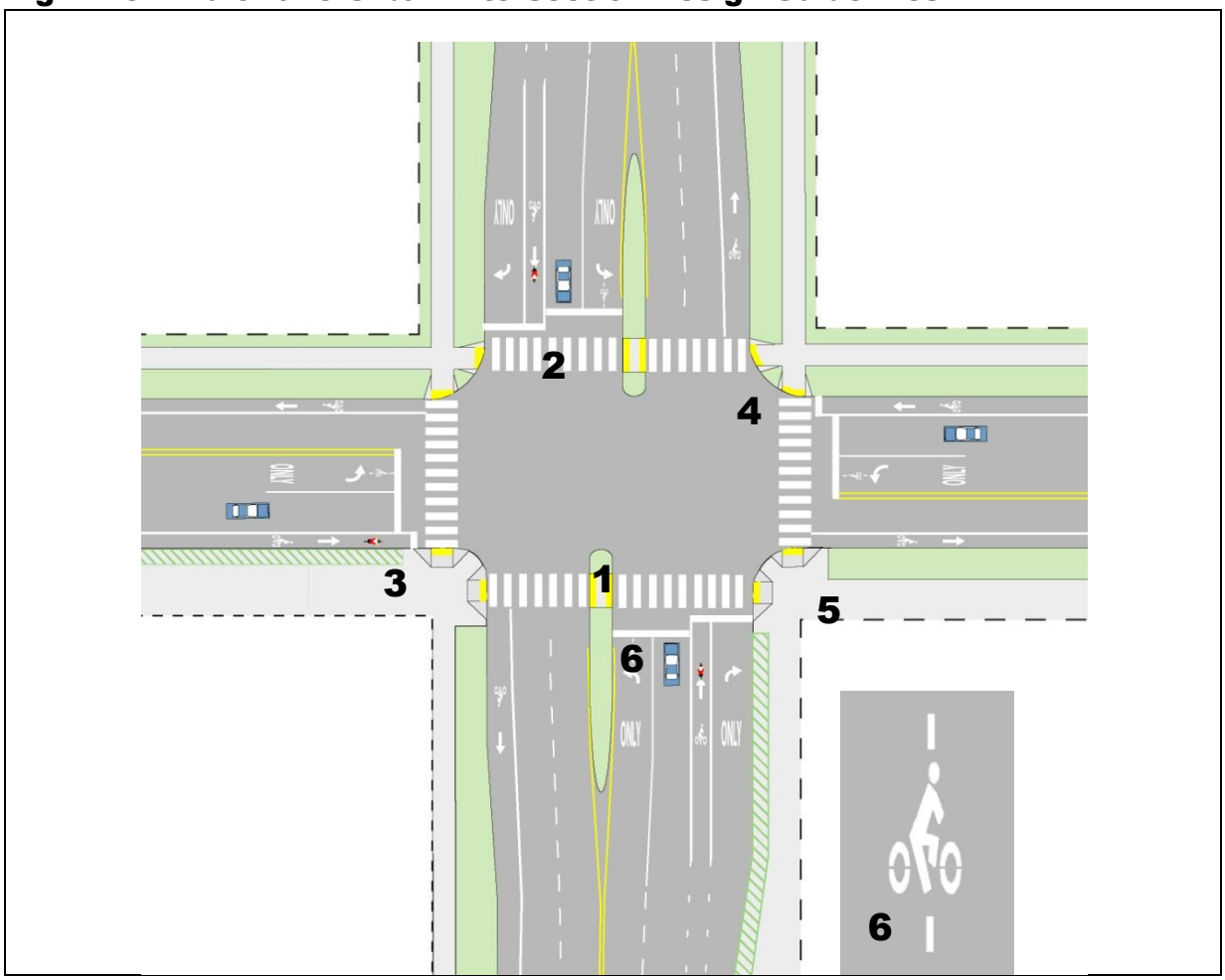
Fig. 2.4I. Urban Intersection Design Guidelines



Key Elements

1. Bike lane striping should stop at the pedestrian crosswalks and resume on the far side of the intersection. Unusual alignments may be aided by extending dashed guidelines through the intersection.
2. Bike lane striping is dashed at the intersection approach to indicate that bikers may be merging with traffic to make a turn.
3. Striping between the parking lane and bike lane encourages motorists to park closer to the curb and discourages motorists from using the bike lane in combination with an unused parking bay as a travel lane.
4. Curb extensions reduce the crossing distance of pedestrians and improve sight distance for both motorists and pedestrians. Curb extensions should be used wherever there is on-street parking.
5. In urban areas, a furniture and street tree zone provides a buffer from the street and improves the pedestrian level of service rating. A sufficiently wide travel way should be clear of any obstructions.

Fig. 2.4J. Multi-lane Urban Intersection Design Guidelines

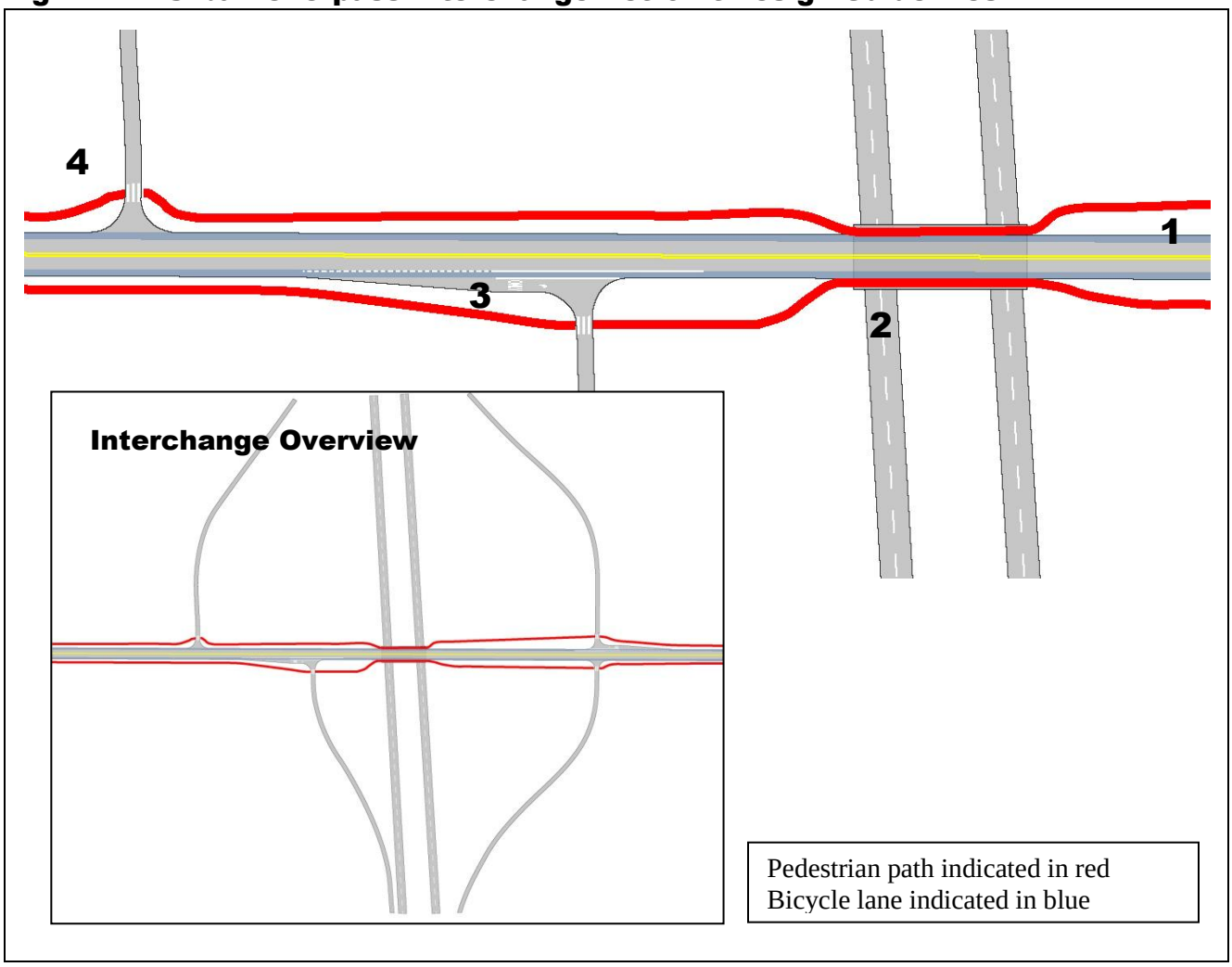


Key Elements

1. Pedestrian crossing islands should be installed at wide, multi-lane streets with high traffic volumes. Curbs, signs, and street hazard markings should delineate the islands.
2. Crosswalks should be a minimum of 10' wide and clearly marked with a white ladder design to increase visibility and resist tire wear.
3. Bike stop bar is advanced several feet ahead of vehicle stop bar to minimize conflicts of right turning cars with through bike traffic.
4. A small curb radius shortens the pedestrian's crossing distance and controls traffic speed around corners. Bike lanes provide a significantly larger effective turning radius than the actual curb radius and should be considered in turning radius calculations.
5. Perpendicular ramps should be built 90 degrees to the curb face and should include a detectable warning strip for visually impaired people.
6. Traffic detectors in left turn lanes should be designed to detect bicycles. Detectors should include pavement markings that indicate where bikes can best be detected.
7. Timing of the traffic signal should allow adequate all red phases to provide sufficient clearance time for bikes to clear an intersection.

Other intersection features may include Right-On-Red turning restrictions, leading pedestrian interval signal phases, and audible signals for visually impaired users where appropriate.

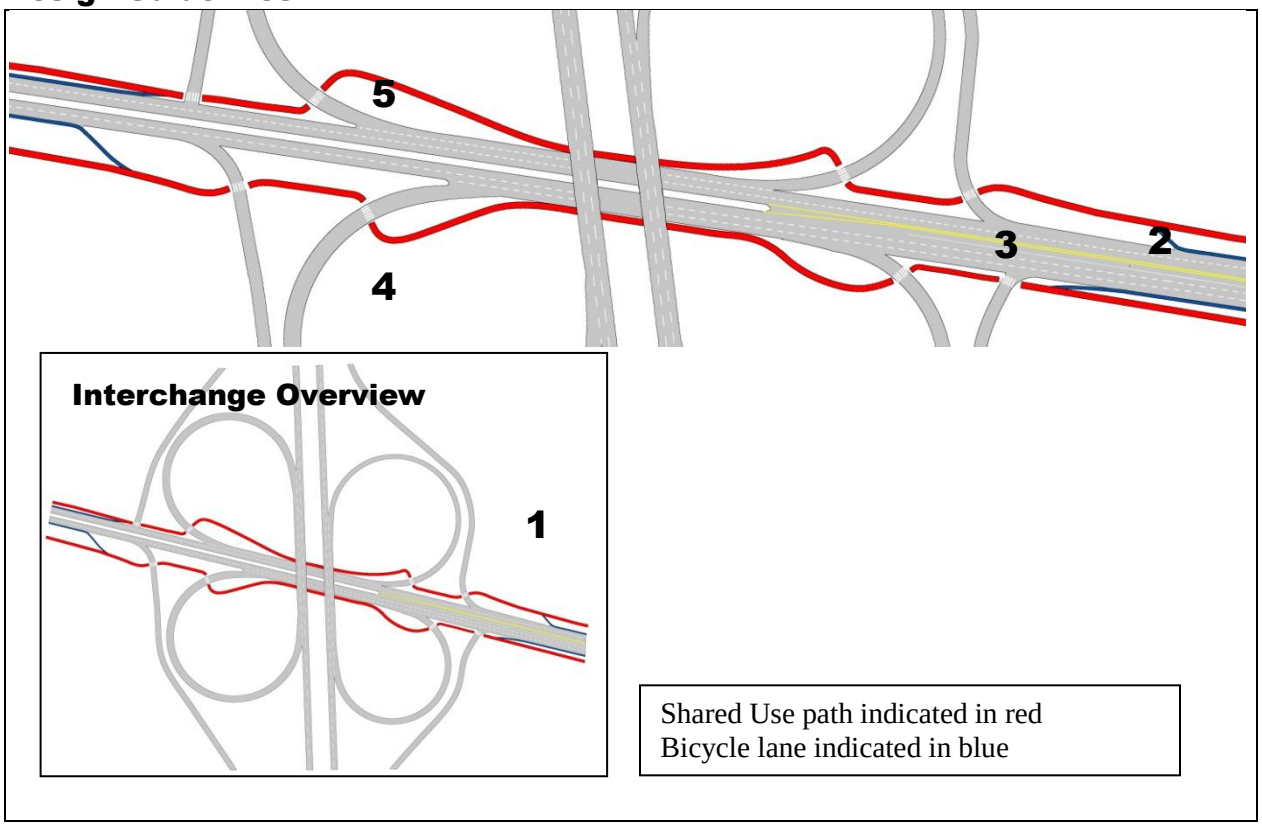
Fig. 2.4K. Urban Overpass Interchange Retro-fit Design Guidelines



Key Elements

1. Bike lanes must be on both sides of the road to allow cyclists to ride with traffic.
2. Sidewalks with barriers between the sidewalk and the roadway should be provided at the bridge. If retrofitting an existing bridge, consider cantilevering a sidewalk, as was done on the Liberty Street and Scio Church Road overpasses.
3. The through bike lane should be to the left of the right turn lane onto the approach ramp.
4. Curb radii of ramps are tightened to narrow pedestrian crossing distances and crosswalks are clearly marked.

Fig. 2.4L. Urban Free-flow Underpass Interchange Retro-fit Design Guidelines



Description

Free-flow ramps pose many dangers to bicyclists and pedestrians. Motor vehicle speeds are high and a lot of merging movements occur in different lanes. When interchanges are reconstructed, all ramps should be brought perpendicular to the roadway to reduce speeds at crosswalk locations.

Key Elements

1. A Shared-use Path circumnavigating the interchange reduces the conflicts between non-motorized traffic and merging vehicles.
2. Approaching the intersection, bike lanes leave the roadway and merge with the sidewalk to form a Shared Use Path.
3. On-ramp radii are tightened to slow right-turning traffic.
4. Shared-use Path meets all roadways at right angles. The distance that pedestrians and bicyclists must cross at the ramps is minimized. Path crosses ramps in a location with good visibility, where speeds are low, and where the driver is not entirely focused on merging with traffic.
5. Shared-use Path should be at least 10’ wide.

Signal Timing and Turn Restrictions

The length of pedestrian signals are generally determined primarily by the motor vehicle flow with the exception of a few cases where the motor vehicle phase is lengthened to accommodate a long pedestrian clearance interval. Where there is heavy pedestrian flow, such as in the campus area, the flow of pedestrians should be given the same consideration as motor vehicles in setting signal timing.

Where intersection geometry is such that the intersection is wider than typical, motor vehicle clearances should be evaluated to make sure that the pedestrian Walk phase is not started when motor vehicles would be moving through the crosswalk. Also, the motor vehicle clearance time should be set to account for bicycle traffic.

Motorists are prohibited from blocking crosswalks by law. The City should evaluate restricting right turns where a vehicle cannot see cross street traffic without entering a crosswalk. Where there is significant pedestrian traffic in a crosswalk that conflicts with motor vehicles making right turns, the City should evaluate the feasibility of using a leading pedestrian interval of approximately 5 seconds. A leading pedestrian interval providing pedestrians with the "Walk" phase prior to motor vehicles given the green light has been shown to help prevent right turning vehicles from cutting off pedestrians trying to leave the curb.

Leading pedestrian intervals and restrictions on right turn on red may be used to minimize conflicts between motorists and pedestrians in crosswalks.

Unsignalized Mid-block Crosswalks

The majority of pedestrian trips are ¼ mile or less, or a five to ten minute walk at a comfortable pace[27]. Any small forced detour in a pedestrian's path has the potential to cause significant time delays if not shift the trip to another mode (most likely motorized). Pedestrians will seek the most direct route possible and are not willing to go far out of their way. Thus, they will often cross the road whether there are crosswalks or not. This results in the increased likelihood of pedestrians unexpectedly dashing out mid-block. This is the second most common type of pedestrian/vehicle collision after intersection related crashes.[28]

A concern with any mid-block crosswalk is providing the pedestrian with a false sense of security. This concern must be weighed against accommodating and encouraging pedestrian travel. If we are to encourage safe and legal pedestrian travel, well designed, high visibility mid-block crosswalks should be provided at appropriate locations. The use of a sign oriented toward pedestrians that states "Cross Road When Traffic Clears" has been used in other communities to underscore the pedestrian's responsibilities at unsignalized crosswalks.

Understanding pedestrian routes and common pedestrian destinations will guide the placement of mid-block crosswalks at needed locations. According to AASHTO's *Guide for the Planning, Design, and Operation of Pedestrian Facilities*, there are numerous attributes to consider when determining whether placement of a mid-block crosswalk is appropriate. These include:

- The location is already a source of a substantial number of mid-block crossings.
- Where a new development is anticipated to generate mid-block crossings.
- The land use is such that pedestrians are highly unlikely to cross the street at the next intersection.
- The safety and capacity of adjacent intersections or large turning volumes create a situation where it is difficult to cross the street at the intersection.
- Spacing between adjacent intersections exceeds 200 m (660 ft or an 1/8 of a mile).
- The vehicular capacity of the roadway may not be substantially reduced by the midblock crossing.
- Adequate sight distance is available for both pedestrians and motorists.

[27] AASHTO. *Guide for the Planning, Design, and Operation of Pedestrian Facilities.* July 2004.
[28] FHWA, Pedestrian and Bicycle Crash Types of the Early 1990's, Publication No. FHWA-RD-95-163, June 1996

Unsignalized Marked Mid-block Crosswalk Signage

Fig. 2.4M. Old Guidelines - 1994 MMUTCD

Pedestrian Warning Sign

W11-2 (W11-1 for Bikes)
30" x 30"

Crosswalk Warning

W11A-2
30" x 30"

Prior to August 15, 2005 in Michigan, Pedestrian Warning (W11-2) signs were used to alert motorists approaching a marked crosswalk with a Crosswalk Warning (W11A-2) located immediately adjacent to the crosswalk. The Crosswalk Warning Sign was distinguished from the Pedestrian Warning sign by the narrow lines at the bottom of the sign representing the crosswalk. Many motorists are unaware of the difference between the two signs. In addition, many motorists do not know what they are required to do when a pedestrian is in the crosswalk. These shortcomings have lead to a new sign in the 2005 MMUTCD.

Fig. 2.4N. Current Best Practices in the 2005 MMUTCD

Pedestrain Warning Sign

W11-2
and
W16-Ahead

R1-5a

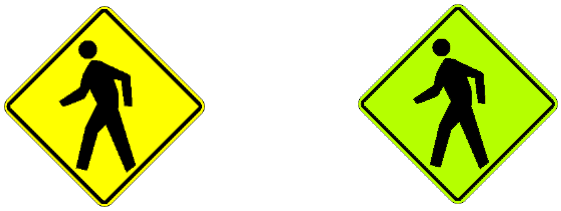
R1-5

Crossing Sign

On August 14, 2005 Michigan adopted the 2003 National MUTCD with a Michigan supplement that addresses laws specific to Michigan, this document is referred to as the 2005 MMUTCD. The new pedestrian warning signs included in the 2005 MMUTCD address the confusion between the similarity of the existing signs as well as the issue of who yields to whom at the crosswalk. The new crosswalk signs clearly indicate that the motorists are responsible for yielding to pedestrians in the crosswalk and where exactly they should do so. They are used in conjunction with a yield line consisting of a row of isosceles triangle pavement markings across approach lanes and pointed towards approaching vehicles. The triangles indicate at what point the yield is intended to be made. See Fig. 2.4N for further discussion of the placement of these pavement markings in conjunction with the R-15a and R1-5 signs.

Ann Arbor's City Code may need to be modified to clarify the use of "Yield Here to Pedestrian" signs. Current Ann Arbor Municipal Code, 2002, 10:148. (b) "Pedestrians Crossing Streets" states that "No operator of a motor vehicle or bicycle shall interfere with pedestrians or bicycle traffic in a crosswalk into which vehicle traffic is then restricted by a traffic control device." Crosswalk markings and the "Yield Here to Pedestrian" signs are traffic control devices. The City Attorney should determine whether "not interfering" can be interpreted as "yielding". Once the City Code is modified, (if deemed necessary) these signs may be phased-in at new crosswalks and at key existing crosswalks.

Fig. 2.4O. Yellow vs. Fluorescent Green Signs



Fluorescent Green should be used for signs within a special zone or for a particular type of crossing such as a school crossing.

Fig. 2.4P. In-Road Signs

R1-6

Many communities use Yield to Pedestrian signs placed within the crosswalk that alert motorists of pedestrian crossings and calm traffic in the vicinity of the crosswalk. These in-street crossing signs cannot be used at signalized locations. If the In-Street Pedestrian Crossing sign is placed in the roadway, the sign should comply with the breakaway requirements of AASHTO's guidelines. The in-street sign may be used seasonally to prevent damage in winter from plowing operations.

Ann Arbor's City Code may need to be modified to clarify the use of "Yield Here to Pedestrian" signs.

In-Road Removable Yield to Pedestrian signs may be used temporarily as part of an education and/or enforcement program in a targeted area or on a semi-permanent basis for critical crosswalks. Ann Arbor's City Code may need to be modified to clarify the use of "Yield Here to Pedestrian" signs.

Fig. 2.4Q. School Crossing Sign Options

Advanced Warning

Crosswalk Warning Options

Non-standard Alternative

In-Street Crosswalk Marking Alternative to Crosswalk Warning Sign

The School Crossing signs are intended to be placed at established crossings that are used by students going to and from school. However, if the crossing is controlled by stop signs, S1-1 should be omitted at the crosswalk location. Only crossings adjacent to schools or on designated routes to school should be signed with S1-1.

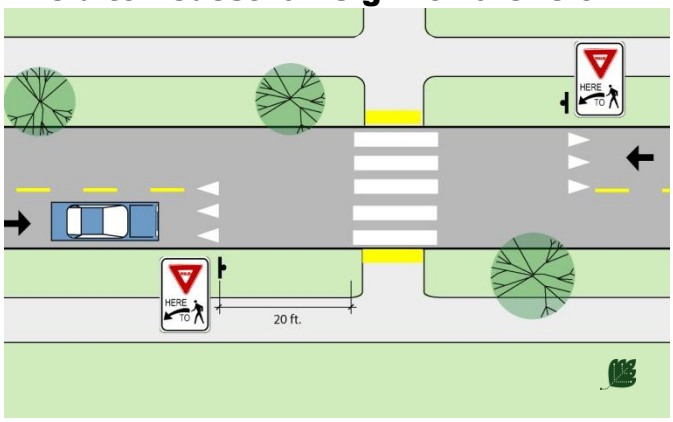
If the City determines that the "Yield Here to Pedestrian" signs are more effective as traffic control devices than the School Crossing signs, the City should consider adding a supplemental plaque (as shown on the Non-standard Alternative Crosswalk Warning Option above) that indicates "Yield to Peds in X-Walk". This would provide a consistent message. Some communities have placed a regulatory plaque (black lettering on a white background) with the same message. Another options indicated in the 2005 MMUTCD is using an in-street Yield to Pedestrians sign.

If the two-sign assembly is used at the Crosswalk it is recommended that the sign be placed slightly behind the crosswalk, so as not to obstruct the views of motorists. A School Advance sign (S1-1) should be used in advanced of every School Crossing sign.

Numerous communities have added supplemental plaques to their School Crossing Signs with the "Yield to Peds in X-Walk" message.

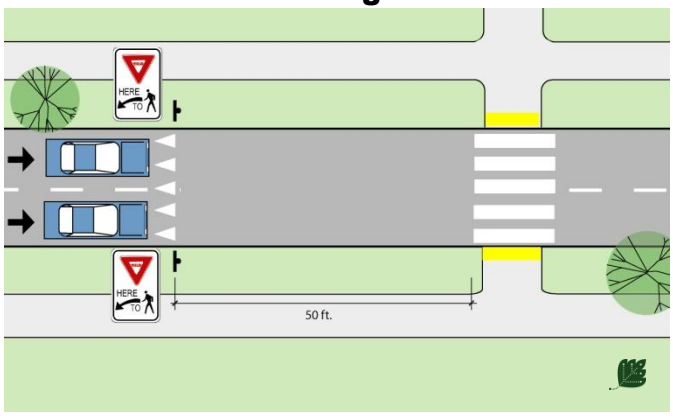
Fig. 2.4R. Crosswalk Sign and Yield Line Placement

"Yield to Pedestrian Sign" on a One or Two-Lane Road



"Yield Here to Pedestrians" signs and yield line pavement markings should be placed a minimum of 20 ft. in advance of a crosswalk to encourage drivers to stop a greater distance from the crosswalk.

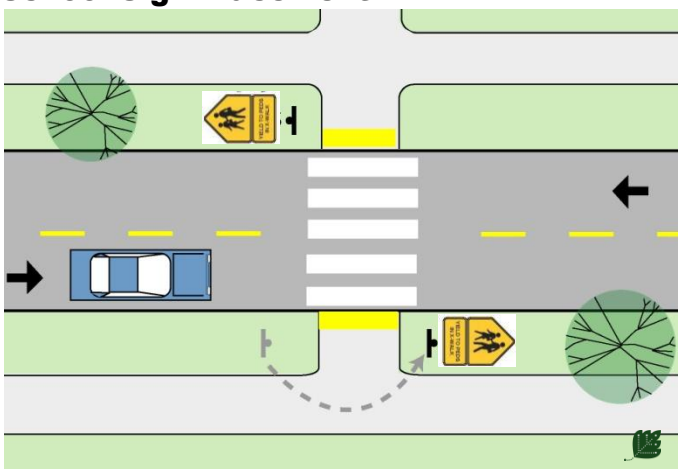
"Yield to Pedestrian Sign" on a Multi-Lane Road



"Yield Here to Pedestrians" signs and yield line pavement markings should be placed further in advance of a crosswalk on multi-lane roads to minimize the risk of a multiple-threat crash (see illustration in this section) and provide improved visibility for motorists in adjacent lanes.

"Yield Here to Pedestrians" signs should be placed on either side of the road to ensure visibility for motorists in both lanes.

School Sign Placement

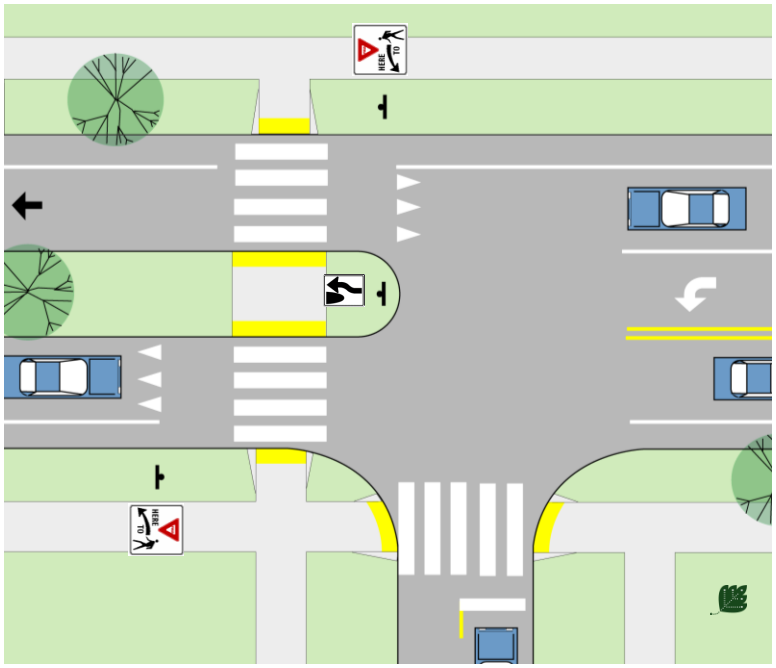


When the W11-1 crossing signs and accompanying plaques are used in place of the "Yield to Pedestrian Here" signs, they should be placed behind the crosswalk to improve visibility of crossing pedestrians rather than in front of the crosswalk where the large signs may obstruct motorists' views.

Selected Placement of Crosswalks at Tee intersections Design Guidelines

On some roads it may be desirable to mark only one of the crosswalks at a Tee intersection in order to channel pedestrians to a safer crossing point and to maximize the effectiveness of the crosswalk by not overusing high visibility crosswalks.

Fig. 2.4S. Unsignalized Tee Intersection with Turn Lane Guidelines



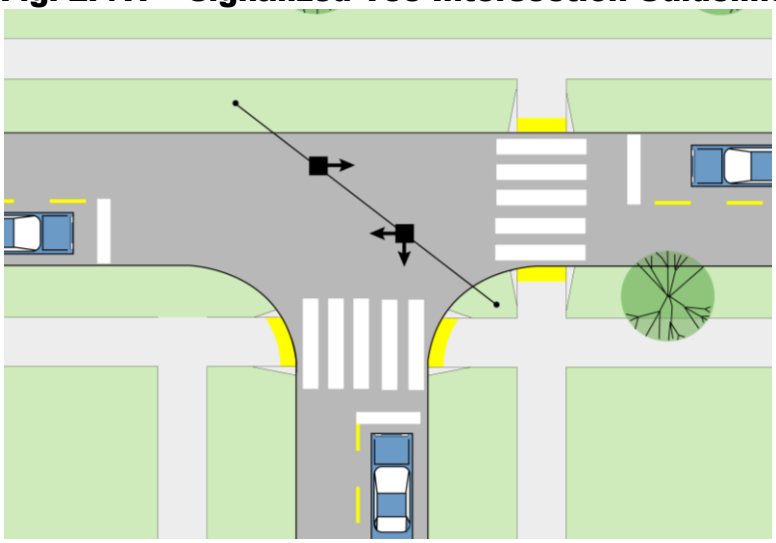
Description

At unsignalized Tee intersections with center turn lanes the marked crosswalk is located to the left of the intersecting street and the turn lane is converted to a pedestrian crossing island. The crossing island should be located such that it requires left turns from the intersecting street to have a fairly tight turning radius, therefore reducing their travel speed.

Curb ramps should be provided at all legal crosswalks, regardless of whether the crosswalk is marked. Driveways should be prohibited in the vicinity of the intersection.

The treatments shown should be used in conjunction with advance warning signs (not shown).

Fig. 2.4T. Signalized Tee Intersection Guidelines

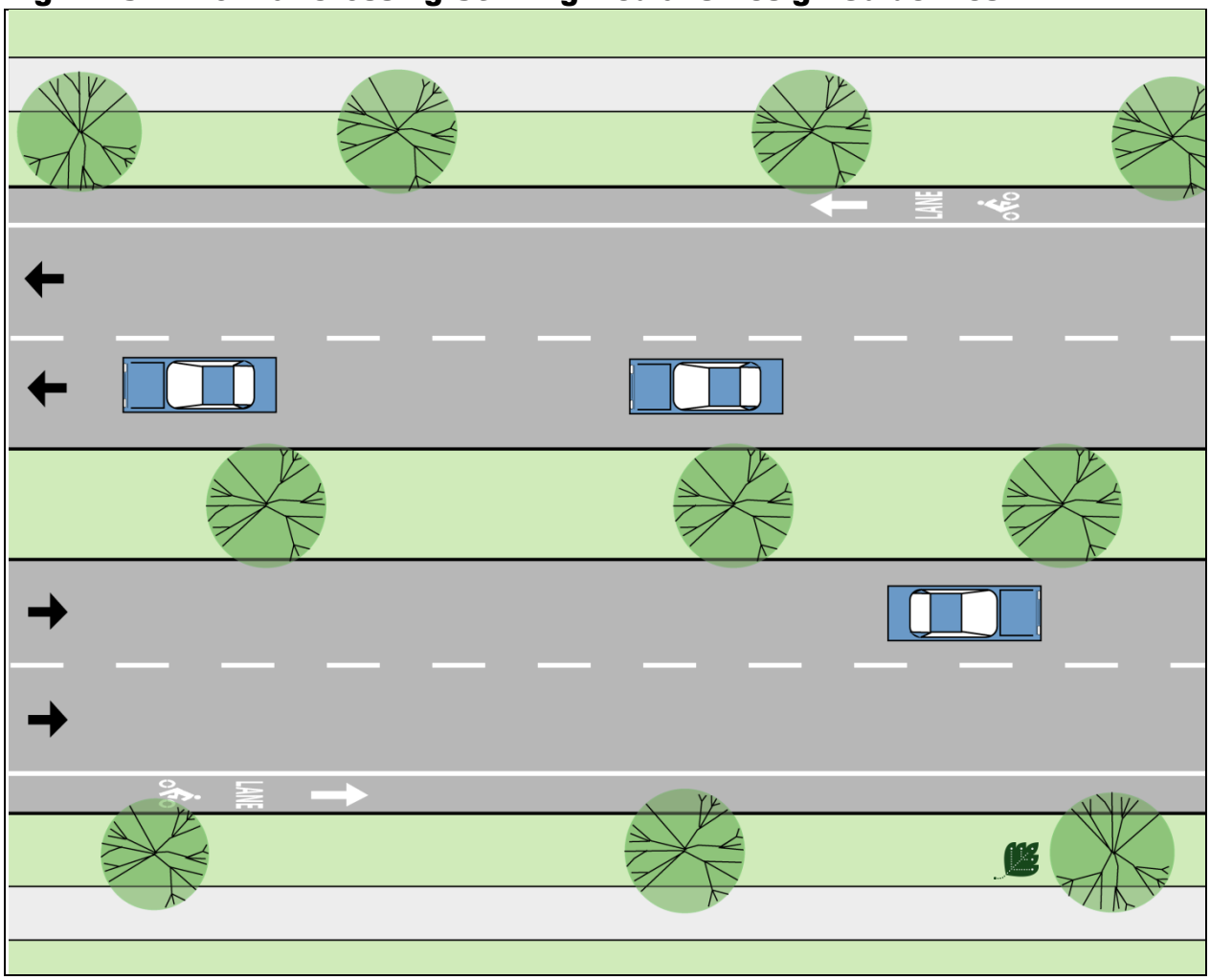


Description

At signalized Tee intersections, the crosswalk to the right of the intersecting street is marked. Left turns at signalized intersections are the most dangerous for pedestrians due to the wider turning radius, the resulting increased travel speed, and the increased distance of the crosswalk from the beginning point of the left turning movement.

There may be individual cases where it is appropriate to have the crosswalk located on the opposite side of the intersection.

Fig. 2.4U. Informal Crossing Utilizing Medians Design Guidelines



Description

Raised medians may somewhat accommodate dispersed informal crossings by able-bodied adults during periods of low snowfall.

Key Elements

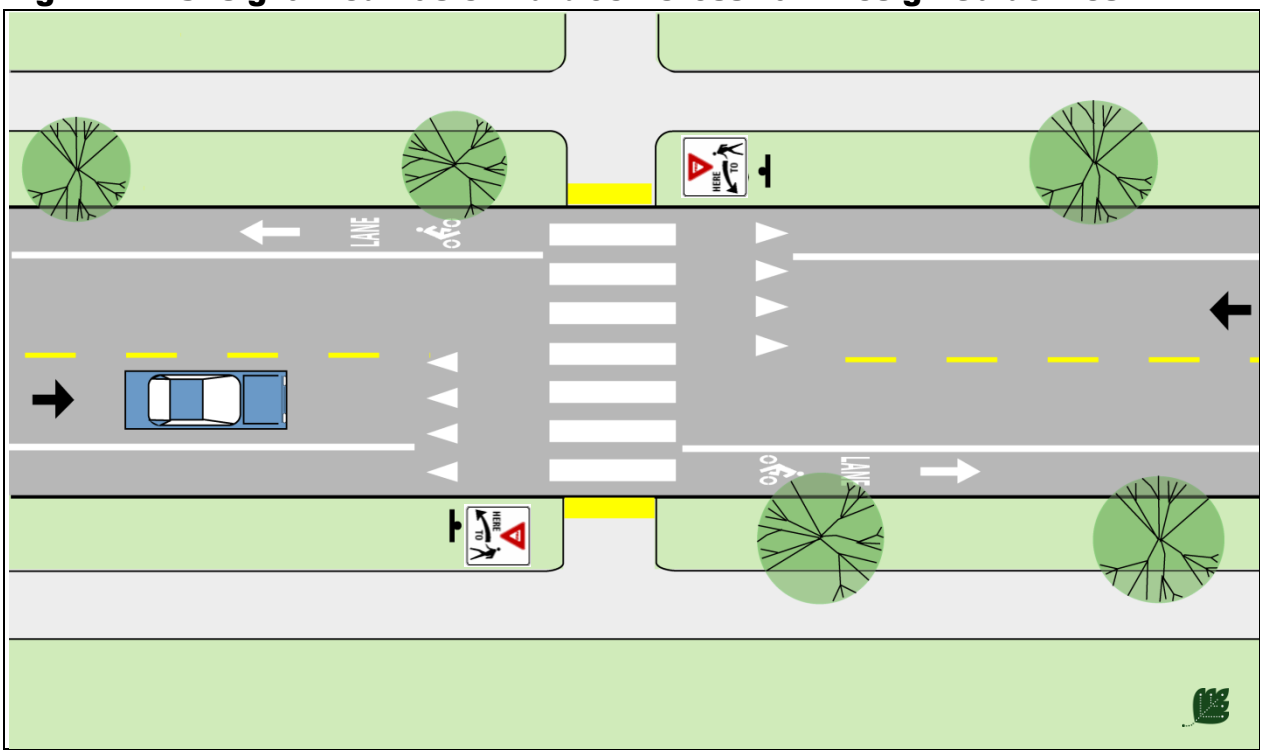
A median with plantings that permits traversing by foot and allows good visibility between the driver and the pedestrian.

Applications

On roads of four or more lanes where dispersed crossings are anticipated, where center left-turn lanes are unused, where minimum pavement is desired, and where traffic calming is desired. They may be used where a marked crosswalk is being considered as a Near-term Opportunities measure.

Example

Fig. 2.4V. Unsignalized Basic Mid-block Crosswalk Design Guidelines



Description

A mid-block crosswalk for a two-lane road at an unsignalized location without parking. The treatments shown should be used in conjunction with advance warning signs (not shown).

Key Elements:

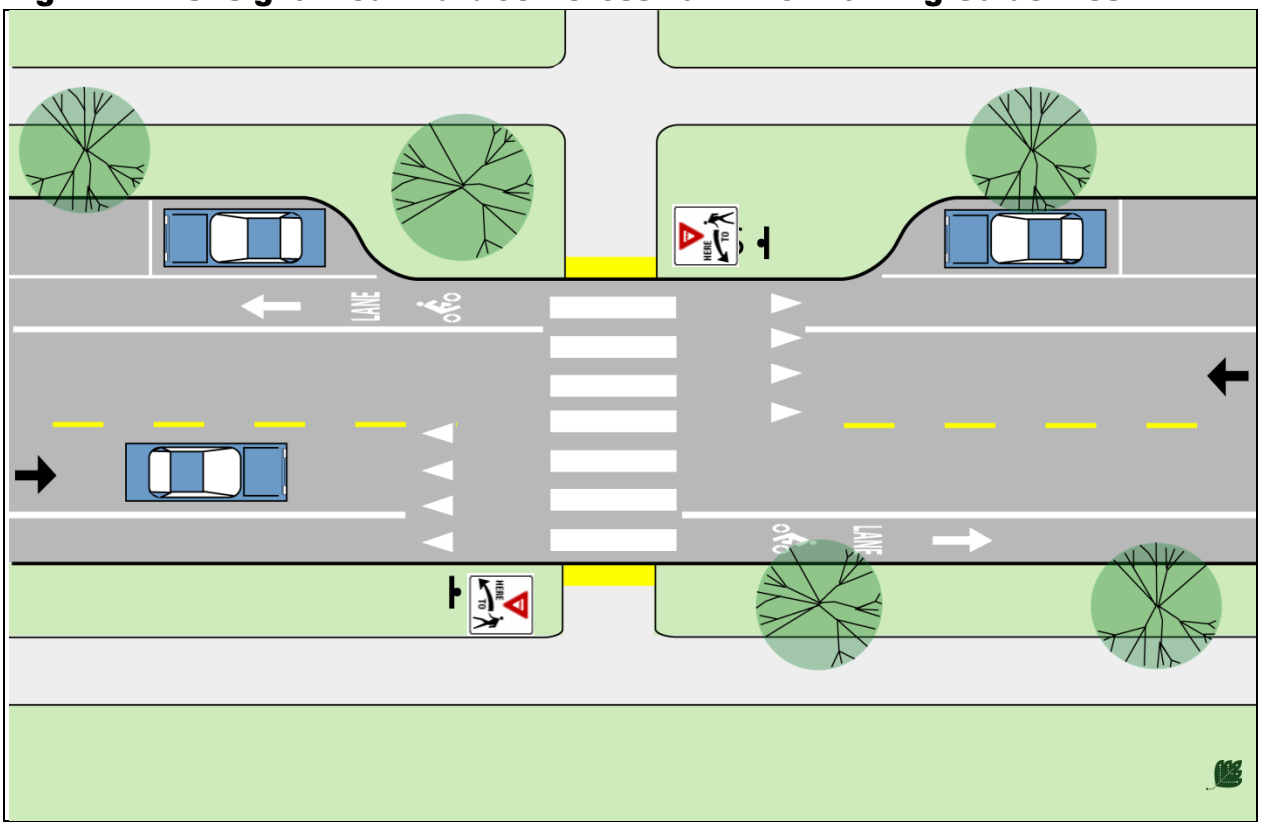
1. The yield markings are set back from the ladder crosswalk to minimize the potential for a multiple threat crash.
2. Where crossing signs other than the R1-5/ R1-5a "Yield Here to Pedestrians" are used, yield lines should be omitted.
3. Sightlines are kept clear of vegetation.
4. A 2' wide detectable warning strip is used at the base of the ramps.

Applications

Generally used on relatively low volume, low speed roads where sufficient gaps in the motorized traffic exist. This crosswalk design should not be used in any situations where there are greater than two travel lanes or when there is on street parking.

Example

Fig. 2.4W. Unsignalized Mid-block Crosswalk With Parking Guidelines



Description

A mid-block crosswalk for a two-lane road at an unsignalized location with parking. The treatments shown should be used in conjunction with advance warning signs (not shown).

Key Elements:

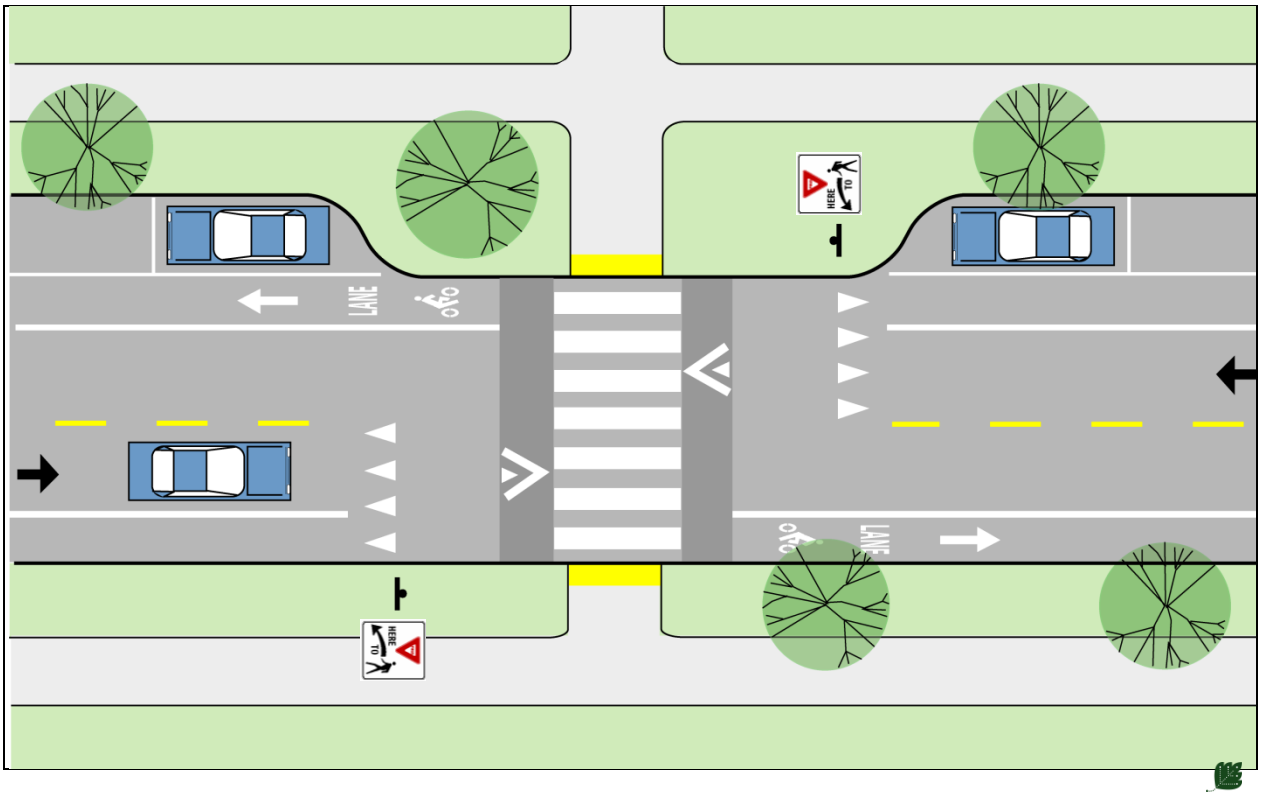
1. See elements listed under Unsignalized Basic Mid-block Crosswalk.
2. A bulb-out extends the pedestrian ramp into the sightlines of oncoming vehicles, reducing the potential for a "dart-out" type crash.

Applications

Generally used on relatively low volume, low speed roads where sufficient gaps in the motorized traffic exist. This crosswalk design should not be used in any situations where there are greater than two travel lanes.

Example

Fig. 2.4X Unsignalized Speed Table Mid-block Crosswalk Design Guidelines



Description

A mid-block crosswalk for a two-lane road at an unsignalized location with parking. The treatments shown should be used in conjunction with advance warning signs (not shown).

Key Elements:

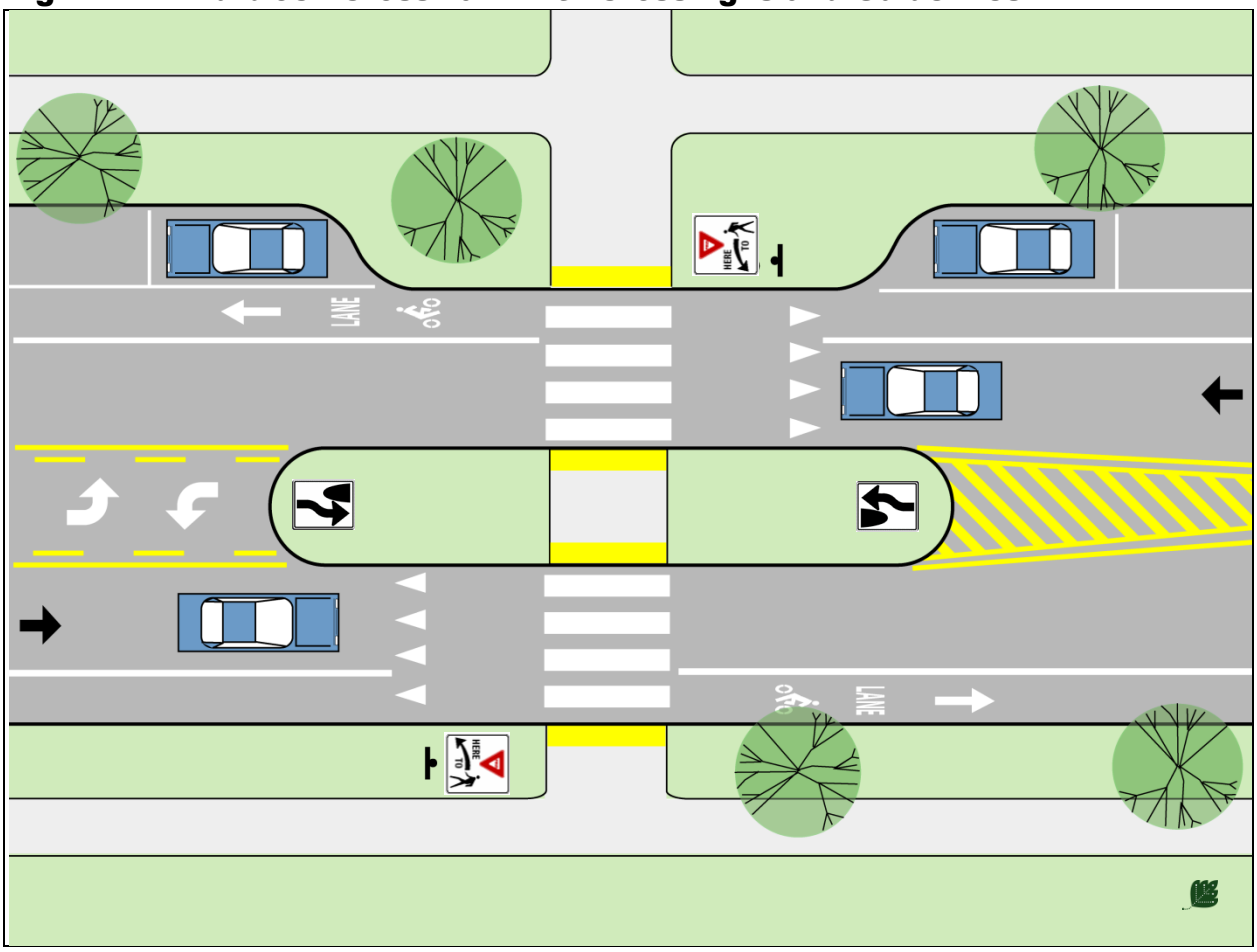
1. See elements listed under Unsignalized Basic Mid-block Crosswalk and Unsignalized Mid-block Crosswalk with Parking.
2. A speed table with 6’ long approach ramps and a 4” high table is placed under the crosswalk to bring travel speeds to approximately 25 MPH.
3. When retrofitting existing roadways, maintaining drainage along the curb may present challenges in meeting ADA ramp requirements.

Applications

Generally used on relatively low volume, low speed roads where sufficient gaps in the motorized traffic exist. This crosswalk design should be used in areas where traffic speeds typically exceed posted speeds. May only be used as a part of a traffic calming program.

Example

Fig. 2.4Y. Mid-block Crosswalk with Crossing island Guidelines



Description

A mid-block crosswalk for a two-lane or three-lane road at an unsignalized location with or without parking. The treatments shown should be used in conjunction with advance warning signs (not shown).

Key Elements:

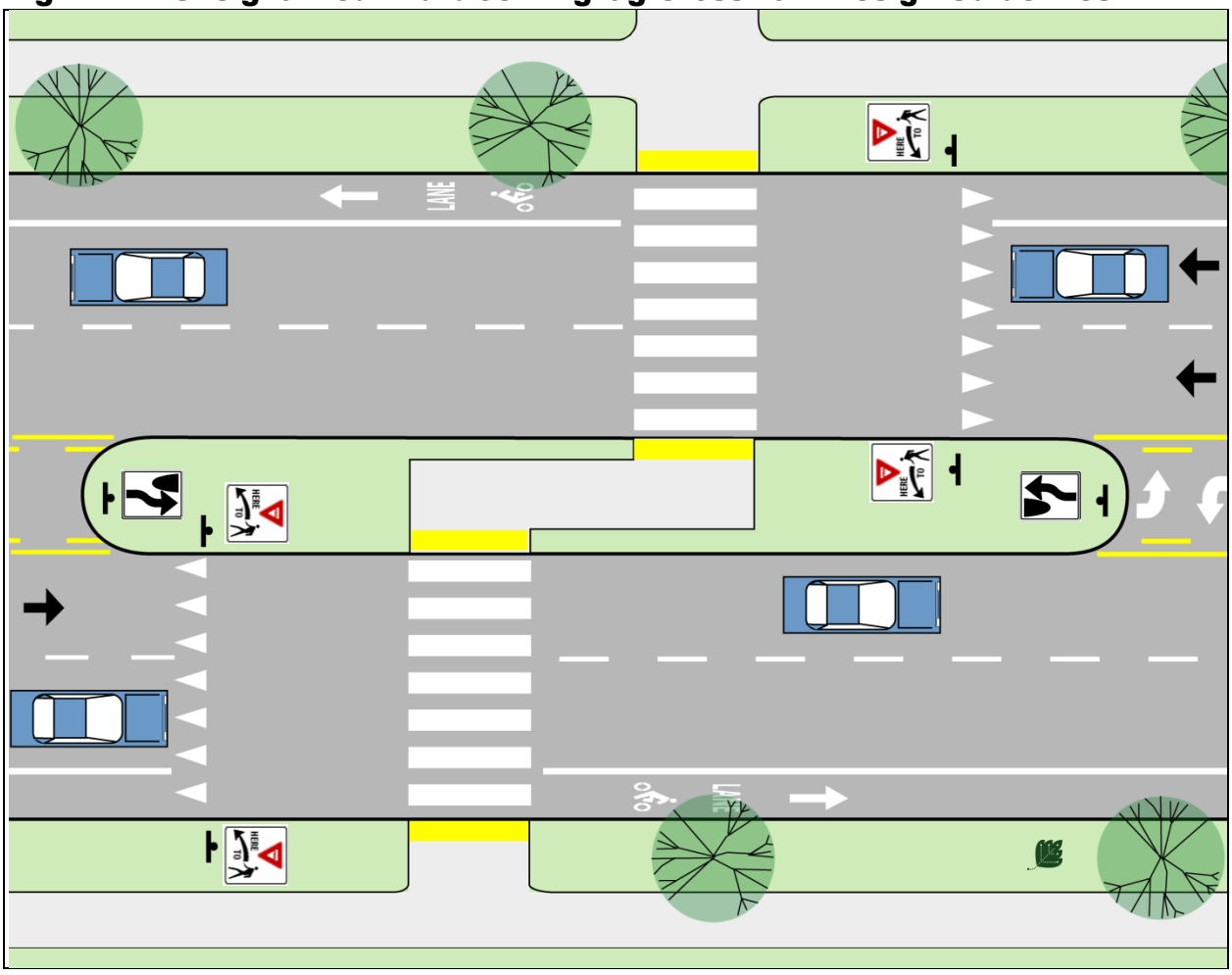
1. See elements listed under Unsignalized Basic Mid-block Crosswalk and Unsignalized Mid-block Crosswalk with Parking.
2. A crossing island is provided to break the crossing into two separate legs. The island has a minimum width of 6’ with 11’ or wider preferred.
3. Planting on crossing islands should be kept low so as not to obstruct visibility.

Applications

Generally used on a higher volume and higher speed road where suitable gaps to cross both directions of traffic in one movement are infrequent.

Example

Fig. 2.4Z. Unsignalized Mid-block Zigzag Crosswalk Design Guidelines



Description
A mid-block crosswalk for a four or more lane road at an unsignalized location without parking.

Key Elements:

1. See elements listed under Unsignalized Basic Mid-block Crosswalk and Unsignalized Mid-block Crosswalk with Crossing island.
2. The crosswalks are staggered to direct the pedestrian view towards oncoming traffic.
3. Yield markings are set further back to improve pedestrian visibility from both lanes and minimize multiple-threat crashes.
4. Median signs are placed higher than typical so as not to impede sightlines.

Application
Generally used on high volume / high-speed multi-lane roads.

Example

Lighting of Crosswalks

All marked crosswalks should be well lighted with overhead lighting. The combination of overhead lighting and crosswalk signs used by the City is a good system that should continue to be employed. The lighting should also extend to light the extent of any crossing island for the motorists safety. The City should consider adding either a passive or active pedestrian activation system to the overhead crosswalk signs that cause the signs either to blink or become brighter when a pedestrian is present.

Marking of Crossing Islands

Crossing islands can present an obstruction in the roadway for motorists. The presence of this obstacle is key to the visibility of the crosswalk even more so than the signage or pavement markings and flush crossing islands have not been shown to have the same safety benefits as raised crossing islands. When the crosswalk is located in a left-turn lane it is located outside of the typically traveled roadway and is a minimum obstruction. When the road flairs around a crossing island it is more of an obstruction for a motorist. To draw attention to the obstruction, typical pavement markings as called for in MUTCD should be utilized. In addition, reflective material may be added to the sign posts, and reflective flexible bollards may be placed on the ends of the islands to increase the island's visibility at night and during inclement weather.

Roundabouts

In many situations, roundabouts have several advantages over typical intersection design: vehicles move at slower speeds, traffic flows more smoothly, and reduced pavement enhances aesthetics and offers the opportunity for landscaping in the central and splitter islands. There are however, serious drawbacks to roundabouts for those with vision impairments, and two-lane roundabouts are problematic for bicycles in particular. Roundabouts, especially larger ones, can present significant out-of-direction travel for pedestrians. Depending on the nature of the surrounding land uses and the design of the roundabouts, pedestrians may attempt to walk directly across the center of the roundabout.

Because there are no traffic control signals to provide a pedestrian "walk" signal, pedestrians wait for an appropriate gap in traffic and cross. The splitter or diversion islands provides a crossing island the pedestrian, breaking the road crossing into two stages so that they are only dealing with one direction of traffic at a time. This system works quite well for pedestrians without vision difficulties. Studies have shown a reduction in pedestrian crashes for single lane roundabouts and about the same number for multiple lane roundabouts as compared to a traditional signalized intersection. Pedestrians with vision impairments often find roundabouts very intimidating as the audible queues are sometimes insufficient to judge a suitable gap in traffic. Research is currently underway to determine the most appropriate way to accommodate blind and vision impaired pedestrians in roundabouts.

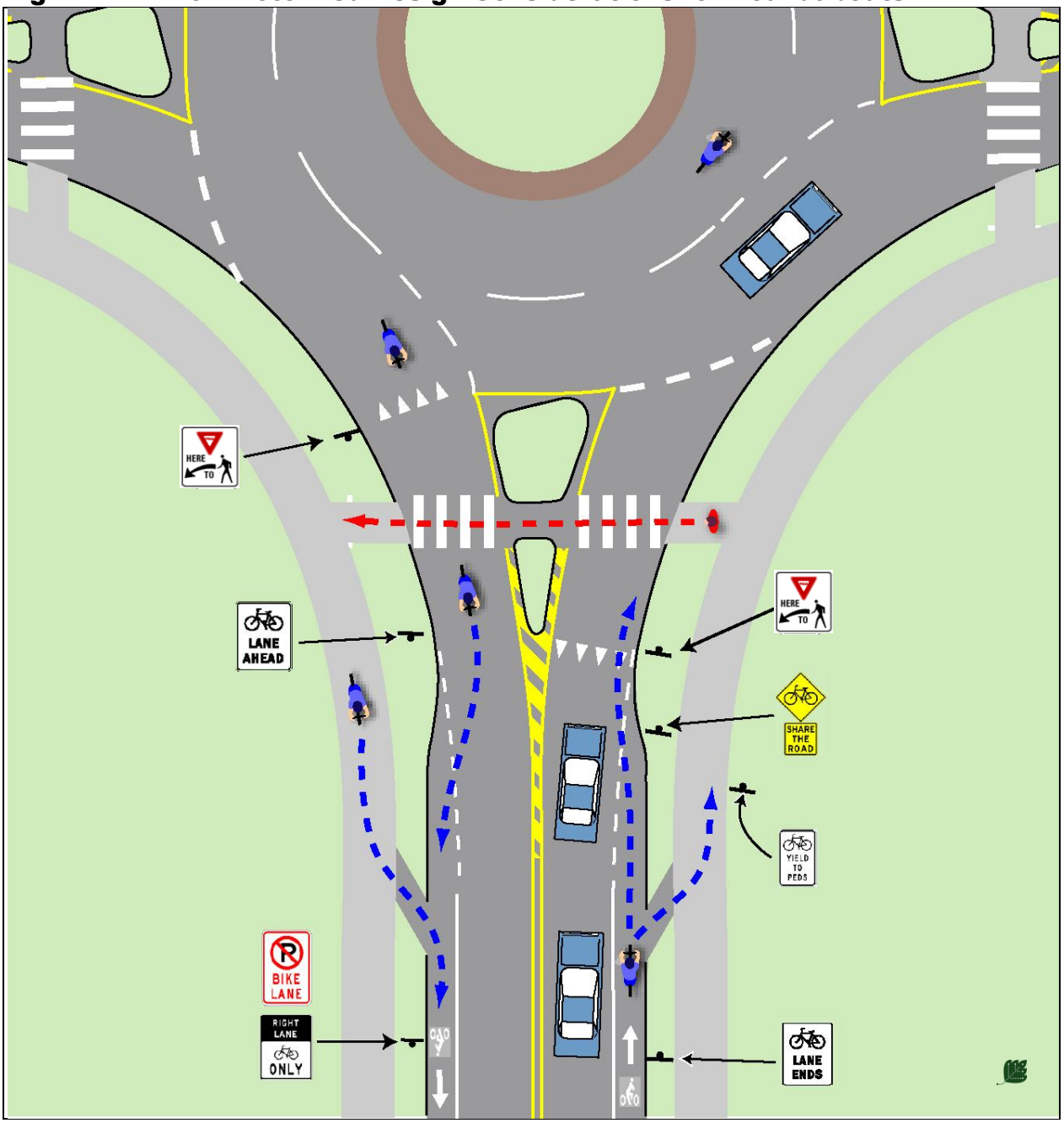
Multi-lane roundabouts are especially problematic for bicyclists. Studies have shown that while single lane roundabouts have about the same number of crashes when compared to traditional signalized intersections, multi-lane roundabouts have significantly more. Because of this, design guidelines recommend allowing bicyclists who are traveling in the roadway approaching the roundabout to exit the roadway prior to the roundabout and navigate the roundabout as a pedestrian would. More confidant bicyclists may remain in the roadway and merge with the motor vehicles.

Design Guidelines:

- Roundabout approaches should include bicycle entrance and exit ramps to give bicyclists the option of biking on a sidewalk bikeway as well as the roadway.
- Roundabouts should include pedestrian crossing islands on all entering roadways.

- The use of roundabouts should be accompanied by an education campaign regarding the issues with blind pedestrians and a motorist responsibly when they see a pedestrian using a white cane.
- The bicycle and pedestrian safety issues should be carefully evaluated for any multiple lane roundabouts.
- The latest research on accommodating blind and vision impaired pedestrians in roundabouts should be consulted before designing and constructing a roundabout.
- Bicycle and pedestrian pavement markings and signs should be regularly evaluated for every roundabout.

Fig. 2.4AA. Non-motorized Design Considerations for Roundabouts



Signalized Mid-block Crossings

Sometimes signalization is needed at a mid-block crosswalk location to ensure safe crossing. Areas that have many elderly, disabled, or young children crossing between signals are places that warrant special consideration. Signals can also help pedestrians cross at mid-block locations where there are insufficient gaps in traffic to cross safely.

Standard Mid-Block Signalized Pedestrian Crossings

The Michigan Manual of Uniform Traffic Control Devices (MMUTCD) has warrants for installing signalized crosswalks based on pedestrian demand. These include considerations given to the type of pedestrians the signal will serve (young, elderly, and/or persons with physical or visual disabilities). They also recognize that current pedestrian mid-block crossings may be inhibited by the road conditions in combination with the type of pedestrians who would like to cross the road.

With standard mid-block pedestrian signals, when a pedestrian activates the crossing button, a yellow then steady red light is displayed to motorists and then a walk signal is displayed to pedestrians. During the pedestrian clearance interval (flashing don't walk or red hand), the steady red light remains displayed to motorists. After the clearance interval is complete the signal for motor vehicles returns to green and the pedestrian signal returns to a steady don't walk signal. These signalized pedestrian crossings may be coordinated with other signals to minimize the impact the signal has on motorized traffic flow.

Other Options

There are also several other types of mid-block signalized crossings that are currently being used on an experimental basis. The following signals, while not meeting current MMUTCD standards, strive to address shortcomings in the standard mid-block signalized pedestrian crossing. Prior to evaluating similar devices in the City, careful analysis would be required. The following are a few of the experimental signals being used around the country:

Mid-Block Signal-Controlled Crossings with Flashing Red

Typically, the signal rests with a green light for motor vehicles. When a pedestrian activates the crossing button, a yellow then steady red light is displayed to motorists and then a walk signal is displayed to pedestrians. During the pedestrian clearance interval (flashing don't walk or red hand), a flashing red light is displayed to motorists who may proceed if the crosswalk is clear. At the conclusion of the pedestrian clearance interval, a steady green signal is displayed to motor vehicles. The advantage of this signal is that drivers have to stop for pedestrians crossing the road, but may resume travel through the crosswalk as soon as light turns to flashing red and the pedestrian is out of the roadway, rather than waiting for the entire light cycle.

Pelican Crossings (Pedestrian light controlled)

Originally developed in Great Britain, there are a few variations that have been implemented in the United States. Tucson, Arizona has implemented a number of these crossings with the following characteristics. The pedestrian crosses the street in two stages, using a crossing island. For each stage a standard traffic signal rests with a green light for motor vehicles. When a pedestrian activates the signal button, a yellow then steady red light is displayed to motorists approaching the crosswalk and then a walk signal is displayed to pedestrians. After the clearance interval is complete the signal for motor vehicles returns to

green and the pedestrian signal returns to a steady don't walk signal. By splitting the crossing into two stages the signal may be synchronized with signals in either direction along the roadway.

Other variations display a flashing yellow signal to motorists during all or a portion of the pedestrian clearance interval. A PUFFIN CROSSING is a variation that uses passive detectors to adjust the pedestrian crossing times.

Toucan Crossing

Toucan Crossings are used at intersections where it is desirable to provide a signalized crossing for bicycles and pedestrians but not for motor vehicles. A typical situation would be where a residential road intersect a primary road and the residents wish to reduce through traffic. The Toucan Crossing uses a standard signal for motor vehicles. Bicyclists and pedestrians who wish to cross the primary road are directed to the center of the minor road where passive sensors trigger the signal. The length of the pedestrian clearance interval is determined by sensors that can detect pedestrians in the crosswalk, thus cutting down on unnecessary delay to motor vehicles when used by bicyclists. Motor vehicles are typically restricted to a right-only turn from the residential roadway onto the primary road.

Hawk Crossing (High-intensity Activated Crosswalk)

The Hawk signal is similar to an emergency beacon in that the signal's purpose is clearly signed adjacent to the signal. The signal is kept dark at its resting state. When a pedestrian activates the crossing button, a flashing yellow signal is displayed to motorists. This is followed by a steady yellow then a solid red at which time the pedestrian is displayed a walk signal. During the clearance interval, the motorists are displayed an alternating flashing red signal.

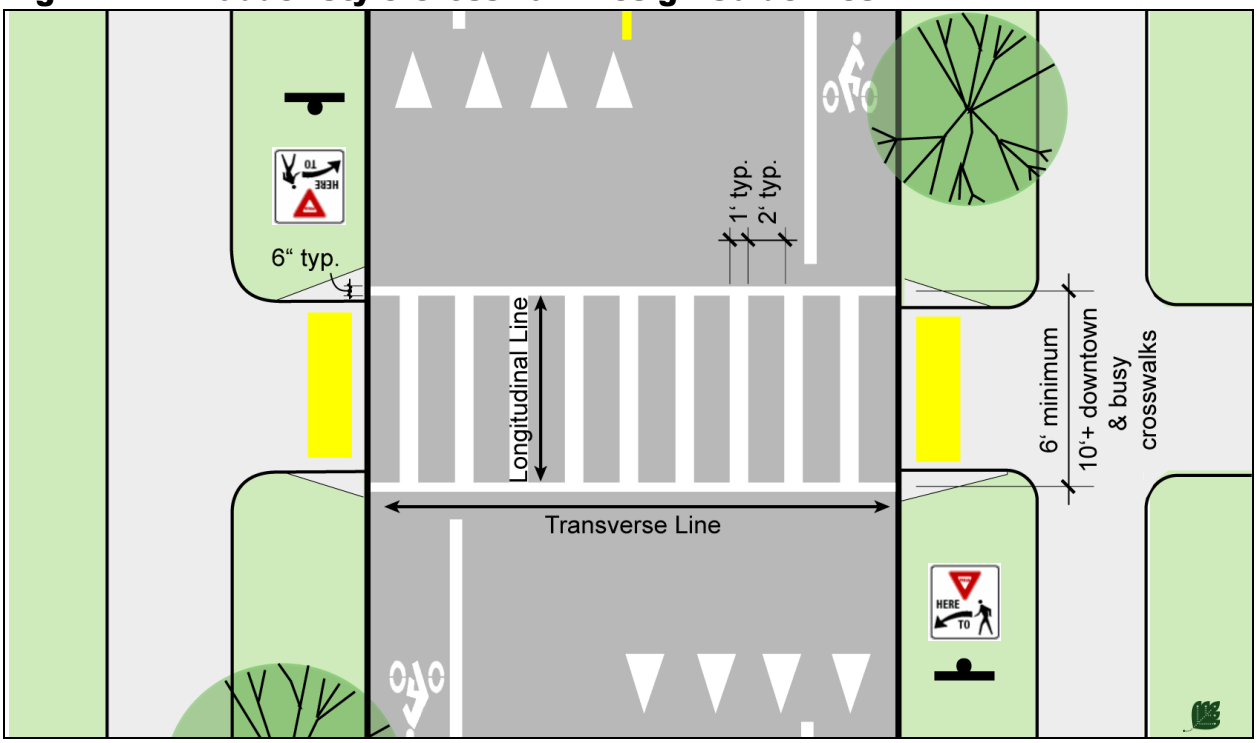
The disadvantage of this signal is that a dark signal indicator for vehicles can often be confusing, and in many states, drivers are required to stop at a darkened signal. Drivers at this signal often remain stopped after it is okay to proceed through the flashing red light.

Other Options and Considerations for Experimental Mid-block Signalized Crosswalks
For further information on the types of mid-block signals being used around the country, refer to following report: *Alternative Treatments for At-Grade Pedestrian Crossings*, by Nazir Lalani and the ITE Pedestrian and Bicycle Task Force, Washington, D.C: Institute of Transportation Engineers, 2001.

As is apparent from the descriptions above, numerous features are available for use in a mid-block crosswalk, however none of these have an ideal combination of features. The ideal mid-block signal should incorporate the following:

- **A "hot response" system that immediately activates the signal when the button is pushed.** Often, the delay time for activated signals is so great that many pedestrians assume that the signal is broken and cross prematurely. A "hot response", with its quick activation of signal change, minimizes this problem. At a minimum, the pedestrian should receive some feedback in the form of a light and/or tone that they have successfully triggered the signal. Many of the newer pedestrian activated buttons have this feature.
- **Automated detection of pedestrians in the crosswalk.** Increasingly, signals are incorporating sensors that use infrared or microwave technology to detect pedestrians in the crosswalk. This technology allows the signals to more accurately reflect when pedestrians leave the crosswalk or ignoring false calls, reducing vehicle delay and minimizing driver frustration. This is an excellent feature where the speed in which typical users cross the road varies dramatically, such as a bicyclist and an elderly pedestrian.
- **Pedestrian yield phase**. As mentioned above, many people crossing at a mid-block signalized crosswalk are likely to feel comfortable enough to cross without activating the signal button. The disadvantage of all of the signals mentioned above is that the pedestrian indicators do not accommodate these types of crosswalk users. The signals either indicate that the pedestrian has the right to cross while the vehicle indicator is red, or that the pedestrian should not cross. What is needed is an indicator that informs people that is ok to cross without activating the button, but that they must simply yield to passing cars. As the pedestrian yield phase is not a MMUTCD standard the use of such would require a design exception and should be accompanied by a study to determine its effectiveness.

Fig. 2.4AB. Ladder Style Crosswalk Design Guidelines



Description

A combination of Transverse and Longitudinal style crosswalks to improve visibility for motorists and usability for pedestrians with sight impairments.

Key Elements:

1. All crosswalk markings are highly skid-resistant and strongly contrast pavement.
2. Longitudinal lines are no more than 1’ wide to minimize areas of thermoplastic markings.
3. Spacing of the longitudinal lines is no more than 2’ to improve the visibility of the crosswalk to motorists.
4. Transverse lines are used to aid pedestrians with sight impairments in finding the edge of the crosswalks (this can be difficult with longitudinal lines alone, especially when spaced far apart).
5. The width of the crosswalk is set such that it can easily accommodate all pedestrians crossing the road.

Application

For all marked mid-block crosswalks across Arterial and Collector streets and signalized crosswalks downtown. Also, on local streets where there is a high potential for conflict between motorists and pedestrians such as crosswalks that serve schools. Locations where pedestrian crossing is sporadic require high visibility as the motorist’s expectation for the presence of pedestrians is low.

Example

2.5 Non-motorized Travel on Independent Pathways

There are many types of Shared-Use pathways, each with unique issues. One type of Shared-Use pathway is the independent pathway that is separate from the road system. Independent pathways include rail-to-trail corridors, paths through parks and other trail systems. Independent pathways can be important and beneficial links to the non-motorized transportation system provided they have direct connections to the existing network of bike lanes and sidewalks. If designed and maintained properly, they can be the "jewels" of a City's non-motorized transportation system.

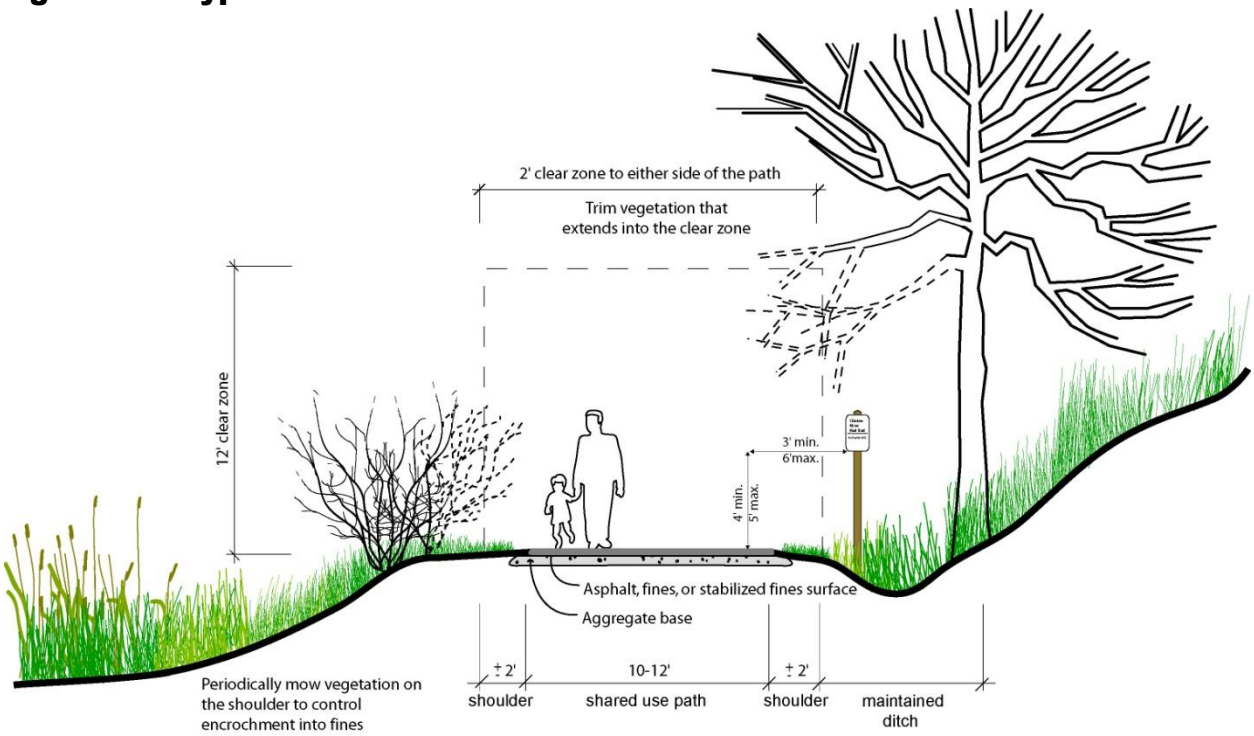
Independent pathways should be designed to accommodate shared uses including cyclists, walkers, strollers, in-line skaters, and people in wheelchairs. For the safety of all users, the pathway should be built wide enough to accommodate these shared uses. AASHTO guidelines indicate that 10' wide path is the minimum width for a Shared-Use path. The preferred minimum width is 12' in most cases in urban areas with 14' to 16' being common widths.

Studies done by the Rails-to-Trails Conservancy have shown that off-road pathways in general are quite safe from a personal safety standpoint. But in urban areas it is important that pathways follow the principles of Crime Prevention Through Environmental Design (CPTED). The City of Ann Arbor Police Department employs officers who are experts and educators in this field and who can help in the design.

Trail Cross Section Design Guidelines

Figure 2.5A below illustrates several key points about the design and maintenance of Shared-Use paths: Whether the surface of the path is asphalt, fines or other material, it should have a solid base and positive drainage as the path may have maintenance vehicles on it at all times of the year. The vegetation along the trail should be regularly trimmed and mowed to maintain a clear zone around the trail.

Fig. 2.5A. Typical Path Cross Section

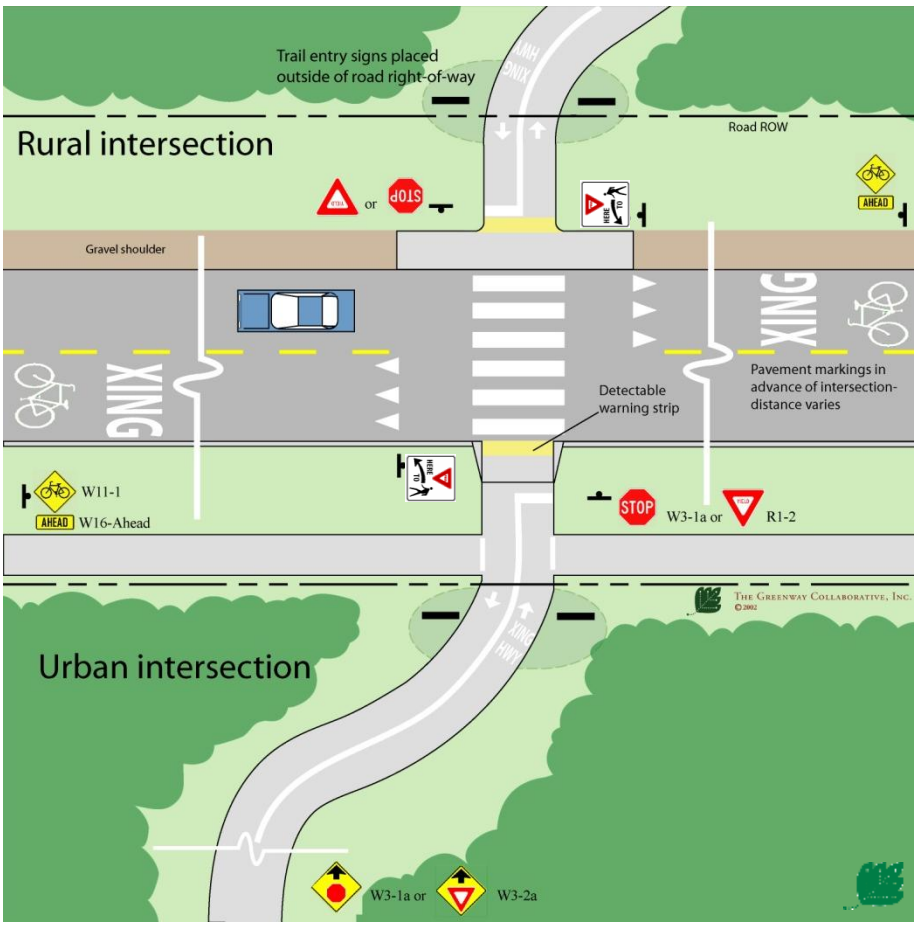


Independent Pathway / Road Intersection Design Guidelines

Independent pathways often intersect roadways at unsignalized mid-block crossings. Many of the design guidelines for a typical mid-block crosswalk apply (See Section 2, Facility Guidelines: Non-Motorized Travel Across Road Corridors) but because of the unique nature of independent pathways, several additional safety points must be considered. The following plan illustrates the key points needed for a safe design of the intersection of an independent pathway with a roadway:

- Clear signage that identifies user rights-of-way and notifies both the users of the pathway and the motorists that an intersection is approaching.
- Pavement markings at the beginning of the trail intersection notify users of direction of travel and rights-of-way. Pavement markings further along the trail should be minimized to avoid visual clutter.
- The pathway should meet the roadway at as close to a 90-degree angle as possible for maximum visibility of users.
- Trail signage is often set back outside the road right-of-way.
- Regardless of the surfacing material of the trail, asphalt should be used for the portion of the trail that intersects the road. The asphalt increases traction for bicycle users and cuts down on debris from the shoulder of the road accumulating in the pathway. The change in materials can also help to notify users of the upcoming intersection. At rural intersections, gravel shoulders should also be paved adjacent to the trail to minimize debris in the stopping zone.

Fig. 2.5B. Typical Pathway/Roadway Intersection



Trail Entrance / Exit Signage Design Guidelines

If designed correctly, trail signage can serve as a pleasing amenity to the trail while providing valuable safety and orientation information to the users of the trail. Key considerations for the design of trail signage include:

- Signs should be placed at the beginning of trail intersections with the roadway to orient the user to his or her location along the trail, the distance to the next intersection crossing, and the rules and regulations of the trail.
- Signs should be a sufficient distance from the shoulder of the trail to prevent obstruction or collisions.
- Signs should be placed to allow access for maintenance vehicles to the trail.

The signs shown below should be considered illustrative only, depicting the type of information to be presented and appropriate locations. They are not intended as specific design recommendations.

Fig. 2.5C. Trail Entrance Signs

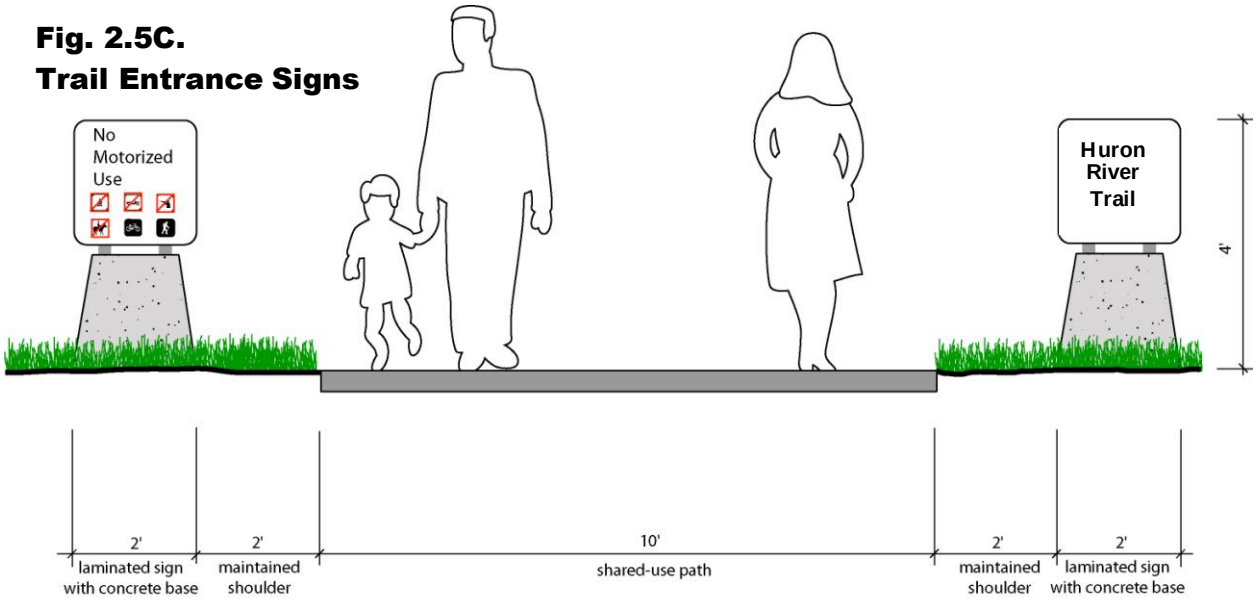
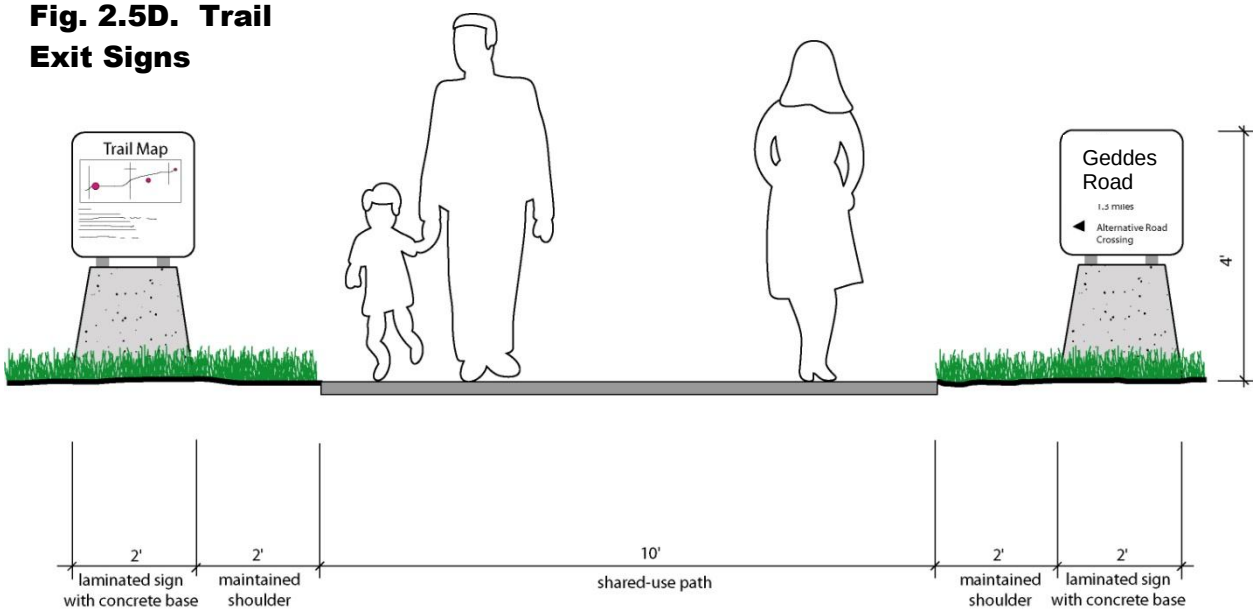


Fig. 2.5D. Trail Exit Signs



2.6 Travel Within Neighborhoods

While the focus of this report is on the primary road system of Collectors and Arterials, local roadways that serve residential and mixed use areas are critical to the success of the City's non-motorized system. Local roads that serve neighborhoods are typically attractive non-motorized links due to the lower vehicle volumes and speeds.

Bicycle Travel in Neighborhoods

Bicycles typically do not need any special accommodations on local residential streets as they can comfortable share the road with the limited motor vehicle traffic. Some local residential streets, by themselves or in combination with off-road paths, provide excellent and attractive alternatives to the primary road system. In some cases, it may be desirable to sign bicycle routes that provide access to destinations such as schools and parks where the route may not be obvious to a cyclist unfamiliar with the area. See Fig. 2.3J, Signed Bike Route Design Guidelines for more information on Bike Routes and Section 5, Proposed Facilities for proposed Bike Route locations.

Public vs. Private Roads

It is as important to provide safe and comfortable pedestrian facilities on private streets as on public streets. However, private street standards are currently interpreted as only requiring a 4' wide sidewalk on one side of the street with no buffer needed between the sidewalk and street. Consequently, many development projects get built with less than adequate pedestrian facilities that detract from the City's overall ability to accommodate non-motorized travel. Regardless of ownership, neighborhood roads should include concrete sidewalks a minimum of 5' wide and compliant with ADA standards, on both sides of the street with a landscaped buffer between the sidewalk and the road.

An issue with private roads is the perception that they may not be open for use by the general public. For this reason public roads should always be the preference for new developments. In crafting development agreements that incorporate private roads it should be clear that the roads are open to all pedestrians and bicyclists and that there should be no signage of physical structures that imply that non-motorized access is limited to the residents of that neighborhood.

Both public and private neighborhood streets should be designed to incorporate many of the same pedestrian safety enhancing measures as those previously noted for primary public roadways. These include reduced curb radii, narrower street widths, curb extensions, and traffic calming measures such as speed tables.

Connectivity Between Neighborhoods and to the Primary Road System

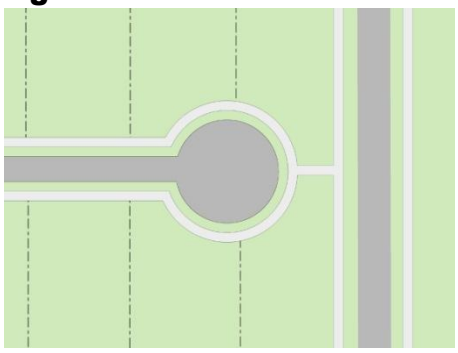
If a new development has limited road access to surrounding arterial streets, special access points for pedestrians and bikes should be incorporated between property lines or along utility rights-of-way. Non-motorized connectivity between adjacent residential, commercial and institutional developments should be provided. The City can regulate the form and shape of new neighborhoods to support and promote pedestrian and bike mobility both by modifying master plans and development standards. Careful site design encourages walking by making non-motorized travel more direct than motorized transportation modes.

Neighborhood Roadways Design

Public and private street standards should clearly require sidewalks on both sides of the street, subject to City review. Neighborhood streets should have the following amendments to encourage pedestrian access with in neighborhoods:

- Slow vehicular speeds.
- Small block sizes.
- Interconnected streets.
- Sidewalks on both sides of the streets.
- Landscaped buffer between the street and the sidewalk with street trees that will provide shade.
- Connections to adjoining neighborhoods.
- Direct walkway connections between residential areas and commercial and institutional areas when not afforded by the street system

Fig. 2.6A. Cul-de-sac connector



Grid patterned streets with sidewalks and small block sizes are preferred for pedestrian use. They allow pedestrians to have multiple options in route choices and follow the most direct route possible. It is desirable for street networks and pedestrian facilities to correspond wherever possible. However, even if grid streets are not desired or feasible, pedestrian and bike links should still be provided even where the road does not connect. If cul-de-sacs and dead end streets are used, pedestrian and bike cut-throughs meeting AASHTO guidelines should be created to link to adjacent streets (Figure 2.6A).

2.7 Travel Within Non-Residential and Mixed Use Developments

Many new commercial, office, institutional and mixed use developments being built today are designed for easy access by motor vehicles and do not take into adequate consideration the patrons arriving by other means of travel. Aspects of site design can discourage non-motorized traffic when designed solely for automobile use. New developments today often have poorly placed bike-parking facilities, large setbacks with parking lots that lack direct access for pedestrians or bicyclists and face large arterial roadways with little or no direct access to neighborhoods and residential areas that may be surrounding them. These problems can be remedied by improving site design and enhancing connections to the external transportation system.

Most commercial developments are oriented to motor vehicles, resulting in an often oppressive environment for pedestrians and bicyclists.

Circulation with the Site

Buildings with frontages along the street create a streetscape that is comfortable and accommodating to pedestrians, and help keep traffic moving at slower speeds. Parking to the side or the rear of the building keeps the streetscape intact, allows easy access for pedestrians from adjacent sidewalks and minimizes automobile and pedestrian conflicts. As the building frontages are moved back from the streetscape to accommodate parking, the pedestrian's sense of exposure to traffic, the distance they must walk to access the store, and their resulting discomfort substantially increases.

Setback of the building frontages from adjacent intersections also complicates pedestrian travel across the roadways. Typical development patterns are "L" shaped with the majority of buildings set back from the intersection and one or two isolated buildings near the intersection. This pattern places the majority of the buildings away from the primary pedestrian crossing point and puts a large expanse of parking between the isolated buildings on the corner and the majority of the buildings. Depending on the development across the street, "L" shaped development can set up strong pedestrian desire lines across mid-block locations. Because of the large scale of most of these developments, the distance between the desire lines and the signal is significant.

If orienting proposed development projects to improve non-motorized uses is not a feasible option in designing the layout of the buildings, then providing clear, direct and safe pedestrian access at mid-block locations is necessary to minimize out of direction travel through or around the parking lot by pedestrians. Parking lots can be dangerous areas for pedestrians and present many challenges for safe navigation. Older adult pedestrians have a high incidence of accidents involving vehicles backing up, a common maneuver in parking lots.[29] Site plans should be required to include the following design measures:

- Reduce building setbacks as much as possible and provide walkways to the entrances that are clearly marked, accessible and is buffered from the surrounding parking lot.
- Use raised crosswalks and striping to clearly define the walkways from driveways. Speed tables and raised crosswalks can calm traffic and increase visibility.

[29] National Highway Traffic Safety Administration. *Pedestrian Safety for the Older Adult*.

Fig. 2.7A. Typical Commercial Center at Intersection of Main Roads

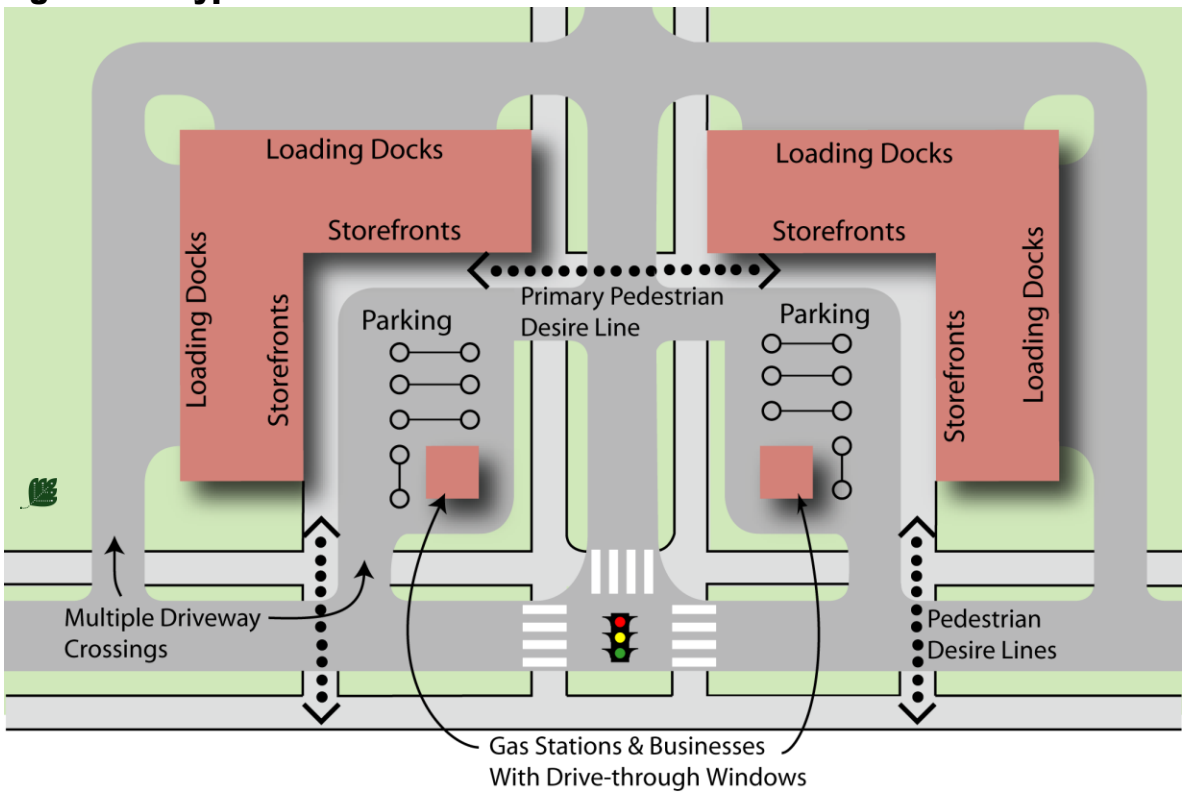
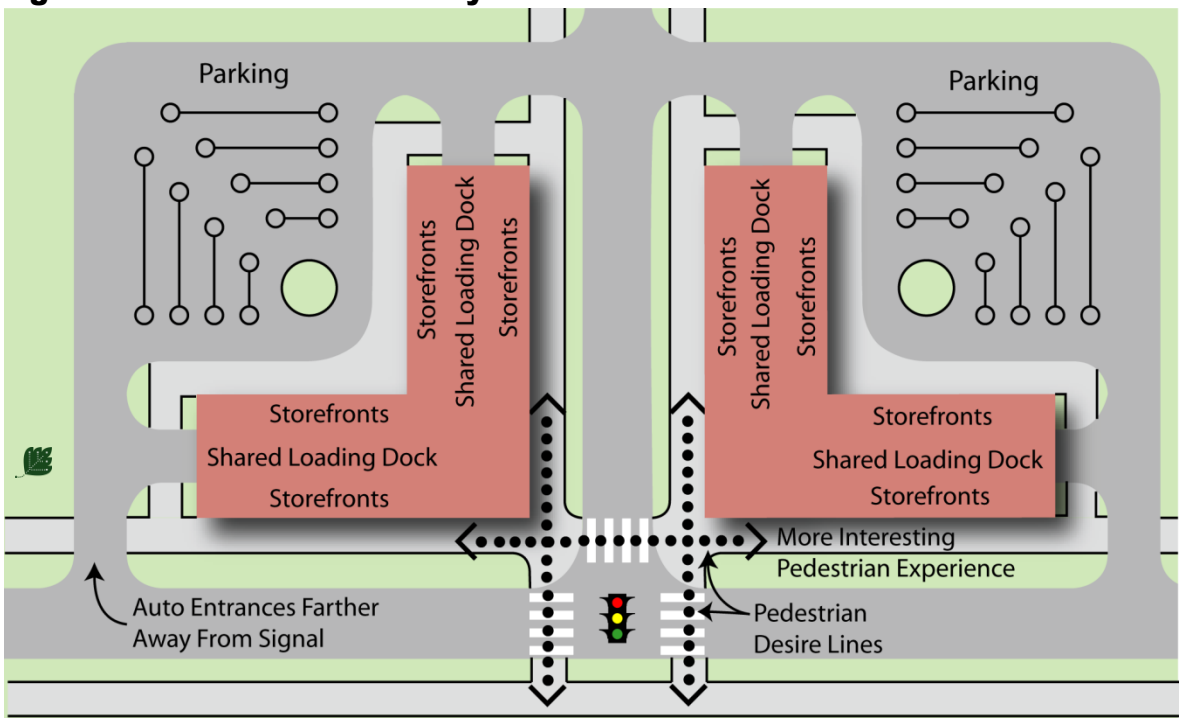


Fig. 2.7B. Pedestrian Friendly Commercial Center Alternative



- Provide trees and other plantings to buffer pedestrians from parking areas, enhance parking lot aesthetics, and minimize the pedestrian's exposure to the elements while crossing the vast expanse of pavement.
- Walkways should have direct and clear access to building entrances and be designed to safely go through the parking lot, or circumnavigate it if necessary.
- Walkways along the buildings should be wide enough to accommodate several people abreast and have frequent curb cuts and ramps for accessibility, as well as tactile and audible pedestrian information.

Just as pedestrians need direct and clear access through the parking lots to the buildings, bikes should also be safely directed through the parking lot. Bike parking should be provided in a visible and convenient location. Many cyclists are reluctant to lock their bikes in an area that is out of the way and unfrequented because of the greater likelihood of theft. This leads to situations where bikes are locked to anything available such as signposts or railings. These bikes can cause hazards for pedestrians and obstacles to accessibility. Providing bike parking facilities in convenient and well-lit locations will minimize these problems.

The site plan review process will allow the City to ensure that these design measures are followed. The City should require that developers include these specific pedestrian and bike accommodations early in the site planning.

Connections to the External System

The site must have convenient and safe access to pedestrian, bicycle and transit facilities outside the development. Frequently, large new developments are located on the edge of town along major arterials with limited non-motorized facilities. New developments should always connect to an existing non-motorized transportation network. Commercial developments should include specific plans for connecting to existing facilities and neighborhoods in surrounding areas.

Motor vehicle access to commercial development should be constructed as a conventional driveway with small turning radii and a ramp up to the sidewalk level, rather than a typical public intersection where the roadbed continues at the same level and there are curbs on either side. Use of driveway entrances rather than typical intersections enhance pedestrian safety and comfort because motorists must drive slowly when entering and exiting the development. When a typical intersection-style entrance is used, the sidewalk should continue across the entrance, preferably at sidewalk height, so the right-of-way is clearly established and motorists understand they are entering a pedestrian area. Supplemental signage and crosswalk pavement markings should be used to indicate a crosswalk and the pedestrian right-of-way.

Plantings should be pulled back away from the entrance crossings to allow maximum visibility for both pedestrians crossing the entrance and the cars entering the commercial development. The radius of the intersection curb should be kept as small as possible, and the width of the driveway should be the minimum needed. Just as roads are updated to accommodate vehicular access at new developments with turning lanes or signals, so should non-motorized facilities be updated with new crosswalks, signage and pedestrian signals.

New roadway designs often favor access control for businesses along the road. In this scenario, several businesses share access through one driveway instead of each business having its own entrance and exit onto the main street. In addition to the advantages for vehicles, this is an advantage for the lateral movement of pedestrians along the street because they do not have to cross as many driveways.

However, more direct pedestrian access points from the sidewalk to the individual building entrances should be incorporated. The spacing of crosswalks along the primary road to developments across the road should also be considered.

The design and placement of the buildings should allow direct and clear access from surrounding neighborhoods and residential areas. Too often, what could be a short walk to a nearby store from a residential street becomes dangerous and un-navigable because the store does not have public access on the side facing the residential streets. Both pedestrian and bicycle access should be unimpeded from these areas. During site plan evaluation, development access and travel distances from surrounding residential areas should be a prime consideration.

Encouraging Mixed Use

While tying commercial developments to surrounding residential areas is a good practice, a better practice is to eliminate the segregation of commercial and housing areas. Incorporating higher density housing into commercial developments can dramatically alter the character of commercial development making the project more similar in feel to a small downtown rather than a strip development. For more information see the Land Use Considerations in the next section. Mixed land uses can significantly increase the number of non-motorized trips.

Site Design Checklist

A site design checklist or similar tool should be provided to developers and used by the City in their review of site plans to make sure that bicycle and pedestrian issues are being adequately addressed. The following checklist was adapted with minor modifications from *The Canadian Guide to Promoting Sustainable Transportation through Site Design* by the Canadian Institute of Traffic Engineers. It is a part of a larger publication that looks at site design issues more fully.

Land Use & Urban Form Checklist:

- ❑ Densities are sufficient to support transit (3 to 7 households an acre / 4 to 7 jobs an acre)
- ❑ Highest density land uses are located close to activity nodes such as transit corridors and intersections.
- ❑ Proposed use provides or adds to a diversity of land uses in the surrounding area and does not result in large tracts of similar uses.
- ❑ Proposed use is compatible with adjacent land uses and with long term land use plans for the area.
- ❑ Adjacent street network provides for connectivity of transit, cycling and pedestrian routes.
- ❑ Mixed uses help support non-motorized transportation.

Safety & Security Checklist:

- ❑ Overall site design attempts to minimize conflict points between vehicles, pedestrians and cyclists.
- ❑ Sight distances have been considered in overall site design and in the placement of entry signs and landscaping.
- ❑ Consideration has been given to personal security for pedestrians, cyclists and transit users.
- ❑ Buildings are located close to the street, but provide adequate clearance for pedestrian activities along street frontage.
- ❑ Where appropriate, retail, restaurants and other pedestrian oriented uses animate the street frontage.

Building Entrances Checklist:

- ❑ Building entrances are located close to the street, with direct pedestrian access.
- ❑ Potential conflict points between users arriving by different modes are minimized.

Internal Transportation Network Checklist:

- ❑ Roads and paths match up with surrounding networks and ensure direct connections through the site for cyclists and pedestrians.
- ❑ Block lengths are limited and mid-block crosswalks are provided where appropriate.
- ❑ Traffic-calming principles are applied, where appropriate (proper site design should avoid the need to apply extensive traffic calming).
- ❑ Appropriate measures have been taken to ensure easy progress of transit through the site.

Desired Pedestrian & Cyclist Routes Checklist:

- ❑ Safe, continuous and clearly defined routes for pedestrians and cyclists are provided along desire lines including links to surrounding residential areas.
- ❑ Weather protection and amenities such as trees are provided.
- ❑ Intersections are designated to facilitate pedestrian and cyclist crossings.

Transit Stops Checklist:

- ❑ Walking distances to stops do not exceed 1300 feet, and pathways to stops are safe and direct.
- ❑ Waiting areas are well lit and attractive.

Site Grading Checklist:

- ❑ Terrain along pathways is kept reasonably level, and ramps are also provided wherever stairs are necessary.
- ❑ Slopes along pathways are designed to avoid the ponding of slush and water.

Motor Vehicle Parking Configuration & Treatment Checklist:

- ❑ Off-street parking is located away from the street, preferably behind buildings or underground.
- ❑ Vehicle access is separate from pedestrian access, and access and egress controls are designed so vehicles do not block pedestrian ways.
- ❑ Parking lots are kept small and designed to prevent speeding.
- ❑ Pedestrians have protected walkways through the lots.

Motor Vehicle Parking Supply & Management Checklist:

- ❑ Off-street parking should be provided, where necessary, at the sides and rear of buildings.

Bicycle Parking Checklist:

- ❑ Bicycle parking is located near entrance for short term users in a high visibility location.
- ❑ Weather protected bicycle parking for longer term users is provided in a secure area. Storage possibilities for gear are considered.
- ❑ Showers, changing rooms and lockers are provided within employment centers.

Passenger Pick-up & Drop-off Areas Checklist:

- ❑ Passenger pick-up and drop-off areas are located to the side or rear of buildings, downstream from the entrance, but no more than 100 feet away from it.

Loading Areas Checklist:

- ❑ Loading areas are located off the street, and are screened from public view.
- ❑ Loading area access is designed so that pedestrian, cyclist, and transit routes are never severed.

Internal Road Design Checklist:

- Appropriate traffic signals and compact geometry of intersections control speeds and allow for safe passage of cyclists. Roads are designed to cross at right angles. Sight lines are respected.
- Lanes are designed to accommodate motor vehicles and cyclists, and remind respective users of the other networks on the site.
- Facilities for cyclists and sustainable modes are provided and continued across the site.

Pedestrian Facilities Checklist:

- Sidewalks are provided along all roads, and follow pedestrian desire lines where possible.
- Properly signed crossings are provided wherever a path or sidewalk crosses a road.
- Pathways are clearly defined, delineated, and are of a sufficient unobstructed width. Appropriate amenities such as lighting and weather protection are provided and safety along path is addressed.

Transit Facilities Checklist:

- Stops are located close to the main entrances of activity generators. Crosswalks are provided at all stops.
- Stops and waiting areas are properly illuminated, visible from a distance, and have warranted amenities such as shelters and benches.
- Spacing between stops is minimized.
- Shelters and rest areas are provided at transit stops and locations where there is a high number of users, the elderly or the disabled.
- Shelters and rest areas are identifiable, accessible, places appropriately, and are comfortable.

Wayfinding Checklist:

- Appropriate signage and physical features are provided for users of all networks to determine their location, identify their destination, and progress towards it.

Street Furniture & Amenities Checklist:

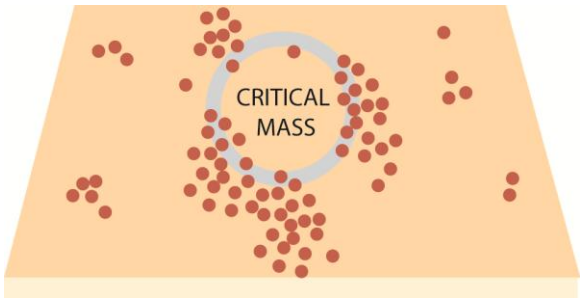
- Amenities are provided to create a comfortable and appealing environment, pre-empting litter and responding to user needs.

Landscaping Checklist:

- Landscaping does not compromise user security and safety.

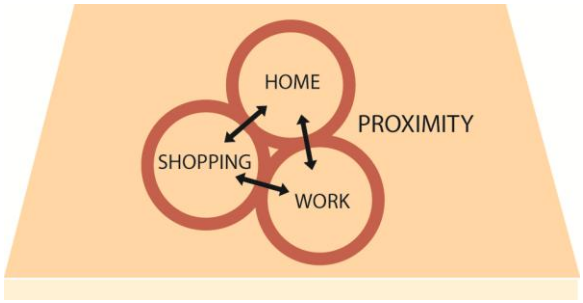
2.8 Land Use Planning Considerations

Land use patterns greatly affect the viability of non-motorized transportation. There is a general consensus based on a significant body of research that three key issues determine how supportive an environment is to walking, bicycling and transit.



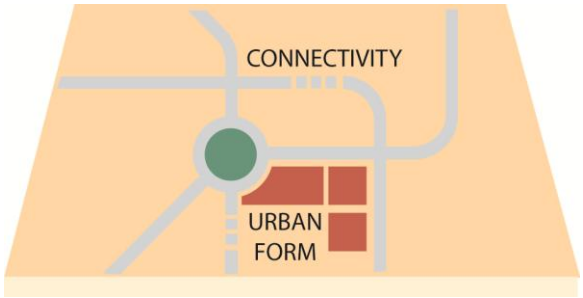
Density

The density of the residential population determines if an area is capable of supporting a transit system, both economically and efficiently. The Southeast Michigan Council of Governments generally considers that at least 3 to 7 households an acre and 4 to 7 jobs an acre are necessary to support a transit system. Higher density encourages retail services needed to maintain a healthy urban environment. Increased population density introduces a critical mass of pedestrians who provide comfort and security to each other with their combined presence. Higher density uses support a non-motorized transportation system more than low density land uses. It has been noted that the key indicator of the vitality of a place is the presence of pedestrians.



Diversity

The diversity of land uses refers to the proximity of trip origins and destinations. If the distances are comfortable for bicyclists and/or pedestrians they will be more likely to use non-motorized means, thus reducing the number of motor vehicle trips. A diversity of services at key public transportation stops allows transit users to minimize their travel and combine many errands at one place.



Design

The design of the non-motorized system and the support facilities determine if a pedestrian or bicyclist trip will be safe, comfortable and convenient. The design is also key in determining how accessible transit stops are and how large an area each transit stop draws from. Design is important on both on a macro and micro scale. On a macro scale the directness and interconnectedness of the network is critical for permitting quick access to adjacent diverse land uses. On a micro scale an environment that rewards non-motorized users with safe and pleasant surroundings encourages use.

Density, diversity and design must all work in concert to make an environment that supports alternative transportation. The absence of one element has the ability to reduce the positive impact of the presence of the other two. Municipal planning can guide land use plans and zoning plans to encourage dense, mixed-use development and design considerations that support a variety of transportation choices. Ordinances may be used to permit mixed-use developments with higher densities, as well as promote increased densities around major destination points and transit lines.

A community's transit, bicycle and pedestrian friendliness has as much to do with a community's population density, land-use diversity and the layout of the street network as it does with providing specific facilities for bicyclists and pedestrians.

2.9 Pedestrian Travel Downtown

The design of the downtown pedestrian environment has a direct effect on the degree to which people enjoy the walking experience. If designed appropriately, the walking environment serves not only the people who currently walk but also entices those who don't. When considering the appropriate design of a certain location, designers should consider not only existing pedestrian use, but how the design will influence and increase walking in the future.

Additionally, designers must consider the various levels of walking abilities and local, state, and federal accessibility requirements. Although these types of requirements were specifically developed for people with walking challenges, their use will result in pedestrian facilities that benefit all people.

In the downtown area, defined by the boundary of the Downtown Development Authority (DDA), pedestrian accommodation takes on a special importance. Though the following guidelines are intended for the downtown area, many have applicability in other areas of town.

Zones in the Sidewalk Corridor

The Sidewalk Corridor is typically located within the public right-of-way between the curb or roadway edge and the property line. The Sidewalk Corridor contains four distinct zones:

- **Curb Zone**
- **Furnishings Zone**
- **Through Pedestrian Zone**
- **Frontage Zone**

Curb Zone **Furnishings Zone** **Through Pedestrian Zone** **Frontage Zone**

The Curb Zone

The Curb Zone defines the pedestrian area, providing a buffer between the sidewalk and street. This zone usually consists of the width of the curb and may contain space for unloading passengers or freight.

- Curb Zone width should be 18 inches where pedestrian or freight loading is expected and may conflict with obstacles, such as planters, in the Furnishings Zone.
- Curb Zone width along all other streets should be a minimum of six inches.

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

On-Street Parking

As noted in Section 2.3 – Travel Along Road Corridors, the presence of on-street parking has a favorable impact on the quality of pedestrian environment. On-street parking increases the lateral separation between pedestrians and moving traffic as well as presenting a substantial buffer between the sidewalk and the street. On-Street Parking also has a traffic calming effect with motorists generally being more cautious looking for opening doors and cars pulling in and out.

Where the buffer zone is limited, on-street parking can compensate for lowered comfort level. Thus, if on-street parking is only allowed on on-side of the street due to road width constraints, the parking should be located on the side with the least buffer, all other factors being equal.

The Furnishings Zone

The Furnishings Zone lies between the Through Pedestrian Zone and Curb Zone. All fixtures and street furniture should be contained in the Furnishings Zone to keep the Through Pedestrian Zone free for walking. This is also the area where people alight from parked cars along the roadway.

Separating pedestrians from travel lanes greatly increases their comfort as they use the Sidewalk Corridor. This buffer function of the Furnishings Zone is especially important on streets where traffic is heavy, yet along many of these streets the existing Sidewalk Corridor is narrow. Where possible, additional width should be given to this zone on streets with traffic speeds over 35 mph.

The furnishing zone is also the area where elements such as signal poles, utility poles, controller boxes, hydrants, signs, parking meters, driveway aprons, grates, and hatch covers are located. Wherever it is wide enough, the Furnishings Zone should include street trees and be paved with tree wells and planting pockets for trees, flowers, and shrubs.

Furnishings Zone Elements

- Trees, planters & landscaping
- Trash & recycling receptacles
- Bicycle racks
- Street lights
- Benches
- Consolidated news racks (advertising racks should be discouraged)
- Clocks
- Public art
- Banners & flags
- Information kiosks
- Fountains
- Wayfinding/signage
- Street Vendors

Planting
Street trees are a highly desirable part of the pedestrian environment, especially large-canopied shade trees. Every effort should be made to provide enough room in the Sidewalk Corridor to accommodate trees in addition to pedestrian travel.

Tree limbs and branches should be trimmed to leave 7' – 6" clear above the level of the sidewalk. Permanent planters usually are not permitted in the right-of-way. Moveable planters may be permitted in the Frontage Zone with a permit from the City.

Street Furnishings
Street furnishings can enliven and provide variety to outdoor public spaces. They serve an aesthetic as well as utilitarian function. Proper design and placement of street furnishings will reinforce the downtown design theme throughout Ann Arbor. The amount and types of furnishings provided will vary depending on the uses along the street and amount of pedestrian activity.

- On sidewalks of ten feet or greater, the Furnishings Zone width should be a minimum of four feet. A wider zone should be provided in areas with large planters and/or seating areas.
- Street furnishing should create a unified look. The color and appearance of street furnishings should be selected in concert with other design elements (such as special paving), surrounding furnishings, and the area as a whole.
- Street furnishings should be securely anchored to the sidewalk and protected with a graffiti-resistant coating to ensure a long-term quality appearance.
- The design and selection of street furniture should include consideration for the security, safety, comfort, and convenience of the user.
- Street furniture should be grouped together to conserve sidewalk space, provide complementary functions, and maintain a clear width sufficient to accommodate pedestrian flow. A greater number and type of furnishings should be located in high-use pedestrian traffic areas.
- The design and siting of furnishings should accommodate the physically challenged. This includes provision of space adjacent to walkways for wheelchairs and/or strollers.
- Textured paving may be used in the Furnishings Zone for decorative purposes.
- To reduce street clutter, consolidate signage on light poles, and other permanent fixtures, wherever possible.
- Dual-level lighting fixtures, which illuminate the street and sidewalk areas, are recommended on downtown commercial streets.

Street Vendors
Street vendors contribute to the life of downtown and provide inexpensive food to many downtown employees and visitors. When permits are granted to vendors the location should be carefully defined so carts and canopies not interfere with the through pedestrian zone. The use of generators should be strictly regulated or banned as the sound of generators severely degrades the pedestrian experience downtown.

The Through Pedestrian Zone

The Through Pedestrian Zone serves as the sidewalk area dedicated to walking and is located between the Frontage Zone and Furnishings Zone. This zone should be entirely free of permanent and temporary objects.

Width

As a general rule, the zone should be at least 6 feet wide in downtown, with 8-10 feet recommended. A minimum of five feet should be reserved to allow for two people to walk comfortably side by side and meet ADA requirements. The volumes of pedestrian traffic should be evaluated prior to granting sidewalk occupancy permits to make sure there is adequate sidewalk width to accommodate typical pedestrian volumes. An acceptable width would result in a pedestrian having to make only minor adjustments in speed and direction to avoid conflicts with other pedestrians and obstacles.

Alignment

The through pedestrian zone should keep in a straight line for an entire block. Zigzagging alignments to accommodate café tables alternately located against buildings and in the furniture zone reduces the capacity of sidewalk and makes it difficult to transverse for persons with sight and mobility impairments.

Intruding Elements

Driveway aprons should not intrude into the Through Pedestrian Zone. This Zone should be kept clear of any fixtures and/or obstructions. Clearance should be provided in a generally straight path for the convenience of all pedestrians, but especially for the sight-impaired. The Sidewalk surface must be stable, firm, smooth, and slip-resistant, per the ADA.

Constraints in the Sidewalk Corridor

Most of Ann Arbor's downtown grid has already been built, and in many cases the existing Sidewalk Corridor is too narrow to accommodate the recommended zone widths. Competing needs for space in a constrained Sidewalk Corridor can be resolved in either of two ways: by compromising on the minimum required clearance for some or all of the zone or by increasing the dimensions of the Sidewalk Corridor. The resolution of such conflicts in any given case must be based on considerations of balancing the conflicting uses and adjusting the magnitude of the solution to fit the magnitude of the project.

Widening the Sidewalk Corridor

In some cases, it is possible to increase the dimensions of the Sidewalk Corridor, either through acquisition of right-of-way or public walkway easements, or by reallocation of the overall right-of-way (such as by narrowing travel lanes or reducing the number of lanes). As part of a roadway reconstruction project on a street with a narrow Sidewalk Corridor, the project planners should first analyze the impact of reclaiming a portion of the existing right-of-way. If this proves impractical, the feasibility of acquiring additional right-of-way should be examined. Acquisition should be considered where its cost is reasonable in proportion to the overall project cost.

In the case of infill development, the dedication of public right-of-way or the granting of a public walkway easement to widen the Sidewalk Corridor may be included as a requirement for obtaining a building permit or land use approval.

Grates
All grates within the sidewalk shall be flush with the level of the surrounding sidewalk surface, and shall be located outside the Through Pedestrian Zone. Ventilation grates and tree well grates shall have openings no greater than 13 mm (1/2 in) in width.

Hatch Covers
Hatch covers should be located within the Furnishings Zone. Hatch covers must have a surface texture that is rough, with a slightly raised pattern. The surface should be slip-resistant even when wet. The cover should be flush with the surrounding sidewalk surface.

Surfaces
Walking surfaces shall be firm and stable, resistant to slipping, and allow for ease of passage by people using canes, wheelchairs, or other devices to assist mobility. Sidewalks are generally constructed of Portland cement concrete. Brick or concrete unit pavers may also be used particularly in the Furnishings Zone or around mature trees where sidewalk lifting is a problem.

Frontage Zone

The Frontage Zone is the area between the Through Pedestrian Zone and the property line. This zone allows pedestrians a comfortable "shy" distance from the building fronts, in areas where buildings are at the lot line, or from elements such as fences and hedges on private property.

Where no Furnishings Zone exists, elements that would normally be sited in that zone, such as transit shelters and benches, telephone kiosks, signal and street lighting poles and controller boxes, traffic and parking signs, and utility poles, may occupy the Frontage Zone. In some cases, easements or additional right-of-way may be required to allow for these items. For residential and mixed-use buildings built to the right-of-way line, these elements should not be sited in the Frontage Zone, as they could block access to an existing or future building. Private temporary uses such as sidewalk cafes may occupy the Frontage Zone, so long as the Through Pedestrian Zone is maintained.

Encroachments

Fences and walls, when permitted, must be at least 1 foot behind the back of the sidewalk (or the future sidewalk, if none exists). Encroachments into the right-of-way should not be permitted where the existing sidewalk corridor is less than the recommended width.

Care should be exercised if elements such as standpipe systems for fire safety project into the Frontage Zone from a building face. Standpipes systems should only project a maximum of 1 foot but not more than four inches if they project in the area between 2 feet, 3 in and 6 feet 8 inches above the sidewalk, per the ADA.

Adjacent Parking Lots

Where there is no landscaping between parked vehicles and the right-of-way, wheel stops or other means such as walls or fences should be used to prevent parked vehicles from overhanging into the Frontage Zone.

3. Proposed Policies and Programs

These policies and programs provide the institutional support for the non-motorized system. They provide the necessary support systems for the proposed physical system. They also provide a framework within which new issues related to non-motorized transportation may be addressed.

The first two policies, Accommodating Bicycle and Pedestrian Travel and ADA Compliance Issues are general in nature but outline the City's approach to addressing non-motorized transportation. Some of the proposed policies are ones that the City itself cannot implement by itself but must work with the Ann Arbor Public Schools and the University of Michigan to implement. The other policies deal with specific design issues, engaging the community, educating the people responsible for implementing and enforcing the system, and approaches to maintaining the system.

Topics:

Prioritization Process for Policy Recommendations:

The method of prioritization for the following policy recommendations was made by identifying the relative importance of that policy and the ease with which it could be implemented within a given time frame. Some policy items could readily be achievable within a year. Others, due to the process required to put together the necessary items needed to fully implement the policy, may take three to five years. These policies are flexible enough that they can be rearranged as priorities and available resources change.

Roles and Responsibilities in Implementing Policy Recommendations:

The policy recommendations have not been assigned to particular departments or staff positions in the City. One of the first tasks in implementing these recommendations would be assigning each policy recommendation to a responsible party.

3.1 Accommodating Bicycle and Pedestrian Travel

In 1999, the United States Department of Transportation issued a policy statement on integrating bicycling and walking into transportation infrastructure entitled *Design Guidance, Accommodating Bicycle and Pedestrian Travel: A Recommended Approach*. This document indicates the federal government's interpretation on how best to address the non-motorized transportation requirements of the Transportation Equity Act for the 21st Century. It serves as the best national policy model for accommodating bicycle and pedestrian travel.

Recommended General Policy Statement

The following draft policy statement is drawn from the United State Department of Transportation's policy statement with minor edits. The entire document may be found in the Appendix. By adopting this policy through a City Council resolution, the City of Ann Arbor would unambiguously endorse and define its support for non-motorized transportation.

1 Bicycle and pedestrian ways shall be established in new construction and reconstruction projects on both sides of a street in all urbanized areas unless one or more of two conditions are met:

   a) bicyclists and pedestrians are prohibited by law from using the roadway. In this instance, a greater effort may be necessary to accommodate bicyclists and pedestrians elsewhere within the right of way or within the same transportation corridor.

   b) the cost of establishing bikeways or walkways would be excessively disproportionate to the need or probable use. Excessively disproportionate is defined as exceeding twenty five percent of the cost of the larger transportation project.

2 Where uncurbed road sections are used, paved shoulders should be included in all new construction and reconstruction projects on roadways used by more than 1,000 vehicles per day. Paved shoulders have safety and operational advantages for all road users in addition to providing a place for bicyclists and pedestrians to operate.

   a) Rumble strips are not recommended where shoulders are used by bicyclists unless there is a minimum clear path of four feet in which a bicycle may safely operate.

3 Sidewalks, shared use paths, street crossings (including over and undercrossings), pedestrian signals, signs, street furniture, transit stops and facilities, and all connecting pathways shall be designed, constructed, operated and maintained so that all pedestrians, including people with disabilities, can travel safely and independently.

4 The design and development of the transportation infrastructure shall improve conditions for bicycling and walking through the following additional steps:

   a) Planning projects for the long-term. Transportation facilities are long-term investments that remain in place for many years. The design and construction of new facilities that meet the criteria in item 1 above should anticipate likely future demand for bicycling and walking facilities and not preclude the provision of future improvements. For example, a bridge that is likely to remain in place for 50 years, might be built with sufficient width for safe bicycle and pedestrian use in anticipation that facilities will be available at either end of the bridge even if that is not currently the case.

   b) Addressing the need for bicyclists and pedestrians to cross corridors as well as travel along them. Even here, bicyclists and pedestrians may not commonly travel along a particular corridor that is being improved or constructed, but they will likely need to be able to cross that corridor safely

and conveniently. Therefore, the design of intersections and interchanges shall accommodate bicyclists and pedestrians in a manner that is safe, accessible and convenient.

c) Getting exceptions approved at an administrator level. Exceptions for the non-inclusion of bikeways and walkways shall be approved by an administrator and be documented with supporting data that indicates the basis for the decision.

d) Designing facilities to the best currently available standards and guidelines. The design of facilities for bicyclists and pedestrians should follow design guidelines and standards that are commonly used, such as the AASHTO Guide for the Development of Bicycle Facilities, AASHTO's Guide for the Planning, Design, and Operation of Pedestrian Facilities, AASHTO's A Policy on Geometric Design of Highways and Streets, and the ITE Recommended Practice "Design and Safety of Pedestrian Facilities". The design of the facilities for bicyclists and pedestrians should also follow the plans and design guidelines set forth in this plan as interpreted on a case-by-case basis.

5 The design of residential, commercial and mixed-use site developments should be in accordance with the best currently available guidelines. The design should incorporate the principals outlined in *The Canadian Guide to Promoting Sustainable Transportation Through Site Design* by the Canadian Institute of Traffic Engineers and other nationally accepted guidelines. Sites should be developed to provide direct pedestrian links between adjacent developments as well as provide for future connections.

3.2 ADA Compliance Issues

Title II of the Americans with Disabilities Act of 1990 (ADA) requires local governments to make their activities, programs and services accessible to persons with disabilities. In the area of non-motorized transportation, the City is required to use accessible design standards for newly constructed and reconstructed sidewalks and shared use paths and to the maximum extent feasible, make altered facilities readily accessible. In addition, the City is required to bring non-compliant curb ramps into compliance throughout the City as part of a transition plan.

The City's Americans with Disabilities Act Transition Plan, updated in 1999, states that the highest priority for curb ramp replacement should be in the downtown area. In addition, the Plan recommends that first priority for new sidewalk construction should be eliminating gaps in sidewalk and path systems that provide access to and from bus stops.

Three recent publications address accessibility of non-motorized facilities. They are:

1. *Designing Sidewalks and Trails for Access Part 2 – Best Practices Design Guide* (FHWA, Publication # FHWA-EP-01-027)
2. *Building a True Community – Final Report of the Public Rights-of-Way Access Advisory Committee*
3. *Draft Guidelines for Accessible Rights-of-Way*, November 23, 2005 (FHWA, Pub. # FHWA-SA-03-019, based in part on the preceding publication)

Together these documents define current best practices for accommodating pedestrians with disabilities for sidewalks and shared-use paths, intersections, crosswalks, and signalization. Until public rights-of-way standars are adopted by the Department of Justice and the U.S. Department of Transportation, the City must follow the ADA Accessibility Guidelines (ADAAG) standards. Once new standards are adopted, the City should provide focused training sessions for City staff and private design and construction professionals to ensure that new transportation facilities are constructed properly.

At the writing of this plan, the ADA Transition Plan is being updated by City staff. The update will include evaluations of the City's programs, services and facilities for compliance with Title II. This evaluation should incorporate guidance from the Comprehensive Non-Motorized Plan to support improved access for all pedestrians, including requirements that ensure accessible routes during construction.

Policy Recommendations for ADA Compliance:

Within One Year:

- Reevaluate the current levels of system-wide access as it relates to non-motorized transportation and update the transportation section of the City's ADA Transition Plan for those areas found to contain obstacles that will not be addressed as a part of a Near-term Opportunities improvement project.
- Incorporate temporary non-motorized access into traffic control plans for construction projects.

Within Three Years:

- Concurrent with the Ann Arbor Transportation Authority's evaluation of its routes, review any route changes to determine if non-motorized facilities provide adequate access between bus stops and destinations such as work and home.

3.3 Planning and Design Policies

The Planning and Design Guidelines section discusses issues and provides specific design guidelines for a variety of situations. Specific policies are needed to work hand in hand with those guidelines to achieve the desired result. The following policies are recommended to be adopted by the City and are grouped in the same manner as the Design Guidelines for ease of reference. They are also grouped by target implementation deadlines. These groupings are do not necessary reflect the policies importance as the groupings recognize that some policies require sufficient time to deliberate, refine and implement.

Policy Recommendations for Travel Along Road Corridors

Within One Year

- Begin the process of evaluating and removing "Sidewalk Bike Route" where appropriate.
- Adopt and utilize the Planning and Design Guidelines in this plan in conjunction with all other applicable guidelines and standards (AASHTO, MMUTCD and ADA) for all new construction and rehabilitation projects.
- Adopt a policy that states if a road-widening project requires the acquisition of additional ROW to accommodate the recommended Non-motorized Zone (comprised of a Bike Lane, a Buffer Zone with street trees, and a Sidewalk) or the recommended non-motorized accommodations at intersections, this cost should be included with the roadway budget and not utilize money set-aside for non-motorized facilities. Further, the policy should state that any disproportionate cost of acquiring additional ROW necessary to accommodate the road or intersection widening, including the non-motorized zone, should not be used as a rationale to eliminate the Non-motorized Zone (see Section 3.1).
- Adopt a policy that states that in evaluating roadway conversions, a certain reduction in Vehicular Level of Service should be deemed acceptable to accommodate safe bicycle and pedestrian facilities. The policy should state that a multi-model approach to roadway engineering is to be employed where the safe movement of all modes is given priority over the capacity of a single mode.
- Evaluate the feasibility of updating the City's LOS guidelines to address the need to accommodate all modes of travel with limited ROW.
- Establish a forum, either new or existing, to coordinate the implementation and funding of non-motorized projects across jurisdictional boundaries.
- Begin a dialog with MDOT representatives regarding near-term and long-term non-motorized improvements to freeway overpasses and interchanges under MDOT's jurisdiction.

Within Three Years:

- Establish a system for assessing and completing sidewalk gaps and repairing sidewalks in disrepair.
- Provide a system for residents to initiate public sidewalk construction in neighborhoods. This system would address completing entire segments or networks.
- Establish a system to provide the necessary maintenance to keep Bike Lanes free of debris.
- Have a financial mechanism in place to implement the necessary maintenance to keep Bike Lanes free of debris.
- Finalize the review of all "Sidewalk Bike Route" signs and complete the removal of sign based upon the review.
- Finalize agreements with MDOT regarding near-term and long-term non-motorized improvements to freeway overpasses and interchanges under MDOT's jurisdiction.

Within Five Years:

- Establish a system to prioritize planting of street trees along busy roads where no trees currently exist.
- Coordinate with MDOT to implement near-term non-motorized improvements to freeway overpasses and interchanges.

Policy Recommendations for Travel Across Road Corridors

Within One Year:

- Adopt and utilize the Planning and Design Guidelines in this report for all new construction and rehabilitation projects.
- Adopt a policy to give pedestrians the right-of-way at mid-block crossings.
- Continue to evaluate best practices for non-motorized facilities with a special emphasis on technological advancements for high volume pedestrian crossings.
- Routinely evaluate the design of intersections as a part of street resurfacing programs to see if non-motorized conditions can be improved.
- Develop maintenance procedures for structures with-in roadways such as medians and crossing islands.
- Implement countdown signals where appropriate.

Within Three Years:

- Develop policies on where to implement countdown pedestrian signals citywide.
- Where pedestrian activated signals are used the activation should call for a pedestrian walk phase at the earliest possible point.
- Evaluate major intersections based on AASHTO guidelines and the guidelines in this document and establish an action plan for improving the conditions for bicyclists and pedestrians at the intersections. This would include the need to evaluate intersections with non-standard geometry, to make sure that motor vehicle clearances do not conflict with pedestrian walk phases and that bicyclists are provided adequate time to clear the intersection.
- Provide for the passive detection of bicycles at all actuated signals by adjusting the sensitivity of existing detection loops, the use of Bicycle Detector Pavement Markings, and the upgrading of equipment.
- In collaboration with AATA, assess the location of bus stops and their impact on mid-block pedestrian crossing to determine if there is a more appropriate location or what measures should be implemented to accommodate mid-block crossings.
- Place at each pedestrian activated signal a sticker requesting pedestrians to report malfunctioning signals to the existing road repair "hotline" 99holes.
- Replace or repair, as necessary, non-working or defective pedestrian activated signals with priority placed on addressing audible signals first.

Within Five Years:

- Where pedestrian activated signals are used, evaluate the integration a pedestrian phase (walk signal) in the typical signal phase. If the pedestrian phase can be accommodated in the typically experienced signal phase then it should be integrated.
- Evaluate intersection sight lines and eliminate right-turn-on-red where limited visibility requires a vehicle to block a crosswalk and in places where conflicts with pedestrians have been reported. This is primarily a concern in the downtown area, and any study should initially focus on the downtown.

Policy Recommendations for Travel on Independent Pathways

Within One Year:

- Adopt and utilize the Planning and Design Guidelines in this report for all new construction and rehabilitation projects.
- Update the path maintenance plan such that short connector paths that provide key non-motorized links receive the necessary maintenance including snow removal. These pathways would include the ones that are a part of the proposed Bike Route system.
- Prepare a strategic implementation plan for the Off-Road Shared-use Path system.

Within Three Years:

- Evaluate the existing pathway system to see if it meets current AASHTO guidelines and current best practices and create an action plan to remedy safety deficiencies. Issues that should be addressed include drainage, clear zones, grade, etc.

Within Five Years:

- Upgrade pathway/road intersections to the new mid-block crosswalk guidelines where appropriate, and align in such a manner as to maximize visibility between the motorists and pathway users.
- Clearly and succinctly delineate the primary rules and etiquette of the pathway with signage at key access points.

Policy Recommendations for Travel within Non-residential and Mixed-use Developments

Within One Year:

- Refine the Site Design Checklist provided in this document and provide the checklist to developers and utilize the check list in the site plan review process.
- Require that site plans include specific accommodations for connecting to existing pedestrian and bicycle facilities, bus stops, neighborhoods, and surrounding areas.

Within Three Years:

- Update the City's development guidelines, standards and city code to provide an approach that encourages the non-motorized principles set forth in this document.

Policy Recommendations for Travel Within Neighborhoods

Within One Year:

- Revise the private street standards for sidewalks and buffer zones such that they are the same as public street standards and meet the guidelines in this document.
- Require that new developments provide for pedestrian and bicycle networks that ensure direct and convenient access to surrounding areas.

Within Three Years:

- Modify existing development standards to encourage non-motorized activity with small blocks and gird street systems.
- Do a comprehensive review and update of Chapter 47, Streets of the City's Code such that recommended designs are consistent with current best practices for walk able and bike able communities.
- Include criteria in the site plan review process that evaluates whether non-motorized activity is encouraged through site design and review, and modify plans as necessary.

Policy Recommendations for Land Use Planning:

Within One Year:

- Determine a method to evaluate planning efforts based on their support of non-motorized transportation. These may include the use of tools such as the neighborhood accessibility index.

Within Three Years:

- Evaluate the area plans and development standards specifically based on their ability to promote non-motorized travel and amend them as appropriate.
- Reduce front setback requirements to encourage non-motorized access.
- Modify plans and policies to encourage compact, mixed use development patterns.

Policy Recommendations for Downtown Pedestrian Use Planning:

Within One Year:

- For City and DDA sponsored projects, utilize the guidelines put forth in this document.

Policy Recommendations for Downtown Bicycle Parking:

Within One Year:

- Evaluate use of existing long-term and short-term bicycle parking and deficiencies in bicycle parking system downtown.

Within Three Years:

- Address deficiencies in downtown bicycle parking.

3.4 School Transportation

The Center for Disease Control states that 13% of children in the United States are overweight, and the number of overweight teens has tripled since 1980. Many children in the United States do not get the hour of daily physical activity recommended by the Surgeon General. Decreased participation in physical activities, and fewer students walking or riding their bikes to school may be contributing to the rise in childhood obesity.

Approximately half of all children in the United States are driven to school in a private vehicle and only 13% walk or bike to school.[30] The number of children walking or biking to school has dropped 37% in 20 years.[31] For many children who live very far away from school, walking or biking is not a feasible option. However, the CDC estimates that only 31% of the children living a mile away or less walk or bike to school. Often times, schools and their surrounding areas lack safe road crossings, preventing children from having safe access to school on foot. Parents and caregivers cite perceived traffic danger as the second most common barrier to children walking and biking to school, preventing as many as 20 million children from walking or biking to school nationwide.[32] The amount of people driving their children to school in private automobiles not only represents a missed opportunity for physical activity, but also increases traffic congestion and puts a huge strain on existing road systems during peak travel times. In one city examined, 20-25% of morning traffic consisted of students being driven to school and 50% percent of children hit near schools were hit by parents of other students.[33]

In an effort to reverse these alarming trends, the CDC has announced a national health objective to increase the proportion of walking and biking trips to school for children living a mile or less from 31% to 50% by the year 2010. Communities, school groups, and local officials all over the country are responding to this challenge by mobilizing children to walk to school, addressing traffic safety concerns, mapping safe routes to school, and by measuring and taking account of their neighborhoods' walkability.

Promotional Activities

National and state agencies such as the CDC, the U.S. Department of Transportation, the Michigan Governor's Council on Physical Fitness, Health and Sports, and organizations such as the Pedestrian and Bicycle Information Center and Partnership for a Walkable America have created information networks, promotional activities, and national and international Walk-to-School events to focus attention on this priority issue. Many programs exist that willing communities can tap into for support and guidance.

Communities around the country and all over the world come together to celebrate International Walk to School Day, a one-day event in October consisted of educational activates involving parents, teachers, kids and community leaders. The event is focused on the importance of physical activity for children, and promoting walkable communities. Other communities use on-going forums such as driver's education, health and fitness organizations, and neighborhood walkability assessments to educate the community about the importance of walkable school routes. Schools can play an active role in promoting their children's health by encouraging and promoting walking and bicycling as a mode of transportation, and ensuring that the City or county is providing safe options for getting to school. Walk-to-School programs can be coordinated with the existing school's physical activity curriculum so that children can receive credits for walking or biking to school. School children in Plattsville, NY keep track of their miles walked to school and are charting it on a map in an attempt to "Walk Across America". Several

[30] Center for Disease Control. *MMWR Weekly*. August 16, 2002. 51(32);701-704
[31] Michigan Governor's Council on Physical Fitness, Health and Sports.
[32] Center for Disease Control. *MMWR Weekly*. August 16, 2002. 51(32);701-704
[33] Center for Disease Control, 1995.

elementary schools in Las Vegas, Nevada schedule at least one walk-to-school event each semester, including a "bike rodeo" where students can show off what they have learned in bike safety classes. The Lamar, South Carolina school system offers prizes and drawings to walkers during their weeklong Walk-to-School promotions.

Another successful activity for promoting walking to school, in use in many communities, is the "walking school bus", when one or several adults walk with children along the route to school, starting in one location and circulating around the neighborhood to pick up children along the way. Under the presence of adult supervision and in a large group children tend to be much more visible to motorists when crossing the street.

Safe Routes to School

Safe Routes to School is a national program funded by National Highway Traffic Safety Administration devoted to identifying the best routes for children to walk to school, based on safe facilities and street crossings. In some areas this has led to on-going efforts to create better routes by building and repairing of sidewalks, hiring crossing guards, and improving crosswalks.

Communities in California that have implemented the "Safe Routes to School Program" with funding from the California state government and the help of parent volunteers doubled the amount of children using the designated safe walking and biking routes to school in the first two years of the program. Typically, the program provides education, engineering and technical assistance to increase safety. AASHTO's *Guide for the Planning, Design, and Operation of Pedestrian Facilities* lists the following procedures for developing safe routes to school:

- Form and support a safety advisory committee.
- Prepare base maps for the area around the school.
- Inventory existing walking conditions and traffic characteristics- checklists are available from the www.walktoschool.org website for use in auditing a community's walkability.
- Design the walk routes.
- Identify improvement areas.
- Get approval of route maps from all necessary parties.
- Implement improvements.
- Distribute maps and educate students and parents.
- Evaluate the effectiveness of the program.

Michigan recently started a new Safe Routes to School Program in response in part to the recently passed SAFETEA-LU federal transportation bill. The program offers an extensive handbook, training, project funding, technical assistance, and walk to school day kits. Projects eligible for funding include sidewalk improvements, traffic calming, crosswalk improvements, etc. More information may be found on the programs website at http://www.saferoutesmichigan.org/.

Identification of Problems

Getting communities involved in examining their neighborhoods and measuring the friendliness of the streets for walkers is an important first step in gathering data to prioritize improvements. A walkability checklist available at www.walktoschool.org helps walkers identify specific problems on their child's route to school. The form allows walkers to rate the existing facilities, how safe and pleasant their walk

was, and how drivers behaved. The checklist also offers a variety of solutions for improving their community's "walkability score" through individual and community action. One great way to teach children about pedestrian safety is to involve them in the assessment process and let them identify potential problems.

Beyond the route to school, pedestrian and bicycle circulation, and safety within the school grounds should be formally evaluated at all schools and an action plan developed to address any deficiencies. For pedestrian routes, issues such as security, accessibility, directness of routes and conflicts with motorized vehicles should be addresses. Bicycle parking areas should be conveniently located near doorways in high visibility areas. Covered and areas that are secured while school is in session should be used to protect the students bicycles.

Transportation Policies

The process of adjusting school districts should include consideration of traffic patterns, neighborhood circulation and major arterials. Defining school districts based in part on considerations of the safest routes to school will help encourage more children to use walking and biking as a form of transportation and minimize the need for children to cross major arterials to get to school. Ann Arbor's transportation policy should include a system of accountability for responding to and remedying safety concerns along children's routes to school. The City should work with the Ann Arbor Public School District to evaluate how best to spend transportation dollars, looking at bussing, facility improvements, and the addition of adult supervisors for children walking to school.

Ensuring safety in the school zone must be a combined effort of traffic engineers, local officials, law enforcement, school officials, parents and children. In addition to promotional and educational programs, a variety of roadway improvements can be used to increase safety in school zones and for children on their routes to school. Some important safety design guidelines for school zones include[34]:

- Reduced speed zones.
- Marked crosswalks.
- Signalized crossings at intersections with pedestrian activation.
- Pedestrian crossing islands and bulb outs where needed.
- Special crosswalk striping, painted according to state standards, and "School Crossing" signage where appropriate.

Police enforcement of yielding and speeding in school zones, and the utilization of adult crossing guards at difficult intersections can also increase safety in the school zone.

Individual school policies as well as district wide policies should be evaluated to make sure that they promote bicycling and walking. Currently some elementary schools restrict bicycling to school.

In conclusion, increasing the number of children who are able to safely walk and bike to school is a national goal that will address childhood obesity, enhance neighborhood walkability, and help alleviate traffic congestion problems.

[34] San Diego's Regional Planning Agency. Model Guidelines for the San Diego Region. April 2002. p. 105.

Policy Recommendations for School Transportation

Within One Year:

- The City should increase enforcement of speeding in school zones and yielding to pedestrians in the crosswalks within school safety zones.
- The City should ensure that within school safety zones, all safety design guidelines are in place and current with national safety guidelines.
- The Ann Arbor Public Schools should develop maintenance standards as well as fix defects and gaps in public sidewalk system adjoining school sites.
- Encourage the Ann Arbor Public Schools to consider the safest routes to school for children when adjusting school boundaries.

Within Three Years:

- The City and School District should continue to enhance a system of accountability for responding to and correcting safety concerns along routes to school and other problems identified through these programs.
- The City should continue to promote and initiate with the school system and parents Walk-to-School Day events, "walking school bus" programs, "Safe Routes to School" programs, and walkability audits in conjunction system-wide with existing national and international programs.
- The Ann Arbor Public Schools should perform formal evaluations of how pedestrians and bicyclists are accommodated to all school grounds and prepare action plans to address deficiencies.
- The Ann Arbor Public Schools should encouraging walking and bicycling to school as a part of the physical education and well being of the students.
- The City should work with the school system to eliminate the need for all "Safety Busing" by remedying the hazard the currently warrants the safety bussing.

Within Five Years:

- The Ann Arbor Public Schools should evaluate all individual school and district wide policies regarding bicycling to school and amend policies that discourage bicycling.
- Encourage residential infill projects within walking distance of schools.

3.5 Community Involvement and Encouragement Programs

Promoting non-motorized transportation through community involvement and encouragement is a critical component to the success of a non-motorized transportation plan. There are many creative approaches being used to involve and educate communities around the country about the importance of non-motorized transportation. Listed in the following paragraphs are a few. For further information on the subject, please consult the references below:

Rails-to-Trails Conservancy and the Association for Bike and Pedestrian Professionals. "Improving Conditions for Biking and Walking: A Best Practices Report." January 1998.

National Highway Traffic Safety Administration. *Pedestrian Safety Toolkit Resource Catalog.* January 1999.

Ride/Walk/Bus to Work

Communities around the country are using the Ride-to-Work Day as a means to educate and involve the public in non-motorized issues. Coordinating days or weeks that specifically promote bicycle commuting is a proven method of increasing number of people who commute by bike.[35] The California Bike Commute Day has had amazing success on a very tiny budget. For the statewide event, transit agencies donated posters and registration cards, and the sale of event tee-shirts helped cover administration costs and limited advertising.[36] The GetDowntown's 2005 Curb-your-car Month program was a great success and should be continued and expanded upon. With a concerted City-led public information campaign, and the potential involvement of transit agencies, businesses, the Chamber of Commerce and the university, the Bike/Walk/Bus to Work Week has the potential to greatly influence citizens of Ann Arbor in their commuting decisions.

Awards

In Michigan, several award programs exist to recognize communities for the efforts they are making in the realm of non-motorized transportation. One such award is the "Promoting Active Communities Award", developed by the Governor's Council on Physical Fitness, Health and Sports and the Michigan Fitness Council. The "Promoting Active Communities Award" recognizes communities that have become healthier places to live through promoting physical activity. The purpose of the award is not only to recognize communities that promote healthy and active living, but also increase awareness of the types of policies and programs that can promote physical activity. Because so much of an active, healthy lifestyle depends on living in communities where there are recreational opportunities, choices in the modes of transportation, and walkable neighborhoods, much of the application focuses on rating the community's policies and planning for non-motorized transportation, and its level of pedestrian and bicycle safety facilities.

Ann Arbor was recently named one of the 9 communities to receive a level 4 award. Level 4 recognizes communities that document outstanding achievements in making it easier for people to be active. Currently no community has reached a level 5 which recognizes Communities that are models of commitment to healthy, active living. Ann Arbor should continue to participate in the program and strive for a level 5 award.

[35] Rails-to-trails Conservancy and the Association for Bike and Pedestrian Professionals. "Improving conditions for Biking and Walking: A Best Practices Report." January 1998.
[36] Ibid.

Another award that recognizes community efforts in the realm of non-motorized transportation is the League of American Bicyclists' "Bicycle Friendly Community Award". This award recognizes municipalities that actively support bicycling. Bicycle-friendly communities are places where people ride for transportation purposes, as well as fun and fitness. The application for the award considers whether a community has taken steps to provide bicycle facilities and infrastructure, safety education, and bike-friendly policies. These awards provide important opportunities for community self-assessment. By participating in the application procedure, a community can critically examine and explore issues that may need improving, evaluate the success of measures already implemented, and acknowledge the important work being done in this area.

Ann Arbor was recently named a Bronze Level Bicycle Friendly Community. Ann Arbor should continue to participate in the program working towards a silver, gold and eventual platinum recognition.

Alternative Transportation Committee Public Workshops

The City currently has an active Alternative Transportation Committee (AKA Alt. Committee) with representatives from key city service areas and partner organizations. This committee is charged with implementing alternative transportation policies in the City. This committee should set up on going, twice yearly, public meeting to share information and gather public input on current initiatives.

Policy Recommendations for Community Involvement and Encouragement Programs

Within One Year:

- The City should continue to participate in the analysis and evaluation of the community's non-motorized programs by completing the "Promoting Active Communities Award" and the "Bicycle Friendly Community Award".
- The City should work with the Get Downtown's Curb-your-car month program to expand the viability and participation in the program.

Within Three Years:

- The City should create a new non-motorized advisory committee to address non-motorized policy and planning issues.

3.6 Education and Enforcement Programs

Professional Staff Education

For Public Services, Planning, Police and Parks and Recreation Staff involved in the planning, design and implementation on non-motorized transportation, there are a number of on-line resources and standard texts that are exceptionally helpful.

FHWA Course on Bicycle and Pedestrian Transportation
http://safety.fhwa.dot.gov/ped_bike/univcourse/instrtoc.htm

The following is the outline of the online course.
Lesson 1: The Need for Bicycle and Pedestrian Mobility
Lesson 2: Bicycling and Walking in the United States Today

Planning Section
Lesson 3: Bicycle and Pedestrian Planning Overview
Lesson 4: Pedestrian and Bicycle Crash Types
Lesson 5: Adapting Suburban Communities for Bicycle and Pedestrian Travel
Lesson 6: Neo-Traditional Neighborhood Design
Lesson 7: Using Land-Use Regulations to Encourage Non-Motorized Travel
Lesson 8: Tort Liability and Risk Management
Lesson 9: Bicycle and Pedestrian Connections to Transit
Lesson 10: Off-Road Trails
Lesson 11: Traffic Calming
Lesson 12: Pedestrian and Bicycle Facilities in Work Zones

Pedestrian Facility Design
Lesson 13: Walkways, Sidewalks and Public Spaces
Lesson 14: Pedestrian Signing and Pavement Markings
Lesson 15: Pedestrian Accommodations at Intersections
Lesson 16: Mid-Block Crossings
Lesson 17: Pedestrians With Disabilities

Bicycle Facility Design
Lesson 18: Shared Roadways
Lesson 19: Bike Lanes
Lesson 20: Restriping Existing Roads With Bike Lanes
Lesson 21: Bicycle Facility Maintenance
Lesson 22: Bicycle Parking and Storage
Lesson 23: European Approaches to Bicycle and Pedestrian Facility Design
Lesson 24: Education, Encouragement, and Enforcement

Association of Pedestrian and Bicycle Professionals (APBP)
http://www.apbp.org
This organization is the only organization that focuses specifically on bicycle and pedestrian issues.
Some of the benefits of membership include:
Newsletter with latest resources and studies
Members Only List Serve – best source for peer review
In-depth Training Seminars

Pedestrian and Bicycle Information Center
http://www.pedbikeinfo.org
This is the single best clearing house of information on bicycles and pedestrians on the web.
It includes:

- Including Safe routes to school information.
- Extensive image library.
- Links to existing studies.

Pro-Walk/Pro-Bike Biannual Conference
This conference is a large gathering of bicycle and pedestrian advocates and professionals from around the US and Canada. It is an excellent way to learn a great deal in a short period of time.

- Presentations and workshops on the latest issues and technologies.
- Networking with others involved in non-motorized facilities.

ITE Transportation Planning Handbook, Chapter 16 Bicycle and Pedestrian Facilities
Chapter 16 is a good introduction to the bicycle and pedestrian planning and design issues.

AASHTO Guide for the Development of Bicycle Facilities
Incorporated by reference into AASHTO's *A Policy on Geometric Design of Highways and Streets*. Most public and private funding sources require projects to be in compliance with this guide.

AASHTO Guide for the Planning, Design, and Operation of Pedestrian Faculties
Incorporated by reference into AASHTO's *A Policy on Geometric Design of Highways and Streets*. Most public and private funding sources require projects to be in compliance with this guide.

Florida Bicycle Law Enforcement Guide
This brief pocket size document is indented as "A review of Florida's Bicycle Safety Laws to help with warnings, citations and crash reports." While not specific to Michigan or Ann Arbor, it can serve as a model for the creation of a similar document that could be used by City police officers.

Public Education and Enforcement Programs

On a few key issues there is not a uniform understanding of the existing laws. A public awareness and education campaign should be undertaken followed by stepped up enforcement of the issues. The key issues are:

Bicycle Laws

Bicyclists need to understand their rights and responsibilities in the roadway. A simple approach such as used by the League of Michigan Bicyclists uses the slogan "Same Road, Same Rights, Same Rules". This is trademarked phrase by Probicyle.com but public and non-profit entities are typically granted permission to use the phrase without charge.

The following are the top four legal issues that should be addressed in a public education program.

- Obey all traffic controls
- Yield to Pedestrians in crosswalks, on sidewalks and walk you bike where posted
- Signal turns
- Having required lights and reflectors when riding at night

Bicycle Operation

In addition to laws there are some basic safe bicycling techniques that should be promoted.

- Options on how to make left turns
- When to use the entire lane
- Riding in a straight line where on street parking exists
- Avoiding opening car doors
- Improving nighttime visibility
- Riding with Buses and Bus Bike Racks

Pedestrian rights and responsibilities in a crosswalk

Pedestrian issues are focused on signalized and unsignalized crosswalks.

- Understanding pedestrian signals, especially the meaning of the flashing "Don't Walk" or flashing red hand clearance interval
- Pedestrians' rights and responsibilities in an unsignalized mid-block crosswalk.
- Accessible pedestrian signals

Motorists Responsibilities

Many bicyclists report being harassed by motorists. A public awareness campaign should focus on the following issues related to bicyclists:

- Expecting and respecting bicyclists in the road
- Keeping a safe distance from cyclists when passing them
- Watching for bicyclists when opening car doors of parallel parked cars
- Understanding why a bicyclist may be positioned somewhere other than the far right side of the road

Pedestrians also experience difficulty with motorists who do not understand pedestrian's rights. The top issues are:

- Not passing a stopped vehicle at a crosswalk
- Not blocking crosswalks when turning right-on-red
- Yielding to pedestrians when turning right and left
- White cane laws
- Stopping at stop bars and yield bars and not crowding crosswalks

Enforcement Programs

One enforcement approach that has been utilized successfully in other university towns is an optional bicycle education class in lieu of a fine. Upon receiving a ticket the offender has three options: pay the ticket, contest the ticket, or attend a class on bicycle safety that is given periodically. This option is typically only available for the first offense.

The current registration program, while helpful in finding a bicycle owner, has limitations. A recent case of a thief registering a stolen bicycle illustrates one of the limitations of registration without proof of purchase. In addition, many bicycle stores do not register bicycles or promote the program. The result is many law-abiding citizens may purchase a bicycle in town and be completely unaware of the registration program.

Bicycle theft can be a deterrent to bicycle use, especially to users with more expensive bicycles. One program that has been used to track down bicycle theft rings is a sting operation using a homing device. An attractive bicycle with a homing device placed in the frame is placed in a location where numerous bicycles have been stolen with minimal protection. The bicycle once stolen can be tracked.

Weather protected bicycle storage is in great demand around town especially near campus. Parking that is intended for daily users are frequently taken up by long-term storage of bicycles. Signage and active enforcement should be used to limit the number of hours a bicycle may be parked in such an area to 72 hours.

Public Education Programs for New Facilities

On-going community education and awareness programs are an important component of a successful non-motorized transportation plan. Coupling public education campaigns with the development of new facilities is a timely and effective way to raise awareness of the new facilities and non-motorized transportation issues in general. Effective public awareness campaigns should include transitional signage at the new facility location as well as posters, flyers, and newspaper articles. Especially important are changes to existing facilities that may not be readily perceptible to users such as the change in curb cut locations.

Bikeway Map

Given the significant increase in the number of bicycle facilities over the past few years, the City's bikeway map is due for an update. The existing City of Ann Arbor Bikeway System Map does not differentiate between Shared-use Paths along a roadway (sidewalk bikeways) or separate from a roadway. While showing sidewalk bikeways may be appropriate in some cases, many of the sidewalk bikeways shown, for example portions of Washtenaw Avenue and Stadium Boulevard, are exceptionally dangerous

due to high numbers of intersecting driveways. A reexamination of how the map presents information should be considered as a part of the updating process.

Also on the bike map is valuable information such as useful phone numbers and bike safety tips. This is a great way to provide basic information on bicycle safety. When the map is updated, efforts should be made to increase its distribution.

Policy Recommendations on Education and Enforcement Programs

Within One Year:

- Establish a plan that addresses which staff should receive advance training on non-motorized issues and which staff should receive baseline training.
- Coordinate public awareness/education and enforcement campaigns regarding pedestrian's rights and responsibilities in crosswalks and bicycles rights and responsibilities in the road.

Within Three Years:

- Provide advance and baseline training on non-motorized planning, design and enforcement issues to staff based on the plan developed in the first year.
- Encourage anti-theft programs.
- Consider providing the option of a bicycle safety and law class for first time bicycle law offenders.
- Reevaluate the format and update the bike map.

Within Five Years:

- Create and use a guide similar to Florida's Bicycle Law Enforcement Guide.
- Provide education on new bicycle facilities and transitional signage/markings where facilities are changed.
- Restrict the use of weather protected parking areas to 72 hours maximum and actively enforce the issue to free-up prime bicycle parking facilities.

3.7 Maintenance of Non-motorized Facilities

The success of the City's non-motorized transportation system ultimately depends on thorough and timely maintenance of all its facilities. Typical problems that can occur on pedestrian and bike facilities include cracked pavement, standing water, obstructions in the clear zone such as sidewalk furniture, overgrown trees and shrubs, construction equipment and signs, and road debris. Without proper maintenance and removal of these problems, people are not encouraged or able to use non-motorized modes of transportation.

General Maintenance of Sidewalks

Regular and consistent maintenance of sidewalks, particularly along arterials and collectors, is important for non-motorized modes of travel. Conditions such as cracks, heaving from tree roots and surface spalling create trip hazards for pedestrians. Inadequate maintenance of sidewalks is not only dangerous, but can complicate any travel by pedestrians who are elderly or have mobility impairments.

Ann Arbor City Code requires that property owners maintain the sidewalk adjacent to their property. Prior to 2005, the City relied on a complaint-based process to identify sidewalks in need of repair. This process corrected some problems, but left others untouched. In the summer of 2005, the Public Services Area initiated a citywide inspection program to identify and cite hazardous sidewalks. If a property owner does not make the required repairs, the City will make the repairs and assess the property for the cost. The program is scheduled to bring all sidewalks within the City into compliance in six years.

In addition to the sidewalk condition inspections program, a proactive approach to sidewalk maintenance is necessary to support non-motorized travel. This approach should include an annual asphalt path maintenance program for shared use paths and trails in City parks; easily accessible web-based complaint forms; and systematic tree and brush trimming along sidewalks and shared use paths adjacent to major streets and in City parks. In addition, research should be done to determine how to minimize the impacts of street tree root damage to sidewalks.

Snow Removal

People who rely on non-motorized transportation as a means of travel are often at the mercy of the weather, especially in the winter. The current practices of snow removal on sidewalks, curb cuts and crossing islands make the large portions of the City impassable to many mobility impaired pedestrians or those pushing strollers or pulling grocery carts.

However, many northern cities around the globe maintain excellent facilities for non-motorized travel in the winter. For example, Boulder, Colorado and Madison, Wisconsin, cities that both have greater amounts of annual snowfall than Ann Arbor, (Boulder-60", Madison-42", Ann Arbor-39") have bicycle mode-shares significantly higher than Ann Arbor. Both Minneapolis and Madison have higher bicycle commuting rates than San Diego[37].

City policy should treat the removal of snow from sidewalks and key off-road pathways with equal importance as the removal of snow from streets. The City already leads by example by clearing paths in parks, adjacent to public buildings and on bridges. Additional attention is needed to identify "orphan" areas, such as under railroad viaducts, over freeways or along other public rights-of-way to ensure that these areas are cleared by the appropriate agency. Through its involvement with the Ann Arbor Public School Safety Committee, the City should work with the public schools to identify walk routes for

[37] Federal Highway Administration. Publication FHWA-PD-041. Case Study No.1:Reasons Why Bicycling and Walking Are Not Being Used More Extensively as Travel Modes.

clearing and weekend and vacation contingency plans. In addition, the City should encourage private businesses and neighborhood groups to contract for shared snow removal services and provide information to assist in this process.

Areas of special concern are curb ramps at intersections and the growing number of pedestrian crossing islands. Curb ramps must be cleared by the adjacent property owner, however, even if this is done, snow is often pushed back into the curb ramp by passing street plows. Crossing islands are not the responsibility of an adjacent property owner, so they require clearing by City staff. To address both situations, City staff should explore the purchase of special equipment that can be used to clear these curb ramps quickly without the need to hand shovel.

Crosswalks

While motorists can tolerate bumpy roads, uneven pavement surfaces at intersection crosswalks can be hazardous for pedestrians. The City's street resurfacing program uses a combination of pavement condition ratings and drive-testing to identify street segments to be resurfaced each year. Additional criteria should be considered to identify those pedestrian crossings that are in need of resurfacing.

In addition to a smooth pavement surface, crosswalks need markings that provide good contrast for motorists and a non-slip surface for pedestrians.

Leaf Storage and Curb Carts

The City's fall leaf removal program requires property owners to move their leaves into the street 24 hours prior to the schedule pick-up. These leaf piles can be slippery for bicyclists and effectively block the portion of street available for bikes and they may cover other potentially dangerous debris. A combination of a public awareness campaign and increased enforcement of early leaf placement will minimize the problem. Additional program guidelines should be considered to determine if City crews could cost-effectively remove leaves stored in lawn extensions along arterials.

The conversion of the City trash system to automated collection of curb carts presents an additional challenge to bicyclists. A public awareness campaign should stress that carts should be stored on the extension and not in the street. Additionally, when bicycle lanes are installed on a street, the City should send a mailing to adjacent property owners explaining what the bicycle lane is and reinforcing that items such as leaves, compost bags and curb carts should not be placed on the street.

Bicycle Lane Striping and Sweeping

Motor vehicles tend to sweep debris into bicycle lanes filling them with debris quicker than the motor vehicle lanes. If debris is left in place it becomes a hazard for cyclists and some cyclists will no longer ride in the bicycle lanes. To avoid this problem, bicycle lanes should receive more frequent sweeping. This has the added benefit of reducing the amount of sediment washed into the storm sewer system and some communities have increased the frequency of street cleaning solely for that purpose.

Maintaining visibility and reflectivity of bicycle lane pavement markings and symbols are important to nighttime cycling safety, especially when raining or snowing. The City's pavement marking maintenance schedule should be revised to include these markings, which may require more frequent restriping than regular lane markings to retain their high contrast and visibility. Materials used for bicycle markings should be non-slip.

When snow is removed, it is critical that the entire bicycle lane be cleared since many cyclists use their bicycle year round. Any loss of bicycle lane width means cyclists are more likely to use the motor vehicle lanes.

The City should also undertake a public awareness campaign on the value of keeping bicycle lanes and curbs in general free of debris to promote bicycle safety and water quality. Citizens should be encouraged to sweep bicycle lanes and curb areas to supplement scheduled maintenance.

Problem Identification and Prioritization

Encouraging the community to identify non-motorized facility problems and maintenance issues can save City staff both time and resources. Public participation also allows citizens to feel that the City is responding to their needs and concerns. The City of Portland, Oregon uses a phone hotline, web pages and postcard/comment cards to aid citizens in reporting maintenance issues. Problems may include malfunctioning pedestrian signals, gaps in the sidewalk system, maintenance of crosswalk or bicycle lane markings, or debris in bicycle lanes. In addition to providing comment cards at locations such as bicycle stores and public buildings, the City should set up web-based forms that allow tracking of service requests and direct the request to the appropriate person.

One area that demands particular attention is pedestrian-activated crosswalk signals that are not functioning properly. By the time pedestrians have completed their trip, they may not remember or do not know how to report the problem. Posting a phone number on the post, along with the fixture number, could allow those with cell phones to call in a report.

Policy Recommendations on Maintenance of Non-motorized Facilities

Within One Year:

- The City should develop and implement a public awareness campaign to reinforce the proper storage of leaf debris and curb carts in bicycle facilities.
- Consider program changes to allow property owners along arterials, especially those containing bicycle lanes, to have leaf debris collected from the lawn extension or driveways.
- The City should mail informational brochures to residents along existing and any newly installed bicycle lanes about the purpose of the lanes and reinforcing that items such as leaves, compost bags and curb carts should not be placed in the lane.
- The City should develop a multi-year maintenance schedule for refreshing pavement markings on crosswalks and bicycle lanes to maintain high contrast and visibility.
- Initiate a program that provides maintenance contact information, either on stickers or signs, to be placed on pedestrian signals.
- Work with the Ann Arbor Public Schools to identify snow clearance schedules.
- Develop an educational campaign encouraging property owners to clear curb ramps and bus stops when shoveling their sidewalks.
- Establish a dedicated phone number and website form for non-motorized service requests.
- Utilize existing city publications and newspaper inserts to encourage citizens to keep bicycle lanes and gutters free of debris to improve bicycle safety and water quality.
- The City should establish a program to sweep bicycle lanes and pathway more frequently than is typically done for streets. In addition, the City should establish a schedule for crack sealing, pot hole filling, removing grass growing in pavement and trimming vegetation. Special equipment may be required to do this.

Within Three Years:

- The City should have a clearly defined and consistent program to assure snow removal from hard surfaced sidewalks and pathways that they own and/or are under their responsibility.
- The City should assess the effectiveness of the efforts of the code compliance staff to enforce the existing snow removal ordinance on privately owned hard surfaced sidewalks and pathways. If necessary, the City should develop a program to assure snow removal from privately owned sidewalks and pathways along Arterials and Collectors.
- The City should designate staff and assign responsibility for clearing crossing islands and key connector pathways of snow and ice.
- Staff from Forestry and Field Operations should identify street tree planting and maintenance strategies to reduce root impacts on sidewalks.
- The City should develop a program that monitors the condition of sidewalks along Arterials and Collectors on a yearly basis.

Within Five Years:

- The City should consider taking responsibility for maintenance on sidewalks and pathways along arterials and collectors.

- Establish a maintenance hot-line and website for non-motorized issues (this may be integrated with other maintenance hot-lines) and place a sticker with this hotline number and website address at locations around town including at all pedestrian activated signals.

3.8 City Codes

A considerable amount of confusion exists regarding the rights and responsibilities related to crosswalks. The resulting confusion is shared by motorists and pedestrians alike and can result in dangerous situations. This issue is one of the prime driving forces behind the "Yield Here to Pedestrian" signs inclusion in Revision 2 of the National Manual of Uniform Traffic Control Devices.

Two primary sets of codes outline the rules and regulations concerning pedestrian and bicycle traffic in Michigan, the Michigan Vehicle Code (MVC) and Michigan's Uniform Traffic Code for Cities, Townships, and Villages (UTC). Both codes are available to communities for adoption by reference. The state codes are modeled on national codes so that as drivers and pedestrians travel throughout the country there are similar sets of rules wherever they go. The National Manual of Uniform Traffic Control Devices MMUTCD is also an attempt to standardize signage appearance and placement along the roadway.

In May of 2005, The City of Ann Arbor adopted the Michigan Vehicle Code as local law. In addition, Ann Arbor has its own traffic code that is based on Michigan's Uniform Traffic Code. However, there are several key issues related to non-motorized transportation where Ann Arbor's Code varies from Michigan's Uniform Traffic Code. Not all of these are problematic. There are, however, some areas where Ann Arbor's Traffic Code could be improved. The following key issues regarding pedestrian and bicycle rights should be addressed:

- Pedestrian rights and responsibilities in Crosswalks
- Crossing at other points than in Crosswalks
- Passing a Vehicle stopped at a Crosswalk
- Bicyclists' rights in a Crosswalk
- Bicycle Parking Requirements

Pedestrian Rights and Responsibilities in Crosswalks:

National Uniform Vehicle Code Model:
UVC § 11- 502(a) Pedestrians' right of way in crosswalks [Yield to pedestrian in crosswalk]
When traffic-control signals are not in place or not in operation, the driver of a vehicle shall yield the right of way, slowing down or stopping if need be to yield to a pedestrian crossing the roadway within a crosswalk when the pedestrian is upon the half of the roadway upon which the vehicle is traveling, or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger.

UVC § 11- 502(b) Pedestrians' right of way in crosswalks [Pedestrian can't suddenly leave curb]
No pedestrian shall suddenly leave a curb or other place of safety and walk or run into the path of a vehicle which is so close as to constitute an immediate hazard.

Comparison to State Code:
This issue is not addressed in the MVC that Ann Arbor adopted in May 2005. Rather it is addressed in the Michigan Uniform Traffic Code for Cities, Townships and Villages. The UTC's version is very similar.
R 28.1702 Sec. 7.2. Pedestrians; right-of-way in crosswalk; violation as civil infraction.

(1) When traffic-control signals are not in place or are not in operation, the driver of a vehicle shall yield the right-of-way, slowing down or stopping if need be to so yield, to a pedestrian crossing the roadway within a crosswalk when the pedestrian is on the half of the roadway on which the vehicle is traveling or when the pedestrian is approaching so closely from the opposite half of the roadway as to be in danger, but a pedestrian shall not suddenly leave a curb or other place of safety and walk or run into a path of a vehicle which is so close that it is impossible for the driver to yield.

(2) A person who violates this section is responsible for a civil infraction.

Comparison to Local Code:
The Ann Arbor Municipal Code addresses pedestrian rights and responsibilities in Crosswalks and the issue of crossing at places other than Crosswalks in the same piece of code (see the discussion on Crossing at Places Other Than Crosswalks in the next section). The portion of the code that addresses pedestrians rights and responsibilities in a crosswalk specifically limits a pedestrian's right of way to crosswalks restricted by a traffic control device. A crosswalk pavement marking is a traffic control device.

10:148. Pedestrians crossing streets.
(b) No operator of a motor vehicle or bicycle shall interfere with pedestrian or bicycle traffic in a crosswalk into which vehicle traffic is then restricted by a traffic control device.

It is recommended that this language be replaced by the national model code.

Crossing at Places Other than Crosswalks

National Uniform Vehicle Code Model:
UVC § 11- 503(a) Crossing at other than crosswalks
Every pedestrian crossing a roadway at any point other than within a marked crosswalk or within an unmarked crosswalk at an intersection shall yield the right of way to all vehicles upon the roadway.

Comparison to State Code:
This issue is not addressed in the MVC that Ann Arbor adopted in May 2005. Rather it is addressed in the Michigan Uniform Traffic Code for Cities, Townships and Villages. The UTC's version is distinctly different from the national model. The code contradicts section R 28.1702 setting up a case where both the pedestrian and the motorist are required to yield at marked mid-block crosswalks and unmarked crosswalks at intersections. The national model used by most states avoids this contradiction. Some local jurisdictions in Michigan have adopted codes to avoid this contradiction. The UTC is as follows:

R 28.1706 Sec. 7.6. Pedestrians; yielding right-of-way; violation as civil infraction**.**

(1) Every pedestrian who crosses a roadway at any point other than within a marked crosswalk at an intersection shall yield the right-of-way to all vehicles on the roadway.

(2) A person who violates this section is responsible for a civil infraction.

Comparison to Ann Arbor's Code:
Ann Arbor's code is similar to the state code with the exception that it further provides that pedestrians must yield to bicyclist as they would yield to a motor vehicle when crossing in unmarked crosswalks or mid-block. While Ann Arbor's code allows a pedestrian to cross freely if they do not interfere with motor vehicles or bicyclists it does not appear that they have the right-of-way in unmarked crosswalks.

10:148. Pedestrians crossing streets.
(a) No pedestrian shall cross a street at a location other than at a crosswalk into which vehicle traffic is then restricted by a traffic control device unless such crossing may be done safely and without interfering with motor vehicle and bicycle traffic on that street.

It is recommended that this code be removed and replaced by the national model.

Bicyclists Rights in a Crosswalk

National Uniform Vehicle Code Model:
UVC § 11-1210(c) [§ 11-1209(c), 2000 version number] Bicycles and human powered vehicles on sidewalks [Bicyclist has rights/duties of pedestrian]
A person propelling a vehicle by human power upon and along a sidewalk, or across a roadway upon and along a crosswalk, shall have all the rights and duties applicable to a pedestrian under the same circumstances.

Comparison to State Code:
No similar or contradictory code is found in either the Michigan Uniform Traffic Code for Cities, Townships and Villages or Michigan Motor Vehicle Code

Comparison to Local Code:
No similar or contradictory code is found in Ann Arbor's codes.

It is recommended that the City of Ann Arbor adopt a code based on the national model.

Other Bicycle and Pedestrian Related Codes

The Ann Arbor Transportation Committee has looked at these issues in detail and come up with Draft Pedestrian Recommendations, and recommended modifications and additions to the Ann Arbor Municipal Code that would improve the pedestrian environment and clarify pedestrians rights and responsibilities in Ann Arbor.

In addition to code modifications, designers and engineers must ensure that intersection treatments are as clear and consistent as possible, and that all users are treated with equal consideration for their safety and mobility. This includes critical decisions on how and where to mark crosswalks, to provide crossing islands where appropriate, or to include pedestrian signals and how they are activated or integrated into the signal phasing.

Ordinances Concerning Bicycle Use in Business Districts

Despite the legal standing bicycles have in the roadway, many people in Ann Arbor currently bike on the sidewalks and crosswalks because of the lack of adequate bicycle facilities in the roadway. The laws governing bicycle use on the sidewalk include the specification that bicycles must yield the right of way to pedestrians in the sidewalk, provide an audible signal when passing pedestrians, and not be operated faster than is "reasonable or proper". Despite these ordinances, due to the high level of both pedestrian and bike traffic in some business districts, conflicts frequently occur between pedestrians and bicyclists sharing the limited space available on the sidewalk.

Bicycles cannot be effectively restricted from the sidewalks without improving conditions for bicycling in the roadway. "Walk Your Bike" signs should be preceded by the placement of Bike Lanes or Shared-use Arrows in the street and Bicycle Warning signs to improve cycling conditions before bikes are excluded from the sidewalk.

Neighborhood Parking Programs

Free, all-day vehicular parking is currently available in most neighborhoods immediately west of downtown and many neighborhoods immediately south and east of the University of Michigan's Central Campus. Hundreds of commuters park in these neighborhoods for the entire day and walk a few blocks to places of employment and university facilities. Free all day parking near downtown and central campus provides a significant disincentive for commuters to consider alternative modes of travel. The current neighborhood parking programs that exist in a number of small areas in Ann Arbor help provide residents of impacted streets with an improved opportunity to park on their street but does little to encourage non-motorized travel. A comprehensive, revenue generating neighborhood parking program could provide an opportunity to capture revenue from the strong demand for neighborhood parking which could help encourage non-motorized activity and help fund new non-motorized facilities.

Bicycle Parking Requirements

The City updated its bicycle parking requirements in 1995. These requirements do a good job at describing the different classes of bicycle parking, location and lighting issues. The code though should be revisited and updated as necessary to address the following issues:

- Rather than describing bicycle rack design and placement in the code, provide or reference graphical design guidelines with information on the specifics of bicycle rack design and placement. The Association of Pedestrian and Bicycle Professionals recently published Bicycle Parking Guidelines; these serve as a good model or may be referenced. The report may be found at http://www.apbp.org/website/content/view/44/73/.
- Add a requirement for the incorporation of bicycle parking into existing developments via certain thresholds such as resurfacing of existing parking lots or renovations to existing buildings.
- The requirements for bicycle parking for multi-family residential developments seem to be too low. Also, a greater emphasis should be placed on Class B (covered) facilities for residential units as bicycles left in the open for extended periods of time will be difficult to maintain.
- The requirements for bicycle parking in special parking districts (such as the downtown) need to be clarified. Even if off-street motor vehicle parking is not required, bicycle parking should be required.
- The ability of a development to meet its bicycle parking requirements via a shared facility such as a Bike Station that is either run privately or through a public or quasi-public agency should be addressed.
- Incentives should be provided to large employers to provide additional Class A (enclosed) parking, Class B (covered) parking, showers and locker facilities.
- Incentives should be provided to encourage Class A (enclosed) and Class B (covered) spaces over Class C (uncovered) spaces.

Policy Recommendations for City Codes:

Within One Year:

- Establish a committee to update the City code based on the recommendations within this report.

Within Three Years:

- Amend City code to encourage non-motorized travel
- Evaluate the feasibility of a comprehensive neighborhood parking program that would encourage non-motorized modes of travel and raise revenue for non-motorized facilities and programs.
- Update the bicycle parking requirements.

3.9 University Programs

The communities with the most successful bicycling and pedestrian programs across the country share one element – a university in their midst. While there is no doubt that students make up a large share of the bicycle and pedestrian traffic, university employees are also significant contributors.

The University of Michigan has expressed a strong desire to safely accommodate non-motorized modes of transportation for students, faculty and staff. Towards this end, the University recently hired staff to oversee alternative transportation modes on campus including non-motorized transportation.

Providing bicycle related information to incoming students is one effective way to increase bicycle awareness and safety on campus. The packet of information received by incoming freshman and graduate students could include bicycle registration and bicycle safety information, lists of bicycle retailers and the bicycle rules and regulations in Ann Arbor. The City of Ann Arbor's bicycle map is an excellent resource that covers the key bicycle laws as well as existing bike routes. Copies of the map should be made readily available to students. An overview of bicycle and pedestrians laws could be integrated into orientation events. The phone number of the University's Alternative Transportation Coordinator should be posted in the dormitories and academic buildings so students can easily obtain information.

Like the City's non-motorized transportation system, the success of the University's bike and pedestrian system ultimately depends on thorough and timely maintenance of all its facilities. In addition to providing bike orientation for incoming students, there could be programs in place for the on-going maintenance, education and enforcement concerns that arise throughout the year. Ensuring consistent coordination of maintenance efforts and a bike coordinator who will respond quickly to concerns will provide the foundation for a successful non-motorized program at the University.

Bike Parking

Providing adequate facilities for the large population of bikers at the University is an essential component of successful campus planning and theft reduction. Covered and secure bike storage could be provided at key points throughout the campus, near academic buildings and dormitories. The bike storage could include adequate space for locking bikes, be shielded from the elements and well lighted with access to emergency phones nearby. Many communities have embraced the concept of bike stations where bicycle storage, maintenance, registration, and education are centered in a facility. Given that many students live in apartments and houses with limited space, a bike station might have an enthusiastic audience.

Separation of Bicycles and Pedestrians

Given that the University of Michigan and the City of Ann Arbor are physically intertwined entities, the approach to bicycle travel between the City and the campus should be as uniform as possible. As the City moves towards a primarily on-road solution for accommodating bicyclists, the University of Michigan currently has an approach based on side-paths for accommodating bicycles along roadways. This is especially true in North Campus. As a part of the North Campus Transportation Plan, the road system should be evaluated to see how it may be retrofitted to better accommodate on-road bicycling.

While there is no survey on the subject, students and faculty have reported concerns with the way bicyclists and pedestrians share pathways across campus. Similar issues have led Michigan State University and other universities around the country to move towards separating bicyclists and pedestrians. For the most part on the MSU campus, bicyclists will be accommodated in bike lanes. For areas where there is a strong desire line for bicycling but no adjacent roadway, separate bike-only facilities are proposed.

The viability of utilizing a similar approach should be evaluated for the University of Michigan Campus. Issues such as the campus aesthetics, pedestrian safety, and convenience for bicyclists need to be considered. Where bicycles and pedestrians will share a pathway, signage and enforcement should be considered to regulate bicycle speeds and bicyclist's responsibility to yield to pedestrians.

Some campuses have proposed pedestrian only zones for congested campus areas providing bicycle parking on the edge of the zone. These have been used with varying degrees of success. The University should consider evaluating the feasibility of restricting portions of the historic central campus for pedestrian only traffic. Prior to implementing such a policy, bicycle traffic should be conveniently and safely accommodated on the surrounding roads and sufficient convenient and secure bicycle parking should be provided on the periphery.

Policy Recommendations for University Programs:

Within One Year:

- Establish quarterly meetings between the University's new Alternative Transportation Coordinator and the City's Alternative Transportation Coordinator to address issues of common concern.
- Look at the feasibility of converting roads to include bicycle lanes as a part of the North Campus Transportation Plan.

Within Three Years:

- Consider providing the City's bicycle map in the orientation packets and making copies readily available to students.
- Evaluate the use of "bike stations" to accommodate the needs of campus cyclists.

Within Five Years:

- Look at ways to incorporate an overview of bicycle and pedestrian laws and bicycle safety into the orientation program and utilize the a2gov.org/goblue website to provide information on bicycling and walking in Ann Arbor.
- Study the feasibility of separating bicycle and pedestrian traffic in high use non-motorized corridors.
- Consider ways to regulate bicycle speed and require that bicycles yield to pedestrians on pathways.
- Consider developing pedestrian only zones in congested historic campus areas.

4. Existing Conditions

The major influences on non-motorized travel may be distilled down to two factors, the physical environment and the social environment. The influence of the physical environment is not limited to the existence of specific facilities such as bike lanes and sidewalks. Just as important as facilities is the underlying urban form. The majority of bicycle and pedestrian trips are for short distances. Even with first-rate facilities, large blocks of homogeneous land uses and spread-out development will inhibit many non-motorized trips.

We are at a key juncture now in Ann Arbor and the country as a whole. Mainstream media has begun to cover the health and economic implications of our land use and transportation infrastructure decisions. Community leaders and citizen activists are calling for a greater emphasis on non-motorized travel. Yet there is a tremendous physical and institutional legacy to overcome.

Routinely, non-motorized mobility comes second to motorized mobility. For example, rarely are bicyclists' and pedestrians' needs considered in construction projects and detours. Also, there is a reluctance to provide bicycle or pedestrian improvements on an arterial that may even slightly diminish the motor vehicle capacity of the roadway.

As it stands now, for a pedestrian or a bicyclist, travel through the City can often be discouraging. The physical environment strongly promotes motorized travel over bicycling and walking. To overcome this legacy, a wholesale change in attitudes and perceptions throughout the public and private sectors will need to be instituted. No small task, but perhaps at no other time in history has the public discussion been at the levels that currently exist.

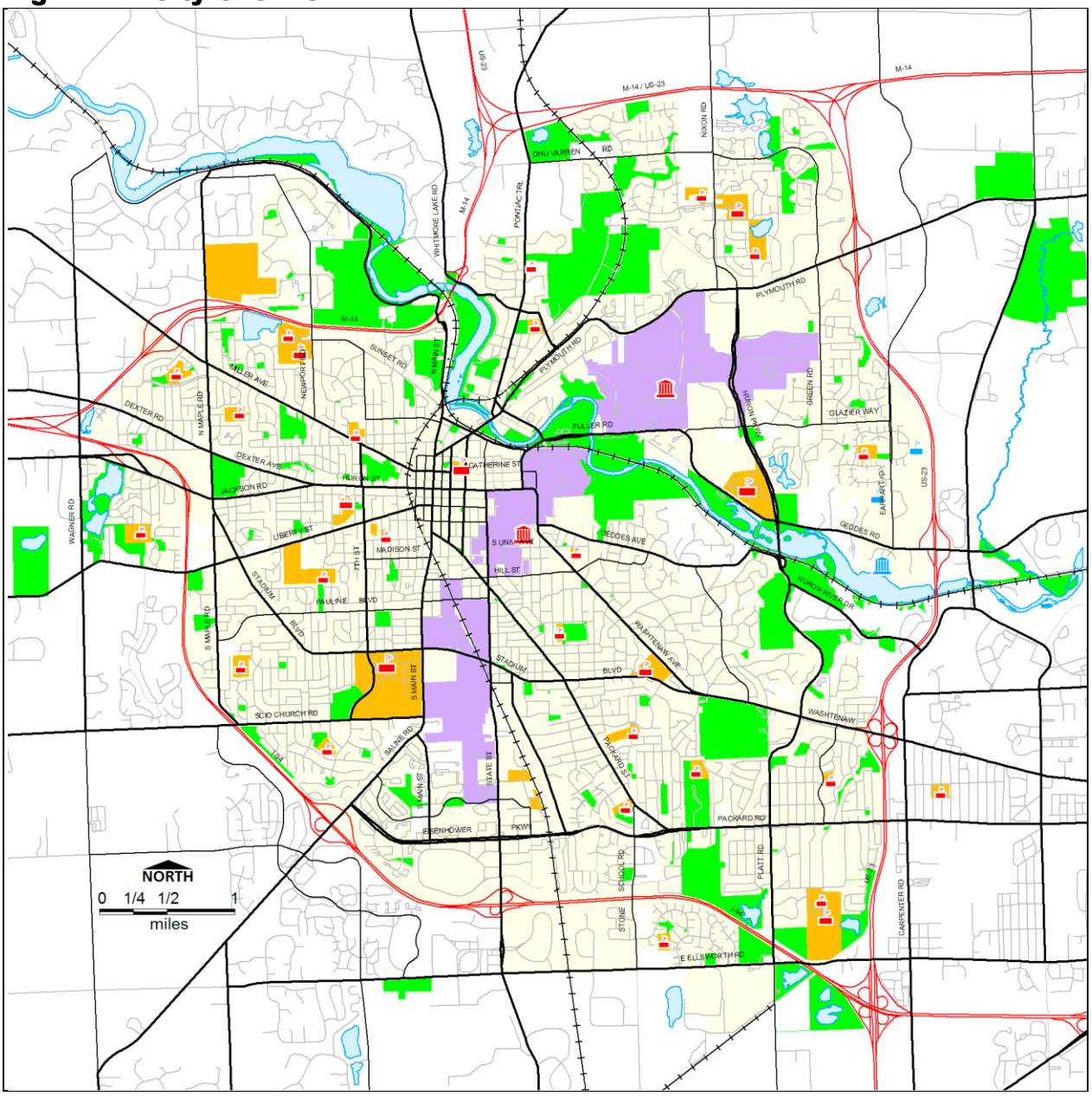
4.1 General Conditions

The City of Ann Arbor has been developed in two distinct patterns. The older parts of town including the Downtown, near Northside, near Westside and Burns Park area generally have a grid street pattern and about half of the primary roads are only two to three lanes wide. Pedestrian and bicycle travel is generally easy and comfortable in these areas and there are often numerous route options.

The newer parts of town, including the Northeast area, South area and development around the freeway loop, often consist of dispersed land uses that are, for the most part, scaled towards automobile use. Few arterial and collector alternatives exist in these areas for bicyclists and pedestrians. Bicycles and pedestrians are directed into corridors with the highest concentration of vehicular traffic. The result is a non-motorized environment that is not favorable to walking and bicycling for everyday transportation.

One of the defining characteristics of Ann Arbor is the amount of park and open space. The City is home to numerous golf courses, as well as the parkland along the Huron River and the open space along Huron Parkway. This, in combination with the natural barrier of the Huron River, and the artificial barriers of railroads, and four-lane arterials tend to fragment the City from a non-motorized standpoint. The City should work to both minimize the impact of the artificial barriers and increase the land use diversity throughout the City.

Fig. 4.1A. City Overview



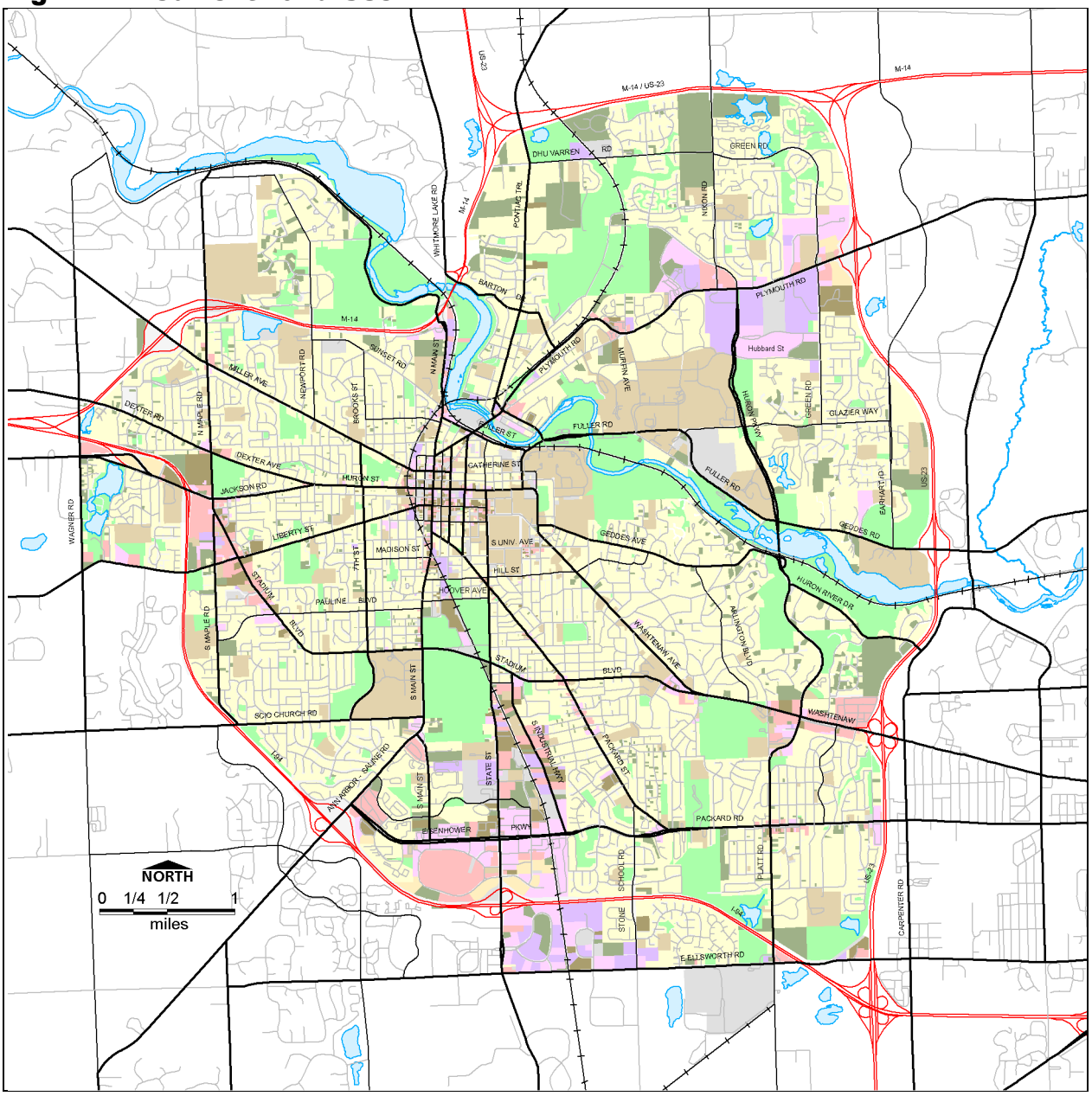
Legend

Educational Facilities:

- University of Michigan Campus
- Private School
- Private College
- Middle School
- High School
- Elementary School

- Main Road or Neighborhood Connector
- Freeway
- Other Road
- Line
- Water
- Park
- Public School Property
- University of Michigan Property
- Approximate City Boundary

Fig. 4.1B. Current Land Use



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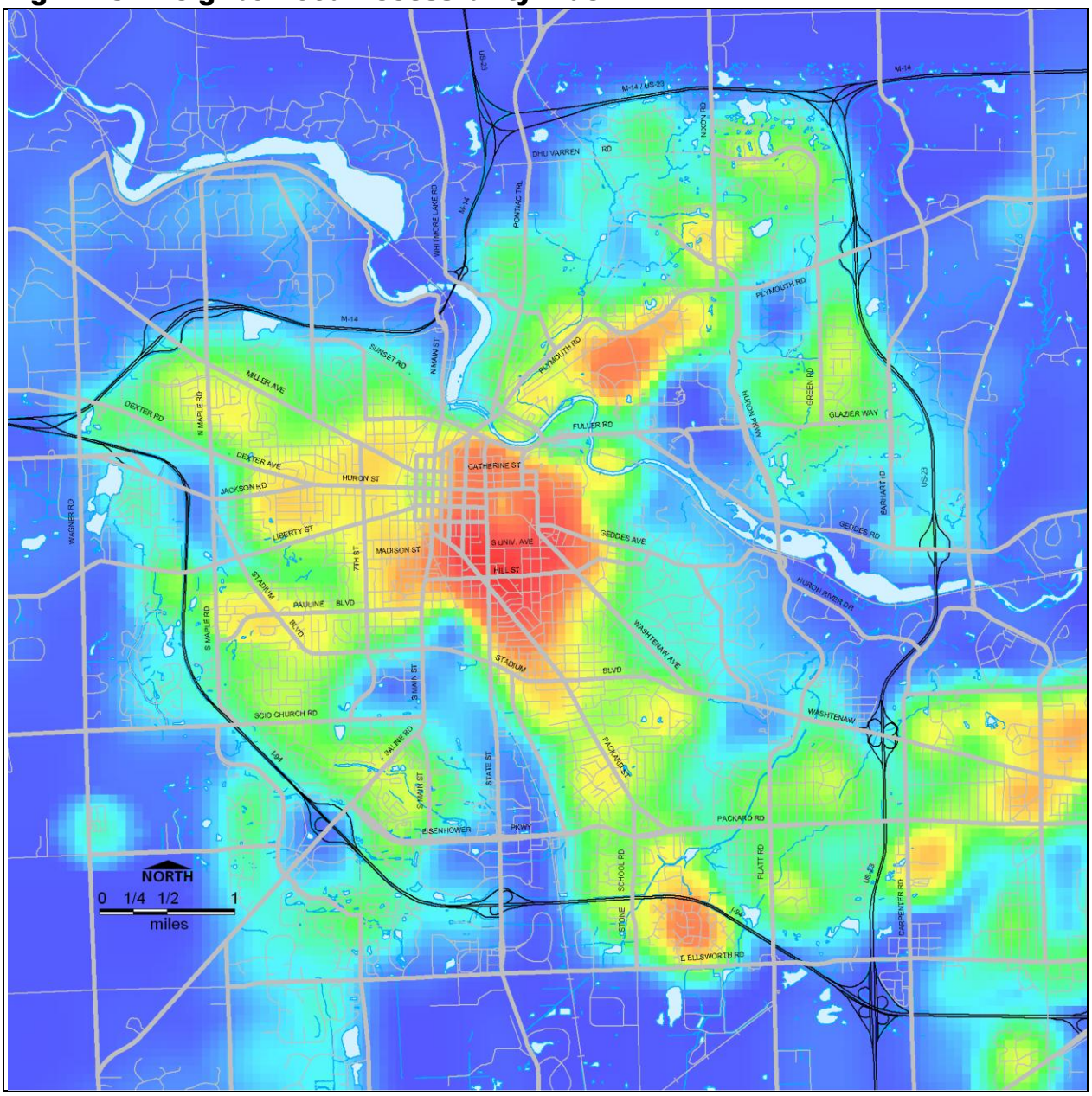
Current Land Use

- Residential
- Lodging
- Office
- Commercial
- Research / Industrial
- Transportation/Utilities
- Institutional
- Parks / Recreation
- Vacant

The land use information is for the City of Ann Arbor only.

Fig. 4.1C. Neighborhood Accessibility Index



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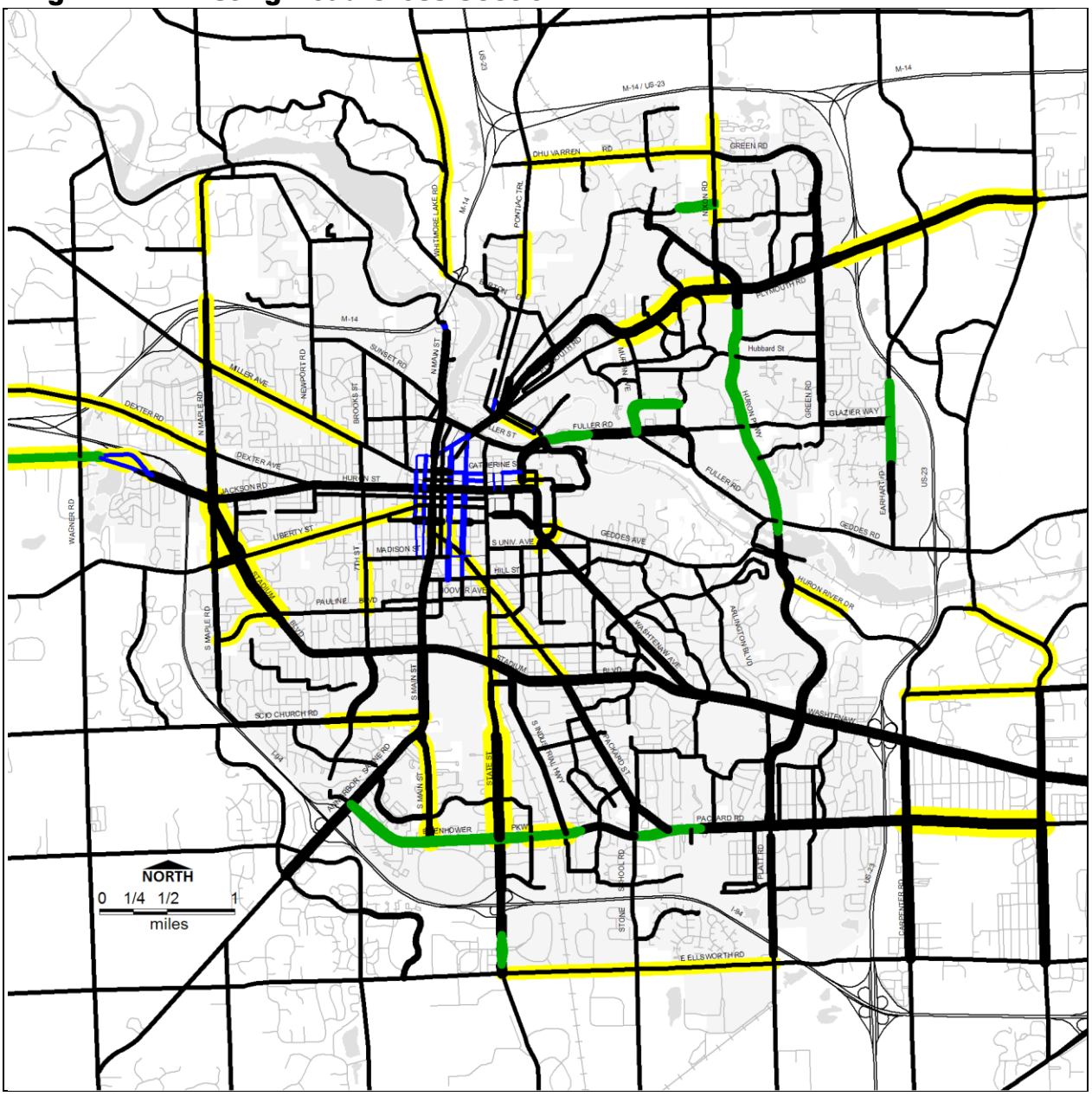
Relative Neighborhood Non-motorized Accessibility

Low Moderate High

This is a quantitative measurement of a neighborhood's bicycle and pedestrian "friendliness" or accessibility. It is based on population density, diversity of land uses, and the design of the physical environment. See the Appendix for a detailed description of the model.

Fig. 4.1D. Existing Road Cross Section



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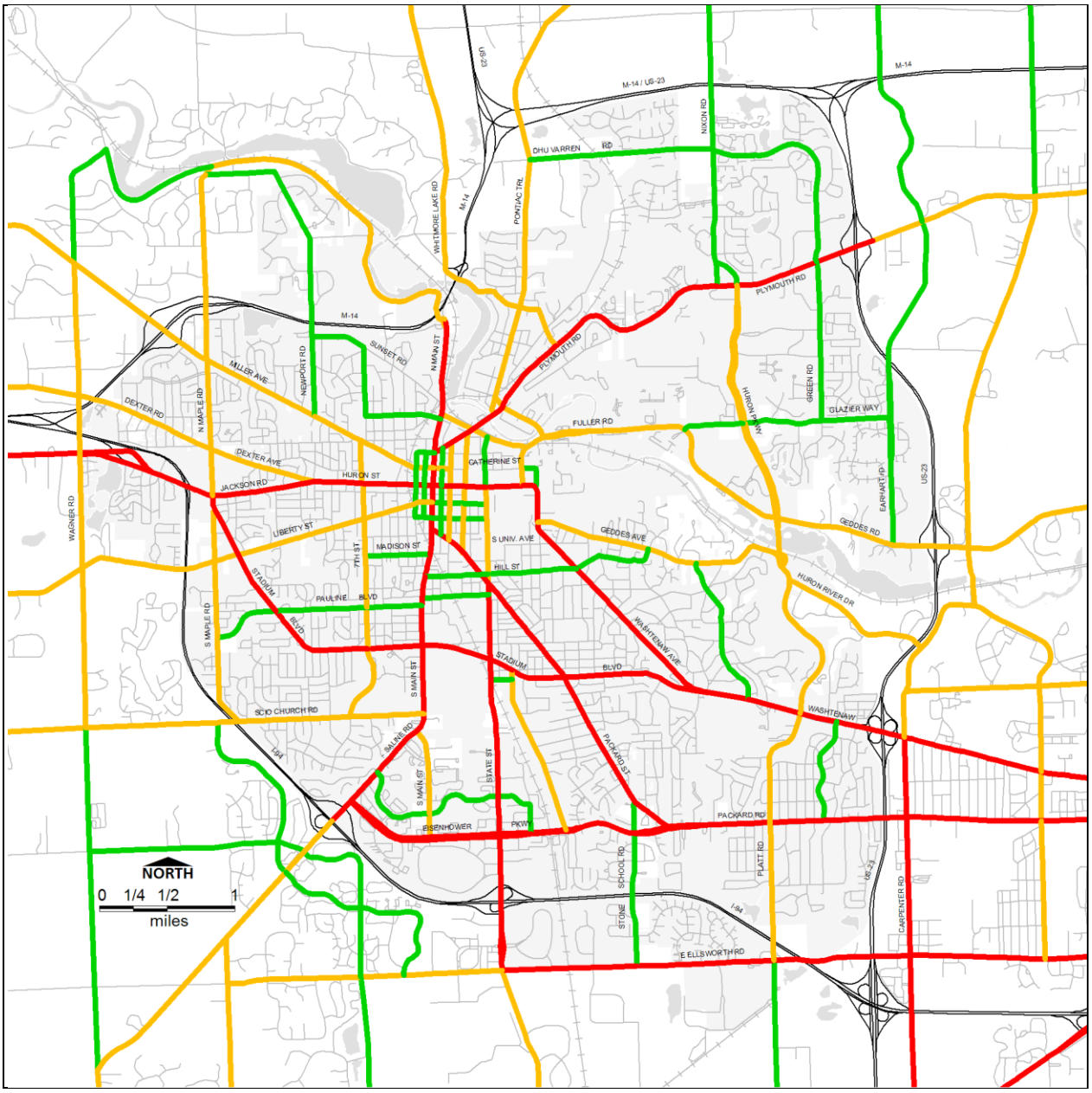
Existing Road Cross Section

- 1 Lane, 1 Way
- 2 Lanes, 1 Way
- 2 Lanes,
- 3 Lanes
- 3 Lanes, 1 Way
- 4 Lane Parkway
- 4 Lanes
- 5 Lanes

Bike Lanes

Bike Lanes are found on a range of roadway types in Ann Arbor including 5 Lane Principal Arterials.

4.1E. National Functional Classification



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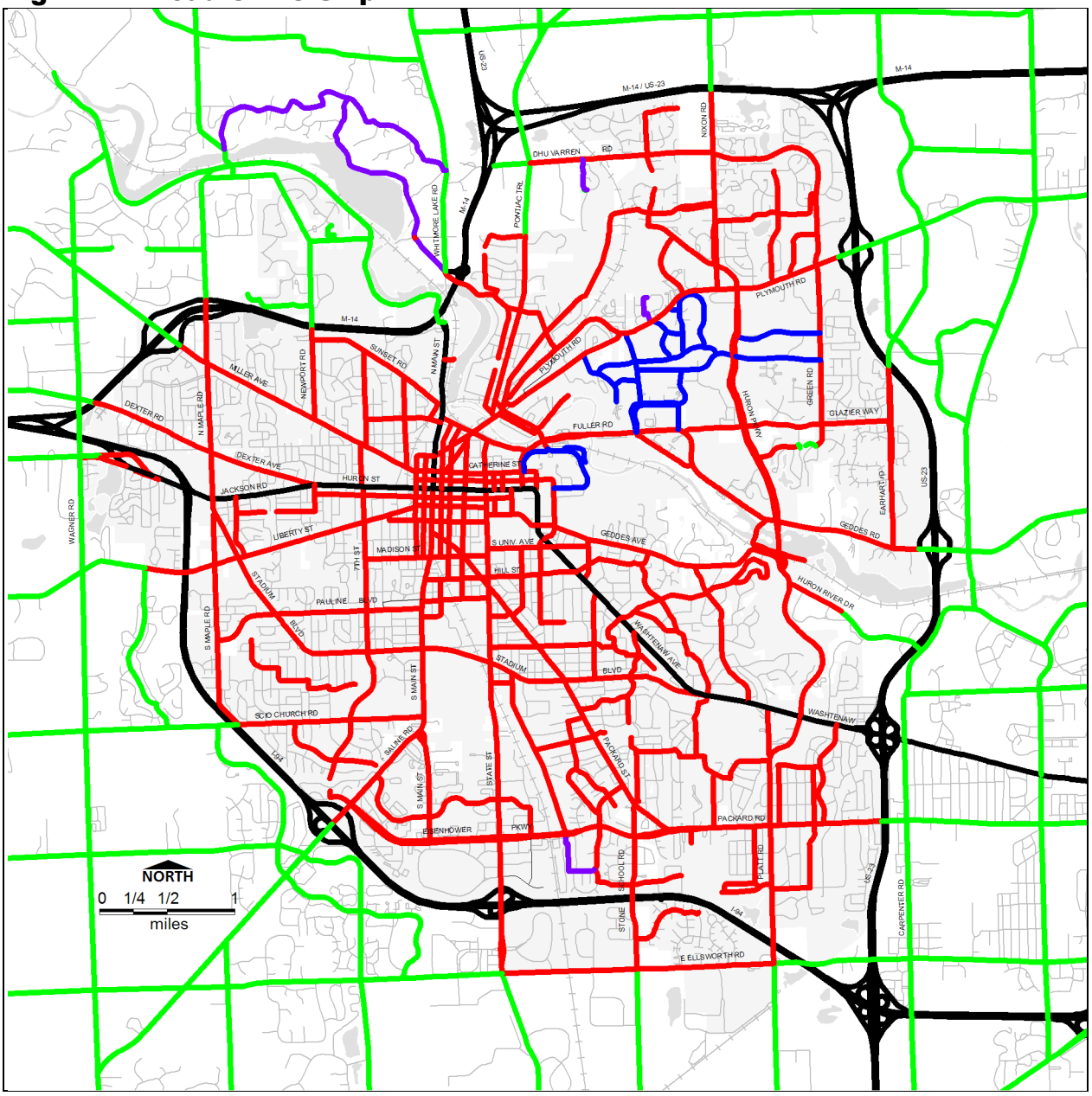
National Functional Classification

- Principal Arterial
- Minor Arterial
- Collector

There are approximately 93 miles of Arterials and Collectors in Ann Arbor.

The National Functional Classifications are referenced in AASHTO guidelines and the guidelines in this document. While the National Functional Classification is intended to define a road hierarchy, substantial variation in road characteristics may be found within the classifications. The actual and projected road characteristics should be the determining factor when selecting appropriate Sidewalk, Buffer and Bike Lane widths.

Fig. 4.1F. Road Ownership



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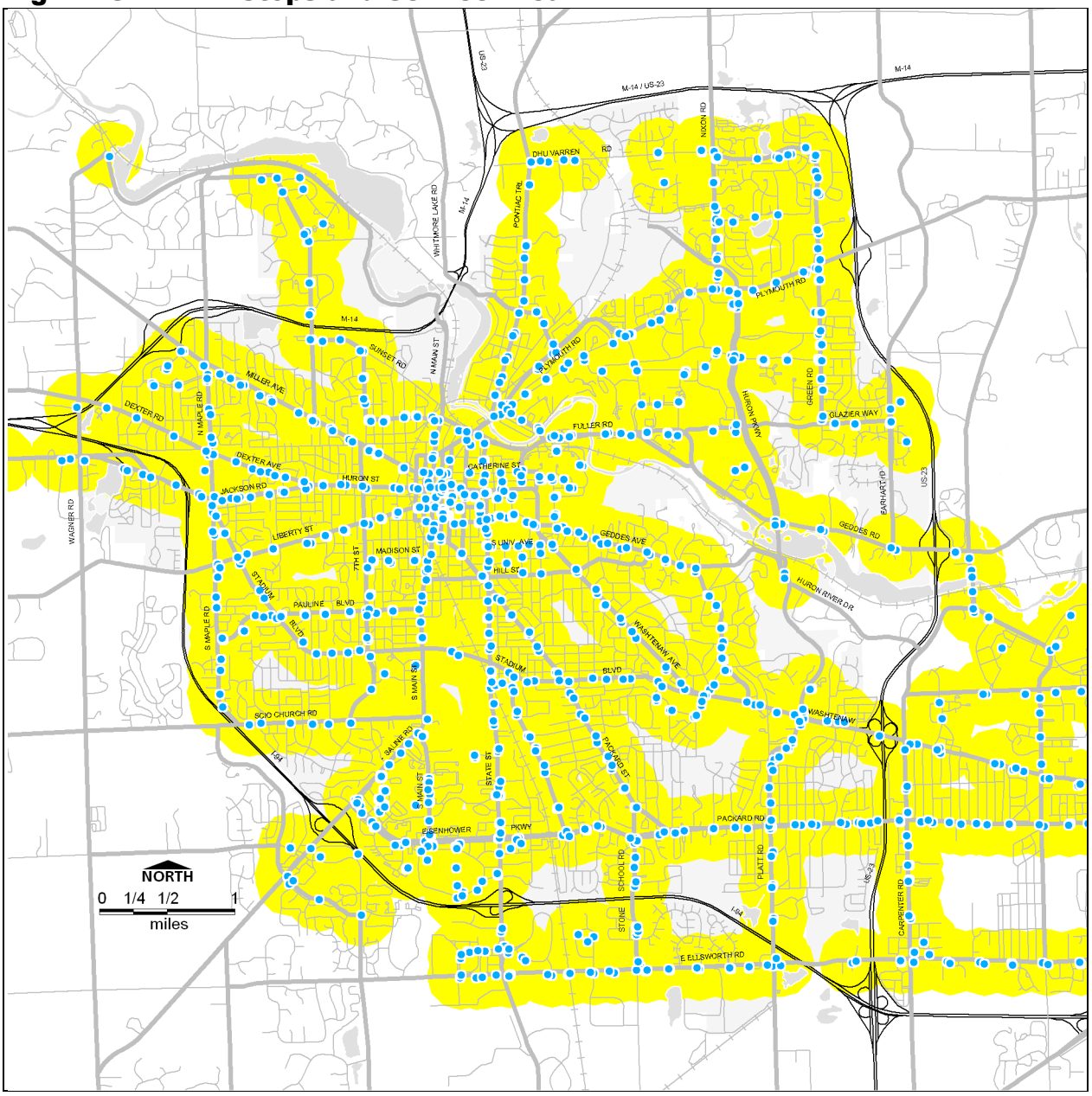
Road Ownership
(approximate - some roads split)

- Ann Arbor
- County
- Private
- State
- University of Michigan

Roads owned by the state and managed by the Michigan Department of Transportation (MDOT) are shown in black. Any modification to these "Trunkline" roads must be coordinated with and approved by MDOT.

Fig. 4.1G. AATA Stops and Service Area



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- AATA Bus Stop
- Area With-in 1/4 Mile of AATA Bus Stop (Generalized Service Area)

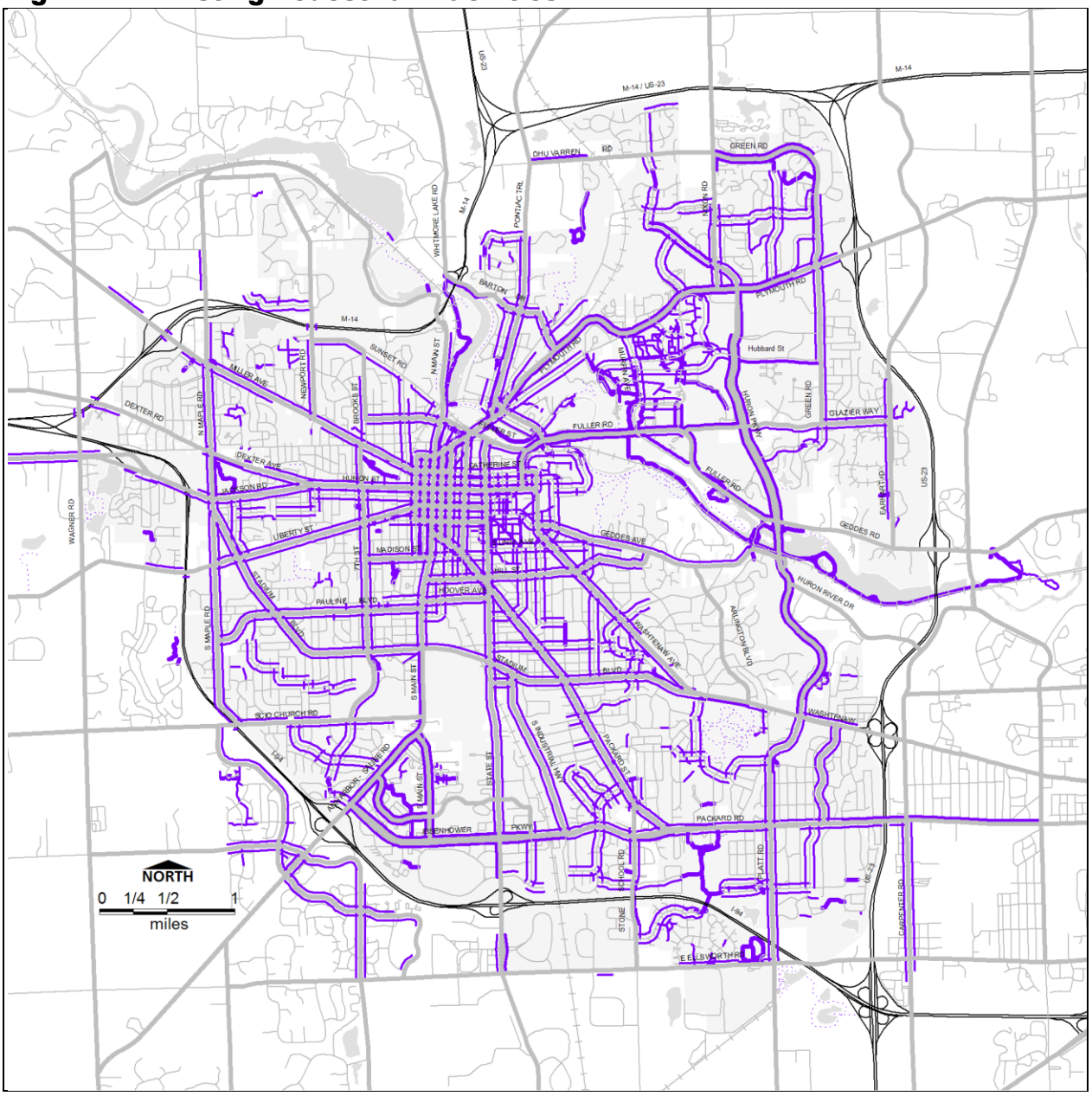
The ¼ mile buffer shown around each bus stop illustrates the approximate service area of each stop. It reflects an approximately 5 minute walk. This is not an accurate depiction of the true service area as that depends on the directness of the pedestrian linkages and the frequency of crosswalks. Even if a bus stop is directly across the street from a potential user, to reach the bus stop may require a trip over a ½ mile if existing crosswalks are used.

4.2 The Pedestrian Environment

The City of Ann Arbor has a nearly complete sidewalk system along most major roadways in the built up areas but there remains significant gaps along major roadway in the more suburban parts of town. The quality of the pedestrian experience on these sidewalks varies greatly throughout the City. Some sidewalks have little if any buffer such as a row of trees or parked cars, between the sidewalk and the roadway. This lack of a barrier has been shown to have a significant adverse impact on the quality of the walking experience (see Section 2.3 Travel Along Road Corridors, Evaluating Quality and Level of Service of Non-motorized Facilities).

Another major issue lies with cross-roadway accommodation. There are significant stretches of the major thoroughfares that provide no means to cross roadway safely. There are also places where logical crossings are not accommodated. Even where there are marked crosswalks they are often inadequate without key safety features such as crossing islands on high speed multi-lane roadways.

Fig. 4.2A. Existing Pedestrian Facilities



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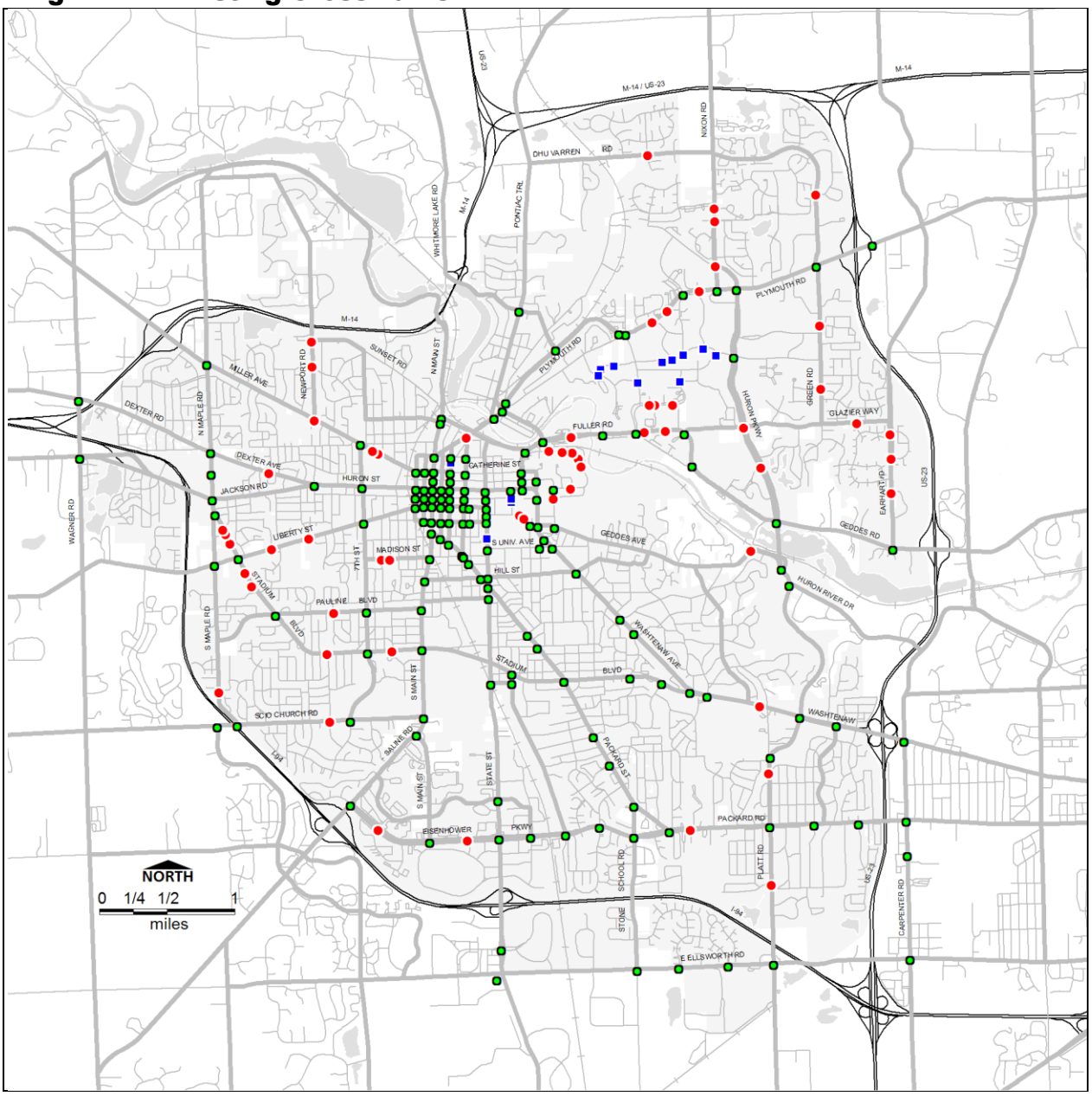
Existing Pedestrian Facilities:

- Foot Trail
- Shared-use Path
- Walk

This illustration shows the sidewalk coverage along primary roads, key neighborhood connectors, and off-road pathways. Ann Arbor has about 100 miles of Sidewalks / Sidewalk Bikeways along the primary road system (Arterials and Collectors). On average, about 56% of Ann Arbor's primary roads have sidewalks on both sides.

Fig. 4.2B. Existing Crosswalks



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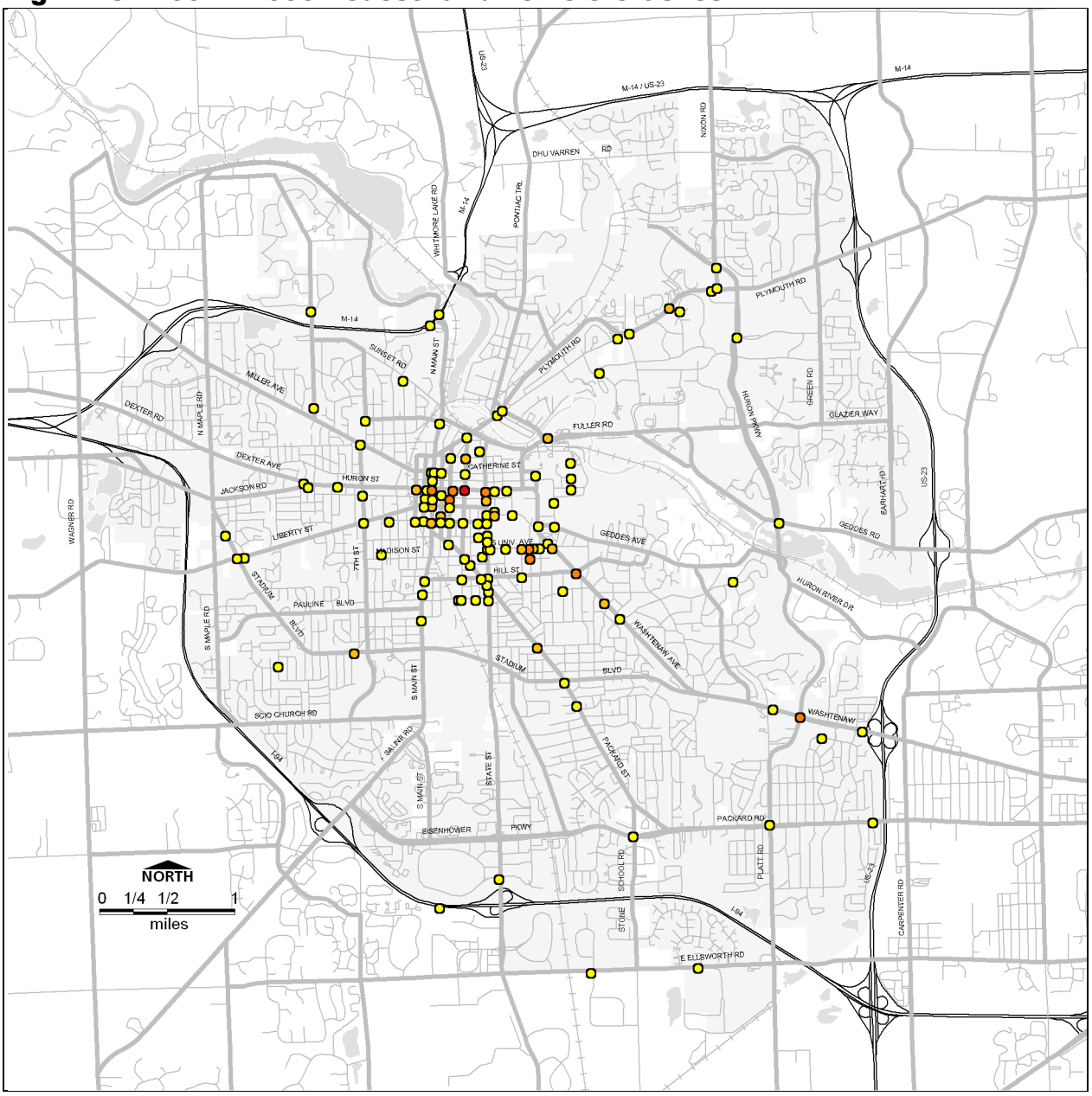
- Signalized Crosswalk (154)
- Major Mid-block Crosswalk (59)
- Minor Mid-block Crosswalk (8)

Major Unsignalized Crosswalks are on primary roads, Minor Unsignalized Crosswalks are on local 2 lane roads with low speeds.

Fig. 4.2C. 1997 – 1999 Pedestrian / Vehicle Crashes



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Pedestrian / Vehicle Crash Locations
Totals for Years 1997 - 1999

- 1
- 2
- 3
- 5

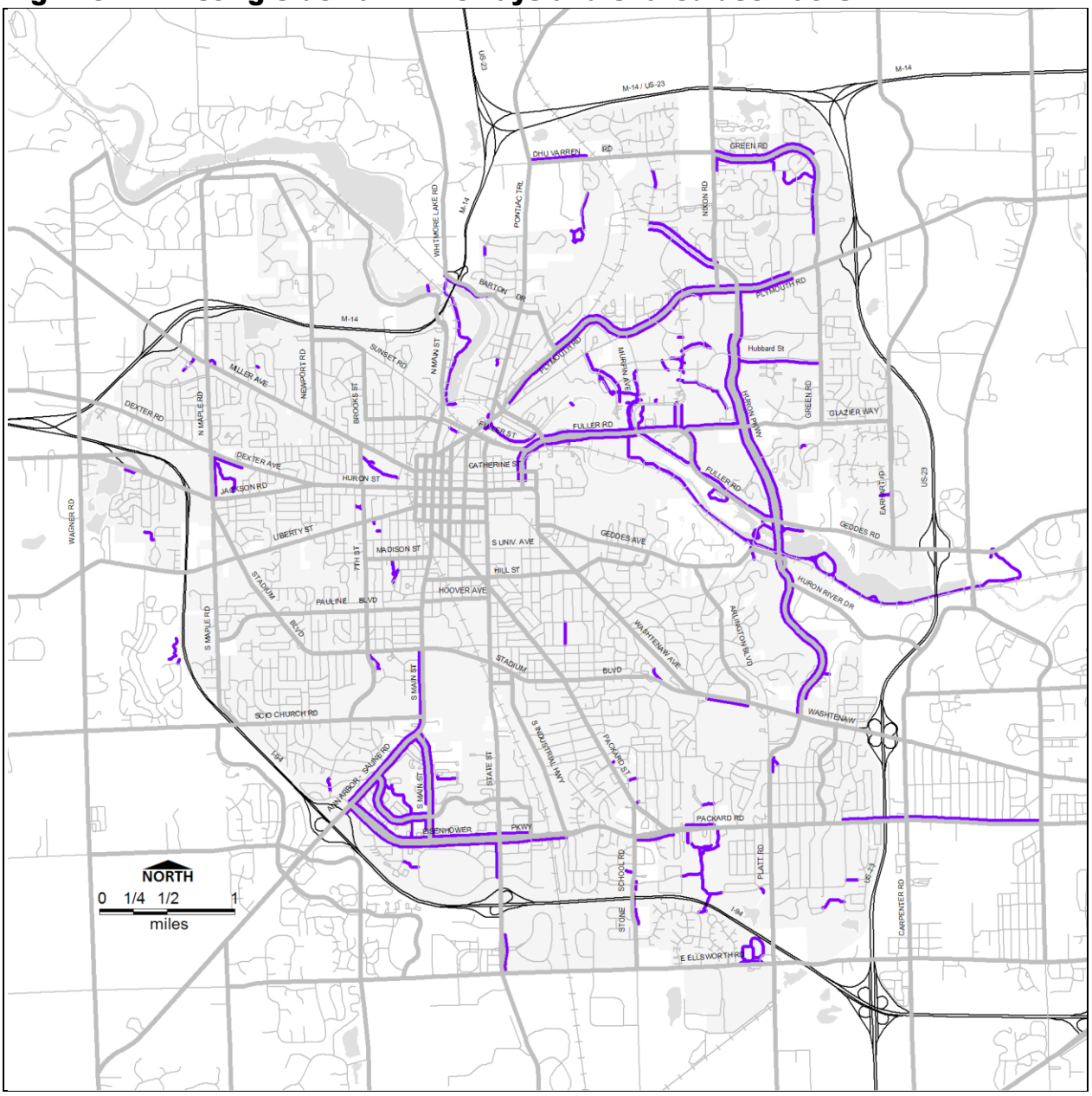
This map illustrates Pedestrian / Motor Vehicle Crashes over a three-year period. Areas with high numbers of crashes have been diagramed; these may be found in the Appendix. In addition, the Appendix includes an aggregate analysis of the crash reports.

- Average of 55 crashes per year
- 1.4% of all traffic crashes
- 96% were injury crashes
- 65% were intersection related
- Conditions: 50% Clear, 59% Day, 65% Dry
- 38% Involved hazardous actions by pedestrians
- 4% Involved pedestrians drinking

4.3 The Bicycling Environment

The approach to handling bicycles in the City is inconsistent and incomplete. In older areas of town there are some isolated bike lanes, in newer parts of town bicycles are expected to use sidewalk bikeways. Even together, the on-road and off-road facilities do not make for a complete system and transfers between on-road and off-road facilities are not logical or convenient. In short, there is no cohesive system.

Fig. 4.3B. Existing Sidewalk Bikeways and Shared-use Paths



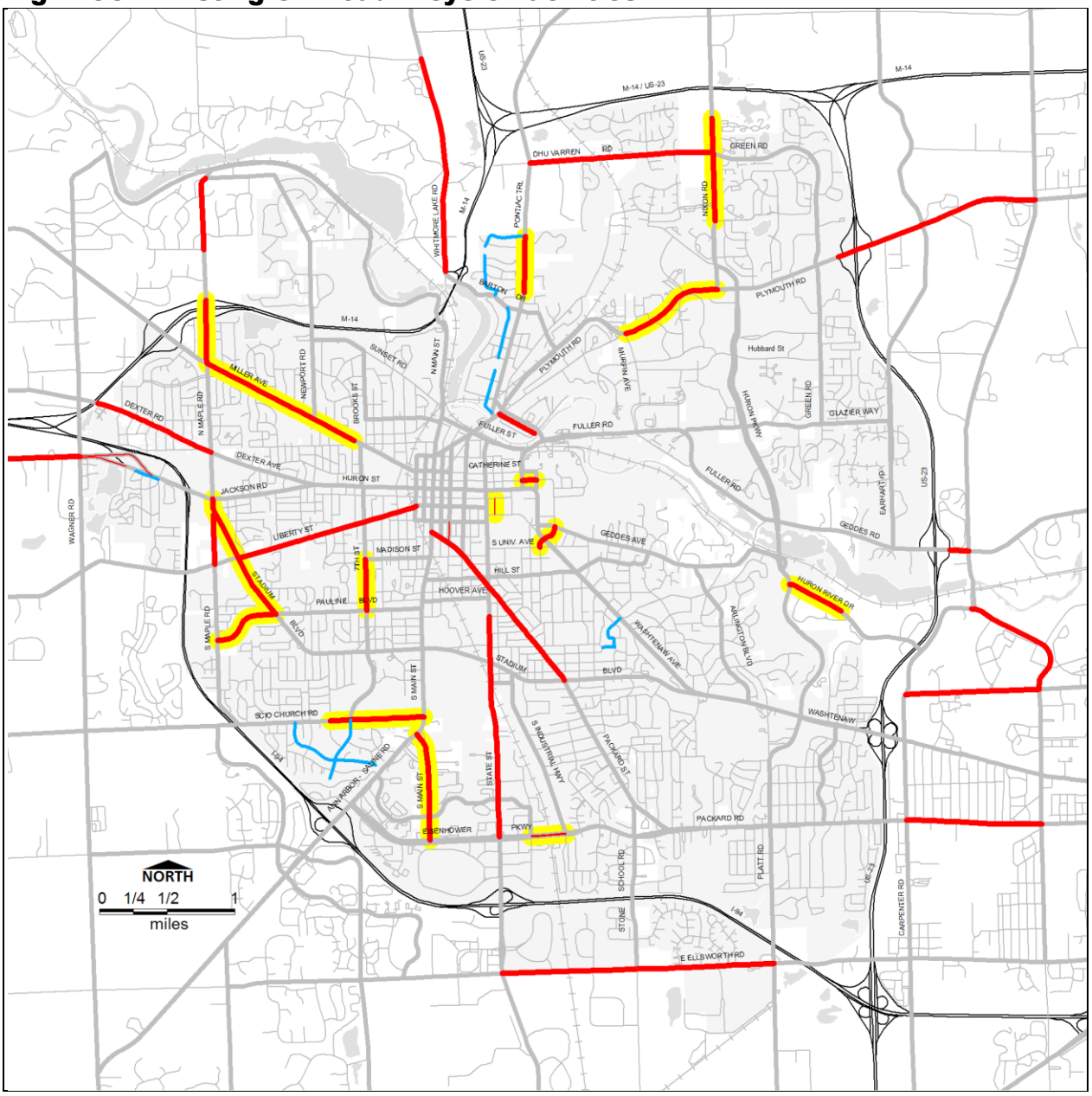
Legend

Existing Off-Road Bicycle Facilities

Shared-use Path

The existing off-road bicycle facilities are concentrated in the areas of Ann Arbor developed since the 1960's. They are often along busy Arterials or along the Huron River.

Fig. 4.3C. Existing On-Road Bicycle Facilities



Legend

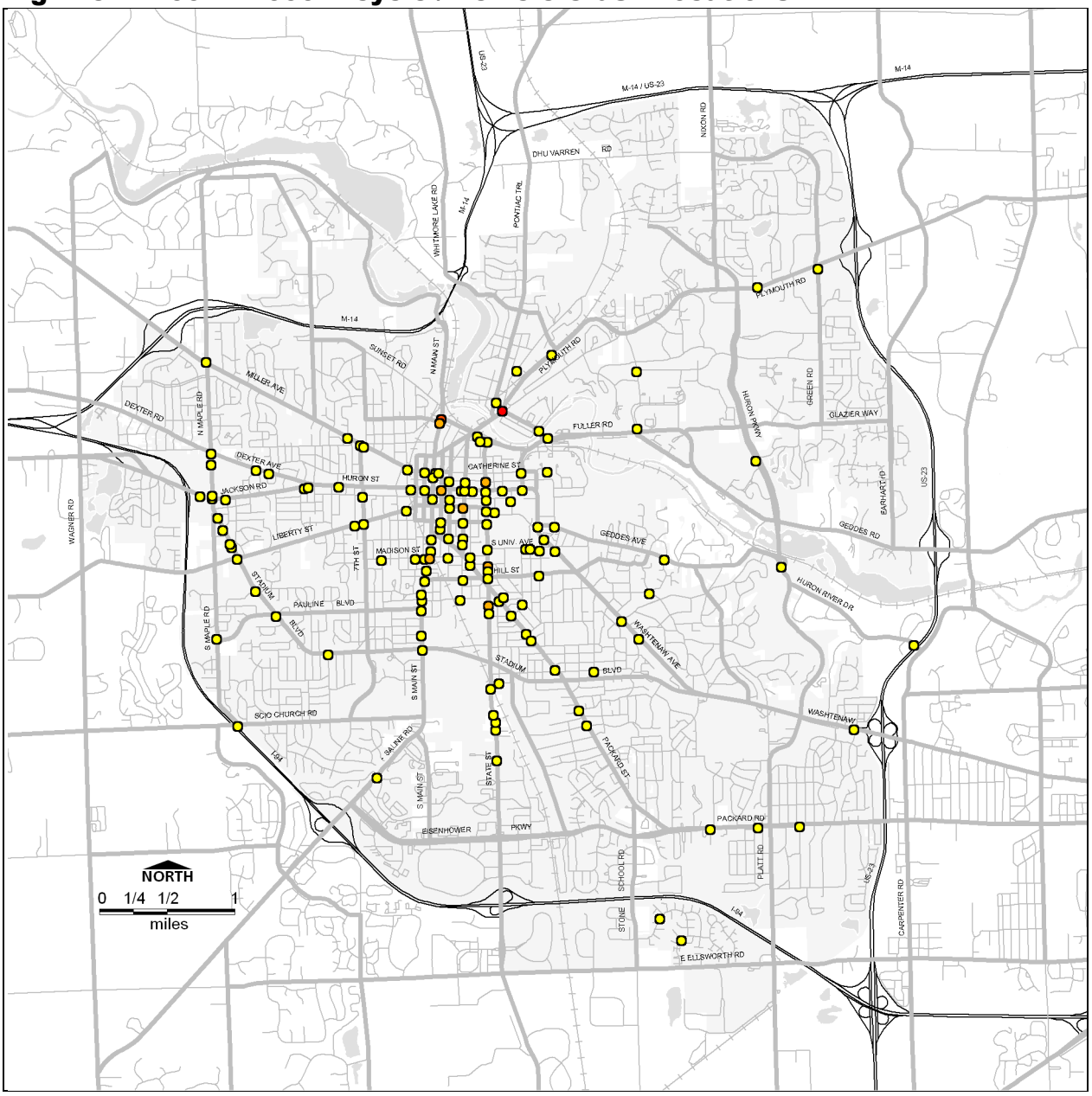
Existing On-Road Bike Facilities

- Bike Lane One-Side
- Bike Lanes
- Signed Bike Route
- New Bike Lanes

There are about 18 miles of Bike Lanes on the primary road system (Arterials and Collectors) in Ann Arbor. Approximately 20% of Ann Arbor's primary roads have Bike Lanes.

Over the past three years about 8 Miles Bike Lanes have been added based on preliminary recommendations of this project and the NE Ann Arbor Transportation Plan. These Bike Lanes have been added as a part of resurfacing and reconstruction projects throughout the City.

Fig. 4.3D. 1997 – 1999 Bicycle / Vehicle Crash Locations



Legend

Bike Crash Locations
1997 - 1999

- 1 to 2
- 3 to 4
- 5 to 6
- 7 to 8

This map illustrates Bicycle / Motor Vehicle Crashes over a three-year period. Areas with high numbers of crashes have been diagramed; these may be found in the Appendix. In addition, the Appendix includes an aggregate analysis of the crash reports.

- Average of 62 bicycle crashes per year
- 1.68% of all traffic crashes
- 82% were injury crashes
- 80% at were at an intersection
- Conditions: 62% Clear, 73% Day, 62% Dry
- 36% involved a hazardous actions by the bicyclist
- 63% of bicyclists were going straight prior to the crash
- 4% involved bicyclists drinking

4.4 Non-motorized Trip Characteristics

The desire to expand non-motorized transportation choices is generally driven by two factors. First is the goal to accommodate non-motorized transportation given the numerous economic, social, health and environmental benefits. The second goal is often to maximize the potential of the existing transportation system, which could take several forms. This could include shifting trips from single occupancy motor vehicles to bicycling, walking or transit, thus expanding the number of people a corridor can serve. Regardless of the goal, the question is what change in transportation choices will occur if the environment for walking or bicycling is improved?

Answering this question precisely is hampered by limited data, sparse research on the subject, and the nuances that go into any transportation choice. What is likely, though, is that the number of people who walk and bicycle will increase when the environment for bicycling and walking is improved. Also, these increases in walking and bicycling do not necessarily have a reciprocal increase in bicycle and pedestrian crashes. Rather, with improved facilities and increases in the number of bicyclists and pedestrians, the crash rates typically decrease as motorists become accustomed to the presence of non-motorized traffic.

One of the least understood aspects of transportation planning is the notion of self-selection. It has been demonstrated that individuals who move to an area with a better non-motorized environment will indeed walk and bicycle more[38]. What is unknown is how much of that increase is the result of the environment alone vs. how much is the result of an individual's choice to live in a place because its environment supports bicycling and walking.

Another interesting recent discovery is that an environment that supports bicycling and walking also supports more frequent single-purpose motor vehicle trips. While there may be a total reduction in vehicle miles traveled, there is an increase in the total number of trips and a reduction of the number of trips chained together.[39]

To understand Ann Arbor's potential to increase the number of people walking and bicycling it is helpful to look at how Ann Arbor's current bicycling and walking trends compare to other areas. Then we may be able to gauge approximately how many more people may be enticed to walk and bicycle.

Existing General Non-motorized Mode-split

The mode-split is the overall proportion of trips made by a particular mode of travel. This information is generally determined by surveys. What is apparent is that Ann Arbor currently has over twice the national average of the percentage of trips taking place by walking and bicycling.

[38] Krizek, Kevin J., Residential Relocation and Changes in Urban Travel: Does Neighborhood-Scale Urban Form Matter? *Journal of the American Planning Association*. Spring, Vol. 69, No. 3, p.265-281.
[39] Ibid. p. 265-281.

Table 4.4A National Mode-split Comparison

	Mode-split	Information Source
Walking:		
National	7.20%	National Personal Transportation Survey, 1995
Region	6.42%	SEMCOG 1994 Household-based Travel Survey (SEMCOG, 1994)
Washtenaw	10.20%	SEMCOG, 1994
Ann Arbor	16.52%	2000 Census
Bicycling:		
National	0.70%	National Personal Transportation Survey, 1995
Region	0.72%	SEMCOG, 1994
Washtenaw	0.91%	SEMCOG, 1994
Ann Arbor	2.39%	2000 Census

Table 4.4B Peer City Commute to Work Comparison

City	Year 2000 Population	% Bike	% Pedestrian	% Public Transit	% Total Non-Car
Ann Arbor, MI	114,100	2.4%	16.5%	6.9%	25.8%
Berkeley, CA	102,743	6.0%	16.0%	19.9%	41.9%
Bloomington, IN	69,229	2.8%	15%	3.0%	20.8%
Boulder, CO	94,510	7.4%	9.7%	8.9%	26%
Cambridge, MA	101,355	4.1%	25.8%	26.5%	56.3%
Eugene, OR	137,799	8.8%	6.4%	5.2%	17.4%
Iowa City, IO	62,381	2.6%	16.0%	7.9%	26.0%
Madison, WI	207,525	3.3%	11.0%	7.4%	21.7%

From the US 2000 Census commute to work data as compiled in the online Carfree Census Database found at Bikesatwork.com, compiled by Bikes At Work, Inc., Ames, IA.

Non-motorized Trips by Purpose

Personal/Family Business and Social Recreation Trips are the two most predominant trip types for both non-motorized and motorized trips.

Table 4.4C Trip by Purpose Comparison

	Earning A Living	School/ Church/ Civic	Personal/ Family Business	Social/ Recreational	Other	Source
Walking						
National	9.0%	15.0%	42.0%	34.0%		NPTS, 1995
Region*	5.0%	10.0%	48.0%	24.0%	1.0%	SEMCOG, 1994
Bicycling						
National	9.0%	9.0%	22.0%	60.0%		
Region*	4.0%	17.0%	45.0%	16.0%	4.0%	SEMCOG, 1994

*Regional data were collected in a slightly different manner than national and the numbers do not add up to 100%

Estimate of Trip Purposes and Distances

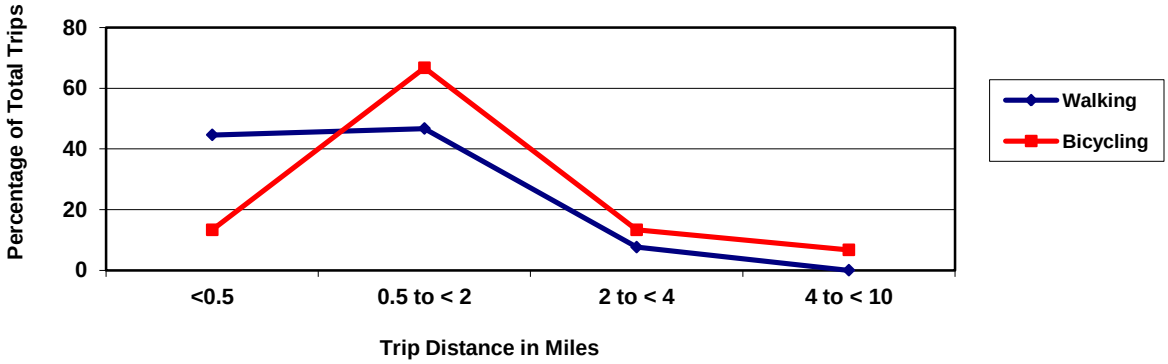
Based on existing survey data and trip distance/time equivalents, the following is an approximation of the existing trips by purpose. There are few studies with reliable data on trip distances by purpose. The studies that are available do indicate that the trip length varies by the trip purpose, with the "Earning a Living" trip being the farthest.

Table 4.4D Estimated Trips by Purpose*

	Earning A Living	**School/ Church/ Civic**	**Personal/ Family Business**	**Social/ Recreational**
Walking				
4 MPH Average Speed	10%	15%	45%	30%
Average Trip	1 Mile (15 min.)	1 Mile (15 min.)	0.5 Mile (8 min.)	1 Mile (15 min.)
95% of Trips Under:	2 Miles (30 min.)	2 Miles (30 min.)	1 Mile (15 min.)	2 Miles (30 min.)
Bicycling				
8 MPH Average Speed	10%	15%	50%	25%
Average Trip	2 Miles (15 min.)	2 Miles (15 min.)	1 Mile (8 min.)	6 Miles (45 min.)
95% of Trips Under:	4 Miles (30 min.)	4 Miles (30 min.)	2 Miles (15 min.)	10 Miles (1.25 Hrs)

*Based on Table 4.5B Data

Fig. 4.4E GetDowntown Survey Results: Trip Distances



A 2002 GetDowntown survey of downtown businesses indicate that in Ann Arbor, the average walking trip is 1.25 miles and the average bicycling trip is 2 miles.

Potential Increases in Non-motorized Mode-share

Given that Ann Arbor's pedestrian mode-share is so high already compared with national and regional averages, an improvement to the physical environment will likely see only limited increase in the overall mode-share. Improvements would likely result in lower crash rates and greater accessibility for those with disabilities.

The biggest changes are likely to be seen with bicycle mode-share. The existing bicycle system is relatively incomplete and areas with comparable demographic and physical characteristics that have a more complete bicycle network have a substantially higher bicycle mode-share. Based on a combination of professional judgment, analysis of existing facilities, and data from other similar cities, reasonable targets for non-motorized mode-share in the City would be:

- Walking trips to comprise 20% of all trips. This is a 21% increase in the current walking mode-share.
- Bicycling trips to comprise 6% of all trips, a 151% increase in the current bicycling mode-share.

The largest source for motorized traffic growth in Ann Arbor is external, and such growth cannot be accounted for in predicting future of mode-share. Also, trips classified as "Earn a Living" are the most universally reliable when predicting the future of mode choice. However, since these trips make up such a small percentage of total trips, there is no statistically sound way to correlate these trips with increases or decreases in the number of overall trips in any mode type.

5. Proposed Facilities

The proposed facilities are grouped into either Near-term Opportunities or the Long-term Plan.

Near-term Opportunities

- May generally be done within the existing infrastructure, for the most part curbs and drainage structures are not changed.
- May be implemented as soon as funding is available and design work completed.
- Include both relatively inexpensive road modifications such as 4 to 3 lane conversions and moderately expensive improvements such as crossing islands.
- Are in some cases design compromises, where the widths of Bike Lanes, Motor Vehicle Lanes, Buffers, and Sidewalks are less than the ideal desired widths to fit within the existing curb lines and right-of-ways.
- May in many cases be the same as the ultimate long-term solution as existing development and right-of-way restrictions limit the design options.
- May be done independently or as a part of operations, resurfacing, restoration, rehabilitation or minor widening project. In general, if a road is to be resurfaced within the next few years, any road restriping should be incorporated in the resurfacing project.

The Long-term Plan

- Are generally implemented when a new road is built or a existing road is completely reconstructed. Reconstruction projects typically include new curb and gutter as well as storm water systems.
- Generally require that a road be widened to accommodate the minimal lane width requirements for all users and may require additional ROW.
- Strive to meet the minimum desired widths for Bike Lanes, Motor Vehicle Lanes, Buffers, and Sidewalks to the extent that it is practical given the project's context.

The lines are not always clear-cut. For example, when Liberty Street was rebuilt in 2003/2004 the segment west of Virginia Street was widened to allow for crossing islands, sidewalks and the desired Bike Lanes, Motor Vehicle Lanes, Buffers and Sidewalk widths because additional ROW could be obtained. East of Virginia when the road was rebuilt, everything was generally kept within the existing curb lines due to the close proximity of the existing homes along the street and to maintain the existing street trees.

5.1 Near-term Opportunities

The Near-term Opportunities Recommendations were designed to be cost-effective and easily implemented by minor changes such as re-striping the existing road surface and the additions of crossing islands. These simple solutions will enhance bicycle and pedestrian conditions quickly and easily until the road is expanded or major reconstruction is undertaken.

In many cases the Near-term Opportunities are the same as the Long-term Plan. Sometimes it is a matter of degree as the Near-term Opportunity may be a 5' Bicycle Lane and the Long-term Plan may be a 6' Bicycle Lane. Other times restrictions due to available ROW may dictate that the road will, in all likelihood, never be widened and the Near-term Opportunities Solution is the best that may be achieved. These are issues that must be addressed at the time of a road reconstruction.

The following maps illustrate the Near-term Opportunities:

- Proposed Near-term Opportunities Map (this is a large fold out map that may be found in the back cover of the report)
- Fig. 5.1A. Near-term Opportunities – In-Road Bike Facilities
- Fig. 5.1B. Near-term Opportunities – Proposed Road Changes
- Fig. 5.1C. Near-term Opportunities – Proposed Parking Changes
- Fig. 5.1D. Near-term Opportunities – Road Crossings
- Fig. 5.1E. Near-term Opportunities – Sidewalks
- Fig. 5.1F. Near-term Opportunities – Downtown Overview
- Fig. 5.1G. Near-term Opportunities – Downtown Detail
- Fig. 5.1H. Near-term Opportunities – Central Campus Detail
- Fig. 5.1I. Near-term Opportunities – Medical Center Detail
- Fig. 5.1J. Near-term Opportunities – North Campus Detail

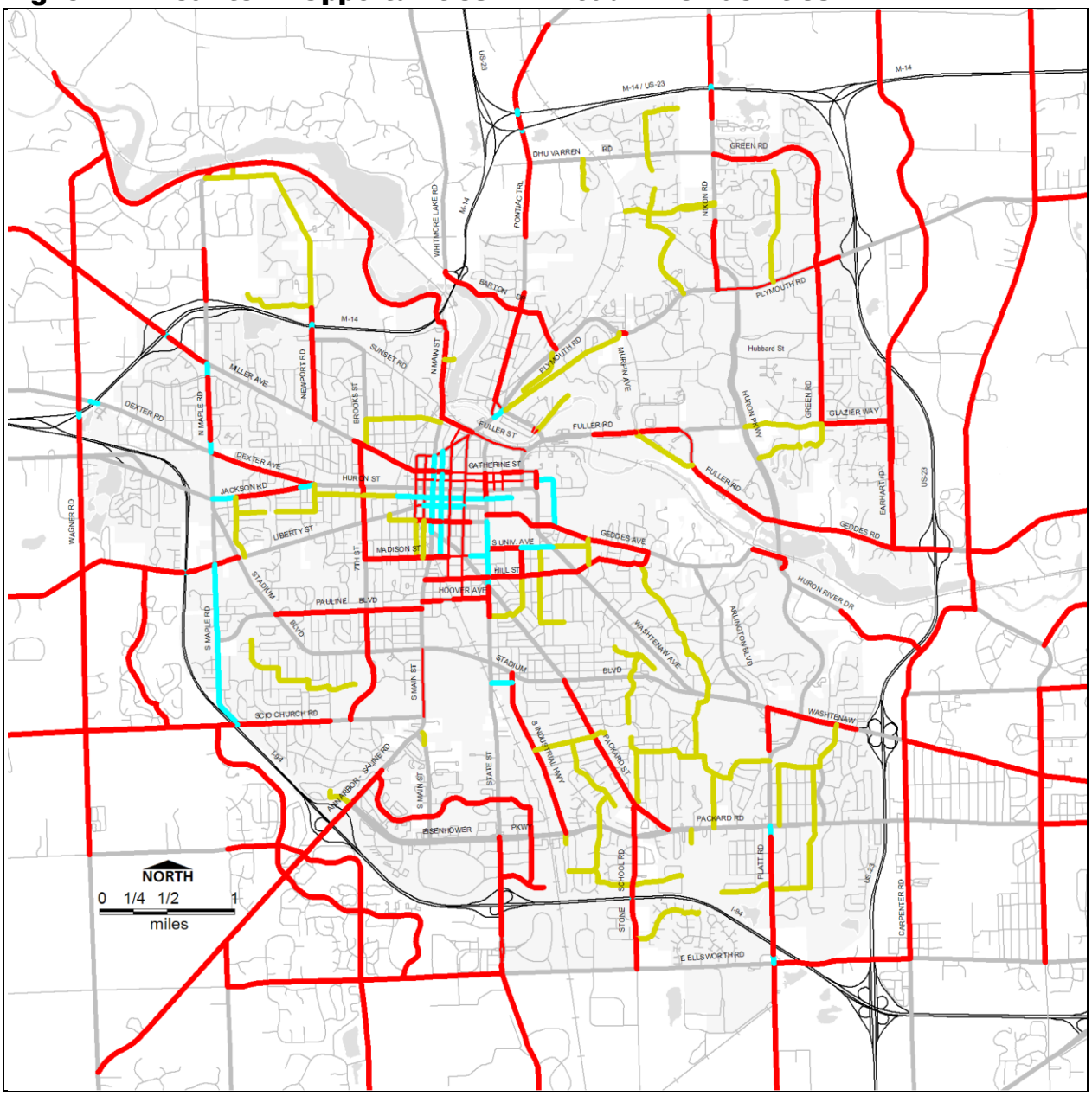
Master Plan vs. Corridor Planning

The recommendations in this Section represent a Master Plan level evaluation of the suitability of the proposed facilities for the existing conditions. Prior to proceeding with any of the recommendations, a corridor level assessment should be done in order to fully evaluate the feasibility and appropriateness any roadway modification and/or proposed bicycle or pedestrian facility.

Proposed Improvements Outside the City of Ann Arbor

On some of the illustrations, improvements are proposed for areas outside of the limits of the City of Ann Arbor. These should not be construed as detailed recommendations as they have not received the same level of evaluation as those facilities within the City. Rather they show diagrammatically how non-motorized facilities within the City may interact with non-motorized Facilities in the surrounding communities.

Fig. 5.1A. Near-term Opportunities – In-Road Bike Facilities



Legend

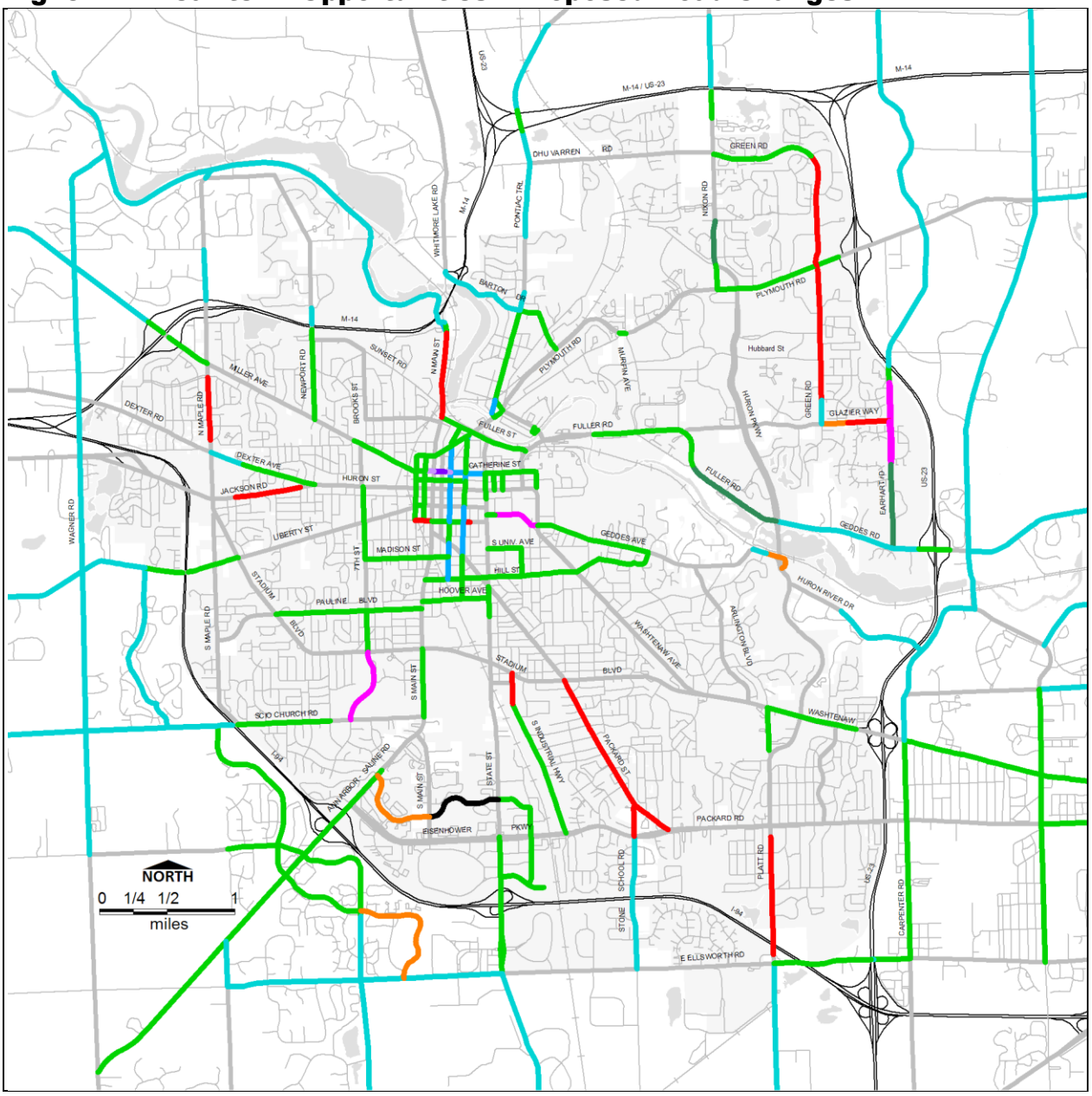
Proposed Near-term In-Road Bicycle Facilities:

- Proposed Bike Lane on 1 Side
- Proposed Bike Lanes
- Proposed Bike Route
- Proposed Shared-use Arrow

Over 38 miles of new Bike Lanes are proposed within the City on Primary Roads. When combined with the over 18 miles of existing Bike Lanes, the City will have will have approximately 56 miles of Bike Lanes.

Please note that this map also shows Bike Lanes outside of the City's jurisdiction. These illustrate desired Bike Lane linkages to the surrounding communities.

Fig. 5.1B. Near-term Opportunities – Proposed Road Changes



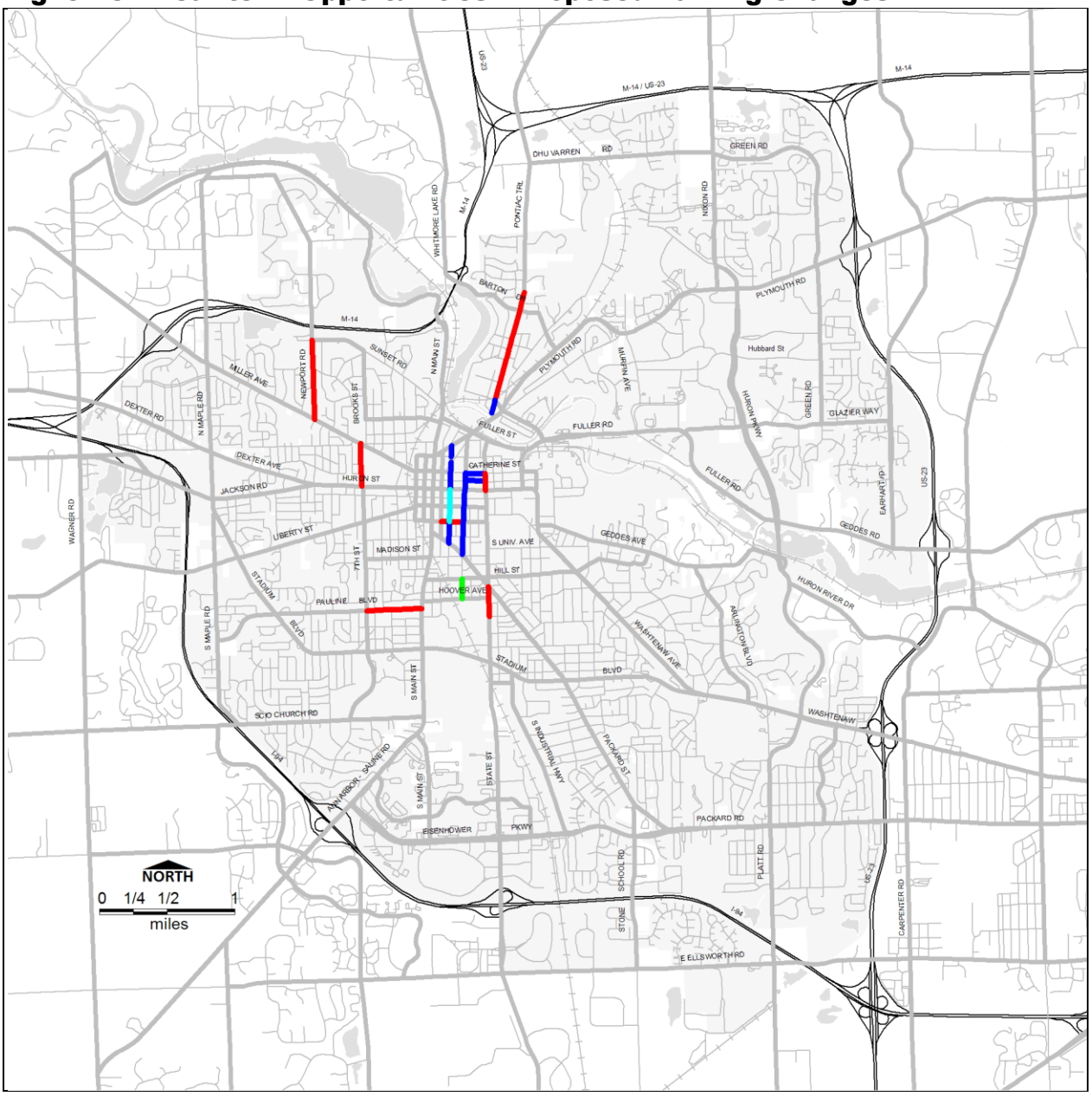
Legend

Near-term Road Changes

- 3 to 2 Lane Conversion
- 4 to 2 Lane Conversion
- 4 to 3 Lane Conversion
- 5 to 3 Lane Conversion
- Eliminate 1 Lane
- Eliminate 2 Lanes
- Eliminate Turn Lane
- Narrow Lanes
- New Road
- None
- Pave Shoulders
- Pave Shoulders/Narrow Lns
- Shorten Turn Lane

Many of the Near-term Opportunities bicycle lanes may be achieved through narrowing the motor vehicle lanes. The 4 to 3 Lane Conversions proposed also permit the use of crossing islands for mid-block crosswalks. Many of the high priority mid-block crosswalks can not be constructed until the roadway is converted to a three-lane cross section. For more detail see the attached fold-out map.

Fig. 5.1C. Near-term Opportunities – Proposed Parking Changes



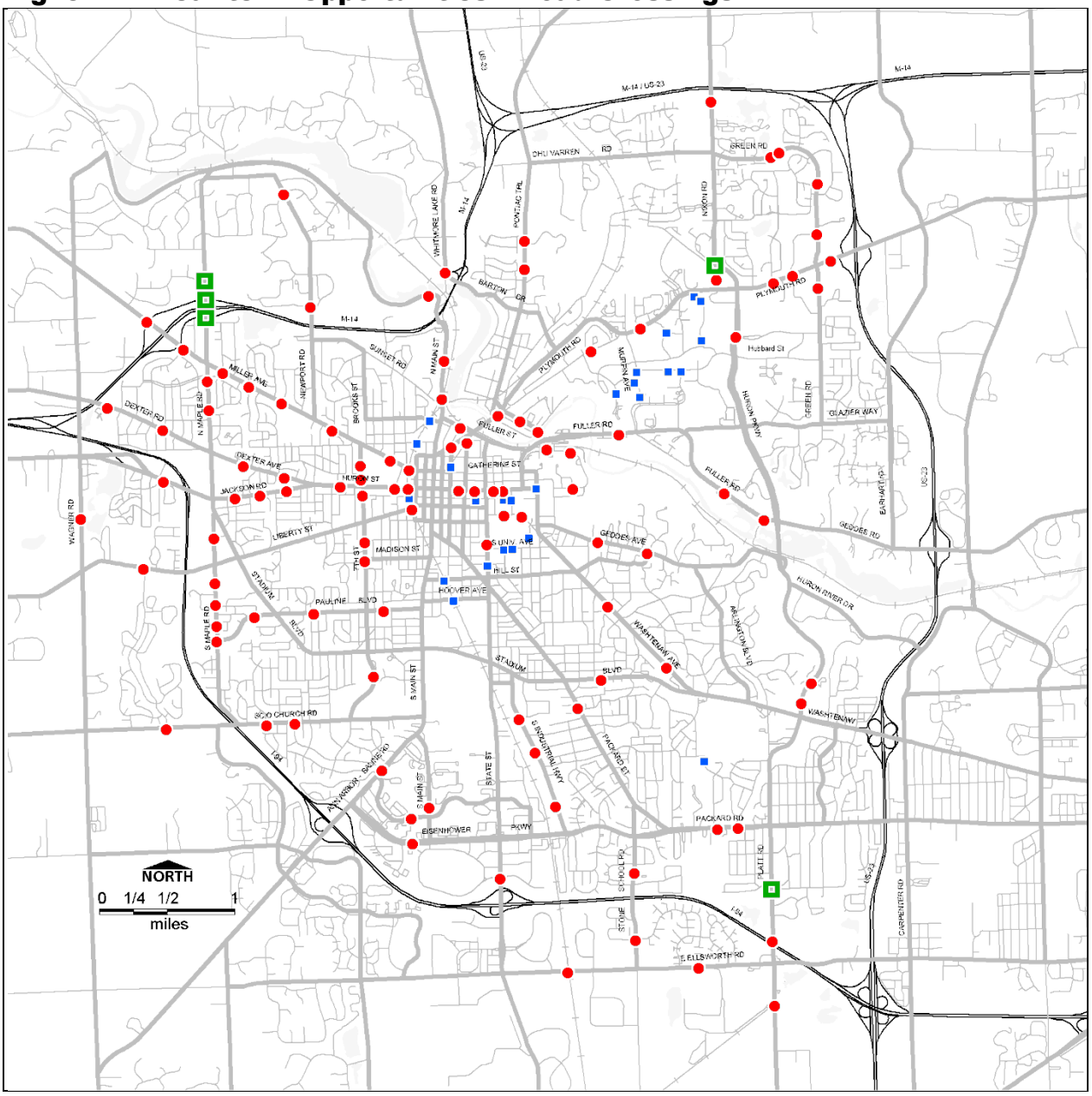
Legend

Near-term Parking Changes:

- Add Parking on 1 Side
- Add Parking on 2 Sides
- Remove Parking on 1 Side
- Switch Sides

On-street metered parking is only recommended to be removed on a few segments in the downtown area. These are necessary to complete key bike lane links. To off-set these losses of downtown parking, areas where found where additional on-street parking may be located. In some cases the City may wish to evaluate permitting on-street parking in the bike lanes after-hours and/or for special events.

Fig. 5.1D. Near-term Opportunities – Road Crossings



Legend

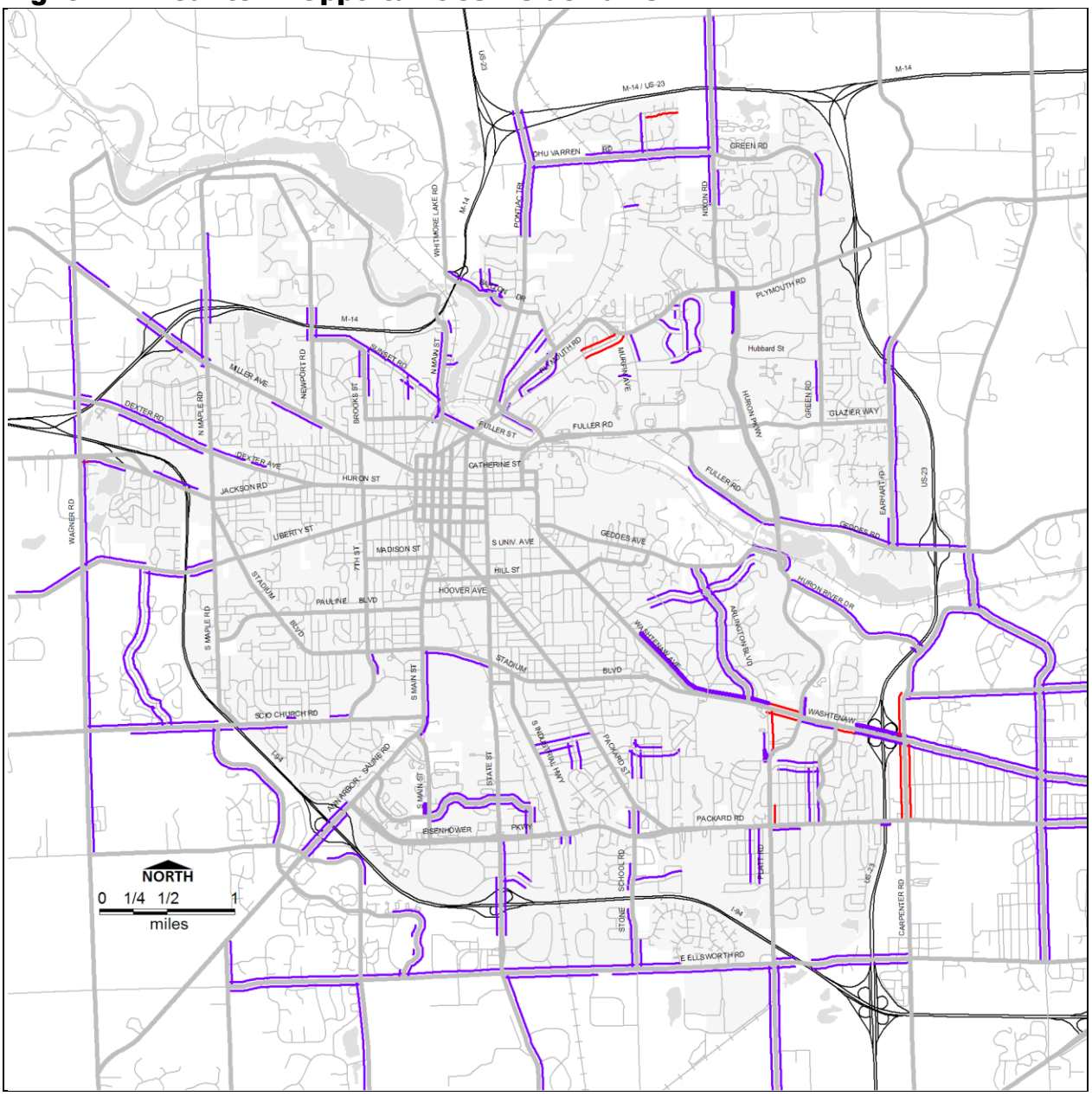
Proposed Near-term Pedestrian Street Crossing Improvements

- Signalized Crossing or Roundabout (5)
- Major Mid-block Crossing (105)
- Minor Mid-block Crossing (25)

The proposed crosswalk locations are based on the difficulty crossing the street in combination with the demand to cross the street based on land uses and bus stop locations.

A number of new crosswalks are proposed to improve the ability for pedestrians to cross the road safely and conveniently. Major Mid-block Crossings will likely have features such as crossing islands. Minor Mid-block Crossings will still be high visibility crosswalks, but in most cases would not have features such as a crossing island. Please note that this illustration does not show existing crosswalks (see the Near-term Opportunities Map).

Fig. 5.1E. Near-term Opportunities – Sidewalks



Legend

Near-term Sidewalks and Sidepaths

- Improved Sidewalk
- Proposed Shared-use Path
- Proposed Sidewalk

Some of the Near-term Opportunities Sidewalk and Sidewalk Bikeway improvements include completing gaps in the system, providing sidewalks through key residential streets where no sidewalks exist and providing sidewalks on major streets where development is occurring. About 25 miles of new sidewalk are proposed. Priority improvements include completing gaps along the primary road system and sidewalks serving schools.

Downtown Overview

Downtown is a destination to bicyclists and pedestrians as well as an area that must be negotiated through. As Arterials and Collectors come into downtown, motor vehicle speeds are reduced and many more route options become available due to the dense grid pattern of the streets. Downtown also presents the challenge of accommodating some of the highest numbers of pedestrians and bicyclists in the City within a restricted ROW that must also accommodate cars, busses, delivery vehicles and parking.

The following strategies were utilized for downtown:

- Provide bike lanes on selected east-west streets generally to the north and south of the central business districts to accommodate bicycle traffic between the west side of town and the University of Michigan's Central Campus and Medical Center.
- Utilize the extra roadway width, and in some places extra roadway capacity, to provide bike lanes on the one-way pairs running north south. These are 1st and Ashley and Fifth and Division.
- Where the presence of on-street parking makes the road too narrow to accommodate bike lanes, use the Shared-use Arrow to encourage bicycling in the road and off of the busy sidewalks.
- Provide mid-block crossings on long blocks where there are a number of pedestrians crossing the street.
- Utilize a variety of other measures discussed in the guidelines such as Pedestrian Count-down signals, Leading Pedestrian Intervals, Right-on-Red Restrictions, In-road "Yield-to-Pedestrian" signs, and reducing the speed of motor vehicles through signal timing. Together these strategies will dramatically improve the walkability and bikeability of downtown.

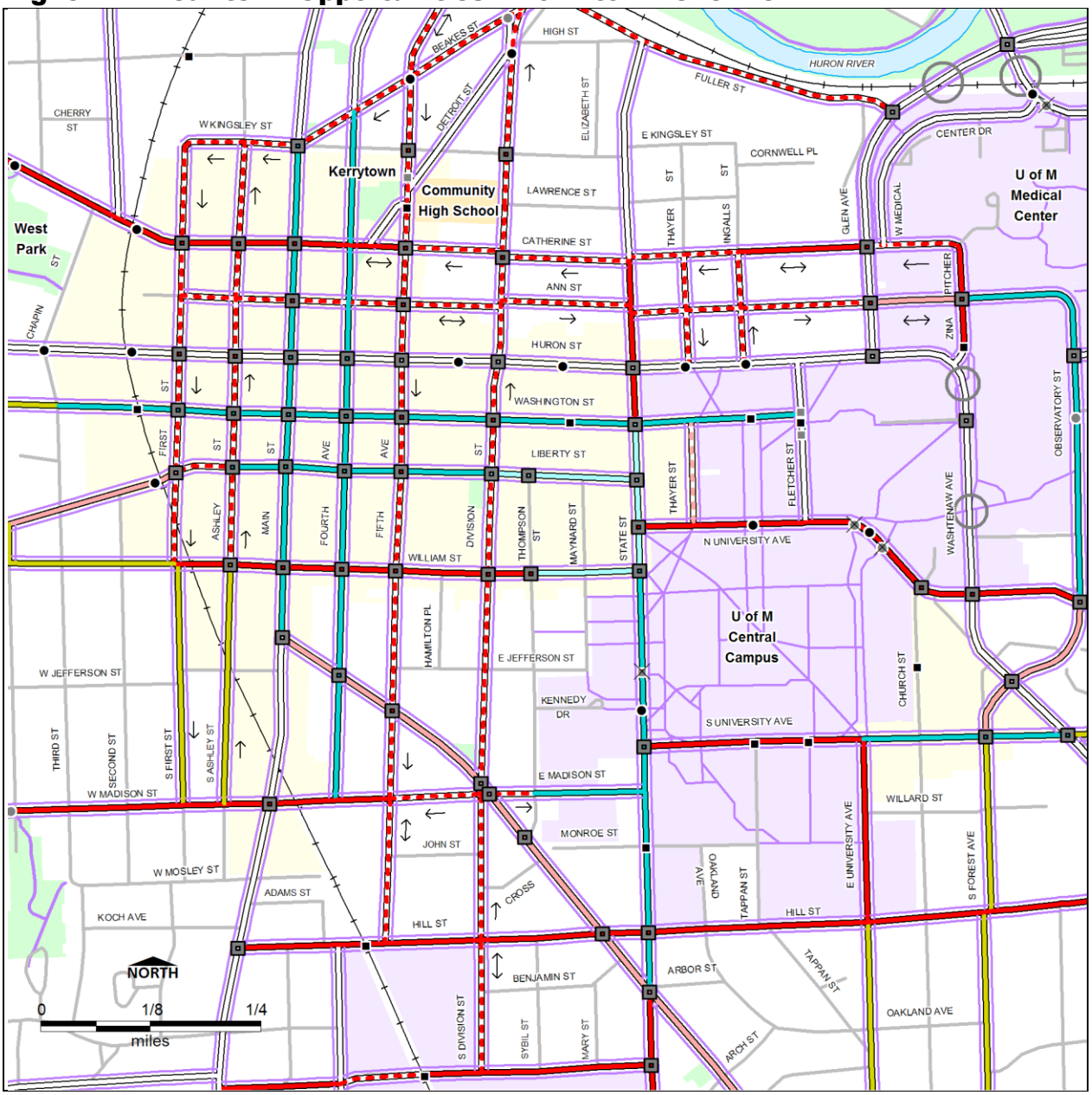
Allen Creek Greenway

The idea of a greenway that would generally follow the historic route of the main branch of the Allen Creek (roughly parallel to the Ann Arbor Railroad) has been around for a number of years. At the time of this report there are numerous proposals for what form this greenway should take. The greenway has also been referred to as the Ann Arbor Greenway and Central Park. The route and form of the greenway are intertwined with citywide discussions regarding infill development, the City's greenbelt and downtown parking. Needless to say, the recommendations in this report should not be interpreted as the final say in the greenway planning and design process; rather they reflects one option that is rather modest in scope.

Greenways may or may not include a pathway component. Some greenways are focused solely on addressing issues such as water quality; while others have little open space and are primarily a Shared-use Path. Numerous participants in the public involvement for this plan indicated they would like to see a path that generally follows the Ann Arbor Railroad. The route shown does that, alternating sides of the railroad based on issues related to property ownership and physical constraints. The route shown would require obtaining easements or purchasing property from private land owners.

The route between Miller Avenue and Madison Street crosses numerous roadways mid-block in rapid succession. This would make for an awkward bicycle facility. Thus the plan shows a walkway between Miller Avenue and Madison Street with on-road bicycle facilities on First and Ashley Streets paralleling the pathway route. North and south of this segment, where road crossings are spaced further apart, the route is shown as a Shared-use Path.

Fig. 5.1F. Near-term Opportunities – Downtown Overview



Legend:

Existing:	Proposed:	
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		Remove Crosswalk
		Grade Separated Crossing
		Bicycle Lanes
		Bicycle Lane, 1 Side Only
		Signed Bike Route
		Shared-use Arrow

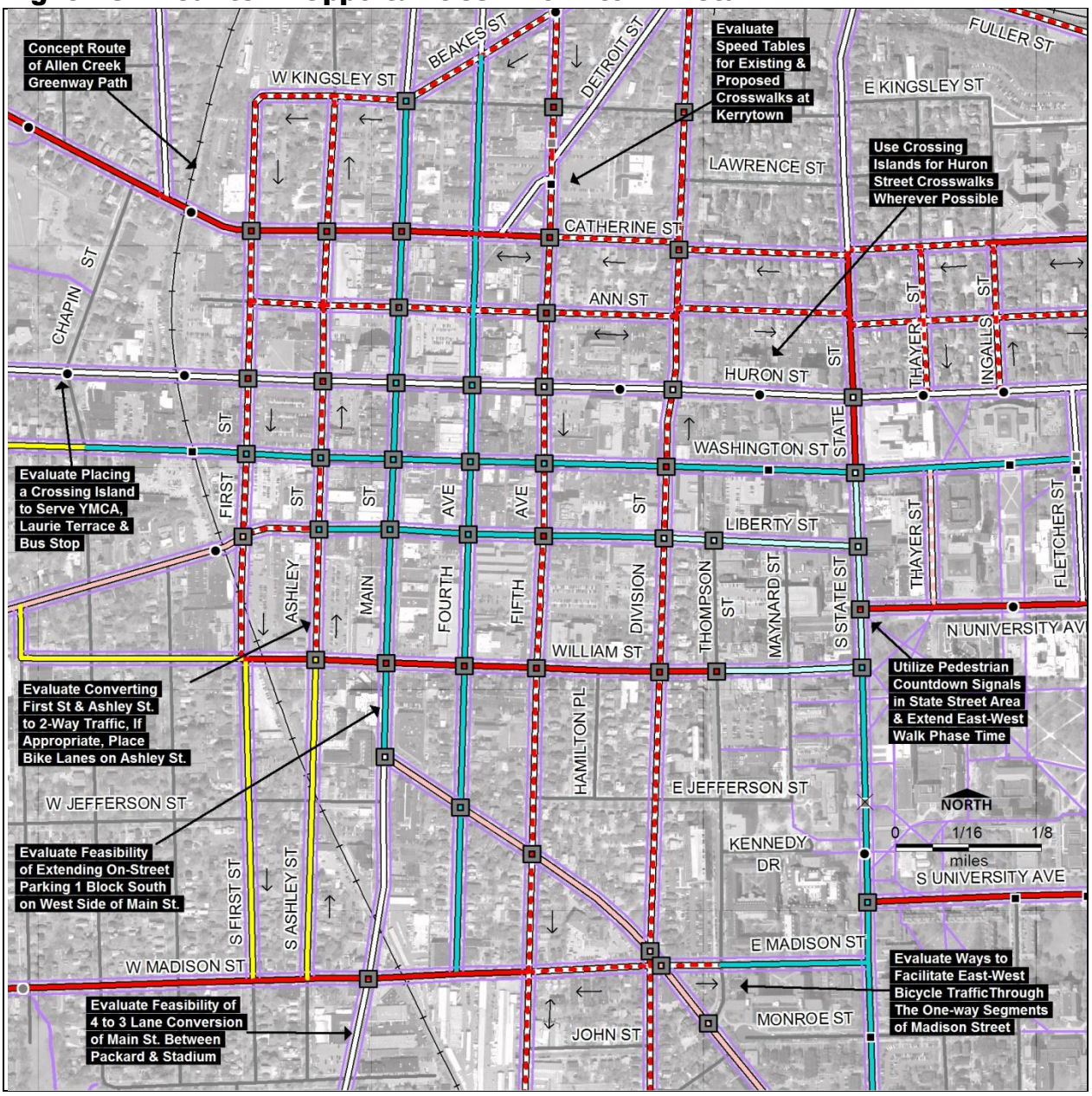
Existing:	Proposed:	
		Sidewalk / Walkway (< 8' wide)
		Shared-use Path (8 - 10' wide) includes Bridges and Boardwalks
		Foot Trail

Other Features:

- Local Road
- Freeway
- Railroad
- No Improvements Near-term

- Water
- U of M Campus
- Public School Propert
- Parks
- DDA Boundary

Fig. 5.1G. Near-term Opportunities – Downtown Detail



Legend:

Existing:	Proposed:	
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		Remove Crosswalk
		Grade Separated Crossing
		Bicycle Lanes
		Bicycle Lane, 1 Side Only
		Signed Bike Route
		Shared-use Arrow

Existing:	Proposed:	
		Sidewalk / Walkway (< 8' wide)
		Shared-use Path (8 - 10' wide) includes Bridges and Boardwalks
		Foot Trail

Other Features:

- Local Road
- Freeway
- Railroad
- No Improvements Near-term

University of Michigan Campuses

With the exception of the roads through North Campus and Medical Center Drive, most of the roads that serve the University of Michigan are City of Ann Arbor roads. Intersecting those roads though are numerous walkways that criss-cross campus that serve tremendous numbers of pedestrians. These points of intersection require coordination between University and City staff.

Central Campus

Strategies for central campus include:

- Relocate parking from one side of State Street to one side of South University in order to permit Continuous Bike Lanes from the south of town to central campus. Evaluate allowing event and/or after hours parking on Bike Lane at this location.
- Place Bike Lanes towards the median along North University in order to minimize conflicts with the transit terminal and frequent bus stops.
- Mark and sign the informal crosswalks where the mall crosses Washington Street and North University Avenue.

Medical Center

As a separate transportation study is currently underway for The Medical Center the recommendations are limited here. Some strategies for the Medical Center include:

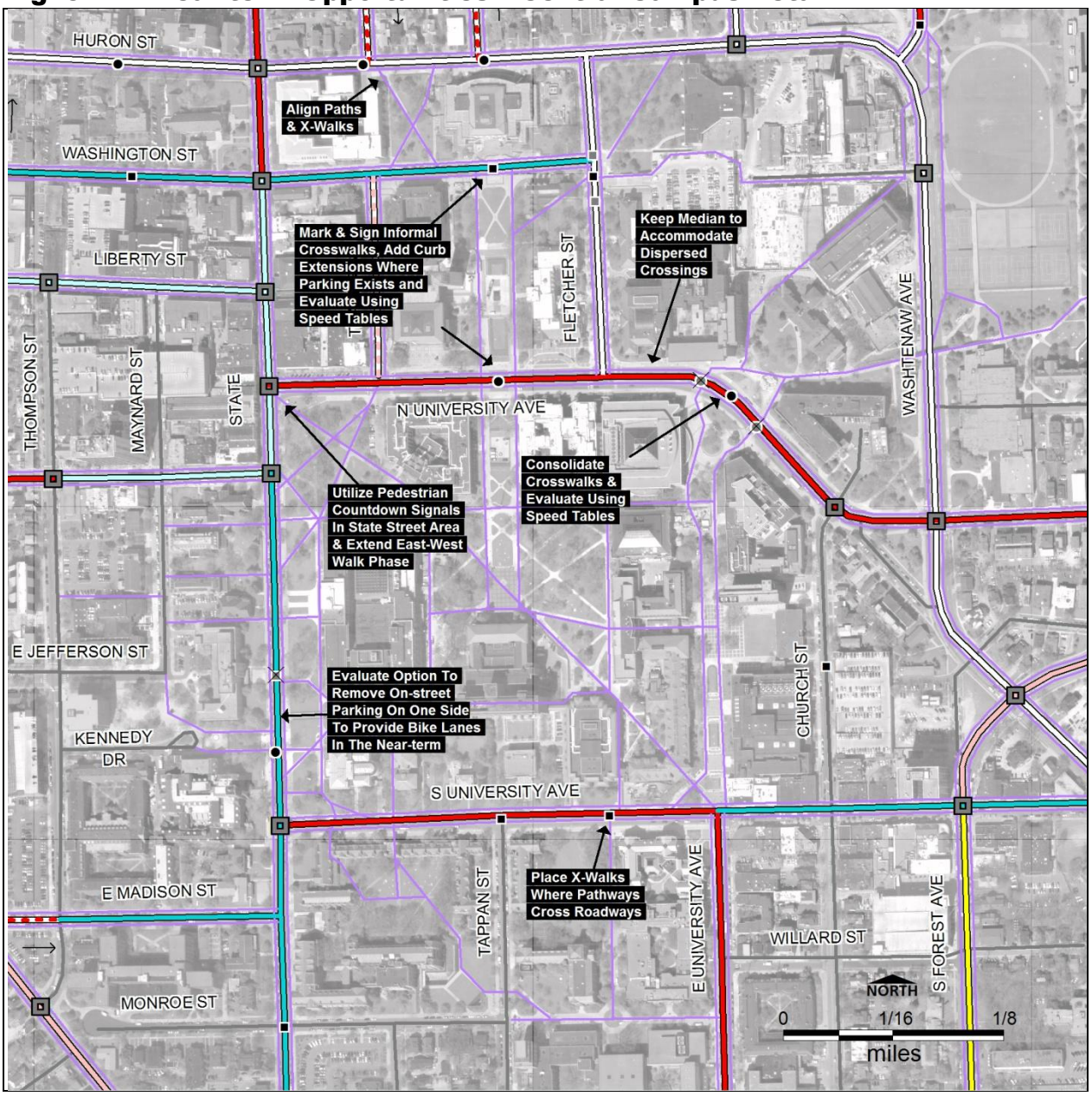
- Relocate some of the crosswalks on Medical Center Drive to locations with less conflicts and add crossing islands as appropriate.
- Evaluate providing a centralized covered and secure bicycle parking area.
- Address sidewalk bicycle use at the Medical Center Drive/Fuller Road intersection. Create separate ramps for bicyclists and have the bicyclists use the traffic signals rather than having to use the pedestrian activated signals which often require bicyclists to dismount.

North Campus

As a separate transportation study is currently underway for North Campus the recommendations are limited here. Some strategies for North Campus include:

- Improving the connections between the internal pathway systems of the housing developments with the sidewalk system.
- Upgrading the existing crosswalks to current best practices and add crosswalks where major pathways cross roadways.
- Adding sidewalks to both sides of the street wherever feasible.
- Work with the City to address pedestrians crossing Plymouth Road at an angle east of Murfin Road where Plymouth Road has both vertical and horizontal curves that make the pedestrians difficult to see.

Fig. 5.1H. Near-term Opportunities – Central Campus Detail



Legend:

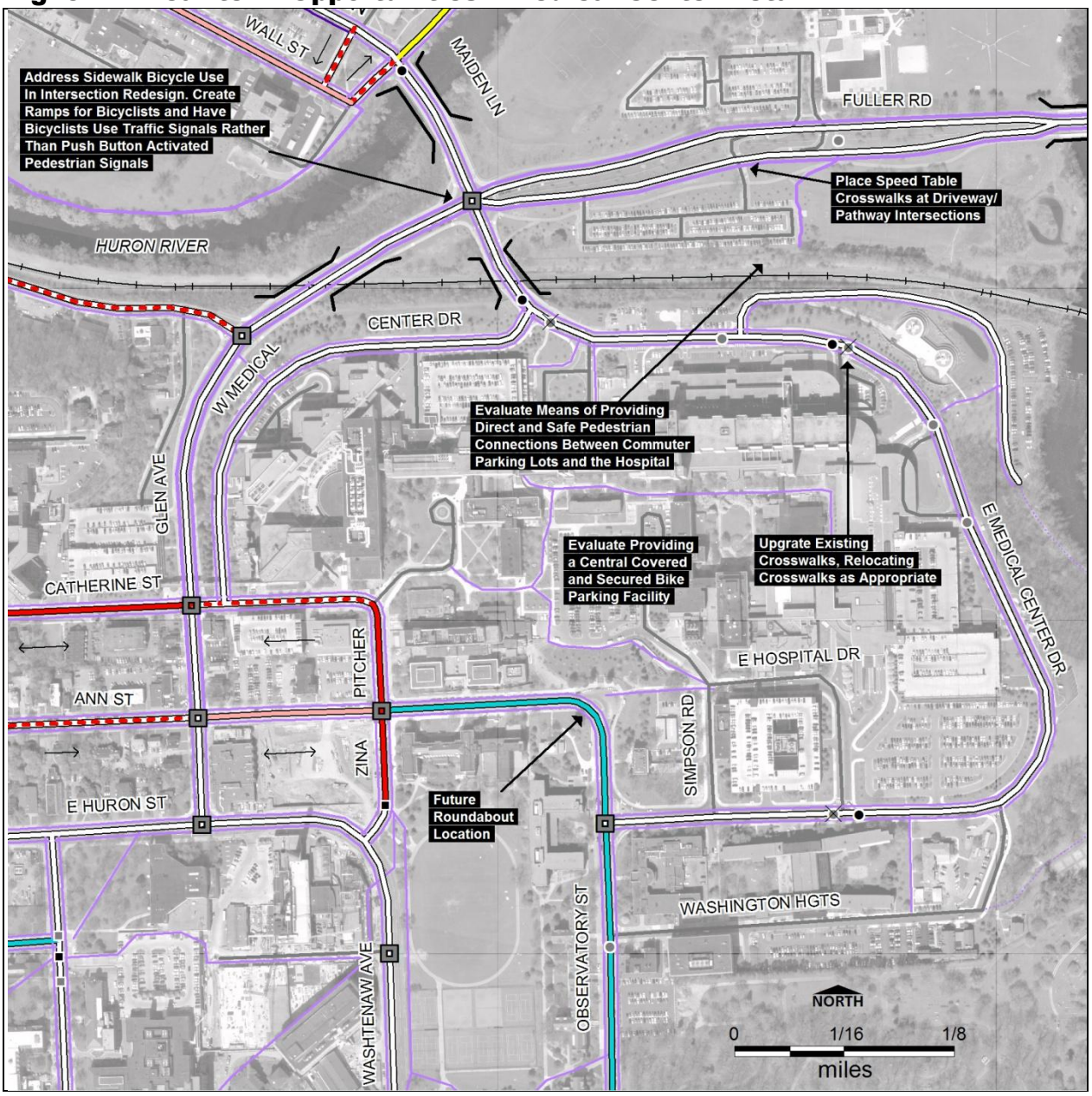
Existing:	Proposed:	
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		Remove Crosswalk
		Grade Separated Crossing
		Bicycle Lanes
		Bicycle Lane, 1 Side Only
		Signed Bike Route
		Shared-use Arrow

Existing:	Proposed:	
		Sidewalk / Walkway (< 8' wide)
		Shared-use Path (8 - 10' wide) includes Bridges and Boardwalks
		Foot Trail

Other Features:

- Local Road
- Freeway
- Railroad
- No Improvements Near-term

Fig. 5.1I. Near-term Opportunities – Medical Center Detail



Legend:

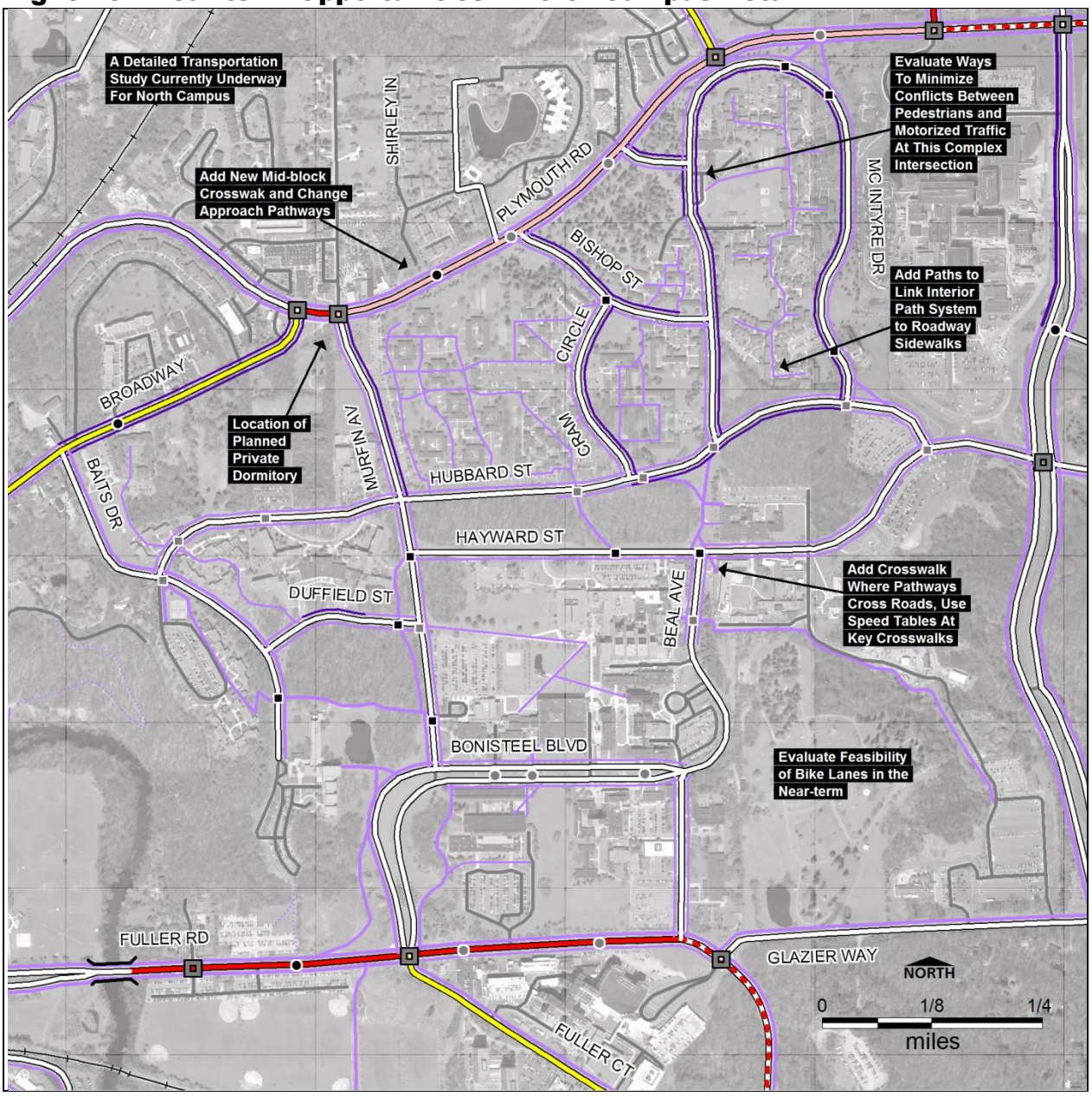
Existing:	Proposed:	
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		Remove Crosswalk
		Grade Separated Crossing
		Bicycle Lanes
		Bicycle Lane, 1 Side Only
		Signed Bike Route
		Shared-use Arrow

Existing:	Proposed:	
		Sidewalk / Walkway (< 8' wide)
		Shared-use Path (8 - 10' wide) includes Bridges and Boardwalks
		Foot Trail

Other Features:

- Local Road
- Freeway
- Railroad
- No Improvements Near-term

Fig. 5.1J. Near-term Opportunities – North Campus Detail



Legend:

Existing:	Proposed:	
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		Remove Crosswalk
		Grade Separated Crossing
		Bicycle Lanes
		Bicycle Lane, 1 Side Only
		Signed Bike Route
		Shared-use Arrow

Existing:	Proposed:	
		Sidewalk / Walkway (< 8' wide)
		Shared-use Path (8 - 10' wide) includes Bridges and Boardwalks
		Foot Trail

Other Features:

- Local Road
- Freeway
- Railroad
- No Improvements Near-term

5.2 Near-term Opportunities Prioritization

In-Road Bicycle Facilities Prioritization

In-Road Bicycle Facilities are prioritized such that the Bike Lanes are a higher priority than Bike Routes and Shared-use Arrows. This is because they will have a greater impact in safety and accommodation to cyclists. The Bike Lanes themselves are prioritized based on the following factors:

- The existence of, or lack of, a Shared-use Path alternative.
- The existence of, or lack of, a suitable on-road alternative.
- The general demand based on land use (see the Existing Land Use and Neighborhood Accessibility Index maps).
- The number of intersecting driveways and roads.
- Connectivity to existing facilities.

Mid-block Crossings Prioritization

Mid-block Crossings are prioritized based on the following:

- The number of lanes.
- The speed of the roadway.
- Spacing of existing crosswalks.
- The existence of bus stops.
- The general demand based on land use (see the Existing Land Use and Neighborhood Accessibility Index maps).
- The existence of special pedestrian traffic generators for high risk pedestrians. For example a bus shelter located across the street from an apartment building for retirees.

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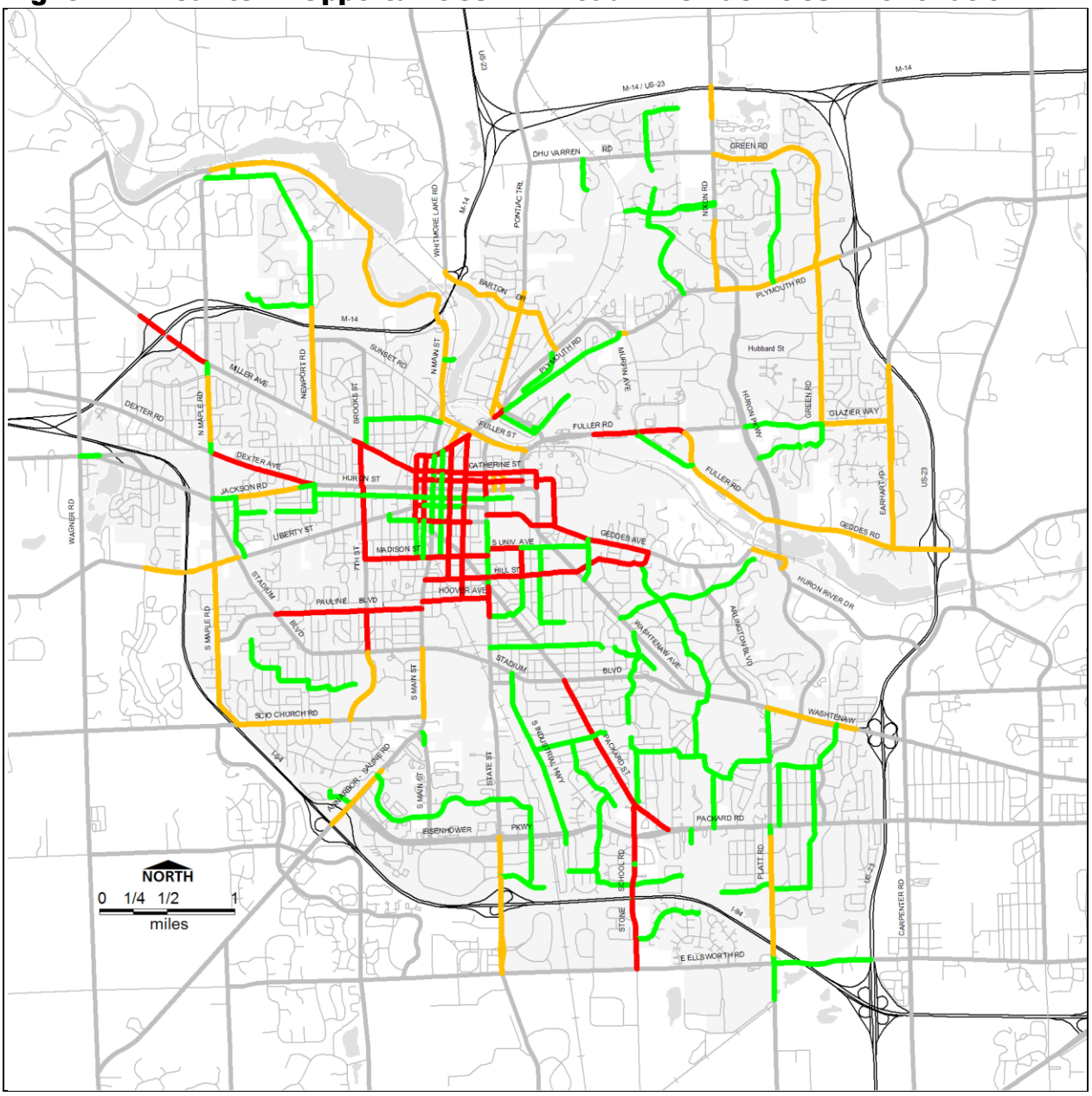
Fig. 5.2A. Near-term Opportunities – In-Road Bike Facilities Prioritization



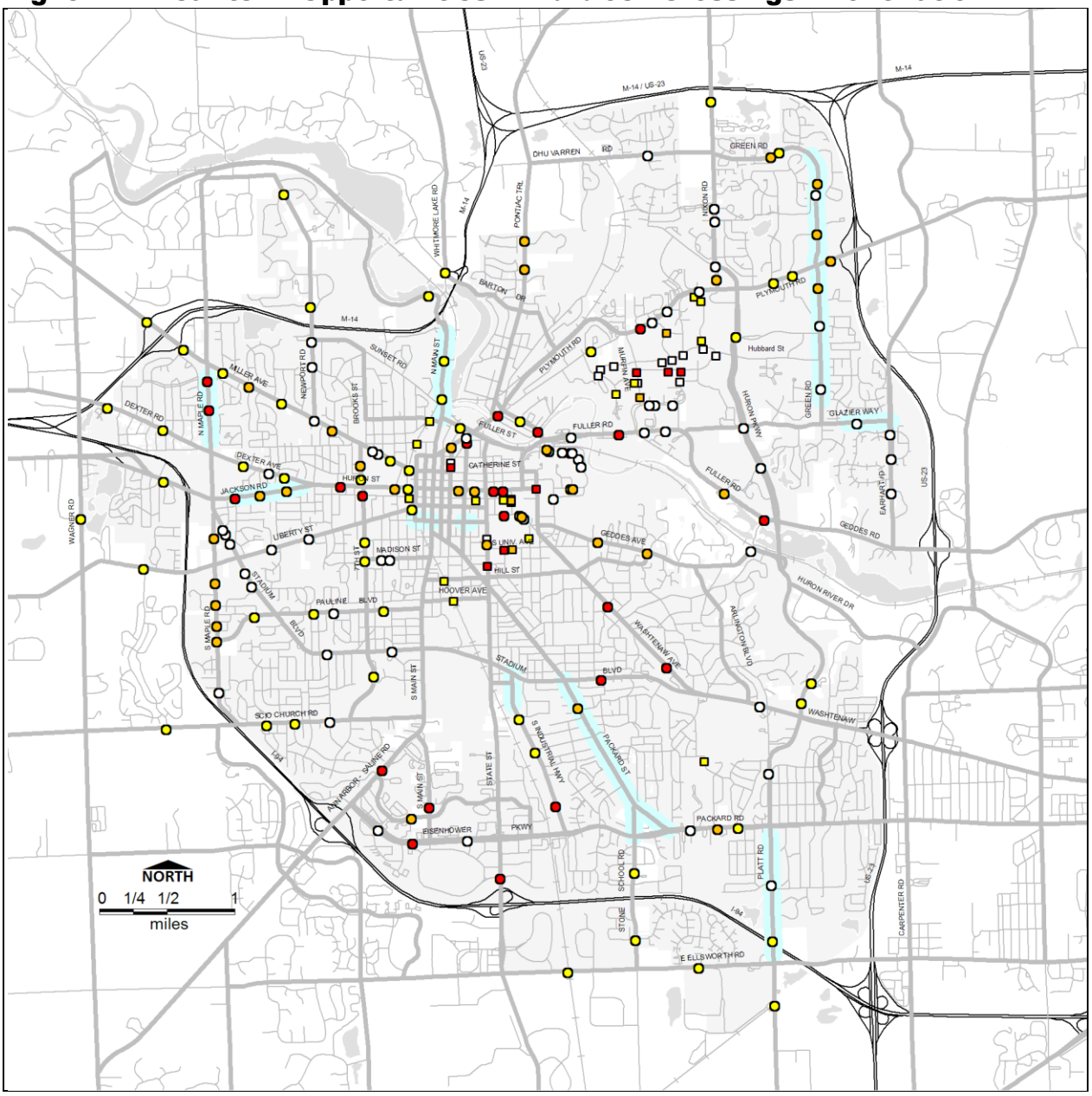
Legend

In-Road Bicycle Facility Priorities:

- First Tier
- Second Tier
- Third Tier

The high priority in-road bicycle facilities are bike lanes that are in the downtown area, along busy roadways with many intersecting roadways and driveways or complementing existing bike lanes.

Fig. 5.2B. Near-term Opportunities – Mid-block Crossings Prioritization



Legend

Major Mid-block Crossings:

Existing - Upgrade as Necessary	(59)
Proposed High Priority	(22)
Proposed Low Priority	(50)
Proposed Medium Priority	(32)

Minor Mid-block Crossings:

Existing - Upgrade as Necessary	(14)
Proposed High Priority	(7)
Proposed Low Priority	(14)
Proposed Medium Priority	(4)

Key Conversion for Refuge Islands

4 to 3 Lane Conversion

Some of the Major Mid-block Crossings should be done in concert with 4 to 3 Lane Road conversions .

5.3 Long-term Plan

The Long-term Plan illustrates the direction the City should pursue as it builds major new facilities or re-builds existing facilities. These are major capital improvements that will be implemented over an extended period of time as funding becomes available or integrated into other major construction projects. For example when Stadium Boulevard was rebuilt, the road was widened slightly to accommodate the inclusion of bicycle lanes.

Long-term Plan for Roadways

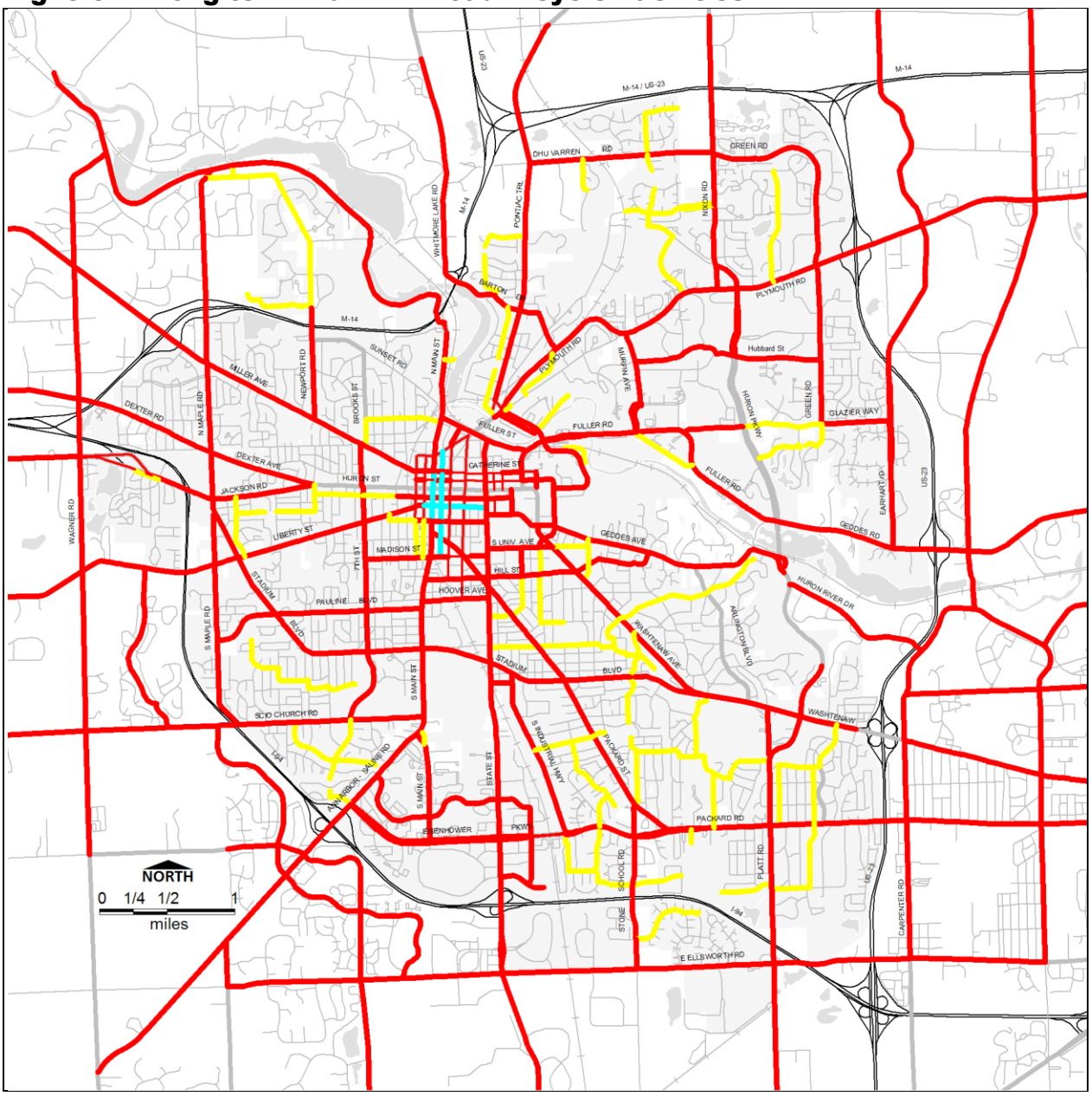
- Are generally implemented when a new road is built or an existing road is completely reconstructed. Reconstruction projects typically include new curb and gutter as well as storm water systems.
- Generally require that a road be widened to accommodate the minimal lane width requirements for all users and may require additional ROW.
- Strive to meet the minimum desired widths for Bike Lanes, Motor Vehicle Lanes, Buffers, and Sidewalks to the extent that it is practical given the project's context.

As noted earlier, the distinction between the Near-term Opportunities and the Long-term Plan can sometimes be obscure. For the majority of roadways the Near-term Opportunities and Long-term improvements will be the same. The difference will be primarily qualitative (width of Sidewalks, Buffers, Bike Lanes and Motor Vehicle Lanes). This report does not define the ideal long-term cross section for every primary road in the City. Rather it defines what improvements should be included and provides guidelines for a wide variety of road and right-of-way scenarios.

What is clear though, is that some of the existing roadways are not able to accommodate Bike Lanes without either elimination of lanes that would result in a substantial loss of motor vehicle level of service and/or decreased motor vehicle safety. In most cases, the necessary widening of the roadway would be minimal, often just a few feet would be necessary to achieve the minimum desirable width.

The following maps provide an overview of the In-road Bicycle Improvements and the roads that would have to be widened to accommodate those improvements. There are a few cases, such as segments of Packard and Stadium where Bike Lanes could be provided within the existing curb lines if the motor vehicle and turn lanes are reduced to 10' wide.

Fig. 5.3A. Long-term Plan – In-Road Bicycle Facilities



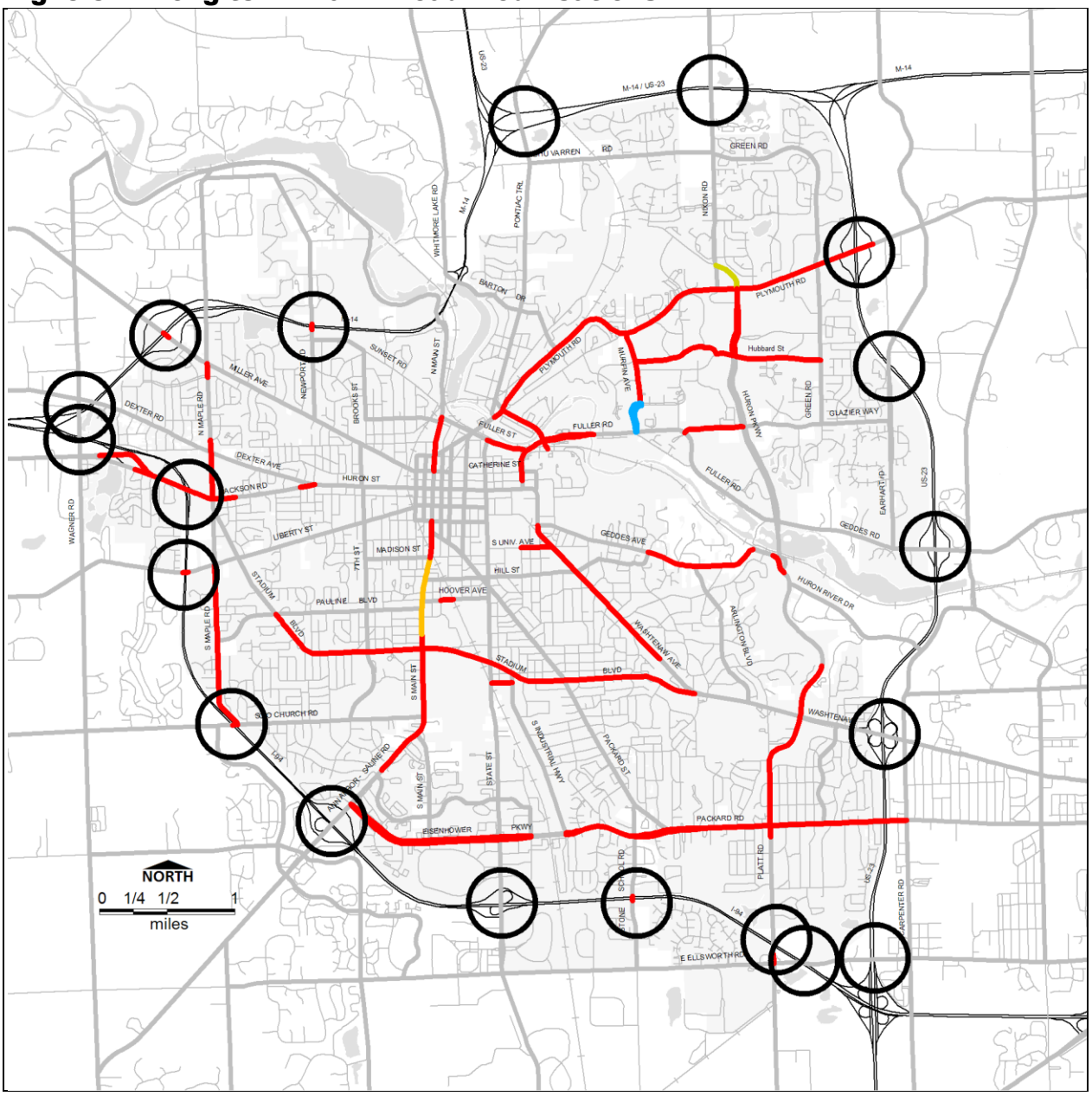
Legend

Long-term In-Road Bike Facilities

- Bike Lane One Side
- Bike Lanes
- Bike Route
- Shared-use Arrow

The Long-term Plan proposes a total of 76 miles of Bike Lanes in the City on the primary road system. This would result in Bike Lanes on 85% of the primary road system.

Fig. 5.3B. Long-term Plan – Road Modifications



Legend

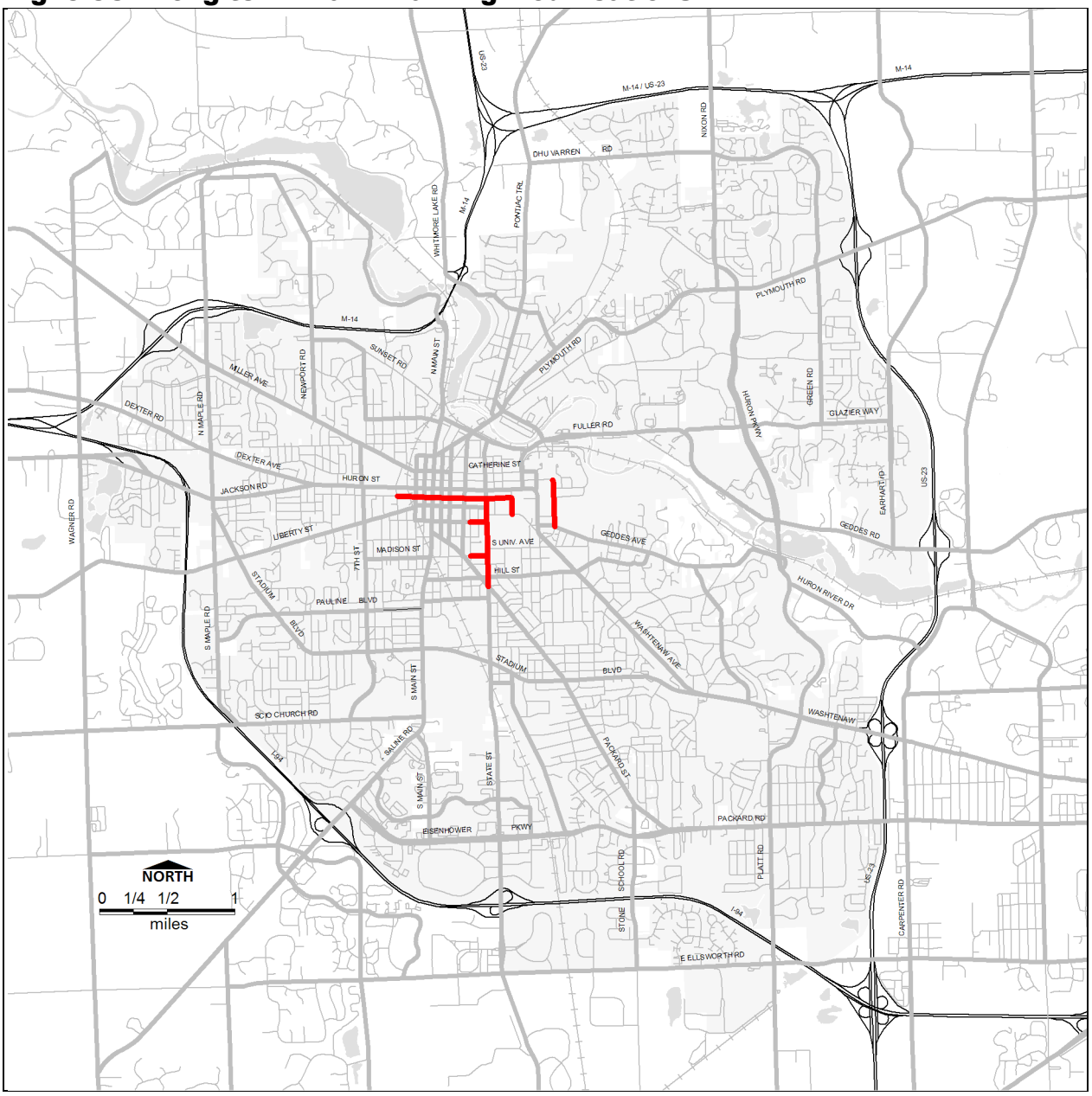
Long-term Road Modifications:

- 4 to 3 Lane Conversion
- 5 to 3 Lane Conversion
- Eliminate 1 Lane
- Minor Road Widening to Accommodate Bike Lanes

Freeway Overpass or Interchange Under MDOT's Jurisdiction

Some of the roads indicated for widening in the Long-term such as Packard Road and parts of Stadium Boulevard are candidates for adding Bicycle Lanes in the Near-term Opportunities through narrowing the lanes if sub-11' motor vehicle lanes are considered acceptable for these roads.

Fig. 5.3C. Long-term Plan – Parking Modifications



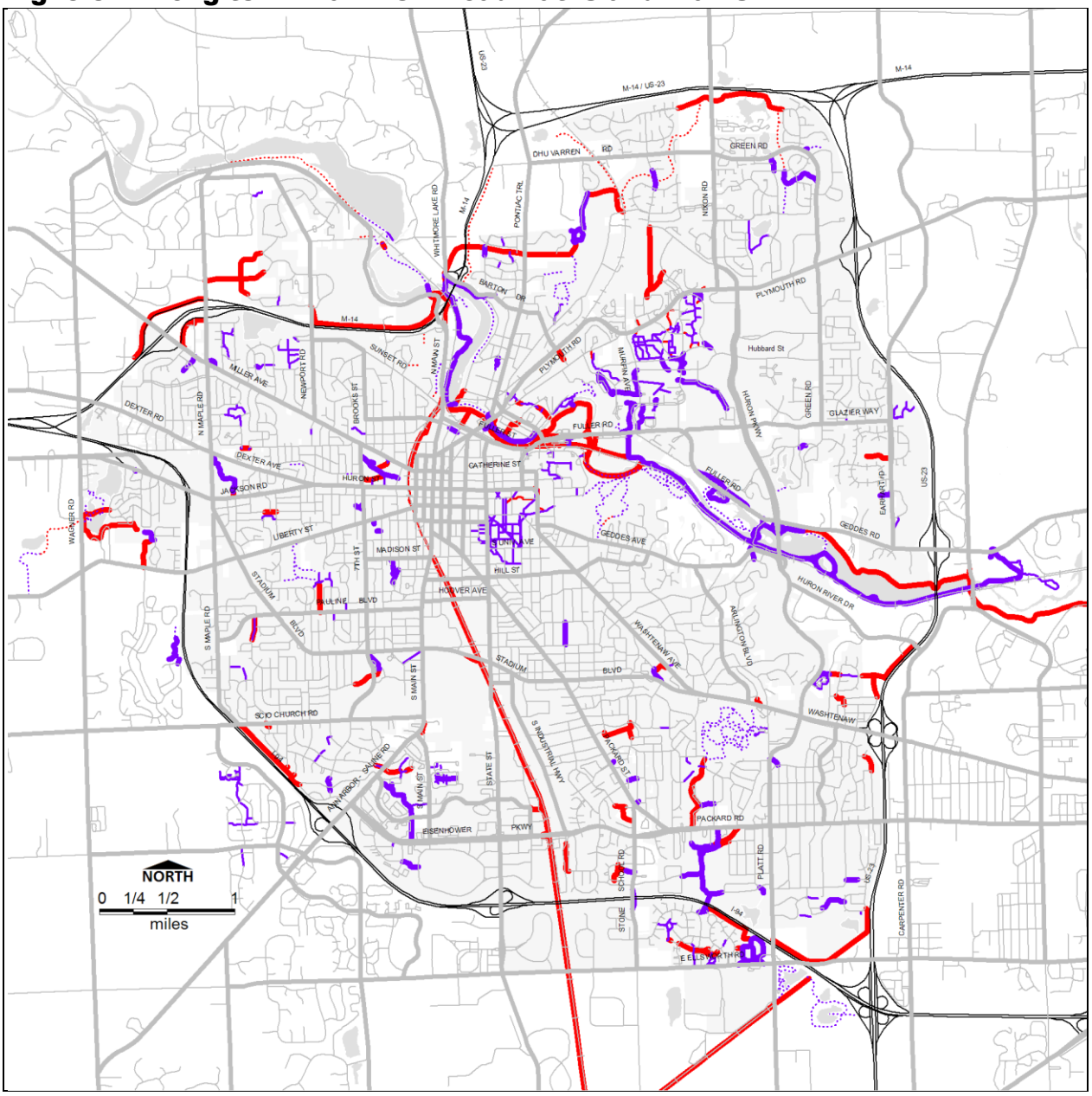
Legend

Long-term Parking Changes:

Remove Parking on 1 Side

As bicycle use increases downtown it may be desirable to remove some on-street parking to make room for additional bike lanes on key corridors.

Fig. 5.3D. Long-term Plan – Off-Road Paths and Walks



Legend

Off-road Paths and Walks:

- Existing Foot Trail
- Existing Shared-use Path
- Existing Walk
- Proposed Foot Trail
- Proposed Shared-use Path
- Proposed Walk

The routing of some of the paths shown is conceptual and requires further refinement. The surface of the Proposed Shared-use Paths is not defined in this study. Appropriate surfaces include asphalt, concrete, crushed fines and stabilized fines.

The highlighted key Off-Road Pathways are discussed on the following page.

Off-Road Paths and Walks

The Plan includes a diagram illustrating Off-Road Paths and Walks that can provide critical links to an expanding system of non-motorized corridors throughout Ann Arbor. They include paths through existing parks, proposed connections to the new high school, and routes over or under the freeway, to connect to areas outside of the city. Some, like the proposed path near M-14 that will provide improved non-motorized access to the new high school, will require significant infrastructure improvements. Other improvements, like paths through existing parkland, will require less infrastructure expenditure.

The Riverfront

The Huron River is the most significant natural resource in the City. For the past 50 years the City has worked to create a series of linked parks along the waterfront to preserve this resource, provide access to the waterfront and establish recreational amenities.

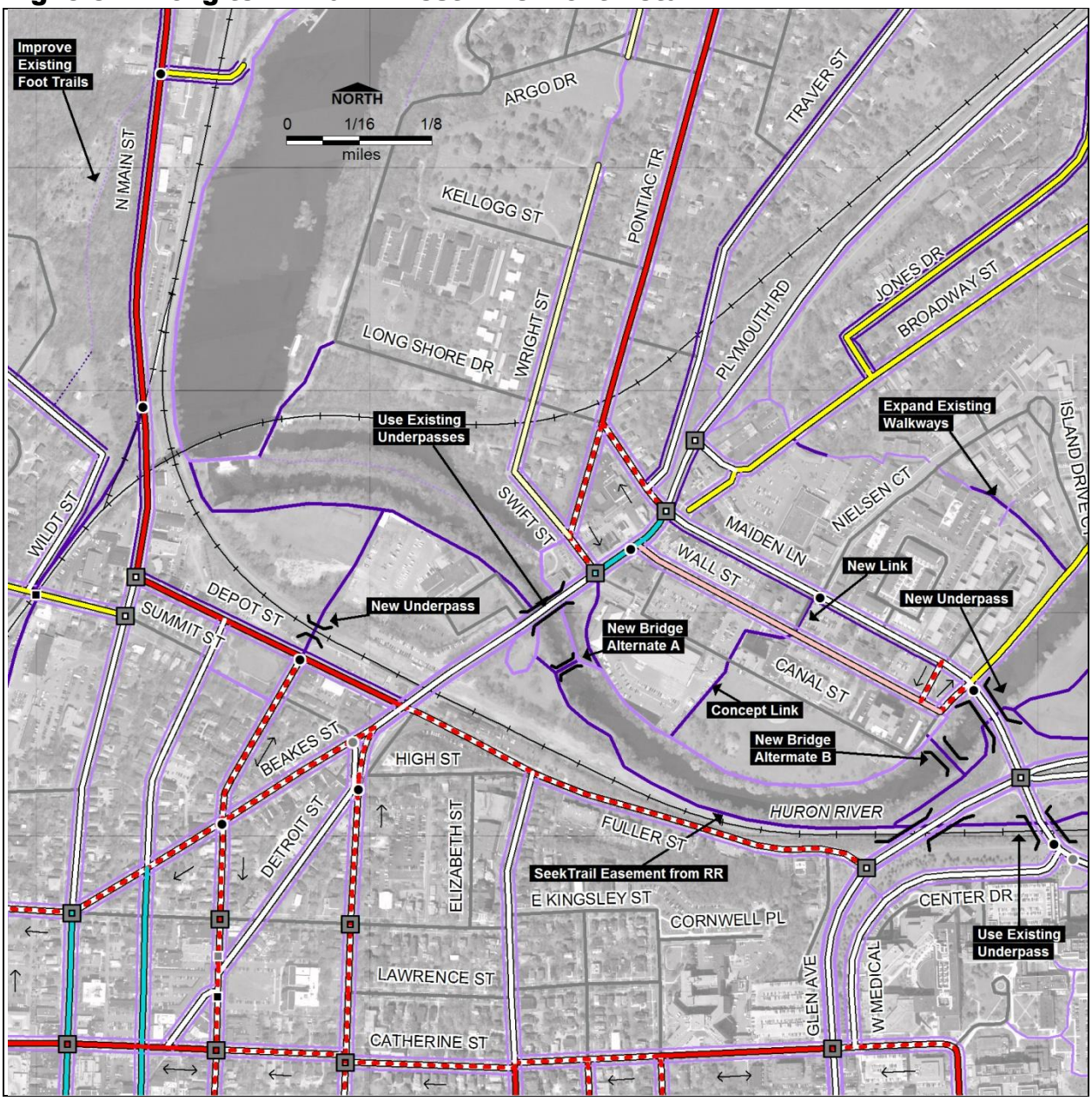
The proposed Shared-use paths along the waterfront will complete gaps in the existing pathway system. In addition, there are a number of paths that tie into the on-road non-motorized network to provide convenient access to the riverfront pathways system.

Many of the bridges that have been built over the past 15 years: Broadway Bridge over the river, Fuller Road over the railroad and the river and Medical Center Drive over the railroad, were designed to accommodate a non-motorized path. Yet there still remain significant obstacles to provide a grade separated pathway along the river and some new underpasses are proposed.

The railroad provides the biggest challenge and four underpasses are proposed. Some of these may be able to utilize the existing railroad bridges over the river, but others may include creating new tunnels under the railroad. The City is currently investigating the feasibility of two of these underpasses.

While most of the proposed pathway is on City or University of Michigan land, some portions will require easements from the rail-road or existing land owners. In particular, the segment between the Broadway bridge and the Argo dam on the south side of the river goes through property now owned by DTE Energy that houses a MichCon maintenance yard.

Fig. 5.3E. Long-term Plan – West Riverfront Detail



Legend:

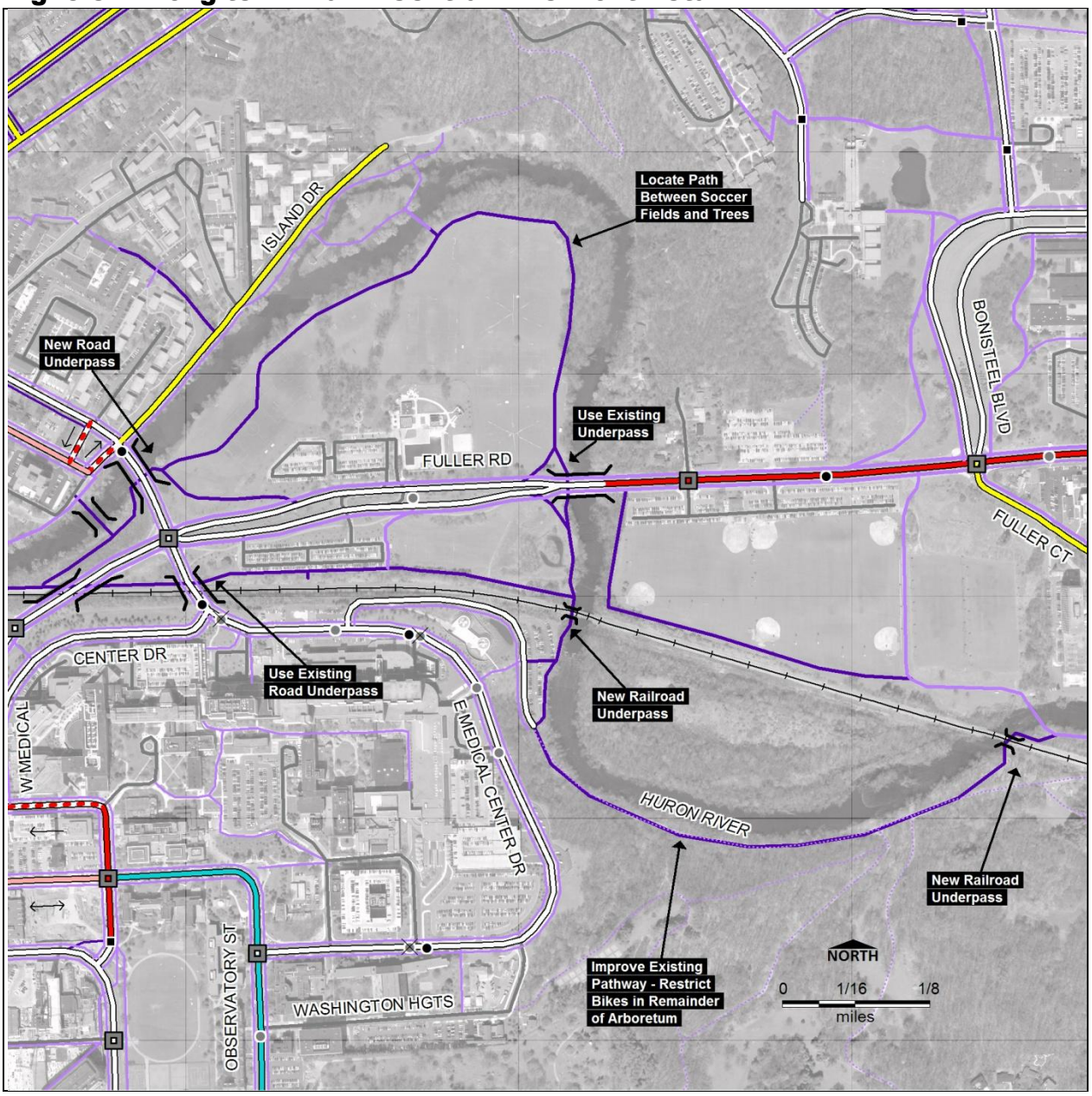
Existing:	Proposed:	
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		Remove Crosswalk
		Grade Separated Crossing
		Bicycle Lanes
		Bicycle Lane, 1 Side Only
		Signed Bike Route
		Shared-use Arrow

Existing:	Proposed:	
		Sidewalk / Walkway (< 8' wide)
		Shared-use Path (8 - 10' wide) includes Bridges and Boardwalks
		Foot Trail

Other Features:

- Local Road
- Freeway
- Railroad
- No Improvements Near-term

Fig. 5.3F. Long-term Plan – Central Riverfront Detail



Legend:

Existing:	Proposed:	
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		Remove Crosswalk
		Grade Separated Crossing
		Bicycle Lanes
		Bicycle Lane, 1 Side Only
		Signed Bike Route
		Shared-use Arrow

Existing:	Proposed:	
		Sidewalk / Walkway (< 8' wide)
		Shared-use Path (8 - 10' wide) includes Bridges and Boardwalks
		Foot Trail

Other Features:

- Local Road
- Freeway
- Railroad
- No Improvements Near-term

6. Implementation

How Things Get Done

The challenge that begins following the adoption of this plan, is its implementation. The plan provides a framework for moving forward and building upon the elements that are already in place; this section describes roles and responsibilities for getting there.

This section outlines what the City is doing and how it will move forward with improvements to planning, system operation and maintenance, policy and project development, as well as human resource policies for its employees. It addresses staff effort, committee composition, project development practices and funding considerations for capital construction and maintenance of non-motorized facilities in the City.

6.1 Staff

The following City units have staff that is actively engaged in moving the Non-motorized Plan forward.

Systems Planning leads the infrastructure planning in the City. This unit maintains transportation planning and capital budgeting process development for the City. Key staff has contributed to this plan and are responsible for managing the City's non-motorized capital resources, in addition to coordination of the Alternative Transportation initiative.

Project Management is where concepts evolve from the broad planning consideration to detailed engineering drawings, construction contracts and ultimately project delivery. Project Management also manages traffic operations such as traffic control orders and signals. The inclusion of non-motorized systems elements as basic components of all future City projects will provide many of the recommendations of the plan.

Planning and Development develops and maintains city comprehensive master plans, and serves to facilitate the linkage between land use and non-motorized planning. Through comprehensive planning and development review processes, this facilitates consideration of appropriate non-motorized facilities via the processes they administer and plans they develop. Community Planning staff have led the development of this plan as one example of how they contribute to non-motorized planning.

Parks and Recreation staff maintains a system of off-road paths in City parks. Staff experience in planning, design and maintenance is essential to contributing and exchanging information on best practices. Additionally, the Parks group develops and implements the Parks, Recreation and Open Space

Plan. That Plan includes expansion of the recreationally oriented path system that also serves transportation purposes. The Border-to-Border Trail is an initiative of this service area.

Field Operations staff monitors the condition of the system, respond to citizen complaints about the condition of the facilities and undertake appropriate maintenance and minor capital construction to assure the non-motorized system accommodates the demands placed upon it. Crack sealing and vegetation management are functions carried out by this service area.

Communications staff assists the other work groups in assuring the community at large is informed and involved in plan development and project activities. Additionally, Communications are essential to assuring the public is aware of the progress the City makes as it delivers improvements and progresses through the lists of recommended improvement. Public participation is important to ensure the City is delivering the system in a way that responds to the community

Community Standards staff monitors overall maintenance and condition of non-motorized facilities and enforces snow removal by private property owners along the non-motorized network. Ann Arbor property owners clean and clear the sidewalks in front of or alongside of their property as a supplement to City maintenance activities. The City has adopted regulations governing the terms of private maintenance and the Community Standards staff assures that all walks are maintained to city standards.

Police and Public Safety play a key role by maintaining proper enforcement of all vehicle codes and also provides education about bicycle and pedestrian mobility safety.

6.2 Committees

Recognizing that several service areas and many staff are engaged in the non-motorized system, collaboration is key to supporting full implementation of the plan. In addition to City staff outlined above, there are many stakeholder groups in the City that foster implementation. Key staff from the University of Michigan, the Get Downtown program, Washtenaw Area Transportation Study, Ann Arbor Transportation Authority, and the Downtown Development Authority meet monthly with City staff as the "ALT Committee." Ideas are exchanged and progress reported through this interdisciplinary team of key agency staff members. Difficulties encountered by any of the ALT Committee members are collectively reviewed, with shared knowledge and experience then applied. The agenda and work of the ALT Committee is focused yet flexible.

The Environmental Commission formally serves citizen interests. The non-motorized subcommittee of the Commission focuses on improving the alternative transportation system as a means to reduce the impact of transportation on the environment. This group has strengthened the importance of alternative transportation by connecting the relationship of moving around in the City to environmental and quality of life issues.

The Non-Motorized Plan Advisory Committee was created to support the Plan's drafting. The group met regularly during the development phase of the plan.

Planning Commission should actively encourage petitioners of proposed development projects to include strong non-motorized components, non-motorized neighborhood linkages, pedestrian amenities, and otherwise be in conformance with the Non-motorized Transportation Plan.

6.3 Funding

Beyond the will to have a world-class non-motorized transportation system, funding is a key tool for implementation. Currently, the City uses funds both directly allocated to non-motorized transportation as well as other capital funds to further the progress of projects. The City Council passed a Resolution --R-216-5-04, which includes the annual dedication of 5% of the City's funds received under Public Act 51, Michigan Transportation Fund (MTF) dollars, toward completing a system of non-motorized routes. This amounted to approximately $350,000 per year in 2004-2005. The funds allow for supporting maintenance activities, planning and design of capital improvements and as resources for direct investment in new facilities. Community Development Block Grants are also available for lower income neighborhoods.

Federal Policy

In 1991 the Intermodal Transportation Efficiency Act, ISTEA, and its successor federal transportation bills have included funding for non-motorized transportation in several sections of the transportation legislation. Surface Transportation Program (STP) funds are assigned to urban regions where local officials meeting as a Metropolitan Planning Organization direct investment of certain federal transportation resources. Other programs with a narrower focus such as Congestion Mitigation and Air Quality (CMAQ), transportation enhancement TE and safety funds can also be used to invest in non-motorized transportation. It is noted that there are needs in each of these funding categories that outstrips the resources available, but in fact are available to fund projects described in the Plan. These federal funding sources were recently reauthorized with the recent adoption of SAFETEA-LU.

Regional Coordination is essential to access federal funds. The Washtenaw Area Transportation Study and Southeast Michigan Council of Governments are the transportation planning and programming agencies that are critical to providing support for implementation of the City's plan. The City has representatives that serve on both the technical and policy Boards of these important agencies. It is likely that continued active participation in these funding bodies will enable additional resources to be invested in non-motorized transportation in the City.

MDOT Policy

The Michigan Department of Transportation is also an important authority in non-motorized transportation planning in the state. MDOT is responsible for state funding and maintaining state transportation rules and programs. Important considerations including design attributes along state roadways, as well as the motor vehicle codes are maintained by the MDOT. State Officials are also key in the role they play with the regional planning bodies described above. Since the completion of the Interstate program in the late twentieth century, MDOT has become much more involved in multi-modal transportation and is actively engaged in promoting context sensitive transportation solutions. Many of the policy and design elements described in the plan are still consider innovative, in design, if not in application.

Lastly, federal transportation policy provides the overarching framework that has enabled the full consideration of non-motorized transportation. Absent the policy framework and funding that the USDOT provides it is unlikely that the City's non-motorized program would be as advanced as it is. This is not to say that the federal government directs local decision making, only that with a policy priority and financial partner at the federal level has created a motivating environment at the state and regional levels that have enabled Ann arbor to secure funds to further its efforts.

City Policy

The City of Ann Arbor thinks about transportation multi-modally. Although prior sections discussed an amount of funding that is directed to non-motorized systems, it is also the City's policy to include non-motorized improvements as it makes other improvements in the community. A recent example is the addition of bicycle lanes, pedestrian crossing islands and sidewalks along West Stadium Boulevard. Funded as a street reconstruction project, the multimodal transportation nature of the improvements was funded as such, and provision of multimodal features did not come from the funds set up for completing a system of non-motorized facilities along the City's streets. It is this type of vision that combined with adequate resources, will enable the City to make substantial progress in realizing this plan's vision and goals and encouraging non-motorized travelers to appreciate the care and attention that has gone into thinking about and implementing the comprehensive and necessary improvement for non-motorized transportation.

6.4 Planning and Policy Development

The City maintains a Capital Improvement Plan (CIP) that details six years of investments. The CIP does not address all of the capital expenditures for the City, but provides for large physical improvements that are permanent in nature. Non-motorized facilities are included in this programming tool. The CIP is used as a tool to implement the City Master Plan and assist in the City's financial planning.

Maintenance and Operations

Field Operations have primary responsibility for maintaining the non-motorized system. With a regular and systematic pavement management and sidewalk inspection program, field operations are the location where maintenance needs are identified and operations scheduled. City staff will monitor maintenance and operations expenditures for non-motorized efforts. The following broad areas define some of the primary functions of Field Operations:

Pavement and Sidewalk Maintenance is an ongoing responsibility to inventory and remedy deficiencies in the existing system. City staff addresses deficiencies such as crack sealing, pothole repair and minor resurfacing on an as-needed basis. The goal is to maintain surfaces in good condition. Sidewalk inspection is assures sidewalks are compliant with the City standards and the requirements of ADA. Sidewalks that are cracked, displaced or otherwise not suitable are identified and adjacent property owners provided the opportunity to repair the problem. The City will implement improvement and seek reimbursement from property owners where they either ask the City to make the repairs or do not respond to the notice of deficiency in an appropriate timeframe

Sweeping of bicycle paths and lanes to remove sand and gravel grit in the spring, leaves in fall and other debris during other times of the year are important to maintaining a high level of service to bicyclist and pedestrians. The City is now looking into how to best determine a proper schedule for non-motorized path sweeping, both from a foreign object removal and cost basis.

Vegetation management is necessary so that when riding in a bicycle lane along the side of a busy roadway or walking along a sidewalk and having it is not necessary to duck to avoid low hanging branches or being whacked by a branch. Maintenance staff address these issues in response to stakeholder input. Often City work crews, with proper equipment, will address vegetative issues as they come across them throughout the City.

Pavement Markings - with a new emphasis of providing on-road bicycle lanes creating a comprehensive on-road system, it is critically important to assure that proper lane markings, bicycle lane symbols and signage are maintained. Visible pavement markings assure all travelers recognize the area of the

transportation corridor reserved for motorized, non-motorized or shared use. Each pavement marking has a different lifespan and depending on adjacent lane traffic, may be worn away faster quickly. City maintenance staff will continue to monitor and refresh pavement markings. Over time, the City will seek the optimal cost and life cycle for this important component.

Snow Removal - Although the northern climate may discourage many from relying on non-motorized transportation, there are many Ann Arbor citizens and workers that do rely on these systems year round. The City has a program to remove snow from its public streets. Additional attention is necessary to define the extent of the separate and exclusive right-of-way paths and develop a program for snow removal along those segments. Special attention may also be necessary for curb ramps, pedestrian islands and mid block crossings.

Key bus stops merit consideration for enhanced snow removal. Bus stops are where non-motorized travelers access motorized forms of transportation for longer distance trips. Snow removal is critical to assure the safety and comfort of the non-motorized traveler at these intermodal locations.

6.5 Capital Investments

Sidewalks

Sidewalks are provided along most major roadways, throughout the downtown and in many of the residential subdivisions. Sidewalks are a fundamental component of the non-motorized transportation network. In spite of the decades of focus on this area there are still sidewalk gaps in the City. To fulfill the Plan's policy to create a comprehensive system, these sidewalk gaps will need to be filled. The plan identifies over 75 missing segments along the major roadways. These areas are confronted with a number of challenges that have prevented sidewalks from being constructed. Steep grades, e.g., hills and ditches or swales as well as vegetation including trees and shrubs are often times found where a sidewalk gap exists. Although the Plan defines the gaps and recommends they be filled, staff has to define the improvement and develop projects for the construction of the sidewalks. At this time there is no cost estimate to complete the sidewalk system and that effort will need to take place as an essential first step. Once the cost to complete the system is known funds will need to be secured.

City code requires that properties along a corridor where a sidewalk or non-motorized path is to be located participate in the cost of the improvement to the extent that the property benefits from that improvement. Special assessment is the tool the City uses to collect these funds. As missing segments often contain need for grading and other site preparation work prior to construction, the City will need to secure funds to prepare the right-of-way, construct the sidewalk and wait for the assessment funds to flow back.

Funds for the site preparation defined above can come from a number of sources. The City may opt to use general funds for this purpose. Act 51 funds may also be used for the construction of new sidewalks

Mid-block Crossings and Crossing Islands

As the City designs reconstruction of major streets, mid-block crossing and pedestrian islands must now be considered. Similar to sidewalks defined above, there are no funds currently earmarked for this purpose and there are more restrictions on other transportation funds that preclude them being used for this purpose. This is another funding area that merits more development.

6.6 City of Ann Arbor as an Employer

At the time of this writing, the City has 825 employees. Many work at City Hall and others report to small to medium sized worksites. The City has adopted both human resources policies and capital improvements at its worksites to foster non-motorized transportation by City employees. City Hall is located in the downtown, an area well served by a system of sidewalks and bike lanes. The Bicycle lockers at City Hall are another amenity that supports non-motorized transportation by city workers.

Support for the go! pass is another policy the City maintains to encourage alternative and non-motorized access to downtown city facilities.

In 1998, a committee of City employees developed the Transportation/Parking Options Report in response to the City Council's challenge for the City to "lead by example." Recommendations included conversion of the current parking subsidy to a "transportation" subsidy; installation of shower and lockers in city facilities; and a guaranteed ride home program. With the adoption of this Non-Motorized Plan, this report should be updated to identify ways in which the City of Ann Arbor can move forward with these types of workplace changes to become a leader in supporting transportation alternatives in the workplace.

7. Summary Tables

The following table summarizes the near-term recommendations drawn from the GIS database. The roads are segmented based on uniform transportation corridor cross-sections as well as the near and long-term recommendations. Additional information on each road segment may be found in the GIS database.

Sidewalk and Shared-use Path Needs

7th Street	W. Stadium Blvd to S. Driveway of Pioneer High School
Ann Arbor Railroad	Ann Arbor City limits to downtown
Ann Arbor Saline Road	Lohr Rd to Brookfield Dr
Arlington Boulevard	Gedds Ave to Washtenaw Ave
Beal Avenue	McIntyre Dr to Hubbard St, one side
Birch Hollow Drive	Stone School Rd and east
Bishop Street	Plymouth Rd to Beal Ave, one side
Brooks Street	Sunset St to Hockey Ln
Brooks Street	Sunset St to Robin Rd
Buhr Park/County Farm Park	Packaard St to Washtenaw Ave
Devonshire Road/Hickory Lane	Washtenaw Ave to Geddes Ave
Dexter Avenue	N. Maple Rd to Allen Dr
Dexter Road	Wagner Rd to N. Maple Rd
Dhu Varren Rd	Pontiac Tr to Nixon Rd
Dolph Park Path	Central Ave to Lakeview Ave
Dolph Park Path	Wagner Rd to Lakewood Ave
Dolph Park Path	Wagner Rd to Lakewood Dr
Earhart Road	Old Earhart Rd to Village Park Entrance
Earhart Road	Old Earhart Rd to Geddes Rd (east side)
Earhart Road	Pine Brae Dr to Geddes Rd
Ellsworth Road	Ann Arbor City limits to Platt Rd
Ellsworth Road	East of Platt Rd to West of Stone School Rd
Ellsworth Road	Shadowood Dr to Stone School Rd
Ellsworth Road	Stone School Rd to S. State St (south side)
Ellsworth Road	Stone School Rd to Oak Valley Dr (north side)
Ellsworth Road	Oak Valley to Maple Rd (portions may be Pittsfield Twp)
East edge of Leslie Golf Course	Huron Parkway to Willowtree Lane
Edgewood Drive	Elmwood Ave to Pittsfield Blvd
Elmwood Street	Packard St to Edgewood Dr
Emerald Avenue	Independence Blvd to Candlewick Dr
Fernwood Street	Packard St to Edgewood Dr
Fuller Road	Fuller Ct to Huron Pkwy
Geddes Road	Earhart Rd to Huron Pkwy
Green Road	Burbank Dr to Burbank Dr
Green Road	Hubbard St to Windemere Dr
Hemlock Drive to SE Area Park	New Shared-use Path
Hickory Place	Hickory Place extended to Kilburn Park Circle
Hilldale Dr.	Barton Dr to former Huron Parkway Extension ROW
Honey Creek Pond Path	W Liberty St to pond
Hubbard Street	Murfin Ave to McIntyre Dr, one side
Huron Parkway	Geddes Ave to HH Golf Course
E. Huron River Drive	Huron Pkwy to Hogback Rd
Huron River Path	MichCon property
Huron River Path	Railroad property
Huron River Path	Fuller Park
Huron River Path	Michell field
I-94 Corridor Trail	Scio Church Rd to North Brook Dr
Independence Boulevard	Victoria Ave to Powell Ave
Jewett Street	S Industrial Hwy to Packard St

Lakeshore Drive	
N. Main Street	M-14 to Depot St
S. Main Street	Eisenhower Pkway to I-94
N. Maple Road	Miller Rd to M-14
N. Maple Road	M-14 to Craig Rd
McIntyre Drive	Hubbard St to Beal Ave, one side
Miller Avenue	East of Saunders Cr to Linda Vista Ave
Murfin Ave – one side	Plymouth Rd to Hubbard St
New High School Connections	Riverwood, Newport Creek Dr and Oak Hills Dr
Newport Road	Sunset Rd to Riverwood Rd
Nixon Road	Clague Middle School to M-14
Oakbrook Drive	S. Main St to S. State St
Page Avenue	Juwett St to Esche Ave
Pontiac Trail	Skydale Dr. to M-14
Scarlett Mitchell Park	Shared-use Path on former railroad ROW
Scio Church Road	7th St to Greenview Dr
Scio Church Road	Churchill Dr to S. Maple Rd
Springbrook Street	Packard St to Marshall St
E. Stadium Boulevard	Main St to White St
S. State Street	Eisenhower Pkway to KMS Place (State Cr)
Stone School Road	Ellsworth Rd to I-94
Stone School Road	I-94 to Pebble Creek Dr
Sunset Road	Newport Rd to W. Summit St
Washtenaw Avenue	Tuomy to Glenwood
Washtenaw Avenue	Huron Pkwy to Pittsfield Blvd
Washtenaw Avenue	US-23 Interchange Area to Pittsfield Twp
Yost Drive	Eli Dr to Oakwood St

8. 2013 Plan Amendment

The City of Ann Arbor 2013 Update to the Non-motorized Transportation Plan was adopted by the Ann Arbor City Council on November 18, 2013.

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Contents

Introduction

Background & Metrics

The 2007 Non-motorized Transportation Plan (NTP) envisioned a physical and cultural environment that supports and encourages safe, comfortable, and convenient ways for pedestrians and bicyclists to travel throughout the City and into the surrounding communities.

Since 2007, the City of Ann Arbor has made significant progress in building this physical and cultural environment. Figure 1 shows the miles for four types of non-motorized facilities in 2007, the NTP recommendations for each facility, and what has been added since the NTP was adopted. Bike lanes are presented as lane miles: a lane mile is calculated by measuring the length of roadway with bike lanes and multiplying it by the number of bike lanes. For example, one mile of road with a bike lane on one side of the road measures as one mile. A mile of road with bike lanes in both directions measures as two miles. The City has added nearly half of the 82.5 bike lane miles recommended in 2007, bringing the total length of bike lanes to 71.4 lane miles.

Figure 1 – Bike facility progress since 2007, in lane miles

	Bike Lanes	Shared-use Arrow	Shared-use Path	Bike Route
Existing in 2007	35.4	0.9	55.0	5.2
Added since 2007	36.0	10.2	2.2	0.0
Total in 2013	71.4	11.1	57.2	5.2
Recommended in 2007	82.5	13.3	2.0	25.4
Progress in 2013	43.7%	77.0%	110.0%	0.0%

Figure 2 shows progress made in pedestrian facilities. Over a quarter of the 2007 NTP recommended midblock crossings have been implemented, and many of these have received facilities like flashing beacons and/or pedestrian crossing islands. The 2007 NTP sidewalk recommendations focused on major facilities and those that served pedestrian access to schools, therefore this inventory illustrates the progress made in those areas only.

Figure 2 – Pedestrian facility progress since 2007

	Major Crossings	Minor Crossings	Sidewalks (miles)
Existing in 2007	59	14	-
Added since 2007	31	7	3.4
Total in 2013	90	21	-
Recommended in 2007	105	25	25.0
Progress in 2013	29.5%	28.0%	13.6%

Introduction

The NTP Plan used mode-share to describe non-motorized use rates in 2007 and to set goals for the City. Mode-share is the percentage of trips made by one mode, e.g. bicycling, relative to all trips. The most common mode-share statistic is commuter mode-share, which measures trips to work. The NTP cited Census data, but in recent years, the American Community Survey (ACS) has replaced the traditional decennial Census. The ACS surveys a small percentage of citizens each year, and averages the annual results into consolidated reports. From 2006 to 2010, the ACS sampled residents of Ann Arbor and produced the 2006-2010 five-year ACS reports.

The NTP anticipated that bicycling would make the largest mode-share gains, which has proven true in the past six years. Figure 3 shows the progress made in commuter mode-share from ACS data for bicycling, walking, and public transit. The NTP does not include direct recommendations for transit, but each transit rider is a pedestrian at the beginning and end of each trip, so an increase in transit mode-share is an important trend to consider in the NTP Update. The total mode-share of alternative transportation has increased from 25.8% in 2000 to 28.0% in 2006-2010.

Figure 3 – Commuter mode-share changes since 2007

	Bicycling	Walking	Public transit
Mode-share in 2000	2.4%	16.5%	6.9%
NTP Recommendation	6.0%	20.0%	-
Mode-share in 2006-2010	3.5%	15.6%	8.9%
Change since 2000	45.8%	-5.5%	29.0%

This ACS measures work trips only; it may be true that recreational, utilitarian, or other trips have different mode-shares. Additionally, the survey data does not accurately measure the annual trends for statistics like bicycle commuter mode-share because it aggregates five years of data into one report. Therefore, a major physical or policy improvement may not be reflected in ACS mode-share reports until several years have passed.

Determining annual mode-share increases for recent years can also be measured by observer counts. Instead of a mailed survey, the following count data is compiled using direct observation of actual trips. The non-motorized program has been able to complete counts at important intersections before and after facility upgrades to measure the direct result of investment. Figure 4 shows the results for two intersections, before and after the addition of bike lanes. A marked increase in total bicyclists and comfort using the road is evident.

Figure 4 – Bicycle counts for intersection of Liberty St & Seventh St, before and after bike lanes on Seventh.

	Bicyclists Observed	Bicyclists in the road
Liberty & Seventh – 2007	354	53%
Liberty & Seventh – 2011	488	65%
Change	38%	22%

Figure 5 – Bicycle counts for intersection of Catherine St and Fifth Ave, before and after bike lanes on Catherine St and Fifth Ave

	Bicyclists Observed	Bicyclists in the road
Catherine & Fifth – 2007	362	55%
Catherine & Fifth – 2012	582	74%
Change	61%	23%

The Non-motorized Planning Framework

In an initial phase of the review process, several technical reports were drafted to review and evaluate the City's non-motorized transportation program's progress. The reports were modeled after the League of American Bicyclists' evaluation categories referred to as the "Five Es"; Engineering, Education, Encouragement, Evaluation, and Enforcement. Reports were also produced for two additional topics: Funding and Prioritization. These reports were created from field surveys, research, public input, and staff experience of implementation since 2007.

Engineering

2007 NTP – Chapter 2

Engineering addresses the physical implementation of the NTP's recommendations for biking for walking. It considers all bike and pedestrian facilities included in the near-term recommendations, as well as signs, bike parking, and the design guidance used by staff to plan system expansion.

The NTP Update recommends an expansion of the non-motorized system through a broader array of non-motorized elements.

Education

2007 NTP – Chapter 3

Education is integral to implementation of non-motorized transportation. It is the avenue by which City staff can inform drivers, cyclists, and pedestrians of the rules and expectations that exist for each of them. With a constantly changing non-motorized infrastructure, culture, and legal context, effective education techniques are critical for successful systems.

Encouragement

2007 NTP – Chapter 3

Encouragement relates to a community's strategies to promote bicycling and increase the number of cyclists. Separate from education, encouragement deals with the programming, maps, signage, and other unique means to advocate for increased use of non-motorized transportation.

Evaluation

2007 NTP – Chapter 3

Evaluation allows a community to measure the effectiveness of infrastructure, policies, programs, and the legal framework in place for non-motorized use. The evaluation process not only quantifies the progress made in a non-motorized program, it helps provide direction for future action. It can provide leverage for a shift in priorities, when appropriate, to ensure that implementation is consistent with the adopted planning documents in place. Evaluation processes demonstrate a commitment to measuring results and planning for the future.

The City's annual physical system evaluation program includes inventorying the conditions of the non-motorized system as well as monitoring of bicycling and walking volumes at key locations. Our evaluation program has resulted in an overall increase in the physical condition of the non-motorized system. Not only has the system expanded as described in the Introduction, but the conditions have also improved. Sidewalk maintenance has been comprehensively evaluated due to recent inventory efforts which, in part, led to the passage of a millage allowing for City forces to assure all sidewalks continue to be maintained properly. The annual bicycle inventory has resulted in poor pavement and pavement marking areas to be addressed responsively. In addition to the City's direct efforts, a 24 hour on-line maintenance reporting program and the pothole hotline add to the ability of citizens to provide input to address infrastructure deficiencies.

Enforcement

2007 NTP – Chapter 4

Enforcement addresses the legal framework surrounding the non-motorized system. It describes how the non-motorized transportation program should operate within the framework of codes and regulations within the City, and it evaluates non-motorized use within the framework of important changes to City Code. Enforcement strategies promote safe interaction between all users of shared roads and sidewalks. Enforcement includes City Code, police actions, and policies and programs. Cycling and pedestrian ordinances, police actions, and policies and programs that guide non-motorized use all contribute to effective enforcement in Ann Arbor.

Speed limits are one example of an element of the legal framework directly related to enforcement. In Ann Arbor, the maximum speed limit on city-owned roads is 35 mph. The intuitive understanding that pedestrian risk rises with vehicle speeds has been established by many studies in the past 20 years. The conclusions of two studies are shown in Figure 6. The non-motorized program focuses on enforcement techniques to ensure the safety of all users along and across the roadway.

Figure 6 – Odds of pedestrian death increase dramatically with elevated vehicle speeds.[40] [41]

	Source 1	Source 2
Vehicle Speed	Odds of Ped. Death	Odds of Ped. Death
20 mph	5%	5%
30 mph	45%	37%
40 mph	85%	83%

[40] Australian Federal Office of Road Safety, *Vehicle Speeds and the Incidence of Fatal Pedestrian Collisions,* Report CR 146, 1994.
[41] U.K. Department of Transportation, *Killing Speed and Saving Lives*, London, 1987.

Funding

Introduction

2007 NTP – Chapter 6

Funding for non-motorized infrastructure and programs comes from many sources, including:

· Moving Ahead for Progress in the 21st Century (MAP-21), the most recent federal transportation bill.

· The Michigan Transportation Fund (MTF), the state's vehicle revenue distribution fund created through Act 51 of 1963.

· City policies like resolutions R-176-5-03 and R-217-5-04 that direct funding to the non-motorized program and promote bike lane installation.

Non-motorized progress has been accomplished through direct investments and by piggybacking on road and other infrastructure projects. This cost-effective approach has led to many new miles of bike lanes and other facilities since 2007 that would not have been implemented as standalone projects. However, this funding mechanism highlights the challenge of funding facilities that cannot often be included with other infrastructure projects.

Prioritization

2007 NTP – Chapter 5

An early look at the 2007 NTP's near-term opportunities revealed that definition of near-term included substantially more projects than could be completed with available resources. The non-motorized program established a priority ranking system to identify the most impactful projects available for implementation. The review process included a review and a reapplication of the ranking system. The prioritization issue paper examines this process in detail.

Access to the Technical Reports

All of the reports created during the writing process for the Non-motorized Transportation Plan Update can be found on the City's Non-Motorized Transportation Plan Review webpage: http://www.a2gov.org/government/publicservices/systems_planning/Transportation/Pages/Non-MotorizedTransportationPlanreview.aspx.

A copy of the technical reports is available under "Draft Issue Papers" link on the Non-Motorized Transportation Plan Review webpage, http://www.a2gov.org/NTPUpdate, or directly at: http://www.a2gov.org/government/publicservices/systems_planning/Transportation/Documents/DRAFT%20Issue%20Papers.pdf.

2013 Non-motorized Plan Update

Many of the recommendations in the 2007 NTP remain valid and relevant today. Innovations in non-motorized facility design and implementation since 2007 have created new opportunities. In November 2011, the City began a review of the 2007 NTP to evaluate the non-motorized transportation program's achievements, describe implementation challenges, identify policy and program areas for improvement, and address new best practices for incorporation into the City's non-motorized transportation program. Public input, staff research and review, and advisory committee guidance have shaped the recommendations listed in this document. The result is a Plan Update to append to the 2007 City of Ann Arbor Non-Motorized Transportation Plan.

The document is divided into three main segments:

Planning and Policy Updates

2007 NTP: Chapters 2 & 3, Pages 11-138

This section evaluates new types of bicycle and pedestrian facilities and programs that have emerged since 2007 as proven strategies for building a non-motorized system. While the 2007 NTP identified some of these facilities and programs, the NTP Update builds on the NTP to further explore the opportunity to use these innovative solutions. This section also provides recommendations that address implementation challenges that staff has experienced since 2007.

Near-term Recommendation Updates

2007 NTP: Chapter 5, Pages 160-176

The 2007 NTP included near-term and long-term recommendations for the following facilities throughout Ann Arbor:

- Signalized Crossings and Roundabouts
- Midblock Crossings
- Bike Lanes
- Bike Routes
- Shared-use Arrows
- Sidewalks
- Shared-use Paths
- Foot Trails

Near-term recommendations included cost-effective and easily implemented minor changes that do not require road reconstruction. Two examples of near-term changes include re-striping the road surface to install bike lanes and adding crossing islands. The 2007 Near-term Opportunities Map illustrated the NTP's near-term recommendations. The NTP also included select detailed views to provide an additional level of analysis in specific areas of the city.

The NTP Update adopts this approach and revisits near-term recommendations in several areas that have proved non-implementable. This section includes a description of the original Plan

recommendation, a discussion of the revised recommendation for the area, and a detail mapping of the new recommendation.

Long-term Recommendation Update

2007 NTP: Chapter 5, Pages 177-184

Long-term solutions represent the ideal implementation for a given corridor, often requiring significant physical adjustments to the cross section of a roadway. Long-term recommendations do not have an implementation timetable. Due to the significant costs or construction required, they are typically completed as an independent improvement or as an element of other projects. For example, East Stadium Blvd was recently reconstructed, and the project incorporated all of the recommendations for that segment, including two major midblock crossings and new bike lanes. These improvements were identified in the 2007 NTP as long-term recommendations.

Long-term recommendations in the roadway:

- Are generally implemented when a new road is built or an existing road is reconstructed. Reconstruction projects typically include new curb, gutter, and stormwater systems.
- Generally require road widening to accommodate the minimal lane width requirements for all users. This may require additional ROW.
- Strive to meet the minimum desired widths for bike lanes, motor vehicle lanes, buffers, and sidewalks to the extent that it is practical given the project's context (Pg. 177).

Most of the 2007 Non-motorized Transportation Plan's Long-term recommendations remain relevant and appropriate in the 2013. However, there are four long-term areas discussed in the NTP Update Report to reemphasize the NTP's recommendation: Allen Creek Greenway, Border to Border Trail, Gallup Park & Fuller Road Paths and Briarwood-Pittsfield Pedestrian Bridge.

Planning and Policy Updates

2007 NTP: Chapters 2 & 3, Pages 11-138

The Planning and Policy Updates section brings forth proven strategies that were considered emerging in 2007 for consideration and integration into the City's standardized practices. These strategies include updated design guidelines, non-motorized in-road facilities and systems, and planning practices.

Design Guidelines:

Since 2007 multiple sets of guidelines that were used in the NTP have been updated. In understanding the dynamic nature of bicycle and pedestrian facility planning, it is essential that innovative and proven strategies are taken into consideration for future use.

Non-motorized In-road Facilities and Systems:

Working off of the updated design guidelines, in-road facilities and systems that were once considered emerging are recommended for implementation consideration. These in-road facilities and systems share a common theme of creating safe, separated facilities for cyclists both on and off the road.

- Bike Boulevard
- Cycle Track
- Bike Share
- Bike Lane Color Treatment
- Bike Station

Planning Practices:

Due to the intrinsic nature of planning, lessons are frequent learned along the way as challenges arise. Since 2007 City Staff has faced and learned from many challenges. From these lessons new recommendations have emerged which address how to better plan for the "Five E's" of transportation planning: engineering, education, education, encouragement and evaluation.

- Snow Removal
- Facility Maintenance
- "3D" Signage
- Online Way-Finding Technology
- Education Campaign Evaluation
- Bike Parking Evaluation
- New Sidewalk Funding
- New Midblock Crosswalk Funding
- MAP-21 (Federal) and Act-41 (State) Funding

Updated Design Guidelines – Engineering

2007 NTP: Pages 4, 11-94

The bulk of the 2007 NTP covered the planning and design guidelines for bicycle and pedestrian facilities. As noted in the introduction, the intent of the NTP was to synthesize the available guidelines into one comprehensive document, interpreted for applicability to Ann Arbor. The NTP drew its design recommendations and illustrations from these documents; it also recognized that the guidelines were subject to change in such an evolving field, and recommended that users of the NTP identify and adopt updates periodically.

City staff uses several sets of guidelines updated as recently as 2012 in designing bike and pedestrian facilities. These include:

- American Association of State Highway and Transportation Officials (AASHTO) Bike Guide
- US Department of Justice's Americans with Disabilities Act (ADA)
- MDOT's MMUTCD
- City of Ann Arbor's NTP
- National Association of City Transportation Officials (NACTO)

NACTO is a recently formed organization that has published an Urban Bikeway Design Guide, a set of design guidelines which staff may choose to utilize. During and following the review process, NACTO guidelines will be scrutinized to determine whether they comply with Michigan law and whether the proposed designs are feasible in Ann Arbor.

Additionally, AASHTO and MMUTCD have been updated in recent years. Staff should establish updated guidelines based on all available resources to standardize implementation of traditional and new facilities such as flashing beacons, 3D signs, and pavement markings.

Coordination between the Ann Arbor Downtown Development Authority (DDA) and the City is recommended in the DDA's writing of the Street Framework Plan. As the Street Framework Plan will address non-motorized facilities, such as bicycle parking, it will be important that the updated design guidelines are considered in the Street Framework Plan's formulation. The DDA announced the Street Framework Plan in the summer of 2013.

Bike Boulevard – Engineering

Planning and Policy Updates

2007 NTP: Pages 18-26

In the 2007 NTP, bicycle travel along road corridors was planned with bike lanes, shared roadways, and shared-use paths (pg. 18). These three options represented the primary facilities used for on and off-road bike travel at the time of plan writing. The NTP described the advantages and disadvantages of each facility under various roadway cross sections, developing a preferred facility option based on the level of service to cyclists under each scenario. Since that time, alternatives to in-road bicycle lanes have become popular. These alternatives can provide a higher level of service for cyclists than bike lanes, shared roadways, or shared-use paths, when implemented correctly. One of these alternatives is the Bike Boulevard.

A Bike Boulevard is a low-traffic, low-speed road where bicycle interests are prioritized. Typically, Bike Boulevards are designated on streets that parallel to a major roadway not suitable for accommodating bicycling. Bike Boulevards are created by deploying a system of signs, pavement markings, low speed limits, and intersection treatments facilitating an environment that welcomes cyclists and discourages automobile through traffic. To maximize their impact, Bike Boulevards should be implemented over lengthy stretches of roadway to serve as significant facility features (NACTO Urban Bikeway Design Guide).

Figure 7 – NACTO Urban Bikeway Design Guide Bicycle Boulevard: Signs and Pavement Markings Illustration

In addition to serving as a priority bicycle facility, Bike Boulevards contribute to traffic calming. The City is dedicated to providing "more livable neighborhoods" through traffic calming measures, and provides a guidebook to help residents understand how these measures can improve their neighborhoods. Many of the physical interventions used by the traffic calming program can be used to implement Bike Boulevards; therefore, a unique opportunity exists to accomplish both goals with one project in strategic locations.

The NTP Update recommends developing a Bike Boulevard planning process to shape specific treatments with substantial community engagement. There is no standard treatment, but rather a variety of options for local application of a Bicycle Boulevard. This plan update recommends Bike Boulevard corridors based on general characteristics. When implementing a Bike Boulevard, staff should maximize community engagement by utilizing steering committees and public meetings to ensure citizen support in addition to appropriate engineering and design potential.

Washington St is an example of an implementable conversion to a Bike Boulevard to serve the east-west bicycle traffic between Ann Arbor's western suburbs and the downtown and central campus areas. The Bike Boulevard could start at Revena Blvd to First St: 0.7 center lane miles. In total Washington St is 1.5 center lane miles long, making it a significant route. It has lower traffic levels and slower speeds than Huron St to the north. Public support also exists for the conversion of Washington Street into a Bike Boulevard. It is important to note, the Washington Street corridor is busy at select locations, including the segment in front of the Ann Arbor YMCA, between 1st St and Chapin St. Staff will need to consider all of these factors in the Bike Boulevard planning process for Washington.

Elmwood Ave is another implementable candidate for a Bike Boulevard conversion. A Bike Boulevard conversion on Elmwood Ave may be an alternative to a road diet on Platt Rd from Canterbury Rd to Packard Rd. Elmwood Ave is 0.4 center lane miles long and runs north-south, directly to the east of Platt Rd. Cyclists using Elmwood Ave as a Bike Boulevard could use the existing shared-use path in Scheffler Park to connect to Platt Rd and South Huron Pkwy; however, the 8' wide bridge connector in Scheffler Park may need to be widened to a 10' shared-use path width.

Broadway St is a third implementable candidate for a Bike Boulevard conversion. Running alongside Plymouth Rd, Broadway St provides an alternative route from the Northside neighborhood, at the intersection of Plymouth Rd and Murfin Ave, to the Lowertown neighborhood and the Broadway St Bridge, at the intersection of Plymouth Rd, Maiden Ln, and Moore St. From its northern and southern intersections with Plymouth Rd, Broadway St is 1 center lane mile in length, primarily residential and has lower traffic levels and lanes than Plymouth. Broadway St also already has traffic calming measures in place such as speed humps.

Cycle Tracks – Engineering

Planning and Policy Updates

2007 NTP: Pages 18-26

Similar to Bike Boulevards, Cycle Tracks are not included in the 2007 NTP. Since that time, they have become more widely used in American cities. A Cycle Track is a buffered bike lane which uses pavement markings or physical separators like bollards, wheel stops, or Jersey barriers to protect the bike lane from traffic. Cycle Tracks may be one-way or two-way. Some Cycle Tracks are elevated from the road by a few inches to further separate bikes from traffic. Pedestrians are not allowed to use Cycle Tracks. Cycle Tracks, like Bike Boulevards, prioritize cyclists over motorists. However, where Bike Boulevards may serve bikes and autos, Cycle Tracks are completely separated facilities.

Figure 8 – NACTO Urban Bikeway Design Guide Two-Way Cycle Track Illustration

Where on street parking is allowed, Cycle Tracks are generally located opposite parked cars, and are separated by buffers, grades and/or pavement color. As a result, there is a positive effect on comfort for cyclists traveling along the road.

Cycle Tracks have the potential to produce more conflicts than bike lanes or Bike Boulevards at intersections and driveways. Separated lanes can lead to less awareness from drivers of moving bicycles when turning into driveways or cross streets. Similarly, drivers looking to pull onto the street from a driveway may pull into the Cycle Track and wait until it is safe to make the turn.

Additionally, divers, used to checking for bikes with the flow of traffic, may not see contra-flow bicycles coming in a two-way bike facility. At intersections, the separated track prevents cyclists from merging with traffic to make left turns as they may do from a bike lane. Instead, bike boxes or two-stage turns should be used to avoid conflicts.

The NTP Update recommends considering Cycle Tracks as an appropriate facility to use where context factors like vehicle speed or volume require additional bicycle separation and the road width exists to accommodate them.

Bike Share – Engineering & Encouragement

2007 NTP: NA

The 2007 NTP did not reference bike sharing, as it was not a widespread technique in the United States when the NTP was written. However, in recent years, several cities have started or expanded bike share systems successfully, illustrating the possibility for Ann Arbor to do the same.

The Clean Energy Coalition (CEC) in Ann Arbor has started exploring a bike sharing program for Ann Arbor. A bike sharing program would enable residents, visitors, and students to access a system of bicycles available throughout town. Under the program, users are able to pick up a bike from one bike parking station, use it to accommodate a trip, and then drop it off at any of the system's stations. There are a number of issues that the CEC needs to explore through the planning process prior to initiating a local bike share program. The placement of bike share facilities in downtown locations where space is limited will require careful planning. Additionally, Michigan weather dictates that protecting bike share bikes from the elements is a concern.

In addition to the independent benefits of bike sharing, it also works well together with transit; bus riders can use bikes to go farther after their transit stop than they would be willing to walk. This extends the effective reach of transit service. Bike share also provides excellent opportunities for visitors to get around town, and it enables everyone to try cycling without the hassle of bike maintenance or a large upfront cost. Washington, DC's Capital Bike share provides a good example of a successful bike share program.

A bike share program is listed as a recommendation under both engineering and encouragement for its two-fold impact. While the structures and bicycles clearly expand the physical system, providing this opportunity also serves to significantly increase ridership throughout the city by creating the opportunity for anyone without a bike to become a bicyclist.

On August 8th, 2013, City Council passed a resolution to approve an Ann Arbor Bike Share Master Agreement with the Clean Energy Coalition (CEC) for implementation and operation of the a bike share program. In alignment with the City, the University of Michigan and the AATA are also providing various levels of financial and planning services for the bike share program.

Implementation of the bike share program will be carried out in phased approach and with significant public input on future station locations and allocation of bikes at stations. At the time of the Plan Update's writing, the bike share program is intended to include 125 bikes at 14 stations throughout the downtown, South Campus, Central Campus, Medical Campus, and North Campus areas. The NTP Update recommends considering locations outside of the immediate downtown and campus areas for the second phase of station placement.

Site locations in the public right of way, on private property, and on University property received consideration for the first phase of station placement. The potential station locations within the City right of way include:

- Ashley St and Liberty St
- Library Lane at Fifth Ave
- Liberty St and Division St
- Detroit St and Fifth Ave
- State St and Hoover Ave

10,100 rides, or checkouts, are anticipated within the first year of the bike share system, which is set to launch in the Spring/ Summer of 2014. The anticipated rides are calculated based on the expected bicycling season in Michigan, which runs from April 22nd to November 30th.

- Annual Members: 54% of the 10,100 expected rides are anticipated to come from the predicted 875 annual members
- 24-hour Members: 45% of the 10,100 expected rides are anticipated to come from the predicted 3,500 24-hour members
- Weekly Members: approximately 1% of the 10,100 rides are anticipated to come from the predicted 75 weekly members

Bike Lane Color Treatment – Engineering

Planning and Policy Updates

2007 NTP: Page 58

There are locations in Ann Arbor where conflict arises between bikes and automobiles due to the configuration of bike lanes, travel lanes, and turning lanes. Often, these problem segments are located where a right-turn-only lane is added to the travel lanes at the intersection. The bike lane continues straight through the intersection, splitting the right-most travel lane and the right-turn lane. Merging traffic not only presents a hazard for cyclists, but also for other motorists when confusion over proper behavior prevents successful merging. Alternatively, if the bike lane remains on the outside of all automobile lanes, the right-turning traffic presents a hazard to through bicycle traffic.

Adding color to the bike lane helps to increase visibility of the bike lane. It reaffirms the cyclists place is in the road and encourages drivers to yield. Clarifying the proper behavior will improve vehicle flow and safety for all users. Staff will consider a trial run of the innovation for costs and abilities of such treatment to stand up to traffic and weather conditions, such as plowing.

"Colored pavement within a bicycle lane increases the visibility of the facility, identifies potential areas of conflict, and reinforces priority to bicyclists in conflict areas…" (NACTO Urban Bikeway Design Guide).

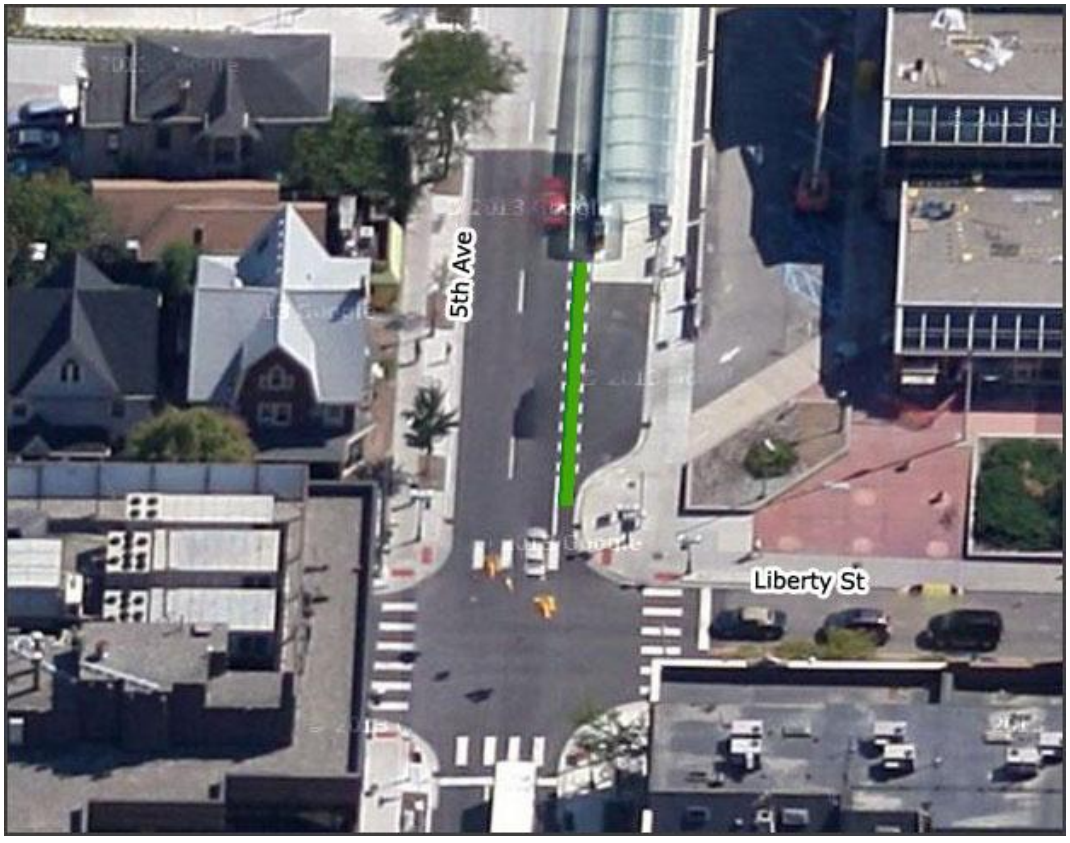


Figure 9 – Green Lane Marking Illustration at S Fifth Ave and E Liberty St – Source: Google Maps and Ann Arbor Staff

The NTP referenced blue bike lanes within the facility design chapter, but as it mentions, color treatments were experimental when the NTP was written, and application to the Federal Highway Administration (FHWA) would have been required to set up a test site for blue lanes.

The goal of green pavement for bikes is to create a safe and unique lane that sends a clear message to all road users. Since 2007, the primary color used in this application is green as prescribed in the Manual of Uniform Traffic Control Devices (MUTCD) to avoid confusion with handicapped pavement markings. The implementation of green lanes for bikes continues to increase awareness and knowledge. To create a safe surface, the material application must be non-stick, visible, and durable. Current best practice uses an epoxy resin that is skid resistant and can be mixed with retroreflective beads. Retroreflectivity creates a high level of nighttime visibility for the lane.

City staff has identified potential locations for color application:

- WB Catherine St from Fourth Ave to Main St
- South bound Fifth Ave @ the underground parking structure entrance
- S State St from Ellsworth Rd to Eisenhower Pkwy
- Ann Arbor Saline Rd over I-94

Bike Station – Engineering & Encouragement

Planning and Policy Updates

2007 NTP: Pages 134-138

The 2007 NTP addressed bike stations largely as bike parking facilities. Describing the importance of secure and plentiful parking options for commuters and U of M students alike, the NTP recommended bike stations to provide both security and capacity.

Since 2000, bike stations in the US have grown to include amenities beyond bike parking security and capacity to facilitate a more complete commuting experience. These stations provide a combination of the following facilities:

- Showers and lockers
- Bike repair
- Bike rental
- Refreshment
- Bike maps and information
- Parts, accessories, and other bike retail

Bike stations encourage more residents to ride because they offer safe bike parking together with the other important amenities listed above. Combining these amenities significantly improves the cycling experience. Chicago, St. Louis, and Washington DC are among the US cities that have installed bike stations in the past decade.

Since plan adoption, the University has significantly increased bike parking capacity on campus. In 2010, a significant area with covered bike parking was added along Rackham Green with the construction of the North Quad Academic and Residential Complex between E Huron and Washington St. The University also built an enclosed bike parking facility since 2007 in the Thompson Street Structure with fifty bike parking spaces, an air compressor and secured card entry. In 2012, the University added two air compressor stations and a fix-it stand near popular bike parking locations. These amenities offer the benefits of a bike station in separate locations, but they signal an important step towards a more complete biking experience.

The NTP Update reinforces the 2007 NTP recommendation by identifying a near-term bike station opportunity and framing a long-term bike station strategy. It is not readily apparent that the City has an immediate opportunity for a standalone bike station; however, there are resources in the community that combine a number of the amenities described above. The YMCA on Washington St and City Hall on Huron St both have locker rooms and showers and may offer a first step towards a bike station concept. In May 2013, the DDA and getDowntown program opened the Bike House. Located inside Maynard parking garage, one of the main downtown parking structures, the Bike House offers guaranteed and reserved bike parking for 37 bikes. The Bike House has 24-hour electronic surveillance, ample lighting, a Dero Fixit stand, and a keycard-only access. The Dero Fixit stands provides Bike House members with access to a bike tire pump and seven hanging tools for bike maintenance repairs. It is recommended that

the non-motorized program explore willingness of these community resources to expand access to bike support facilities.

In the long-term, as the City advances planning for the Ann Arbor Station project, it is exploring ways to ensure that the station is truly multi-modal. A bike station at, or near, a train station or transit center would provide secure overnight bike parking, showers and locker rooms, and bike repair services for commuters and residents of Ann Arbor. Providing this service could encourage more people to commute to Ann Arbor via transit or bike. It would also serve as a recognizable center of biking activity, strengthening the culture of non-motorized access and priority in the City.

Snow Removal – Engineering

Planning and Policy Updates

2007 NTP: Pages 126-127, 189

Ann Arbor, as a northern city, has inclement weather during winter months. Nonetheless, many people rely on alternative transportation year-round. The 2007 NTP recognized the need to have non-motorized facilities cleared of snow with the same priority as the city's roads. The NTP identified areas of special concern for snow clearance (Pg. 127, 189):

- Curb ramps at intersections
- Pedestrian crossing islands
- Bus stops

Although the NTP did not focus on travel by transit, it acknowledged the often multimodal nature of non-motorized transportation. Because every transit rider is a pedestrian at the beginning and end of every trip, it is imperative that bus stops are cleared well for safe access on and off of the bus. However, many Ann Arbor Transportation Authority (AATA) bus stops are not cleared of snow.

Section 4.60 of Chapter 49 of the Ann Arbor City Code places the responsibility for snow removal on property owners. All private property owners must "remove the accumulation from the adjacent public sidewalk" within a specified timeframe. The Code identifies curb ramps and crosswalk leads, but there is no language that specifically mentions bus stops. The Code does distinguish between residential and non-residential property, allowing more time for clearing sidewalks adjacent to residential properties.

The Community Standards Unit of the Ann Arbor Police Department enforces the City Code. Regarding snow clearance, Community Standards requires private property owners to remove all snow from the sidewalk, including paved or concrete segments that serve as bus stops.

Beyond the current provisions of Ann Arbor City Code, other communities extend the area for snow removal to include the gutter area at crosswalks. From the City of Minneapolis:

> "If you have a corner property, clear curb cuts at corners and crosswalks to the street gutter. You are not required to clear snow ridges or piles left by the plows *beyond* the gutter…" (ci.minneapolis.mn.us).

Requiring snow clearance to the gutter would ensure that the curb ramp and bus stop area adjacent to the standard sidewalk is completely clear and accessible to everyone.

The 2013 Plan Update recommends a review of Code language to ensure clarity and specificity regarding the issue of snow clearance at curb ramps and bus stops. Staff should seek AATA's input on the specific snow clearance needed at the bus stop surface to maintain accessible stops. Staff should ascertain if there is a need to differentiate between treatment of the gutter area in residential and non-residential areas. This effort will support the steps needed to achieve full accessibility during all times of the year.

Facility Maintenance – Engineering & Encouragement

2007 NTP: Pages 126-130, 185-189

Consistent and complete maintenance of non-motorized facilities is important for safe travel. Inadequate maintenance of sidewalks, midblock crossings, paths, bike lanes, signs, signals, and other features is dangerous and inconvenient for pedestrians, especially those who are elderly or have mobility impairments; further, it also discourages non-motorized users from riding or walking.

Each type of non-motorized facility requires a unique maintenance approach and funding source. Since November 2011, sidewalk repair is the responsibility of the City, funded by a special millage. Bike lanes require sweeping and snow clearance. Fixing potholes in a bike lane by overfilling the hole with asphalt as in the roadway is not appropriate; bikes do not flatten the asphalt like cars do. If potholes were filled in this manner, dangerous bumps of asphalt would replace the potholes. Clearing snow from midblock crossings is challenging with existing equipment and requires more effort. As result, some crossings collect snow or other debris over time.

The NTP Update recommends that Systems Planning staff work with Field Services to develop a full understanding of the maintenance needs of the current system and ensure that sufficient resources are in place for operations and capital maintenance activities. Additionally, the NTP Update recommends continued use and expansion of the Online Citizen Request System[42] to keep the community engaged, informed and helpful to maintenance activities.

[42] http://www.a2gov.org/government/publicservices/customerservice/Pages/OnlineCustomerServiceRequest.aspx

Non-motorized System Signage – Engineering & Encouragement

2007 NTP: Page 38

The 2007 NTP referred to directional information signs as Directional Signage, noting "The key aspect of a bicycle route is the destination sign that should call out points of interest along the route such as schools, shopping centers or parks" (Pg. 38). Adding distance to the sign expands the utility and usefulness of these proposed signs.

Figure 10 – 3D Sign example modeled after Portland, OR

The Directional Signage called for in the NTP was not installed. Staff made great strides though since 2007 in replacing and adding several hundred new official "Bike Lane" signs to meet the requirements of the Michigan Manual of Uniform Traffic Control Devices (MMUTCD).

Ann Arbor community members are responding to and are in support of directional signage. Public feedback received through the review process acknowledged the intended use of existing "Bike Lane" and "Share the Road" signs to establish cyclists' place in the road. Also, residents reacted positively to the idea of adding informational directional signage to provide more information to cyclists and encourage others to use a bicycle to satisfy their travel needs.

Signs displaying the destination, direction, and distance (3D) information to popular locations in a city can serve to both introduce the system to first-time users and establish a common brand for the non-motorized system. By illustrating how the non-motorized system offers alternative routes to popular destinations, these signs offer citizens the opportunity to reach key locations within their ability by walking or bicycling. The NTP Update recommends installing 3D signage for popular destinations throughout the city. The locations for the signs should be determined through a citywide planning process to define the key destinations, preferred bike routes and location for such 3D signage. The NTP Update also recommends considering adding additional information such as walking time if the design of the signs allow for such information.

Online Way-finding – Encouragement

Planning and Policy Updates

2007 NTP: Page 125

Bicycle system expansion since NTP adoption makes the City's 2000 bike map an incomplete resource for cyclists. The NTP recommended an update to the map, which was completed with the updated Bikeway System Map. However, due to the nature of a growing and working non-motorized program, the Bikeway System Map quickly became obsolete as a representation of the bike facilities in Ann Arbor.

Bike maps are an important encouragement tool because they help people to know where they can rely on non-motorized transportation facilities. The NTP recommended increased bike map distribution to reach more residents and maximize the value of the map. Various City facilities, as well as public and private partners, have carried and distributed the maps over the years. As part of the review process, staff inventoried the remaining 2005 maps and found the supply nearly exhausted.

The bike map is the primary resource for new and veteran cyclists looking for a specific bike route or the complete system of bike facilities. To accurately reflect the progress made, the map should be updated. In recent years, the City has embraced an online Geographic Information System (GIS) to serve other mapping needs. This "central spatial data resource serving all citywide applications and customer service needs" (City of Ann Arbor) allows users to access such data as street trees and parcel lines from any computer with an internet connection. The online maps also show the road network – adding bike facilities is a natural fit for this system. Benefits of the online venue include:

- The map may be updated at any time, so it is always an accurate representation.
- The City avoids printing costs; therefore, information is provided for free.
- Users can decide whether they want to access the map on a device or print it out at their convenience.
- The data will be made publically available in Shape File format, for GIS users, as well as in KML and KMZ formats, for Google Maps and Google Earth users, on the City's website.

The non-motorized program should make use of this system to provide a current representation of the biking and walking facilities in the city, which is easily updated as new infrastructure is installed.

Education Programs & Campaigns – Education Planning and Policy Updates

2007 NTP: Page 123

The 2007 NTP categorized the desired outcomes of the non-motorized program into three main areas:

- Policy and planning integration
- Physical network completion
- Education

Although education is a major component of the NTP's overall goals, only a small portion of the plan text discusses specific recommendations related to educational programming. The NTP tied education to enforcement, and recommended that they be administered together in the context of bicycle and pedestrian laws for cyclists, pedestrians, and drivers. However, education and enforcement are distinct from each other.

Education is meant to:

> "Increase awareness of the opportunities, for, and benefits of, non-motorized transportation, as well as provide information to all users on safe ways to integrate motorized and non-motorized modes of transportation" (Pg. 7).

The corresponding objectives called for professional education for the staff, education around bicycle and pedestrian laws, and ongoing education to highlight new facilities as they are installed.

The professional staff education process was completed, and continues to be addressed internally as new guidelines are available.

An Ann Arbor Safe Streets and Sidewalks (A2S3) Committee was shaped to guide development of outreach and communication activities. The A2S3 Committee is composed of key stakeholders, including staff from the City, the University of Michigan, AATA, the Downtown Development Authority (DDA), the Washtenaw Area Transportation Study (WATS), and a representative from the Washtenaw Biking and Walking Coalition (WBWC). The Committee has administered an education campaign about several aspects of Non-motorized travel, with the most recent emphasis on revised pedestrian rights in the crosswalk from 2010-2012. Other educational initiatives have responded to recommendations listed in the NTP in order to meet the goal set on Page 7 of the NTP.

Moving forward, an ongoing effort is required to make sure key educational messages are reinforced continuously. To assist in focusing on key messages, evaluation techniques should be developed to gauge the effectiveness of previous and current education campaign strategies, and recommend new outreach ideas. Identifying similar communities' successful efforts and applying them to Ann Arbor's non-motorized program may suggest new campaign tools to use.

Bike Parking – Engineering & Evaluation

2007 NTP: Pages 124, 136

One of the most crucial parts of bike travel is safe and secure bike parking. The 2007 NTP addressed bike parking in a number of contexts:

- Site plan checklists for developers
- University bike parking capacity
- City Code requirements for covered or locker parking

Bike parking has to be considered at every location where a bike trip might end. Ann Arbor City Code describes bike parking design and quantity requirements for private development (Chapter 59, Section 5:168.1). It includes three classes of bicycle parking:

- Enclosed bicycle storage – individual bike lockers or enclosed areas for multiple bikes.
- Covered bicycle racks – exterior bike parking with an overhang or self-standing cover.
- Fixed bicycle racks – inverted U-hoop racks and other fixed rack styles.

For those wishing to place bike parking in the City's right of way a License Agreement Application will need to be completed and submitted, along with detailed construction plans for each location proposed. The License Agreement Application can be acquired online through the City's website, www.a2gov.org, under Government/Public Services/Project Management/Private Development/Fee Worksheet Templates. Associated permits, licenses and fees are required for completion of the application process by the City.

The NTP recommended guidelines to further clarify the requirements for new site development, and city staff produced the Bike Parking Guide in 2008. The guide describes design requirements for illumination, the connection between the driveway or sidewalk and the parking area, and the size, spacing, and location of bike parking spots. It also explains the three classes of bike parking that are approved for use in Ann Arbor. The bike parking guide is an effective tool to inform and help developers to provide appropriate bike parking at new developments.

However, Code revision is needed to address the different bike parking needs of development inside and outside of the downtown area. Specifically, city staff is looking to address long-term bicycle storage for multi-family residential and commercial buildings within DDA boundaries. In March of 2013, City Staff compared best practices and bicycle parking ordinances from Portland, OR, Madison, WI, Boulder, CO, and San Francisco, CA; and, surveyed long-term bicycle storage facilities at multi-family residential and commercial buildings within the DDA boundaries. The Zaragon West, Zaragon Place, and Landmark buildings were surveyed. The data was used to create recommendations for future revisions to Ann Arbor's zoning ordinance regarding bicycle parking design for long-term bicycle storage at multi-family residential and commercial buildings. The recommendations should be taken into consideration during future code revisions.

Several recent multi-family developments installed bike storage rooms, and the DDA installed a "bike house" in the Maynard parking structure in 2013. The Bike House provides 37 bike parking spaces and only uses the space of two car parking spots. The NTP recommends adding new language to Chapter 59 to respond to the growing number of bike parking options that accomplish the non-motorized program's goals for bike parking in private development.

Public bike parking evaluation, a related issue, allows staff to direct efforts to the appropriate areas. The DDA began evaluating public bike parking in the downtown in 2010. Evaluations in 2010 and 2011 measured the amount and types of bike parking weekly through the summer months. The walking surveys allowed the DDA to determine where bike parking should be relocated or added, and in 2013 the DDA will use evaluation results to install additional bike parking on priority city blocks. The NTP Update recommends working with the DDA to develop a public bike parking evaluation program for the rest of the city and to collaborate on evaluating future installation priorities.

Abandoned bikes can clog bike racks, preventing active users from using existing bike parking. Bike parking evaluation allows the DDA and city staff to identify abandoned bikes and prioritize the highest need for bike removal. Removing abandoned bikes involves a complex process that includes tagging, removal, transport, and storage. Further consideration is necessary to enhance the current abandoned bike removal program. The NTP Update recommends working with the DDA, Ann Arbor Police, and Field Services to create an abandoned bike removal protocol to more actively manage bike parking availability and remove abandoned bikes from the public right-of-way.

New Sidewalks – Funding

2007 Plan: Pages 187-189

The 2007 Plan proposed approximately 25 miles of new sidewalk be provided to fill sidewalk gaps along major streets. The NTP focused primarily on sidewalk deficiencies along major street facilities and those providing access to schools. The plan noted the increased safety and convenience needs for pedestrians walking along higher speed, higher volume roadways. The Plan did not, therefore, define all areas with missing sidewalk segments as "Sidewalk Gaps." It is recognized that there are large areas in the city where sidewalks do not exist; these areas are found mostly in neighborhoods along local streets. While installation of sidewalks in such areas could also fill an important non-motorized function, these missing sidewalk segments are not listed in the NTP as sidewalk gaps to maintain primary focus on major street sidewalk deficiencies

The 2007 Plan's recommendation was to install the high priority sidewalks as a Near-term Opportunity. City policy requires that street projects include and provide coincidental non-motorized improvements. The Plan cited the West Stadium Blvd reconstruction project that implemented bike lanes, crossing islands, and sidewalks in addition to the bridge and street reconstruction. Continued application of this policy has resulted in several new sidewalk segments being provided since 2007. Examples include Dexter Avenue from Huron to Maple, Packard Road along the St. Aubin right-of- way, and along portions of S. State Street and E. Stadium Blvd as part of the Ann Arbor Bridges project. Beyond the investments for new sidewalks coincidental to street projects, no sidewalk funding mechanism, other than the method described next, has yet been identified.

An additional funding source for constructing new sidewalk is via special assessment. While a sidewalk repair component of the City's Street Millage was approved by voters in 2011, installation of new sidewalks was explicitly excluded as an allowable use of that revenue. Per the Fact Sheet for Sidewalk Repair Millage, City of Ann Arbor: "Installing a new sidewalk for the first time would be considered an initial improvement, which would mean that the adjacent property owners would be charged for the work. A special assessment is typically applied to the properties." However, adjacent property owners (particularly single family residential owners), faced with the sometimes significant cost of sidewalk installation, often oppose the special assessment for such new sidewalk construction. This limits, to some degree, the utility of this approach to filling sidewalk gaps in the City.

Since the 2007 Plan did not identify funding sources for sidewalk construction beyond that coincidental to street projects or via Special Assessments, many gaps identified in the 2007 Plan remain, and a few additional gaps have been identified.

To comprehensively address sidewalk gaps in the city, an adequate policy base and funding program are needed. The Plan Update, while continuing to maintain the 2007 Plan sidewalk gap listing, is now placing increased emphasis on seeking to identify funding to fill those gaps. Partly in response to this

identified ongoing need, the FY2014-2015 City Budget allocated $75,000 of general funds to study the sidewalk gap issue in more detail. This analysis, anticipated to take approximately 18 months, will:

1. Complete a GIS inventory of sidewalks/gaps
2. Generate planning level estimate of costs to fill all gaps
3. Research sidewalk gap elimination strategies employed by other communities
4. Form Stakeholder/Advisory Committee
5. Characterize the nature of gaps (small discrete gaps, neighborhood level gaps, those per the NTP, etc.)
6. Develop tentative gap elimination prioritization criteria and funding strategies
7. Undertake public engagement regarding tentative prioritization and funding strategies
8. Prioritize sidewalks based on research and public engagement
9. Develop detailed funding strategies
10. Develop a Draft Plan and conduct additional public engagement
11. Revise and present Final Plan to City Council
12. Begin implementation of the plan

This effort will allow staff to develop an implementation program that not only responds to the needs outlined in the Plan, but also to address sidewalk gaps at a level beyond the scope of the NTP.

Federal policy was updated and clarified in March 2010, through a new US Department of Transportation Policy Statement on Bicycle and Pedestrian Accommodation Regulations and Recommendations. It states that transportation projects should incorporate safe and convenient walking and bicycling facilities, unless:

> "The cost of establishing bikeways or walkways would be excessively disproportionate to the need or probable use. Excessively disproportionate is defined as exceeding twenty percent of the cost of the larger transportation project" (FHWA).

During the upcoming sidewalk gap elimination planning, project specific location issues need to be taken in to account. There are, for example, locations along roadways where the provision of a sidewalk segment is not practical, feasible, or the investment is not warranted by the limited use such a facility might serve. A more detailed evaluation is needed to so that identified efforts to eliminate sidewalk gap areas are consistent with this local and federal policy.

The Plan Review acknowledges the need for filling sidewalk gaps and defining appropriate funding sources for addressing this important program area. It recognizes the increased attention to the need to fill sidewalk gaps evidenced by City Council's recent budget action. Once the sidewalk planning effort is completed, the task will turn to securing the resources necessary to address this non-motorized system need and installing improvements. Although several years have passed following adoption of the 2007 Plan, through this plan review effort the City has framed addressing sidewalk gaps as an important issue. Over the next few years the goal is to develop a better definition of the problem, secure additional

avenues for funding and create a more walkable community by making appropriate investments pursuant to the NTP and additional information that emerges from the sidewalk planning process.

New Midblock Crosswalks – Funding

2007 NTP: Pages150 & 189

Midblock crossings are a crosswalk where motorized vehicles are not controlled by a traffic signal or stop sign. They facilitate more frequent crossings in places with heavy pedestrian traffic or near major pedestrian destinations like schools or high density housing. Midblock crossings may be implemented where people often cross at unmarked locations along the road.

In reviewing Figure 4.2B *Existing Crosswalks*, page 150 of the NTP, the figure should list there being 14 minor mid-block crossings and not eight.

The NTP identified 135 crossings identified as near-term opportunities, but without dedicated funding for implementation.

Since 2007, the City has installed 40 crossings. Some midblock crossings are enhanced with pedestrian islands in the median or pedestrian-activated signals. In 2010, a High-intensity Activated crossWalK (HAWK) signal was installed on W Huron St at 3rd and Chapin streets. A HAWK is an overhead signal that flashes yellow and red to direct drivers to stop. Since 2012, the City has installed 11 Rectangular Rapid Flashing Beacons (RRFB) on Plymouth Rd, Seventh St, E Stadium Blvd, Packard Rd, and Green Rd. The beacons flash yellow from a rectangular light bar attached to a pedestrian crossing sign, directing drivers to stop for pedestrians. High rates of use reveal the popularity of the beacons: in October 2012, the beacon at Plymouth and Bishop was activated on average 315 calls per day: 9,764 times in total. Initial reports indicate a much safer environment for pedestrian crossing than the marked crosswalks alone. Yielding counts conducted by City Staff showed a marked increase in yielding behavior at intersections which received RRFB's. Yielding counts are conducted immediately prior to and following installation of the RRFB's. The yielding counts measure the percent of cars within close proximity to the RRFB that yield to pedestrians trying to cross at the crosswalk.

Despite these significant efforts, 70% of the recommended crossings remain incomplete. A funding source needs to be identified for installing, improving, and maintaining midblock crossings, a highly prioritized facility in 2007.

City staff has identified criteria for appropriate placement of additional flashing beacons. Roads with the following characteristics should be further evaluated for beacon installation:

- Three or more lanes
- A speed limit at or above 35 mph
- Average daily traffic at or above 12,000 vehicles

These criteria allow staff to identify potential RRFB locations calculate the total cost of remaining projects. In all, 20 locations fit for potential beacons, as shown in figure 11. At an average cost of $12,500, the total cost to implement every recommended location is approximately $300,000.

The NTP update recommends continued efforts to install the remaining beacons and find additional funding sources.

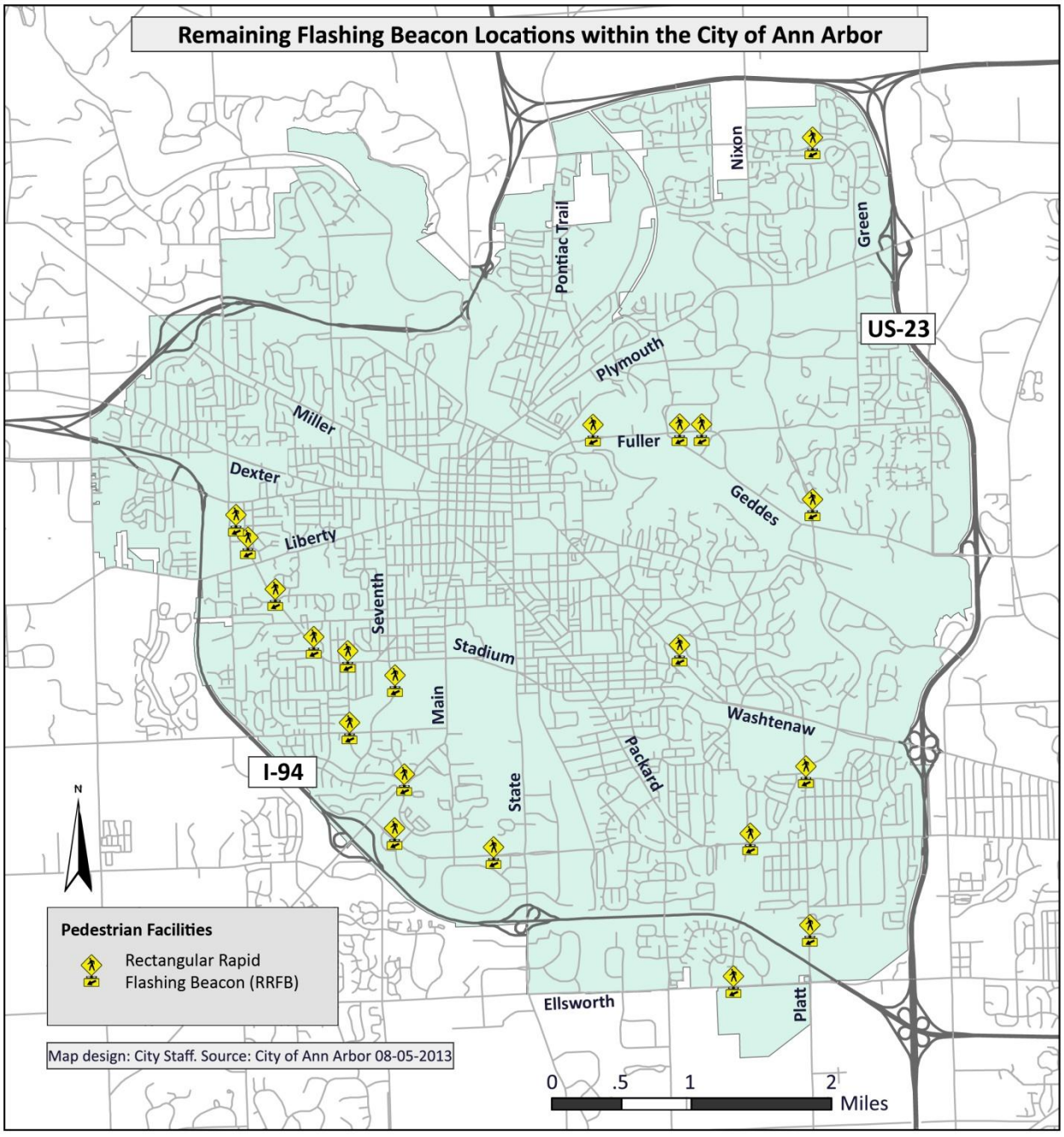


Figure 11 – Remaining flashing beacon installation sites

MAP-21 (Federal) and Act-51 (State) – Funding

2007 Plan: Page 187

MAP-21

Moving Ahead for Progress in the Twenty-first Century (MAP-21) was signed in to law July 6, 2012. It provides federal surface transportation funding for FFY 20134 and FFY 2014. The law builds on and refines many of the highway, transit, bike, and pedestrian programs and policies established in the Intermodal Surface Transportation Efficiency Act of 1991 and its successor bills up to and including the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU). Non-motorized facility improvements remain eligible under most of the major funding programs under MAP-21 as described below.

- National Highway Performance Program (NHPP)

  The NHPP provides support for the condition and performance of the National Highway System (NHS), for the construction of new facilities on the NHS, and to ensure that investments of Federal-aid funds in highway construction are directed to support progress toward the achievement of performance targets established in a State's asset management plan for the NHS.

- Surface Transportation Program (STP)

  The Surface Transportation Program (STP) provides flexible funding that may be used by States and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects, including intercity bus terminals.

- Congestion Mitigation and Air Quality Improvement Program

  The CMAQ program is continued in MAP-21 to provide a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Funding is available to reduce congestion and improve air quality for areas that do not meet the National Ambient Air Quality Standards for ozone, carbon monoxide, or particulate matter (nonattainment areas) and for former nonattainment areas that are now in compliance (maintenance areas). Non-motorized Projects are eligible to receive CMAQ funds. Bicycle and pedestrian projects have been and continue to be eligible for CMAQ funding.

- Highway Safety Improvement Program (HSIP)

  MAP-21 retains the Highway Safety Improvement Program (HSIP) as one of the core highway programs intended to reduce injuries and fatalities on all public roads, pathways or trails. For the first time a “road user” is defined as both a motorized and non-motorized user (i.e., someone walking or biking). These two shifts lay the framework for more effective spending of safety dollars on projects that make roads safer for all users

- Railway-Highway Crossings (set-aside from HSIP)

  This program funds safety improvements to reduce the number of fatalities, injuries, and crashes at public grade crossings.

- Transportation Alternatives Program

  The TAP provides funding for programs and projects defined as transportation alternatives, including on- and off-road pedestrian and bicycle facilities, infrastructure projects for improving non-driver access to public transportation and enhanced mobility, community improvement activities, and environmental mitigation; recreational trail program projects; safe routes to school projects; and projects for planning, designing, or constructing boulevards and other roadways largely in the right-of-way of former Interstate System routes or other divided highways.

Further, the USDOT has made a policy statement regarding the incorporation of safe walking and pedestrian facilities into transportation projects.

"The DOT policy is to incorporate safe and convenient walking and bicycling facilities into transportation projects. Every transportation agency, including DOT, has the responsibility to improve conditions and opportunities for walking and bicycling and to integrate walking and bicycling into their transportation systems. Because of the numerous individual and community benefits that walking and bicycling provide — including health, safety, environmental, transportation, and quality of life — transportation agencies are encouraged to go beyond minimum standards to provide safe and convenient facilities for these modes."

Act-51

Michigan State funding is provided through the Michigan Transportation Fund (MTF), a program that has distributed formula-based transportation funds to Michigan cities from vehicle revenues since 1963. Act 51 requires that municipalities use at least 1% of MTF dollars for non-motorized facilities."[43]

Locally, Ann Arbor officials mandated a larger investment in non-motorized infrastructure than the Act 51 requirement. In 2003, City Council committed to invest five percent of Ann Arbor's MTF dollars in the non-motorized system through resolution R-176-5-03. The resolution allocates the funds for the Alternative Transportation (ALT) Fund. After NTP adoption, these funds were planned for bike lanes and midblock crossings. In 2004, City Council adopted resolution R-217-5-04, which required that road projects include bike lanes when they were incidental to the overall project. This resulted in significant non-motorized system expansion through road resurfacing or reconstruction projects.

[43] *State of Michigan*. http://www.michigan.gov/documents/act51simple_28749_7.pdf. Accessed 8-12-2012.

The non-motorized program has capitalized on these and other external funding opportunities since 2007 to promote network expansion. In July 2012, Congress passed a new transportation bill, "Moving Ahead for Progress in the 21st Century" (MAP-21). MAP-21 consolidates many of the programs in SAFETEA-LU that applied to non-motorized planning and investment into one program, called Transportation Alternatives Program (TAP). Aggregate spending on these programs was reduced by approximately 25% from the previous federal transportation bill's (SAFETEA-LU) levels. As MAP-21 goes into effect from 2012 into 2013, Safe Routes to School, Transportation Enhancements, Recreational Trails, and other consolidated programs will compete for funding from TAP. In addition, several communities within the state will apply for TAP funding, creating a more competitive context than SAFETEA-LU presented.

Moving forward, it will be important for City staff to work closely with regional and state partners to develop sound proposals and maximize potential funding for TAP projects in Ann Arbor.

Geographic Area Recommendations

Geographic Area Recommendations

Near-term Recommendations

Long-term Recommendations

Geographic Area Recommendations

2007 NTP: Chapter 5, Pages 160 -184

Staff has identified several areas in the city where 2007 NTP recommendations have not yet been able to be-implemented. These geographic areas often present opportunities to address gaps and build additional system connections on important corridors, and are therefore priorities for the non-motorized system.

These opportunities cover a range of implementation time scales and improvement costs; as such, the opportunities are categorized as either near-term or long-term recommendations. As discussed on pages 12 and 13, near and long term recommendations differentiate themselves based on the level of physical change required and cost. Near-term recommendations do not require road reconstruction, while long-term recommendations often require significant physical adjustments to the cross section of a roadway. Near-term recommendations are cost-effective and easily implementable, while long-term recommendations represent the ideal non-motorized environment for the corridor. Taken together, near and long term recommendations create an overall vision for a phased implementation of Ann Arbor's non-motorized transportation vision.

In reviewing the NTP's near and long term recommendations specific geographic areas were highlighted as needing revision. These updated recommendations are sensitive to how the unique physical and cultural environments of the areas have changed since 2007. Staff created the updated recommendations in part through a collaborative workshop. The map on the following page highlights the selected areas.

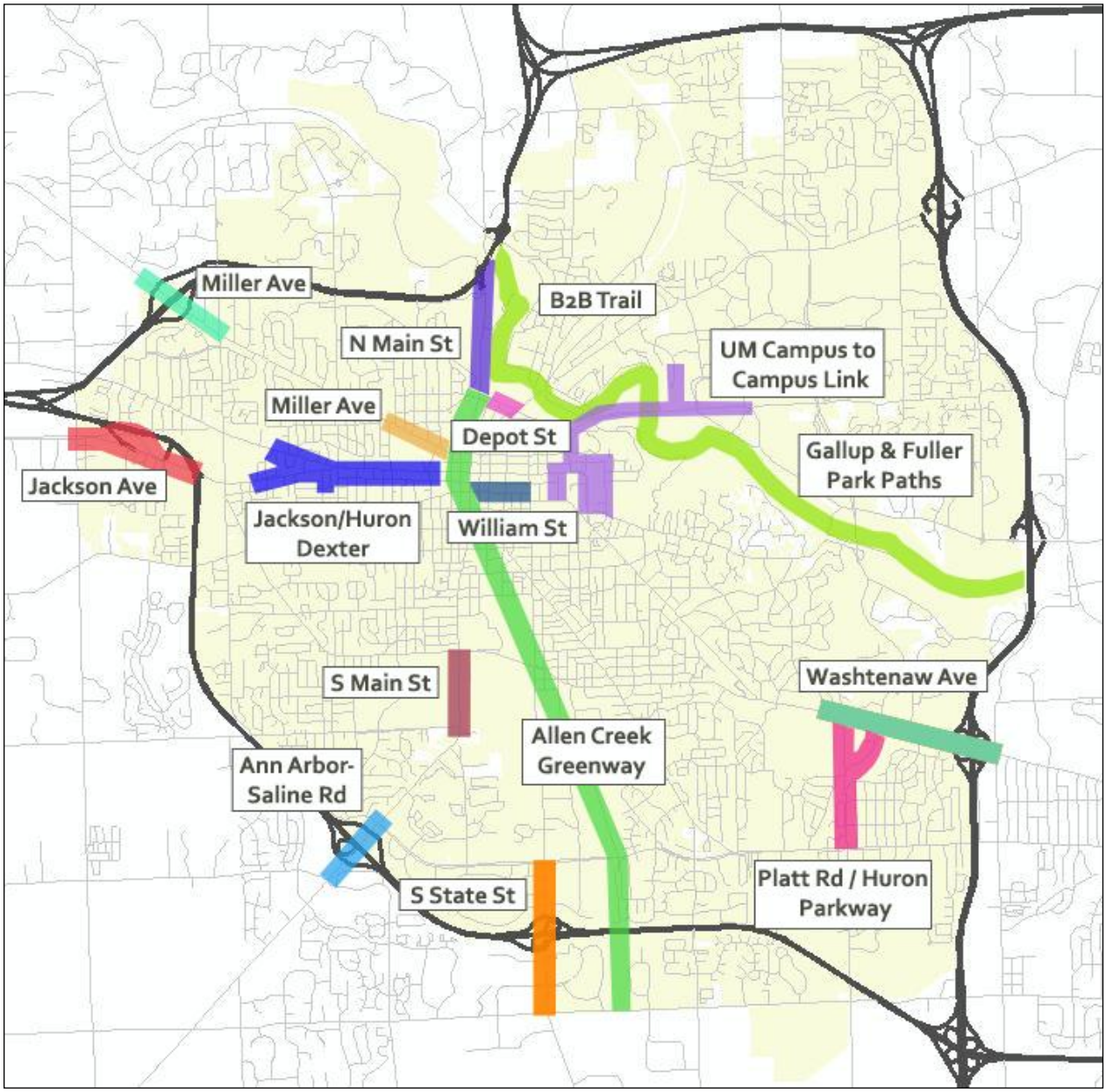


Figure 12 – Geographic Area Recommendations

Geographic Area Recommendations

Near-term Recommendations

The following areas, originally presented in the NTP, were analyzed for updated recommendations due new engineering strategies and the areas' evolving physical and cultural environments.

Near-term Site Recommendations

Ann Arbor-Saline Road

Eisenhower Pkwy to Waters Rd | 0.5 Miles ***2007 NTP: Near-term Map***

The 2007 NTP recommended narrowing the lanes on the Ann Arbor-Saline Rd Bridge over I-94 to collect enough width for bike lanes and sidewalks over the interstate. The current configuration does not provide a safe non-motorized crossing on the bridge, and the nearest alternative crossings are Scio Church Rd to the northwest or S State St to the east. Both crossings are multiple miles out of the way via the closest road connections, and S State St does not offer a safer non-motorized crossing than Ann Arbor-Saline Rd.

Completing this recommendation requires modifying the road geometry, including interstate ramps. The structure of the bridge may not allow for narrowing lanes and moving traffic towards the center of the bridge. The overall complexity and challenge of the project led staff to seek a new solution in the near-term.

A resurfacing project is scheduled for Ann Arbor-Saline Rd at this location in the near-term. The project includes 5’ wide bike lanes in both directions, and sidewalk improvements on both sides of the bridge. The sidewalk improvement on the east side of the bridge will connect the existing shared-use path section north of Lohr Rd to the existing shared-use section south of Eisenhower. The sidewalk improvements on the west side of the bridge will connect the Park and Ride lot to the non-motorized facilities at the Eisenhower Pky and Ann Arbor-Saline Rd intersection. The Michigan Department of Transportation (MDOT) is reviewing the feasibility of the project. The NTP Update recommends that staff work closely with the resurfacing project manager to maintain the programmed connections and consider opportunities for including long-term recommendations in the project’s scope.

The long-term recommendation from the 2007 NTP remains installing bike lanes and sidewalks in both directions over the bridge. This recommendation will require additional consideration and engineering to address the limitations on the bridge in the long-term.

Jackson Avenue

Wagner Rd to Maple Rd | 1.1 miles ***2007 NTP: Existing Bike Lanes***

This area focuses on the section of Jackson Ave near the I-94 exit ramp and Weber's Restaurant & Hotel where westbound traffic separates from eastbound traffic around the hotel. The 2007 NTP showed Jackson Ave with bike lanes in each direction at this location. Westbound, the bike lane is in very poor condition approaching the bridge over the exit ramp. Further, the shoulder ends where the bridge begins, terminating the bike lane. Eastbound, the paved shoulder that accommodates the bike lane ends at Parklake Ave.

Repairing the shoulder on westbound Jackson Ave can reestablish a functional bike lane. A "Share the Road" sign should be placed prior to the bridge, with the bike lane picking up again after the bridge. Improvements on Jackson Ave in this area may require the cooperation of MDOT.

An eight-foot-wide path begins before Parklake Ave, and ends after 400' at Hilltop Dr. Hilltop Dr runs parallel to Jackson Ave, and is the preferred cycling facility at this location. The NTP Update recommends signage where the shared-use path begins at Parklake Ave to inform cyclists of the changing facilities and to encourage them to use Hilltop Dr.

Jackson Avenue/Huron Street/ Dexter Avenue Corridors

Maple Rd to 1st St | 1.5 miles ***2007 NTP: Near-term Map***

The NTP recommended a 4-to-3 lane road diet on Jackson Av from Maple Rd to the Jackson Ave/Huron St/Dexter Ave intersection with bike lanes in each direction. MDOT is planning the road diet, matching the recommendation, and will install bike lanes as part of the project. However, east of the intersection, the road configuration and daily traffic on W Huron St prevent a similar road diet and the corresponding bike lanes.

The 2007 NTP recognized the challenge of installing bike lanes on W Huron St, and recommended that Charlton St, Revena Blvd, and Washington St serve as signed bike routes for east-west bike traffic. However, the recommended routes do not provide a connection to westbound Jackson Ave from westbound Washington St. In addition, the intersection pictured in Figure 13 is particularly challenging for cyclists or pedestrians, and additional consideration is needed to determine what implementation can facilitate non-motorized travel while remaining feasible from a traffic perspective.

Figure 13 – The Jackson Ave/Huron St/Dexter Ave intersection is not conducive to non-motorized travel

The NTP Update recommends a 0.7 center lane mile Bike Boulevard for Washington St from Revena Blvd to Fletcher St. The characteristics of Washington St make it a good candidate for a Bike Boulevard, and cyclists and the neighborhood alike can reap the benefits of implementation as described on page 10. At the west end of Washington St, signage can direct westbound cyclists to use Revena Blvd, Abbott Avenue, and Virginia Ave to reach Jackson Ave. Signage can also direct eastbound cyclists on Jackson Ave to use the same route in the opposite direction to reach Washington St. Eastbound cyclists on Dexter Ave will be encouraged to use Revena Blvd to reach Washington St.

Depot Street

Geographic Area Recommendations

N Main St to Broadway Bridge | 0.25 miles ***2007 NTP: Near-term Map***

Depot Street connects N Main Street to Fuller Street at the north edge of downtown. The 2007 NTP recommended bike lanes on both sides of Depot St, but the current road and configuration and traffic pattern make this recommendation non-implementable.

The revised near-term Plan recommendation is for a bike lane on the south side of Depot St with a shared road defined in the north side of the roadway. This will match the recommendation for Fuller St, the extension of Depot St to the east side of the Broadway Bridge. Therefore, a one-way bike lane will accommodate cyclists traveling uphill. Westbound cyclists will use a signed and marked shared-use lane.

An additional recommendation for this area is to designate shared-use lanes with signage and pavement markings on Summit Street. Summit St runs parallel to Depot St to the south, from N Main St to 4th Avenue, and Fifth Avenue to Beakes Street. The low traffic, low speed conditions on Summit St present an attractive shared-use roadway option in each direction. While the road is interrupted at Wheeler Park, a shared-use path runs the length of the park from each end of Summit St. Signing and marking Summit St from N Main St to 4th Ave and Fifth Ave to Beakes St will create a connected bike route from N Main St to Beakes St. In addition, crossing N Main St is facilitated at Summit St, not at Depot St, providing a natural extension to the proposed signed bike route to the west of N Main St on Summit St.

The Plan Update recommends changing the near-term recommendation on Fifth Ave from Beakes St to Depot St from a bike lane on one side to a shared-use arrow. Low traffic volumes and a narrow cross section on Fifth Ave between Beakes St and Depot St direct the recommendation for shared-use arrows instead of bike lanes.

N Main Street

Depot St to M-14 | 0.8 miles ***2007 NTP: Near-term Map***

N Main Street has a very important role as part of an extensive regional bike network. Due to the M-14 freeway and the Huron River, N Main St offers important bike access in North Ann Arbor. It links the Border to Border (B2B) trail from the Argo Dam to Huron River Dr and providing an interim B2B connection in this part of Ann Arbor.

The 2007 NTP called for a road diet along N Main St from 4 to 3 lanes, but traffic volumes are too high for a successful conventional 4 lane to 3 lane reduction. Given N Main St's important role to the bicycling network, a unique solution may be needed.

One recommendation is to evaluate and install a "managed lane" cross section. The cross section could include a reversible center lane, one travel lane in each direction, and bike lanes. The reversible lane would accommodate the existing traffic flows during morning and evening commutes. As an MDOT trunk line, N Main St requires the cooperation of MDOT for any project.

Staff also recommended using the sidewalk on the east side of N Main St to provide near-term non-motorized access to Huron River Dr and Bluffs Nature Area. The sidewalk could be extended northerly and connected to Huron River Dr, south of M-14, with midblock crossings. A sidewalk installed from Huron River Dr to Huronview Blvd on the west side of N Main St would provide access to Bluffs Nature Area from Huronview Blvd.

The NTP Update also recommends monitoring planning projects. In particular, a combined non-motorized path and stormwater management tunnel at 4th Ave and Depot St may be able to provide a railroad crossing, if the project is feasible. As new concepts emerge, the next NTP Update should incorporate new opportunities as appropriate. In addition, the NTP Update recommends coordination with the findings and recommendations from the North Main - Huron River Corridor Vision Task Force.

The long-term recommendation for this corridor remains a reconstruction to a five-lane boulevard with bike lanes on both sides. It is recognized that there are significant right-of-way needs tied to this opportunity.

S Main Street

Stadium Blvd to Ann Arbor-Saline Rd | 0.7 miles ***2007 NTP: Near-term Map***

The NTP recommended narrowed travel lanes and installing a bike lane on the east side of S Main St between Stadium Blvd and Ann Arbor-Saline Rd. This would complement the existing shared-use path on the west side of the road. However, this recommendation does not provide for pedestrian access on the east side of the road. Creating a sidewalk in this location requires right-of-way. The adjacent golf course has objected to the idea, and as a result, staff has listed the bike facility as a near-term opportunity and moved the sidewalk into the long-term plan.

The NTP Update recommends a northbound bike lane on the east side of S Main St, from Scio Church Rd to Stadium Blvd. South of Scio Church Rd, a shared-use path exists on the west side of S Main St before it becomes Ann Arbor-Saline Rd, but nothing exists on the east side of the road. The recommended shared-use path has proven non-implementable, so it has been removed as a near-term recommendation. This area requires additional study.

Miller Avenue

M-14 to east of Maple Rd | 0.6 miles ***2007 NTP: Near-term Map***

Miller Ave had bike lanes from Maple Rd to 7th St when the 2008 Plan was written. The NTP recommended bike lanes and sidewalks west of Maple Rd to connect Ann Arbor to Scio Township, on the west side of M-14, but this recommendation was not implementable due to road configuration.

Staff has determined that the current road configuration can accommodate bike lanes if the road remains a rural section. With paved shoulders and no curb, 4' bike lanes and 10' travel lanes are appropriate on a rural street section. The NTP Update recommends coordination with the Township and Road Commission prior to paving the shoulders to provide this near-term solution.

Non-motorized travel on the bridge over M-14 requires a wider span or an adjacent bridge. Staff should work with MDOT to secure that opportunity when it arises in the long-term. The NTP Update maintains the near-term recommendation on the bridge for shared-use lanes with markings and signage.

In the long-term, development in the area within Ann Arbor will lead to curbs along this street section, and 5' bike lanes would be required. Therefore, the long-term recommendation is bike lane implementation with road reconstruction.

Miller Avenue

N 7th St to Spring St | 0.4 miles ***2007 NTP: Near-term Map***

Bike lanes and shared-use arrows have been implemented on the entire 2.5 mile Miller Ave/Catherine St corridor from Maple Rd to Glen Ave, except for a stretch between 7th St and Spring St. Previously, the 30' road width prevented installing bike lanes, because in 2007, 10' was seen as too narrow for a travel lane.

However, staff has experienced success with lanes under 11' wide since Plan adoption. Therefore, this recommendation is now considered implementable. The NTP Update recommends marking Miller Ave for bike lanes.

Platt Road/Huron Parkway

Washtenaw Ave to Packard Rd | 0.9 miles

2007 NTP: Near-term Map

This segment of Platt Rd & Huron Pkwy plays an important role in connecting Ann Arbor destinations. South of the segment, Platt Rd has bike lanes to Ellsworth Rd, which connect to a greenway shared-use path in Pittsfield Twp. North of Washtenaw Ave, shared-use paths on Huron Pkwy provide non-motorized access to Gallup Park and the B2B Trail along the Huron River and to Plymouth Rd. The 2007 NTP recommended a road diet along this stretch to accommodate bike lanes, but at that time, the traffic volumes were seen as too high to perform the road diet.

Staff noted that the NTP recommendation may be feasible in 2013 due to changing conditions and positive experience with road diets. The NTP Update recommendation is to monitor the traffic on Platt Rd and Huron Pkwy and evaluate the opportunity for a road diet. For Platt Rd north of Canterbury Rd, the NTP Update maintains the 2007 recommendation for bike lanes and sidewalks.

If the road diet is not feasible along this stretch, the alternative recommendation is to evaluate the potential to transform Elmwood Ave to a 0.4 center lane mile long Bike Boulevard to provide access from the Platt Rd and Packard Rd intersection to the shared-use path on the southeast side of Huron Pkwy. 3D signs should be used at both ends of Elmwood Ave to inform cyclists and encourage them to use the bike boulevard. This recommendation includes upgrading the 8’ wide bridge connector in Scheffler Park to 10’ shared-use path width before this alternative is considered in accordance with contemporary design standards complete.

S State St

Eisenhower Parkway to Ellsworth Rd | 1.0 miles ***2007 NTP: Near-term Map***

S State St is an important non-motorized corridor and connection between south Ann Arbor and University of Michigan's Central Campus. Recent reconstruction on the Stadium Bridges at S State St and E Stadium Blvd has finished, reopening S State St to non-motorized use. The corridor also provides an important link over I-94 to Pittsfield Township.

The 2007 NTP recommended extending the existing bike lanes south and onto the bridge over I-94 while narrowing vehicle lanes. However, this complicated area has challenges with road geometry issues and entrance and exit ramps and requires additional analysis to plan the best facilities.

In the near-term, staff has identified quick efforts that can enable bike access over I-94. Paved shoulders on S State St are 8' – 12' wide through much of the segment and can be designated as buffered bike lanes. At specific points along the corridor, adjusting curb sections may allow the bike lanes to continue unobstructed. The NTP Update recommends considering the use of green pavement markings on bike lanes and placement of "Right Turn Yields to Bikes" signs at conflict points along S State St.

Sidewalks and 10' shared-use path links are not considered near-term opportunities in this area. Given the challenges of the segment and the analysis required, connecting the existing sidewalks and shared-use paths will be a key part of the upcoming S State St Transportation Corridor study that considers the corridor from Stimson St to Ellsworth Rd. Another opportunity may be using the median for a non-motorized bridge crossing with links to sidewalks and shared-use paths. The long-term recommendation for the NTP Update is to continue analyzing options along S State St and to monitor concurrent planning processes like the South State Street Corridor Plan for new options.

U-M Campus to Campus link

Central Campus to North Campus | 1.8 Miles ***2007 NTP: Near-term Map***

The University of Michigan's Central and North Campuses are approximately 1.8 miles apart via Fuller Rd. A trip under 2 miles and the presence of the Fuller Rd shared-used paths make the campus to campus connection is ideal for biking (Pg. 158). From Non-motorized Program counts, an October 2006 sampling showed over 700 bicycles passing through the Fuller Rd-Maiden Lane intersection daily. Two additional counts were conducted at Glen Ave and Catherine St in June 2008 and July 2013, when most students are out of class. The 2008 count showed over 350 bikes daily through the intersection, and the 2013 count showed 324 bikes daily.

On Central Campus, depending on the ultimate destination, completing the trip requires using roads that are not marked for bikes or sidewalks. Fuller Rd's shared-use paths existed when the NTP was written in 2007, but the NTP did recommend bike lanes and shared-use lanes on several roads around Central Campus. Several of these recommendations have been completed, but a direct path into Central Campus from the Glen Ave-Catherine St intersection does not exist. To provide a safe and convenient route, staff developed new recommendations to support the near-term recommendation identified in the 2007 NTP.

The Plan Update recommends the addition of shared-use arrows on Fletcher St from North University Ave to Huron St. Fletcher St's direct connection from the bike lanes on North University Ave to the wide sidewalks on the south side of Huron St assists in creating a comfortable bicycling connection between Central Campus and the Medical and North Campuses. Bike lanes are not recommended for near-term consideration on Fletcher St due to the existing on-road parking and bus stops on either sides of the street.

In connecting to the existing wide sidewalk on the south side of Huron St from Fletcher St to Glen Ave, wider sidewalks are recommended along Glen Ave from Huron St to Catherine St. Sidewalk riding etiquette signage is recommended along Huron St and Glen Ave as well. The sidewalk riding etiquette signage will assist two-fold in creating a comfortable connection between the campuses as it will 1) help to direct bicyclists to use the sidewalk sections between on-road facilities between the campuses and 2) promote respect between bicyclists and pedestrians sharing the sidewalk.

Bike lanes on Zina Pitcher Pl are recommended from Huron St to Catherine St. The recommended bike lanes on Zina Pitcher Pl would connect to the existing Palmer Field Path, the shared-use path on the east side of Washtenaw Ave. The Palmer Field Path would connect the Zina Pitcher Pl bike lanes to the non-motorized bridge over Washtenaw Ave, adjacent to the Central Campus Recreation Building, and bike lanes on Geddes Ave.

The route between Geddes Ave, non-motorized bridge, Palmer Field Path and Zina Pitcher Pl would serve as the campus connector for bicyclists coming from the east, while the Fletcher St, Huron St and

Glen Ave route would serve bicyclists coming from west. Either route would connect bicyclists to the Glen Ave/ Fuller Rd existing shared-use paths. Once on the shared-use paths cyclists can travel directly to North Campus.

In considering how to improve the biking experience along Fuller Rd an intermediate term, and possible near term, recommendation is to provide a link-connecting path along Fuller Rd and MDOT railroad that would go under E Medical Center Dr. This path addition would be a major improvement as it would eliminate north to central campus cyclists and pedestrians from the Fuller Rd and E Medical Center Dr intersection.

Once on North Campus, bicyclists are able to use existing shared-use arrow sections to travel around the campus. In 2010 the University, who owns many of the roads on North Campus, added shared-use markings and signs to Bonisteel Blvd, Murfin St, and Hubbard St, clarifying the rights of and prioritizing bicyclists on multiple routes. There are also several existing off-road shared-use paths that serve the North Campus area.

In traveling southbound from North Campus to the Medical and Central Campuses the same routes in reverse are recommended.

The long-term recommendations set forth in the NTP for bike lanes between Huron St and Bonisteel Blvd and a connecting shared-use path through the Nichols Arboretum remain.

Washtenaw Ave

Platt Rd to US-23 | 1.0 Miles

2007 NTP: Near-term Map

Washtenaw Ave is the primary link between Ann Arbor and Ypsilanti and a very important non-motorized corridor. The 2007 NTP recommended bike lanes for the stretch from Platt Rd to US-23, but the road configuration, MDOT ownership, and traffic on Washtenaw presented a challenge for the non-motorized network. The rest of Washtenaw Ave is served by shared-use paths and sidewalks, including a new shared-use path constructed in 2011 from Tuomy to Glenwood & Platt and a new shared-use path completed in 2013 under US-23.

The in-road bike lane recommendation has proven difficult to implement, and staff now recommends a shared-use path on the south side of Washtenaw Ave. At the east end of the segment, shared-use paths on both sides of the corridor have been completed, accommodating non-motorized traffic across entrance and exit ramps and under US-23. Connecting existing facilities west of Platt to these new shared-use paths becomes the priority for Washtenaw Ave in the NTP Update.

The long-term recommendation for Washtenaw is a full road reconstruction that transforms Washtenaw into a boulevard with a median and bike lanes in both directions. The recommendation references the improvements suggested by ReImagining Washtenaw.

William St & Downtown Area

Geographic Area Recommendations

Downtown Overview | 1.5 Miles

2007 NTP: Page 167 & Near-term Map

The 2007 NTP described the downtown area as both a destination for non-motorized users and a challenge to design. The NTP recommended facilities for nearly every central downtown street, according to road configuration. Many of the 2007 recommendations have been completed, linking west Ann Arbor to the downtown area and beyond into Central Campus.

The DDA has administered improvement projects on Fifth Ave and Division St to incorporate complete streets, including a bike lane in each direction, pedestrian bumpouts at intersections, street lighting, bike parking, and other improvements.

The NTP recommended bike lanes for William St, but this has not yet been implemented. Due to the road configuration, staff decided to maintain the 2007 recommendation for bike lanes on William St in the near-term, although other options may be possible, subject to City Council's approval. Such options, subject to engineering considerations, may include a bicycle boulevard. In the long-term, potential road reconstruction projects may allow for a new look at non-motorized facilities on William St.

Concurrent to the Non-motorized Plan Review process, William St was identified as a priority planning project. The DDA has studied William St and led community engagement efforts to identify improvement opportunities, including new facilities to enhance non-motorized travel.

Seventh Street

Huron St to Stadium Blvd | 1.2 Miles ***2007 NTP: Pages 51-59 & Near-term Map***

The City has received notification of issues related to traffic speed on Seventh St and need for implementation of pedestrian crossings at locations near to, or as is identified in this plan, or other locations to be determined. The City is reviewing traffic and pedestrian facilities across the corridor, looking at adding pedestrian crosswalks and possible traffic calming measures appropriate for arterial streets. The Plan Update recommends that City Staff also evaluates the pedestrian generators along Seventh St such as schools, parks and churches.

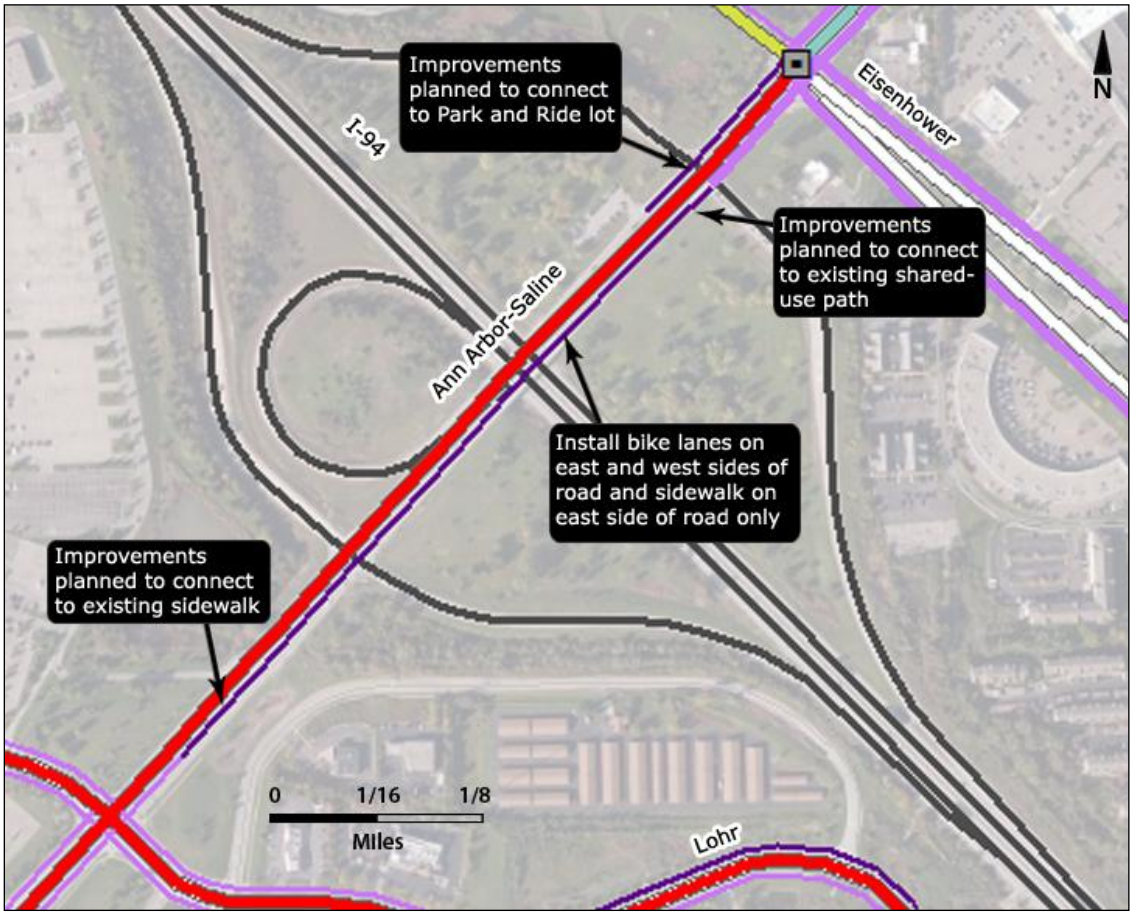
Traffic calming tactics may include horizontal deflection of traffic by use of bulb-outs, pedestrian islands, chicanes or other elements. These elements are discussed in detail in section 2.4 Travel Across Road Corridors, pages 51-59, of the 2007 NTP. Careful consideration of these traffic calming measures is needed in order to maintain a balance between calming traffic and limiting impact on the existing bike lanes on Seventh St.

Near-term Opportunities

The following pages illustrate revised near-term recommendations for specific areas in the city. Notes are intended to provide planning-level insights to the revised recommendation.

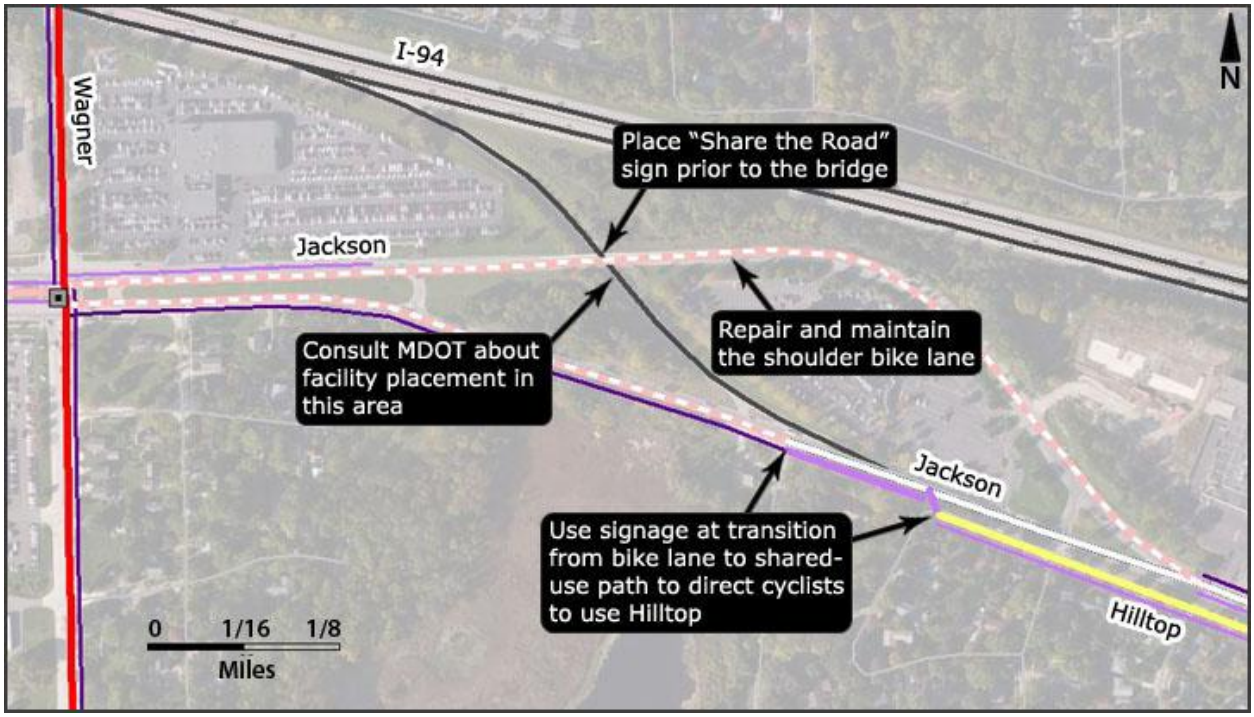
Near-term Opportunities Update – Map Detail

Ann Arbor-Saline Rd



Near-term Opportunities Update – Map Detail

Jackson Ave

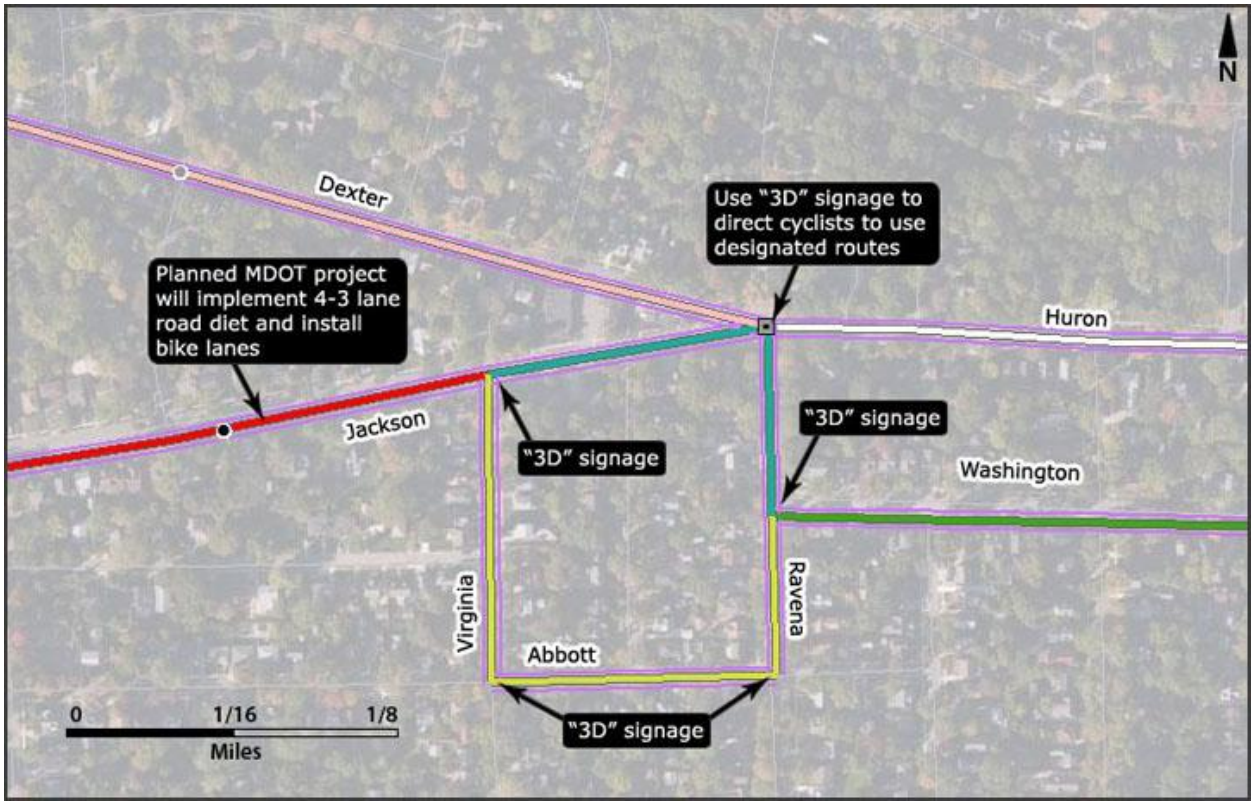


Existing	Proposed	
		Bike Lanes
		Bike Lane, 1 side only
		Bike Boulevard
		Cycle Track
		Shared-use Arrow
		Signed Bike Route

Existing	Proposed	
		Shared-use Path
		Sidewalk
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		No Near-term Improvements

Near-term Opportunities Update – Map Detail

Jackson Ave/Huron St/Dexter Ave



Existing	Proposed	
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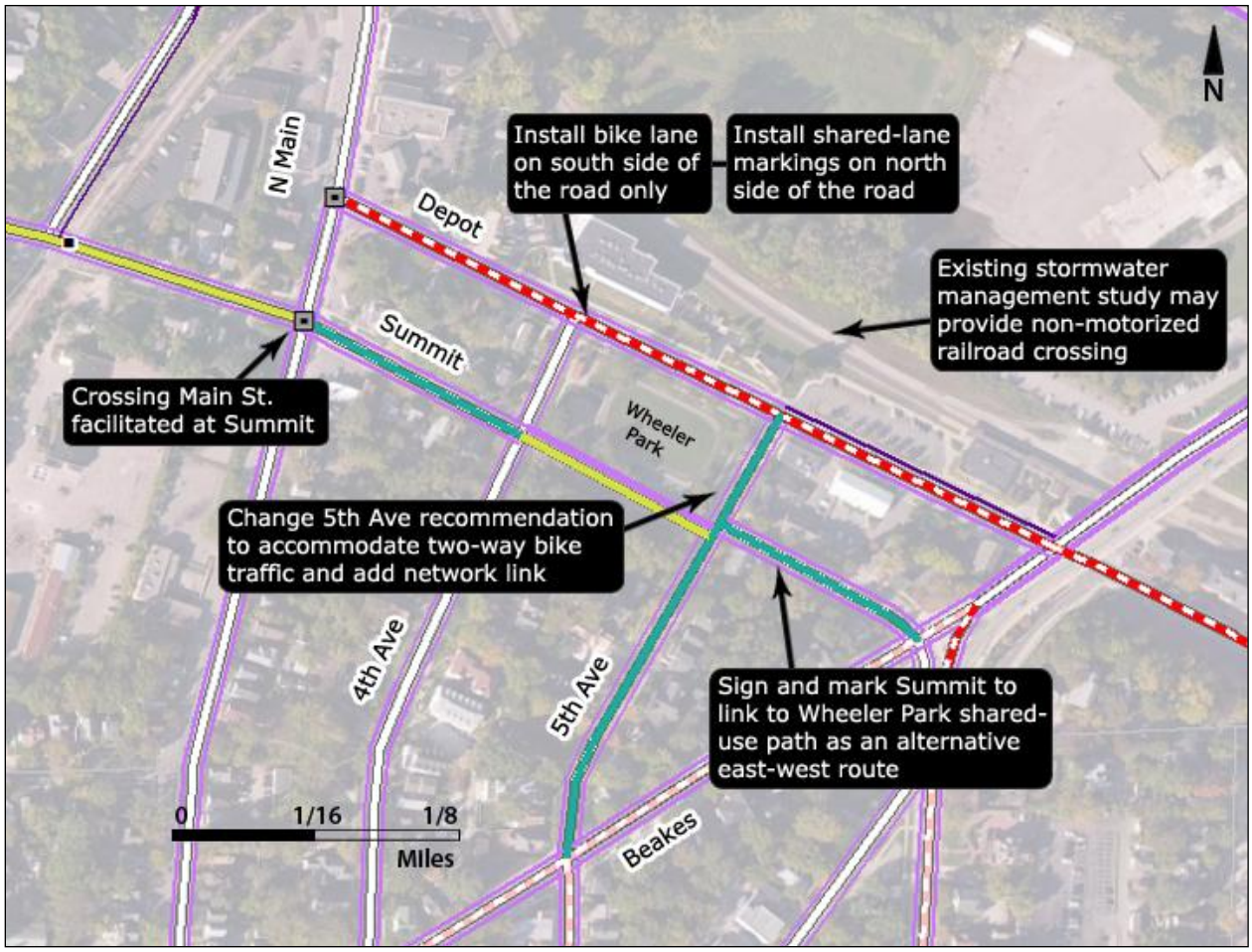
		Bike Boulevard
		Cycle Track
		Shared-use Arrow
		Signed Bike Route

Existing	Proposed	
		Shared-use Path
		Sidewalk
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		No Near-term Improvements

Near-term Opportunities Update – Map Detail

Depot St



Existing	Proposed	
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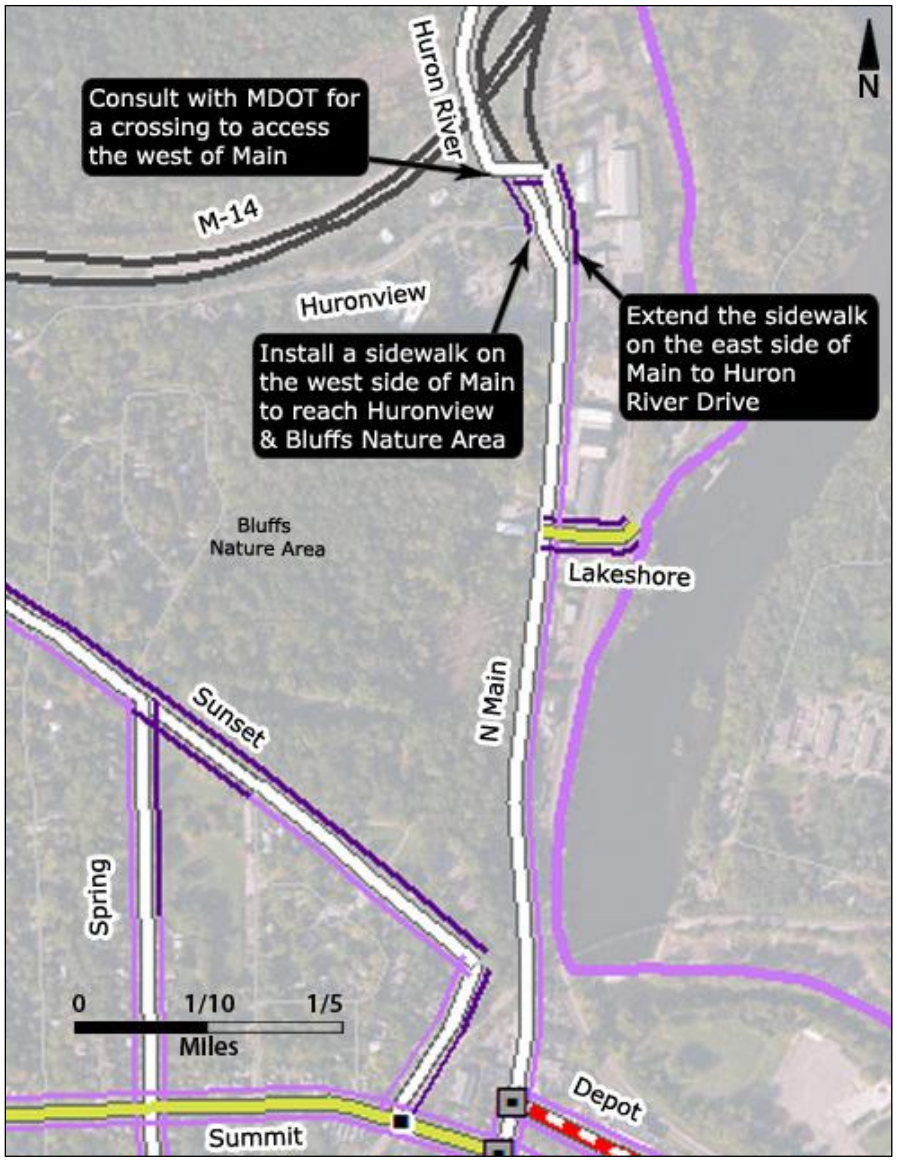
		Bike Lane, 1 side only
		Bike Boulevard
		Cycle Track
		Shared-use Arrow
		Signed Bike Route

Existing	Proposed	
		Shared-use Path
		Sidewalk
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		No Near-term Improvements

Near-term Opportunities Update – Map Detail

N Main St



Existing	Proposed	
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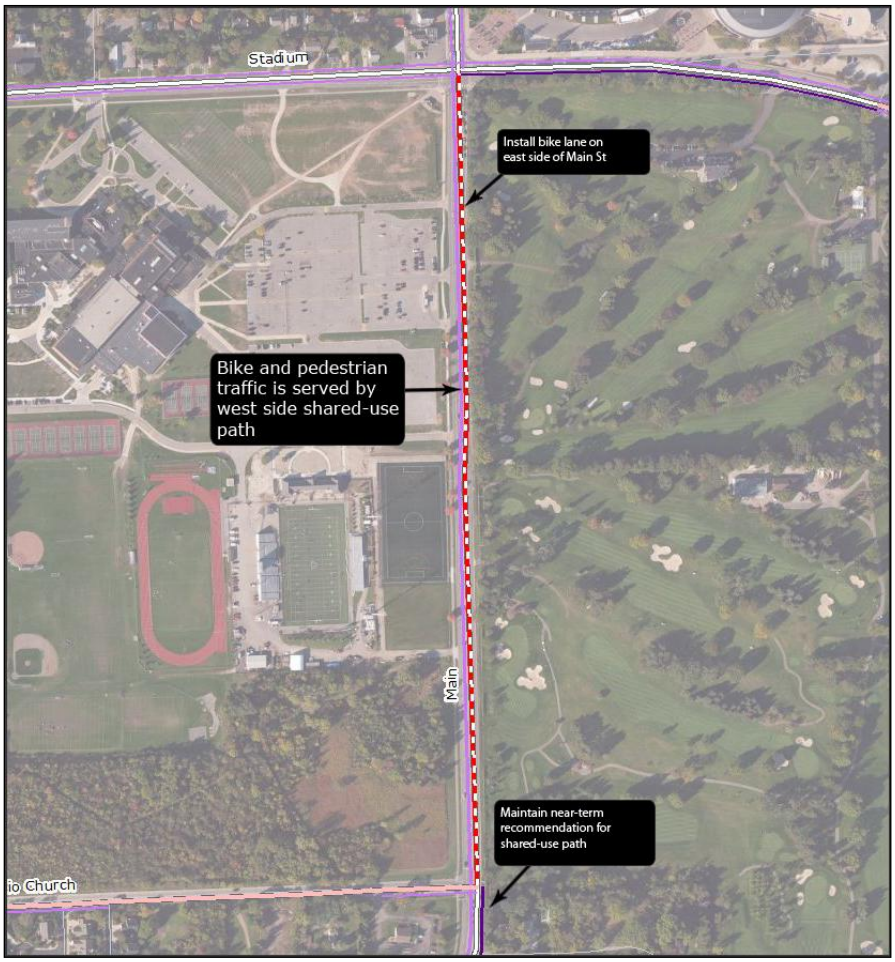
		Bike Lane, 1 side only
		Bike Boulevard
		Cycle Track
		Shared-use Arrow
		Signed Bike Route

Existing	Proposed	
		Shared-use Path
		Sidewalk
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		No Near-term Improvements

Near-term Opportunities Update – Map Detail

S Main St



Existing	Proposed	
		Bike Lanes
		Bike Lane, 1 side only
		Bike Boulevard
		Cycle Track
		Shared-use Arrow
		Signed Bike Route

Existing	Proposed	
		Shared-use Path
		Sidewalk
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		No Near-term Improvements

Near-term Opportunities Update – Map Detail

Miller Ave

Existing	Proposed	
		Bike Lanes
		Bike Lane, 1 side only
		Bike Boulevard
		Cycle Track
		Shared-use Arrow
		Signed Bike Route

Existing	Proposed	
		Shared-use Path
		Sidewalk
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		No Near-term Improvements

Near-term Opportunities Update – Map Detail

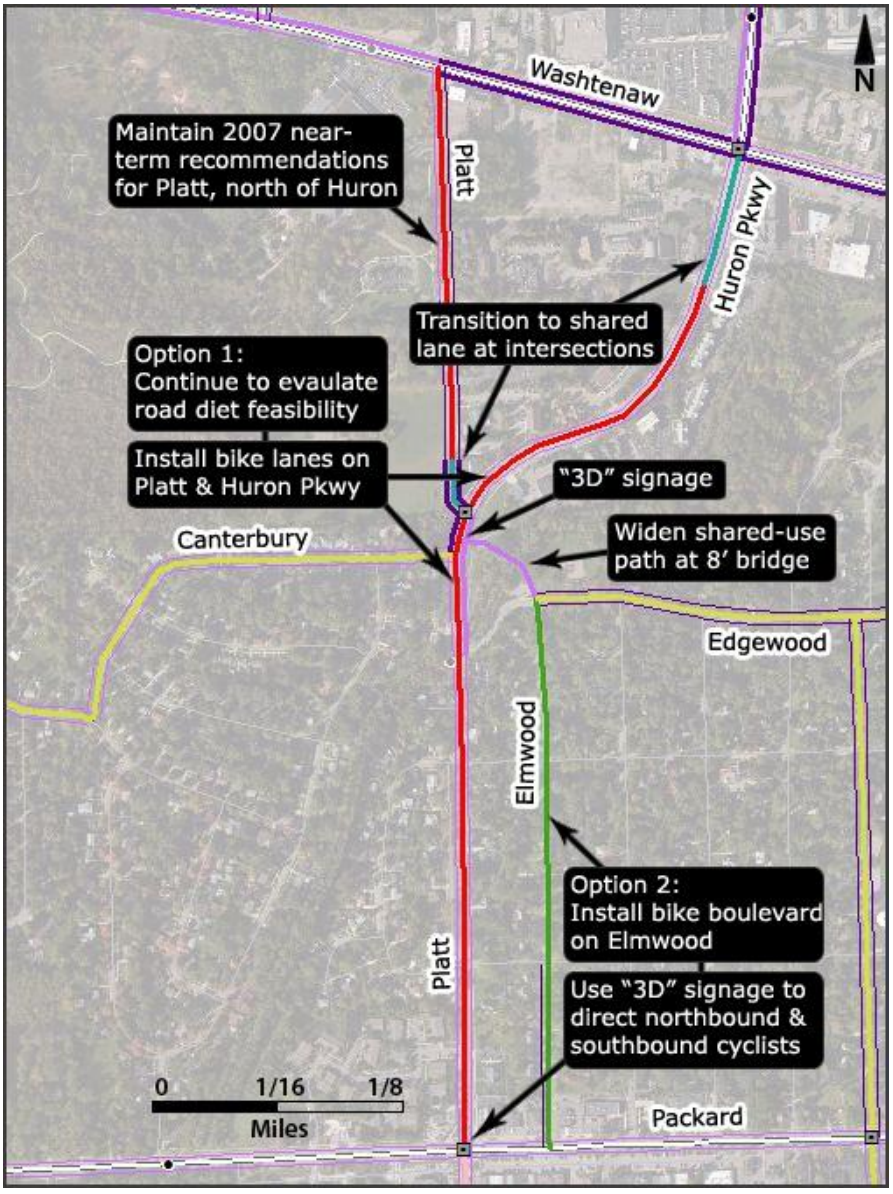
Miller Ave/Miller Rd

Existing	Proposed	
		Bike Lanes
		Bike Lane, 1 side only
		Bike Boulevard
		Cycle Track
		Shared-use Arrow
		Signed Bike Route

Existing	Proposed	
		Shared-use Path
		Sidewalk
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		No Near-term Improvements

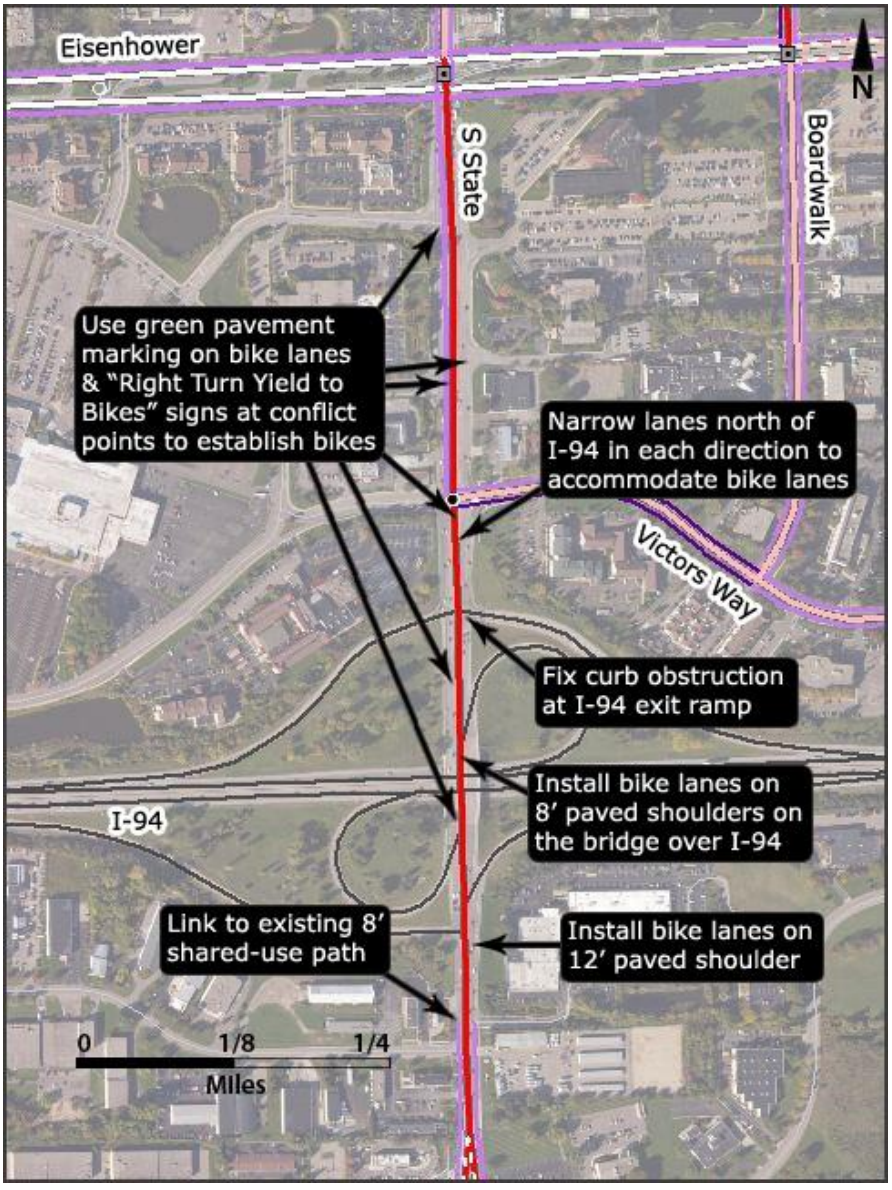
Near-term Opportunities Update – Map Detail

Platt Rd



Near-term Opportunities Update – Map Detail

S State St



Existing	Proposed	
		Bike Lanes
		Bike Lane, 1 side only
		Bike Boulevard
		Cycle Track
		Shared-use Arrow
		Signed Bike Route

Existing	Proposed	
		Shared-use Path
		Sidewalk
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		No Near-term Improvements

Near-term Opportunities Update – Map Detail

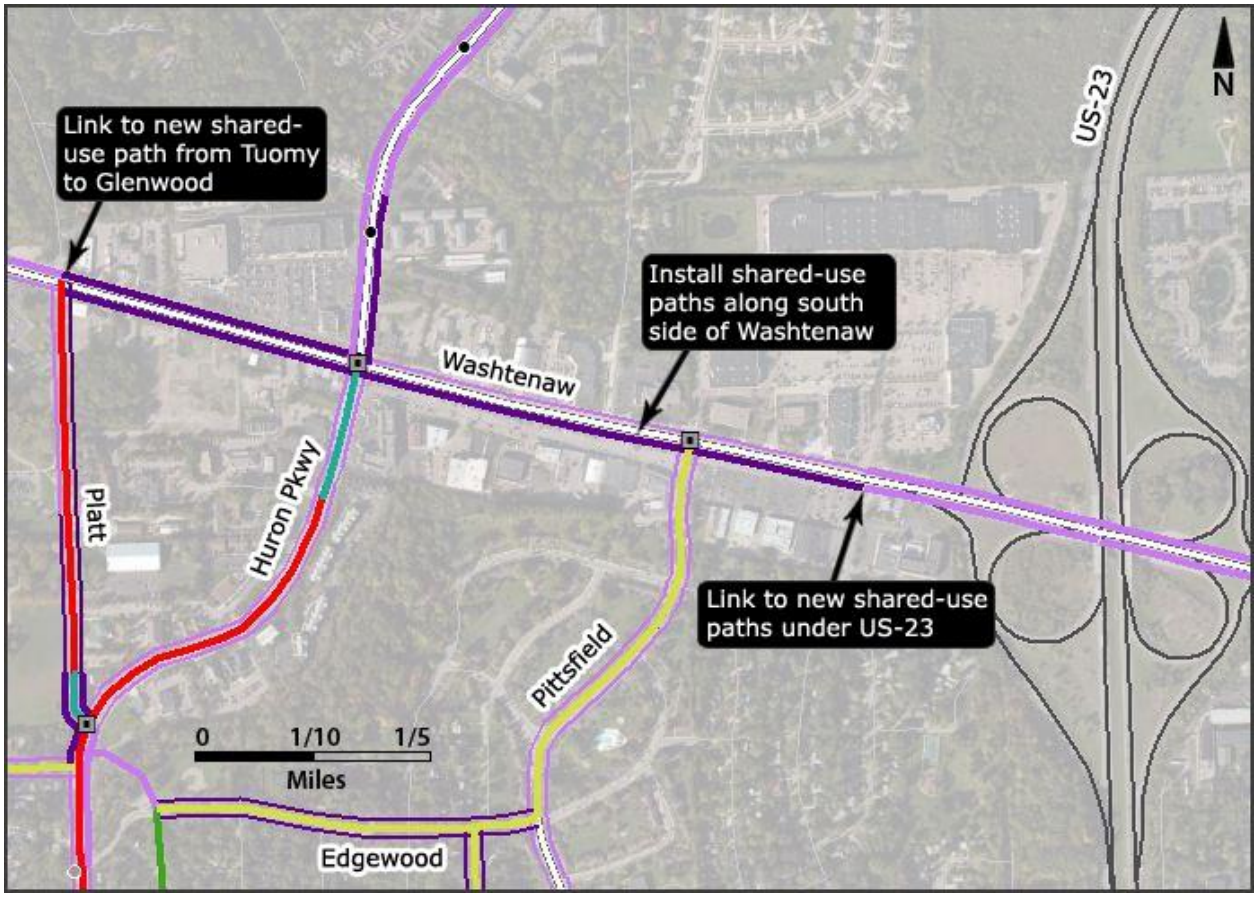
University of Michigan Campus Connection

Existing	Proposed	
		Bike Lanes
		Bike Lane, 1 side only
		Bike Boulevard
		Cycle Track
		Shared-use Arrow
		Signed Bike Route

Existing	Proposed	
		Shared-use Path
		Sidewalk
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		No Near-term Improvements

Near-term Opportunities Update – Map Detail

Washtenaw Ave



Existing	Proposed	
		Bike Lanes
		Bike Lane, 1 side only
		Bike Boulevard
		Cycle Track
		Shared-use Arrow
		Signed Bike Route

Existing	Proposed	
		Shared-use Path
		Sidewalk
		Signalized Crosswalk
		Major Mid-block Crossing
		Minor Mid-block Crossing
		No Near-term Improvements

Geographic Area Recommendations

Long-term Recommendations

The 2013 Plan Update focuses on near-term recommendation updates and revisions, but through the review process, long-term recommendations were brought to staff's attention for review. The 2007 Long-term recommendations were often the same as near-term opportunities; those that were different were meant as implementations to be made along with new or reconstructed major facilities. Long-term recommendations are major capital improvements that will be implemented over an extended period of time as funding becomes available or they are integrated into other major construction projects.

The 2007 NTP included a map of Long-term Recommendations to illustrate the ultimate facility goal for each near-term recommendation. The following areas are presented in the NTP Update to reemphasize or clarify 2007 NTP long-term recommendations in light of near-term revisions.

Long-term Site Recommendations

Allen Creek Greenway

South Ann Arbor to N Main St | 2.3 miles ***2007 NTP: Pages 167, 181***

The Allen Creek Greenway is a proposed "green walking and bicycle pathway located in the Ann Arbor Railroad right-of-way, running from the University of Michigan athletic complex to Argo Dam and the Huron River" that will establish a link between residential, commercial, retail, and cultural development in Ann Arbor with the open space and natural areas along the river (acgreenwayconservancy.org). The Greenway will provide non-motorized access from the University of Michigan's South Campus to west of Downtown and the B2B Trail's shared-use path along the west bank of the Huron River.

Detailed analysis of the route and opportunities is provided with the 2008 Proposed Route of the Allen Creek Greenway: Essential Route and Future Opportunities Draft from the Allen Creek Greenway Conservancy. The guide displays overhead satellite images with the route and other features overlaid on top of the image. It also shows many photos of current conditions along the railroad and describes the property information for adjacent parcels.

The 2007 NTP identifies the Greenway as a long-term opportunity due to its extent and cost. Although the Greenway remains a long-term opportunity in the 2013 Update, staff will continue looking for opportunities to advance the project according to City Council direction. Key elements of the Allen Creek Greenway will be implemented as funding opportunities become available.

The N Main St area is being reviewed by the North Main Taskforce for recommendations to address multiple parcels in the area. The Taskforce may include non-motorized recommendations relevant to the Greenway and the Non-motorized Transportation Program. As with the Taskforce's non-motorized recommendations, the implementation designs of the Allen Creek Greenway will be made with careful attention to other projects and planning documents. Such planning documents include the City of Ann Arbor Parks & Recreation Open Space Plan (PROS Plan) and South State Street Corridor Plan.

Border to Border Trail

North Ann Arbor ***2007 NTP: Page 181 Map***

The Border-to-Border Trail (B2B) is a system of shared-use paths, bike lanes, bike routes, and other facilities that winds along the Huron River in Washtenaw County. It is designed to link communities and preserve open space along the river. The B2B Trail is an ongoing project, and the ultimate goal is a 35-mile trail that completely follows the Huron River through Washtenaw County.

In Ann Arbor, the B2B Trail winds from East Ann Arbor to the Argo Dam and up into the northwest corner of the city, but the trail is not continuous, due to multiple railroad and river crossing obstacles. Although the B2B Trail is not presented as a near-term opportunity, the NTP proposed a number of long-term shared-use path additions and multiple railroad and river crossings to link existing segments of the trail.

The need to connect existing B2B Trail segments was a common theme from public comment received in the review process, and is also identified in the Parks & Recreation Open Space (PROS) Plan. Also, recommendations from the North Main Tasksforce will consider a number of alternatives for facilitating non-motorized use in the North Main St area. Additionally, a stormwater management study is in progress for a tunnel project under the railroad where Fourth Ave meets Depot, which may find an opportunity for simultaneously establishing a non-motorized connection. The stormwater management study is working with property owners in considering preferred non-motorized connections in the area.

This Plan Update and its progress will benefit from the products of ongoing planning processes. Therefore, the updated recommendation is to maintain the long-term plan for B2B connections while monitoring concurrent planning projects. However, if new concepts emerge, the next update should incorporate new opportunities as appropriate.

Gallup Park & Fuller Road Paths

Location Varies

2007 NTP: Page 181 Map

The Gallup Park & Fuller Road shared-use paths are some of the most heavily used paths in the city. According to the PROS Plan, Gallup Park is the most popular park in the city. The shared-use paths along Fuller Road are the most direct non-motorized link between Central Campus and North Campus for University of Michigan students. Both parks contain the B2B Trail.

The Gallup Park & Fuller Road Paths are not a near-term opportunity in the 2007 NTP. However, staff identified the need to widen some segments of each park's shared-use paths to 10' wide, which is the AASHTO standard minimum width for heavily utilized shared-use facilities. Where possible, paths should be improved to achieve 12' or 14' width.

Environmental issues need to be assessed to define opportunities to widen facilities. The NTP Update recommends that the addition of impervious surfaces be made with considerations to possible impacts to runoff and stormwater services. This area is not a near-term opportunity.

Briarwood-Pittsfield Shared-Use Bridge

Over I-94

2007 NTP: Page 181

A non-motorized bridge over I-94 would provide improved linkages between the communities of Ann Arbor and Pittsfield Township. This link should be evaluated in context of the State Street Corridor Plan.

The possible linking of Ann Arbor and Pittsfield Township can improve access to the various employment, recreational, residential and shopping opportunities on either side of I-94. Coordination between Pittsfield Township, the Road Commission, MDOT and the City will be essential in planning for this long term non-motorized improvement.

The link is proposed from Briarwood Mall, near the Towne Place Suites Hotel, to near the water tower on the south side of I-94. This recommendation would take advantage of the existing low traffic density and speed limits on Briarwood Circle, on the north side of I-94, and the existing path on the south side of I-94 which connects to Oak Valley Dr.

9. Appendix Contents

A substantial Appendix accompanies this report. It is in PDF format and included on the CD-ROM in the back cover of this plan. Also included on the CD-ROM is a PDF version of this report and three full size maps.

Full Size Maps in Adobe Acrobat PDF format:

- Near-term Opportunities Map
- Long-term Plan Map
- Shared-use Path Map

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