City of Novi Non-motorized Master Plan

DRAFT

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City of Novi

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Contents

1. Introduction

Encouraging healthy, active lifestyles through pathway and sidewalk connectivity has been a focus for the City of Novi. The City is a three-time Promoting Active Communities Gold Award winner from the Governor's Council on Physical Fitness, largely due to the over 225 miles of exiting and 90 miles of planned public pedestrian and bicycle facilities.

The City of Novi is now poised to take its bicycle and pedestrian facilities, policies and programs to the next level. This document, funded by the Federal Energy Efficiency Block Grant program, lays out a systematic way to support non-motorized transportation.

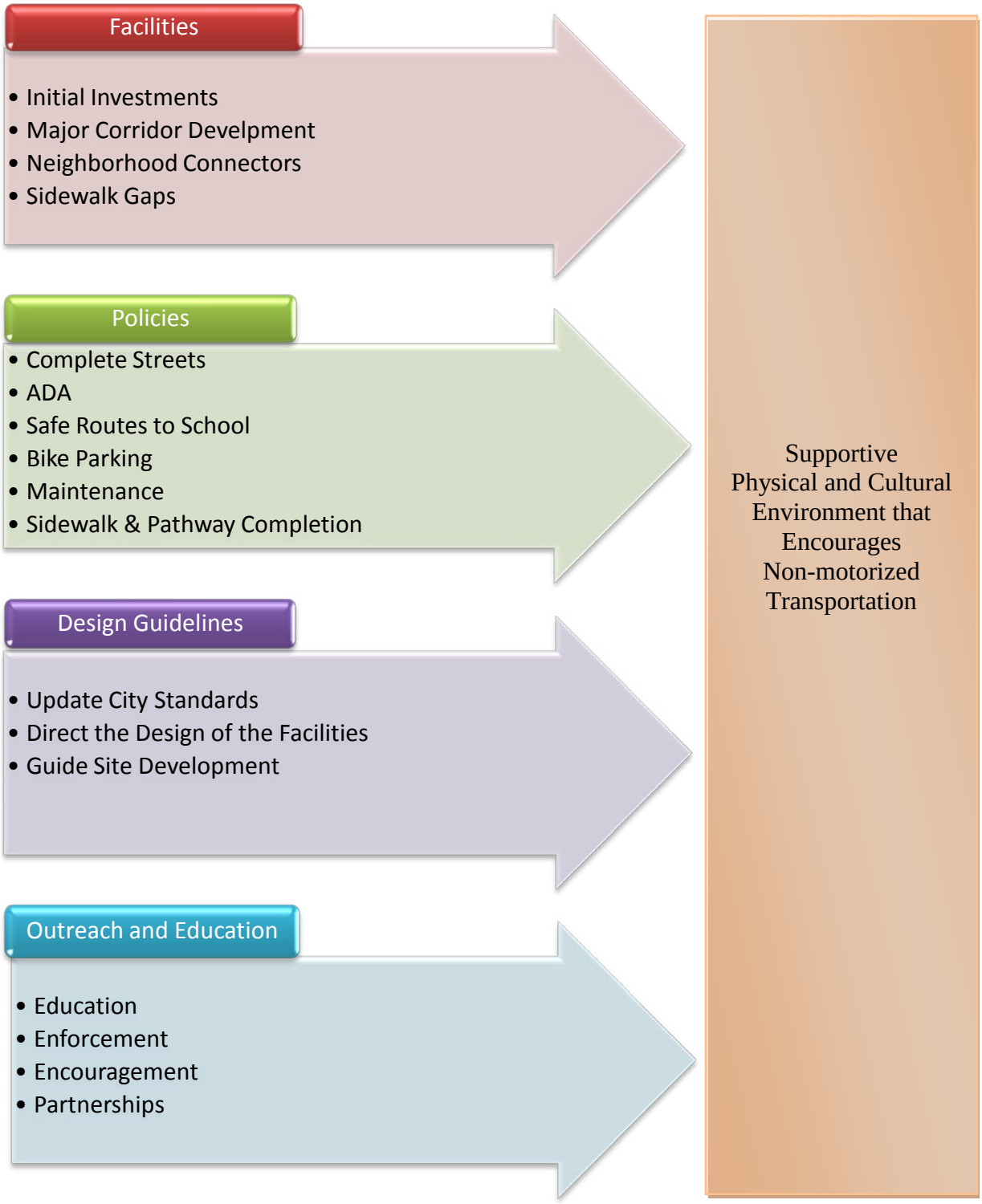
Helping to shape this plan, has been a dedicated group of elected officials, public employees and the general public. The results of an on-line survey and the input gathered at two public workshops guided the proposed non-motorized network as well as setting implementation priorities.

The Non-Motorized Master Plan is comprised of four concurrent implementation tracts that when employed in concert will 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 surround communities.

It is anticipated that the environmental changes will result in a greater number of individuals choosing walking and bicycling as their preferred mode of transportation for many local trips. These choices will lead to healthier lifestyles, improved air and water quality, and a more energy efficient and sustainable transportation system.

The following chart outlines the four implementation tracts in the plan. Each sub-element may move forward independently as resources allow. As the Non-Motorized Master Plan is in many ways a continuation and expansion of the City's sidewalk and pathway program, a natural first step for implementation is to address the top priorities from that effort. This are included in the Initial Investments category.

Fig 1a Four Concurrent Implementation Tracts of the Non-Motorized Plan



1.1 Why Walking and Bicycling Are 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 Novi. 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 parking spaces.
- 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] 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.

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, local public demand for improved facilities is significant as evident by community surveys that continually rank bicycle and pedestrian facilities at the top of the list of desired community improvements.

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 Novi. 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.

[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.

1.2 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.

Bicycle Boulevard - a low-volume and low-speed street that has been optimized for bicycle travel through treatments such as traffic calming and traffic reduction; signage and pavement markings; and intersection crossing treatments.

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 South Lake Drive, East Lake Drive and Taft Road.

Bike Route –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, Shared-use Paths, and Walkways.

Clearance Interval – 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.

Complete Street- streets that are planned, designed, operated and maintained such that all users may safely, comfortably and conveniently move along and across streets throughout a community.

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 further into the 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.

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

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

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 the 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 –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 location 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. In 2009 a new National MUTCD was adopted, the state has two years to adopt the national manual. Typically, there are only minor divergences between the two manuals due to specifics in Michigan traffic laws.

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.

Near-term Opportunities –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.

Neighborhood Greenway – a route that utilizes residential streets and short connecting pathways that link destinations such as parks, schools and **Shared Use Paths**. Neighborhood Greenways may contain the characteristics of a **Bicycle Boulevard** but, in addition, provide accommodations for pedestrians and sustainable design elements such as rain gardens.

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

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

Off-road Trail – see Shared Use Path

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 vehicle travel movement.

Shared Roadway –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. These routes may also be signed and include pavement markings such as shared-use arrows.

Shared Use Arrow – a pavement marking consisting of a bike symbol with a double chevron above, also known as "sharrows". These pavement markings are used for on-road bicycle facilities where the right-of-way is too narrow for designated bike lanes. The shared use arrow alerts cars to take caution and allow cyclist to safely travel in these lanes when striping is not possible. They are often used in conjunction with signage.

Shared Use Path – a wide pathway that is separate from a roadway by 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 I-275 Metro Trail.

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

Sidepath – see **Roadside Pathway**

Roadside Pathway – 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**.

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.

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. They may also be used at intersections in place of a turning lane.

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.

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. Inventory and Analysis

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.

The City of Novi and land country as a whole are at a key juncture. 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.

Topics:

2.1 General Conditions

The City of Novi generally consists of dispersed land uses that for the most part, are scaled towards automobile use. Typical of the region, Novi has a primary road system based on a one mile grid with commercial centers located along the busy roadways and intersections and near freeway interchanges.

Bicycle and pedestrian travel outside of neighborhood streets generally follows the primary road system on sidewalks and roadside pathways, although there are some bike lanes in the north and south of town. Opportunities to cross the primary road system are limited with poor bicycle and pedestrian connectivity between neighborhoods that are located on opposite sides of the roadway.

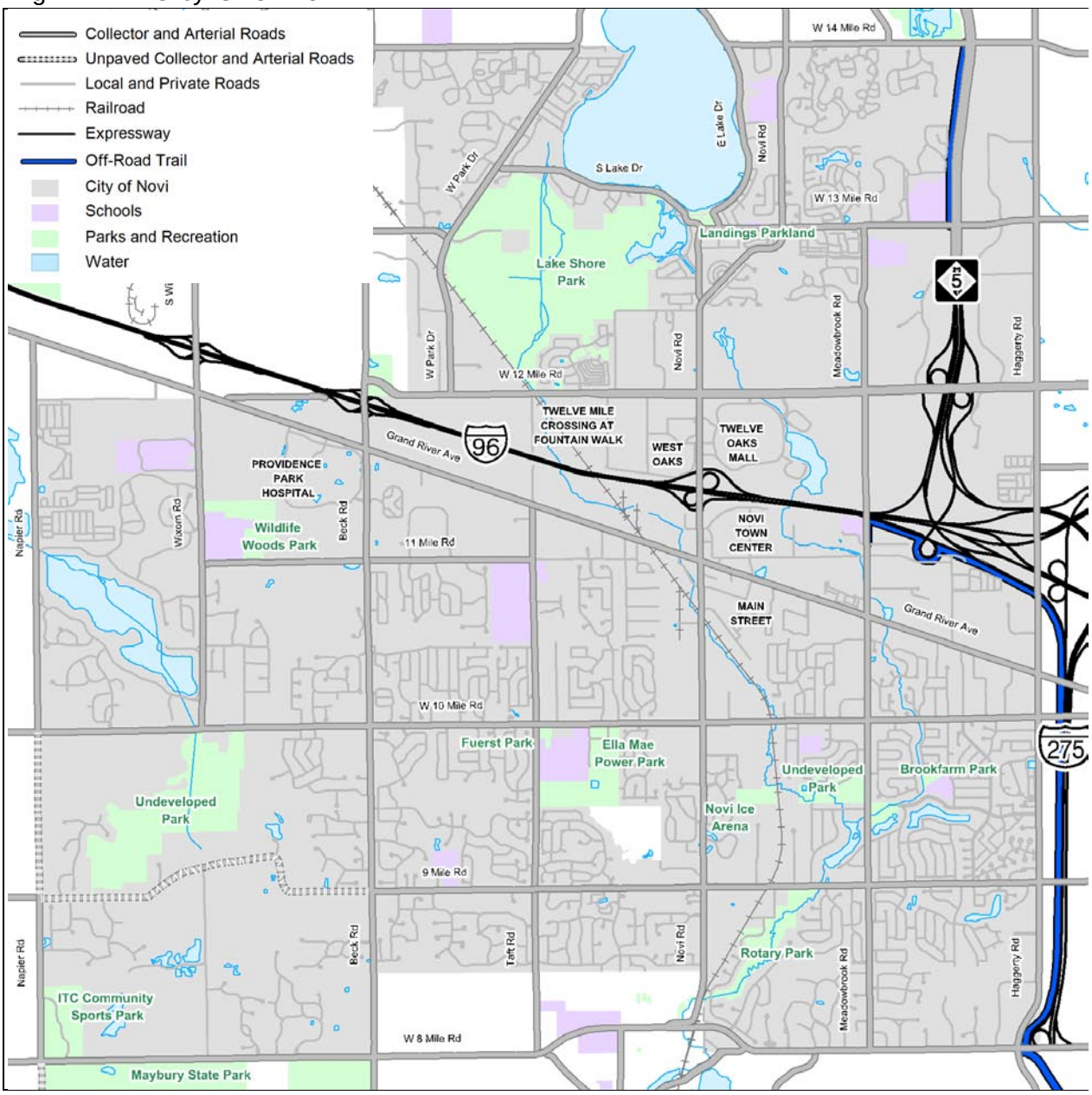
Over the past number of years, the City of Novi has systematically been adding sidewalks and pathways along the primary road system. However, there are still numerous gaps remaining in the system which makes many trips challenging. Trips on unfamiliar routes may often result in a dead end without an obvious alternative. The artificial barriers of the railroad, expressways and the four and five-lane arterials also tend to fragment the City from a non-motorized standpoint. The result is a non-motorized environment that is generally not favorable to walking and bicycling for everyday transportation but is capable of providing for more recreational based trips.

Many of the city's primary roads are only two to three lanes wide. These roads may be more easily converted to a more bicycle and pedestrian corridors.

The following maps provide a general summary of the existing conditions in the City of Novi:

- Fig. 2.1A. City Overview
- Fig. 2.1B. Current Land Use
- Fig. 2.1C. Population Density
- Fig. 2.1D. Future Land Use
- Fig. 2.1E. Existing Trails Inventory
- Fig. 2.1F. Regional Trails Overview
- Fig. 2.1G. City of Novi Pathway and Sidewalk Prioritization Analysis and Process
- Fig. 2.1H. Road Jurisdiction
- Fig. 2.1I. Transportation Improvement Projects
- Fig. 2.1J. Average Daily Traffic Volumes
- Fig. 2.2 K. Posted Speed Limit
- Fig. 2.2 L. Existing Road Cross-Sections
- Fig. 2.1M. Block Size Analysis

Fig. 2.1A. City Overview



Population: currently estimated to be 52,231 (city special census 2007)

Size: Over 30 Square Miles

Fig. 2.1B. Existing Land Use (2008)

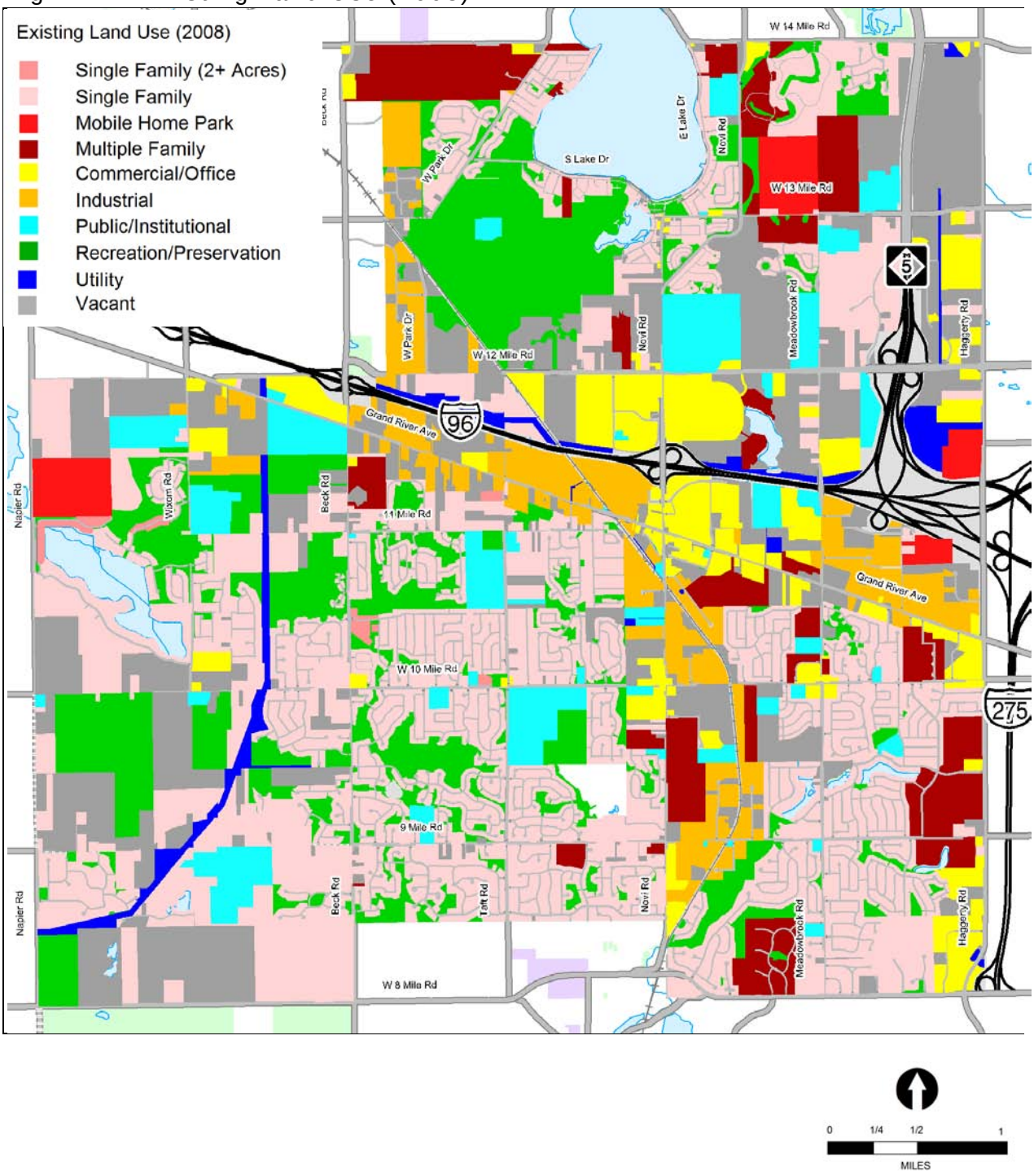
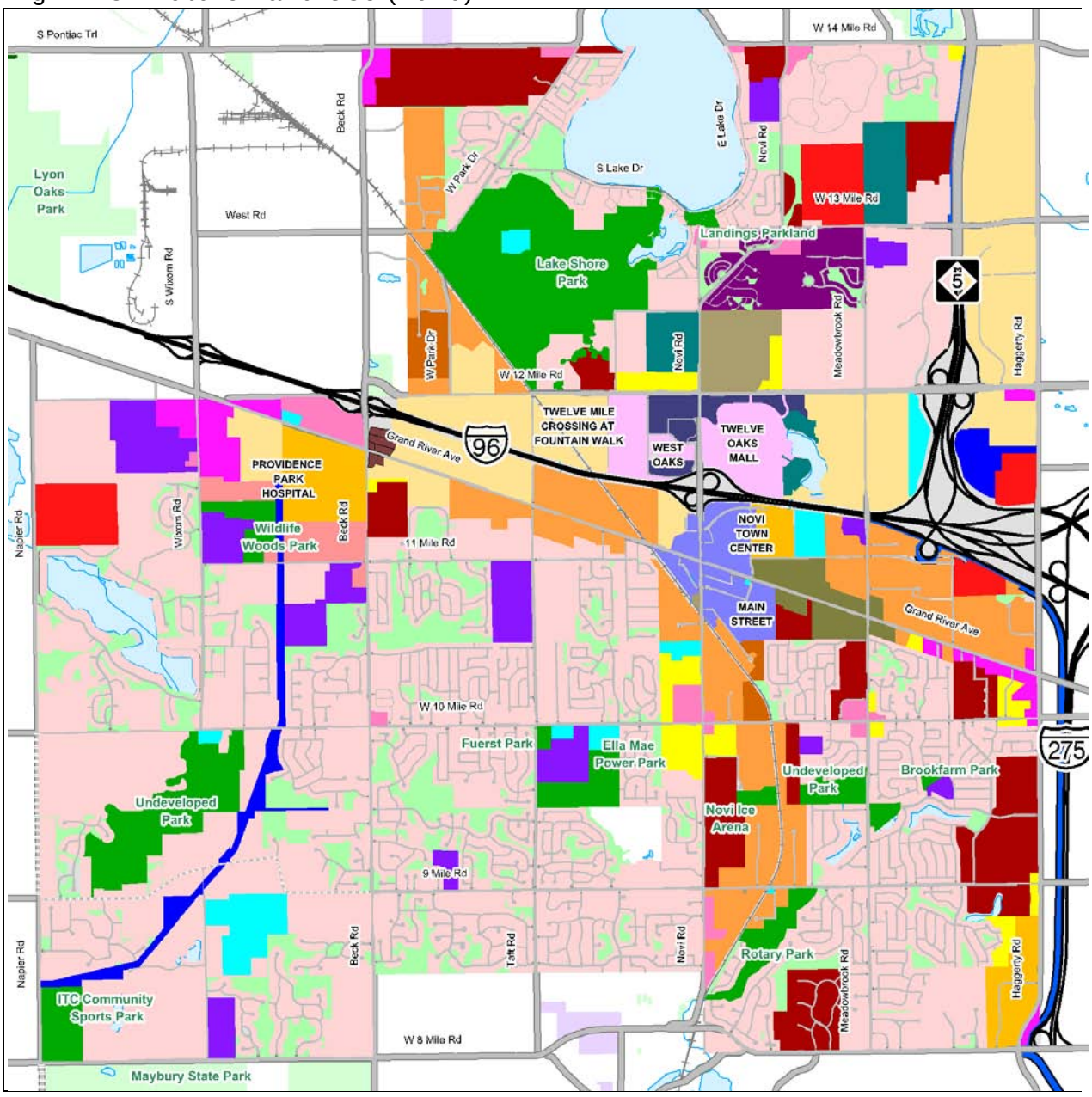


Fig. 2.1C. Future Land Use (2010)

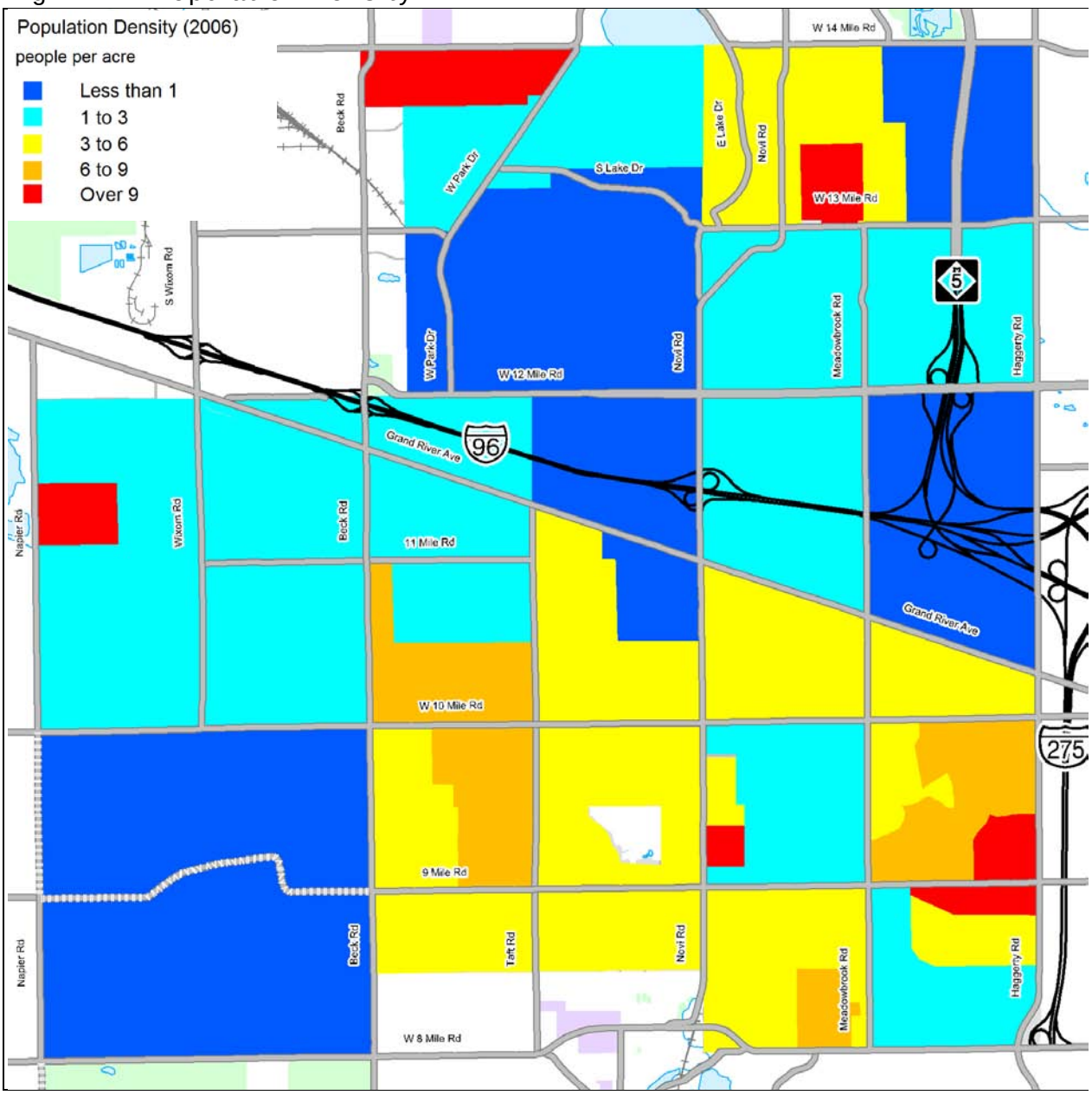


Future Land Use (2010)

- Suburban (Low Rise)
- Single Family
- Mobile Home Park
- Multiple Family
- Local Commercial
- Community Commercial
- Regional Commercial
- Office Commercial
- Community Office
- Office Rd Tech
- Industrial Rd Tech
- Heavy Industrial
- TC Commercial
- TC Gateway
- PD1
- PD2
- PUD
- Educational Facility
- Public
- Private Park
- Public Park
- Cemetery
- Utility

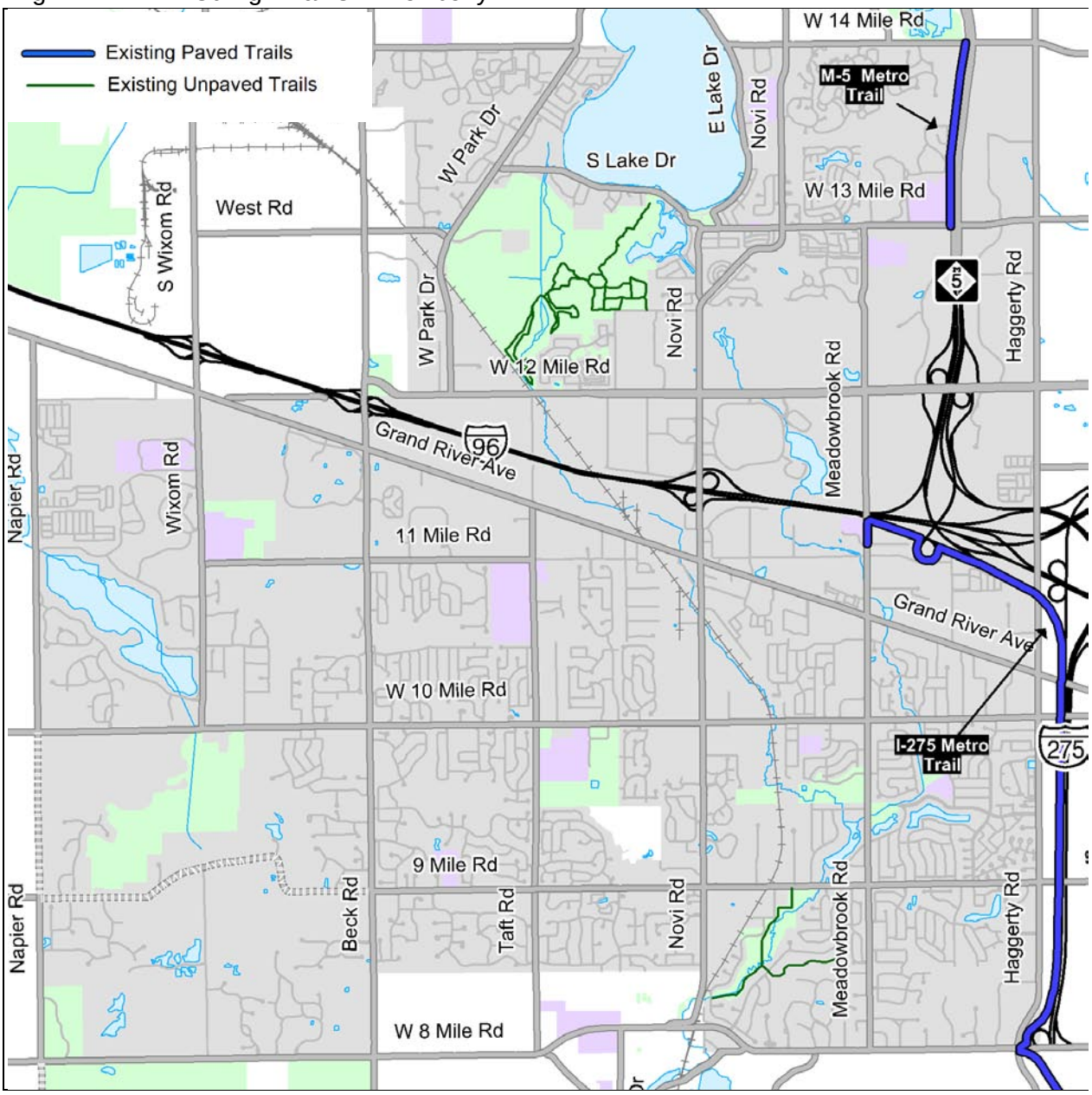
0 1/4 1/2 1
MILES

Fig. 2.1D. Population Density



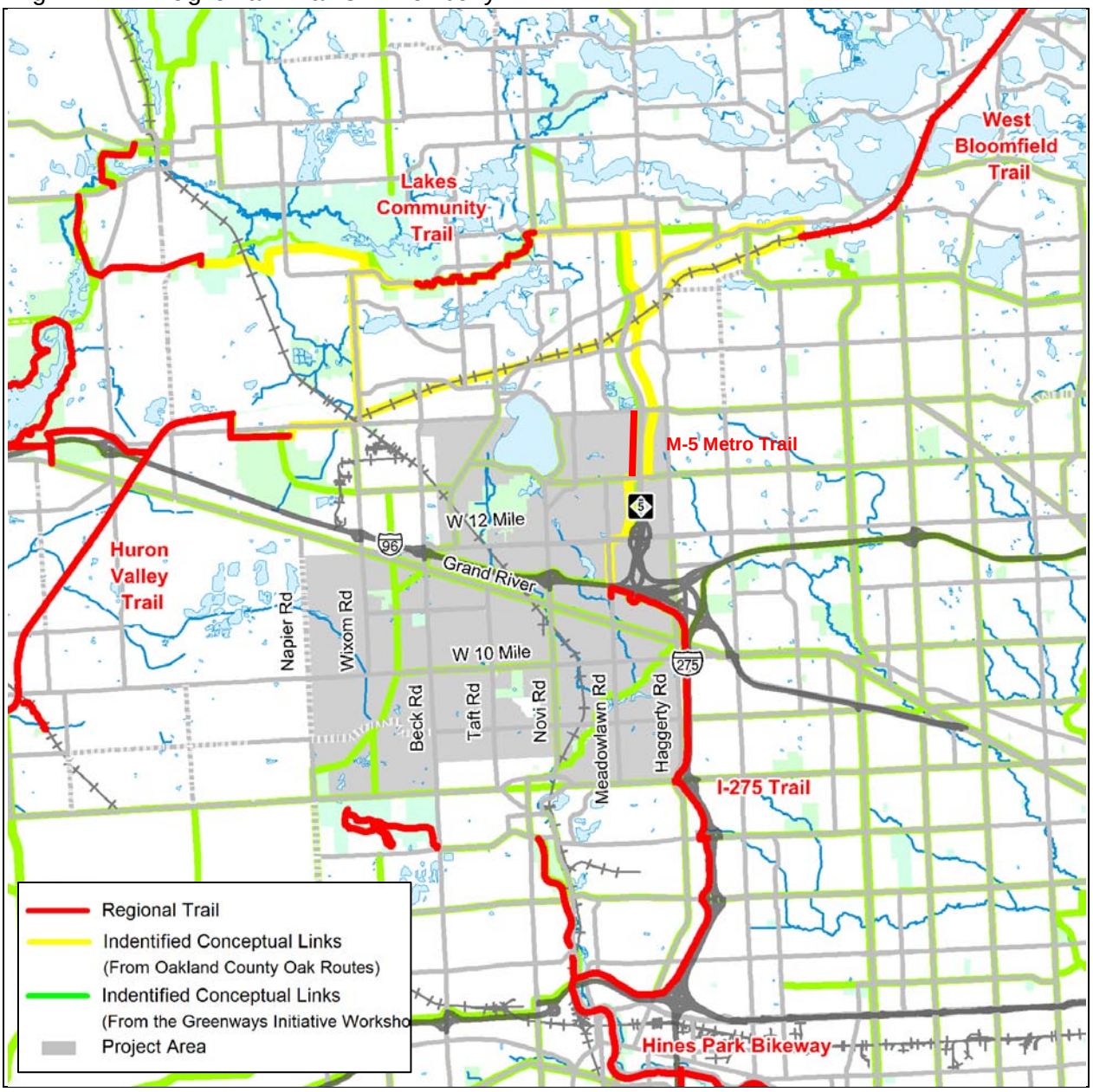
Based on the 2006 special census.

Fig. 2.1E. Existing Trails Inventory



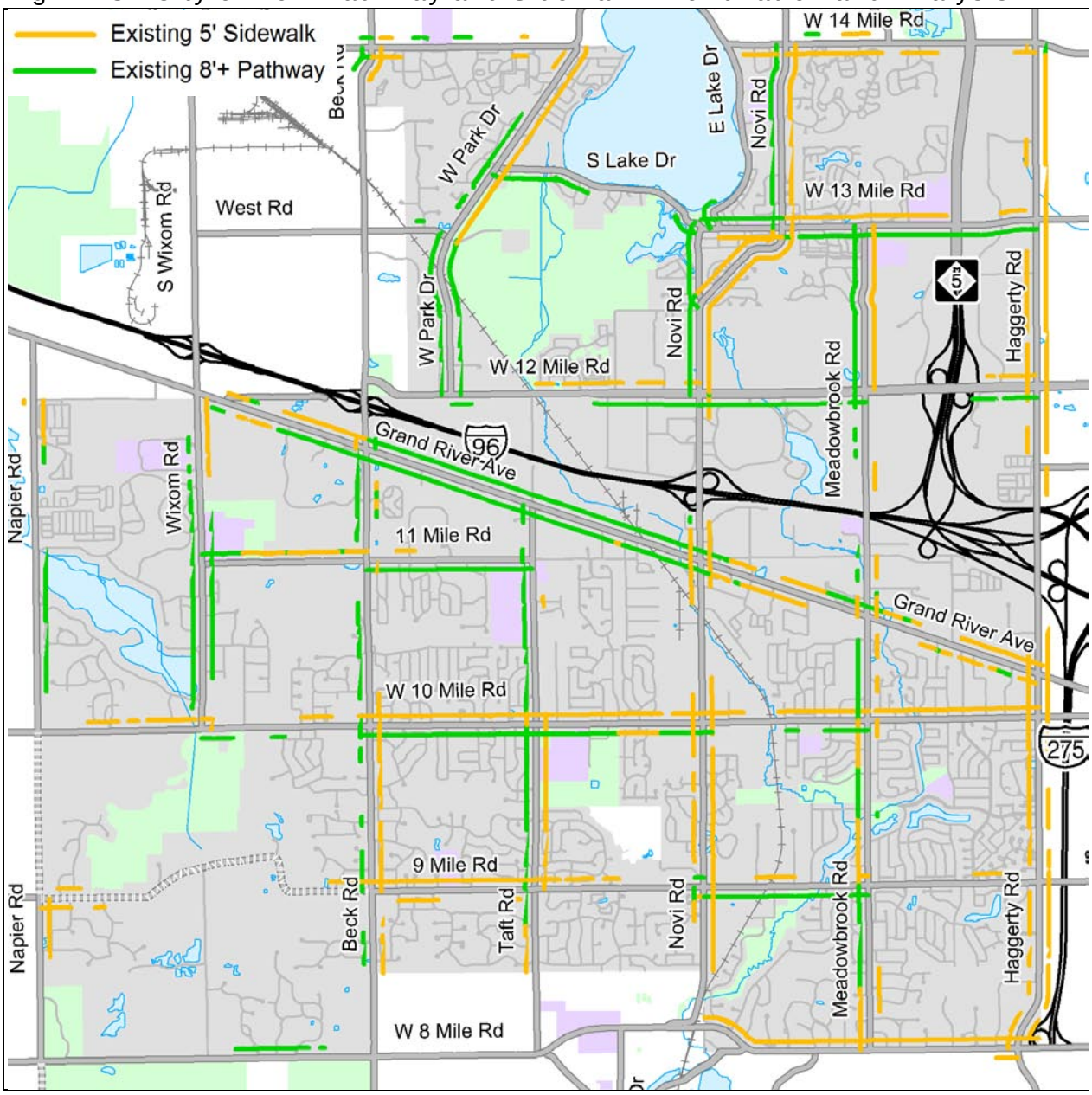
The I-275 Metro Trail is a 40 mile bikeway that links communities in Wayne, Oakland and Monroe counties. The trail terminates at Meadowbrook Road just south of the I-96 expressway. The M-5 Metro Trail was recently built in 2010 with plans to extend north along M-5.

Fig. 2.1F. Regional Trails Inventory



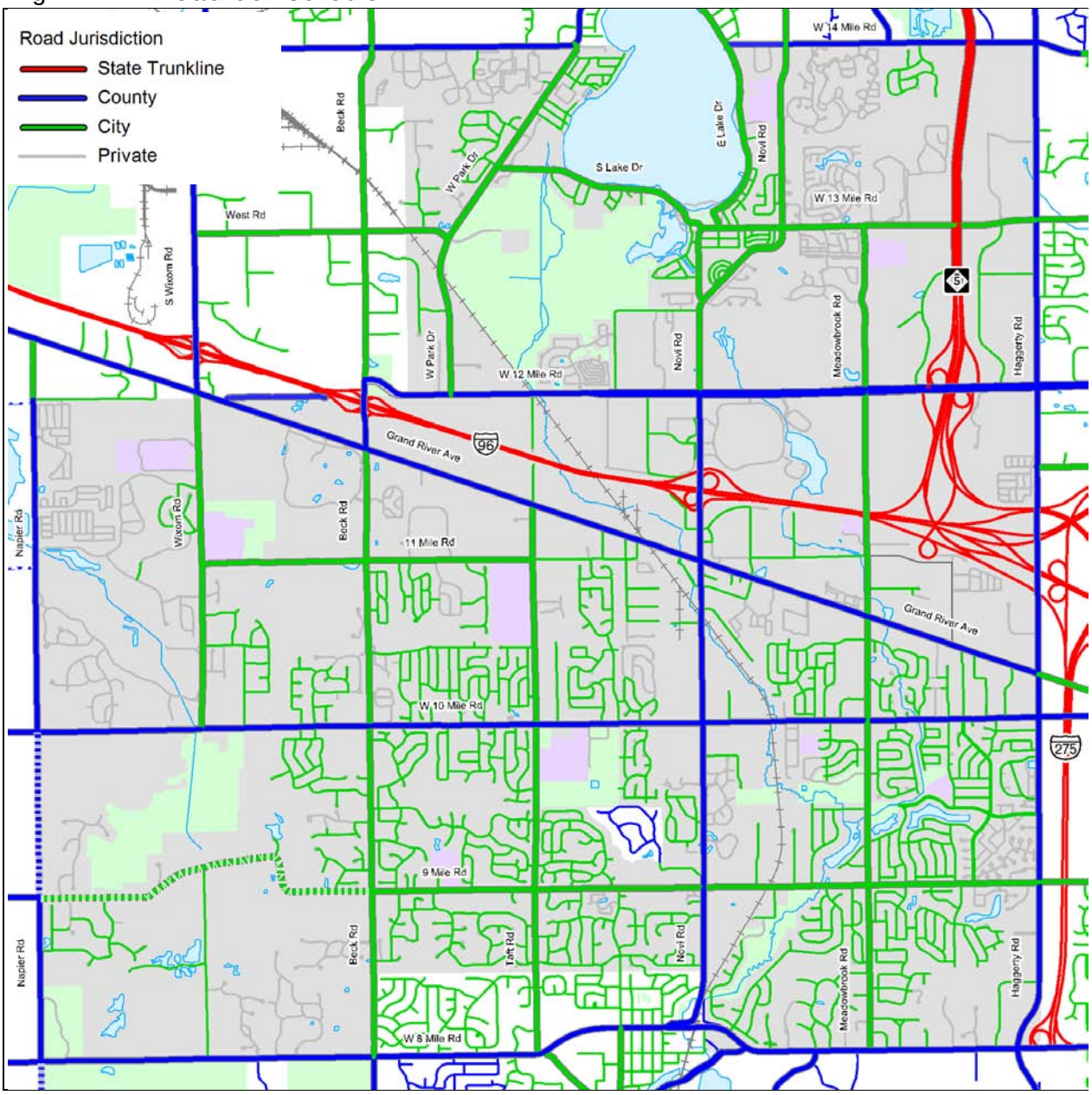
The existing I-275 Metro Trail and under development M-5 Metro Trail runs up the eastern border of the city. When completed it will provide a key link between the extensive regional trail system to the south and the proposed cross state trail to the north. The ITC corridor that generally runs north-south between Wixom Road and Beck Road between Maybury State Park and just east of Lyon Oaks County Park has the potential to link key regional parks to the residents.

Fig. 2.1G. City of Novi Pathway and Sidewalk Prioritization and Analysis



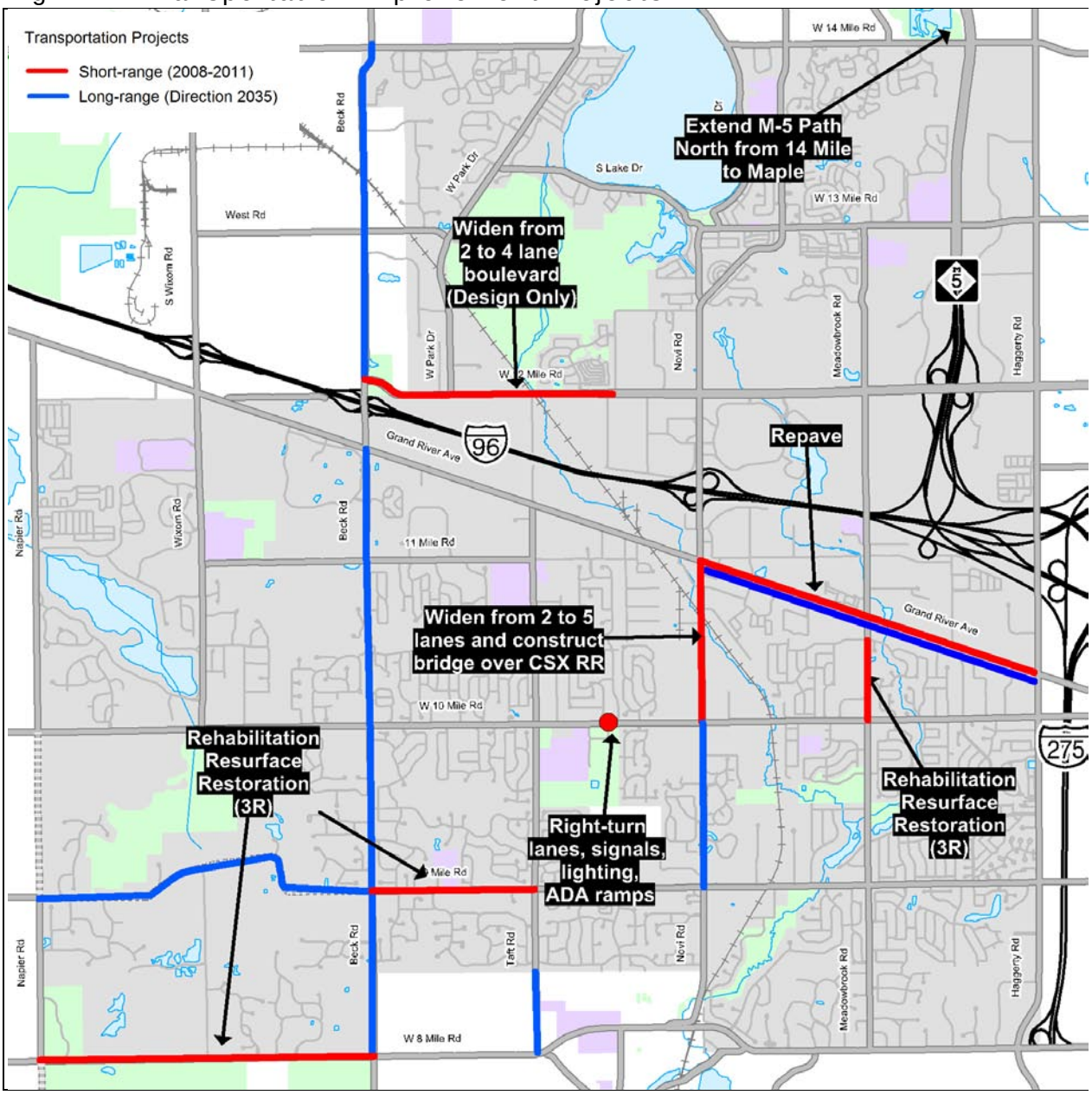
The City of Novi Pathway and Sidewalk Prioritization Analysis and Process was approved by the City Council on November 13, 2006. Since that time the City of Novi has completed around 20,000 feet of pathways and sidewalks and developers completed over 10,000 feet of pathways and sidewalks in the City of Novi.

Fig. 2.1H. Road Jurisdiction



Roads owned by the state and managed by the Michigan Department of Transportation (MDOT) are shown in red. Any modifications to these "trunkline" roads must be coordinated with and approved by MDOT. Likewise any roads shown in blue are under the jurisdiction of the county road commission and any modifications to these roads must be coordinated with and approved by the county road commission.

Fig. 2.1l. Transportation Improvement Projects

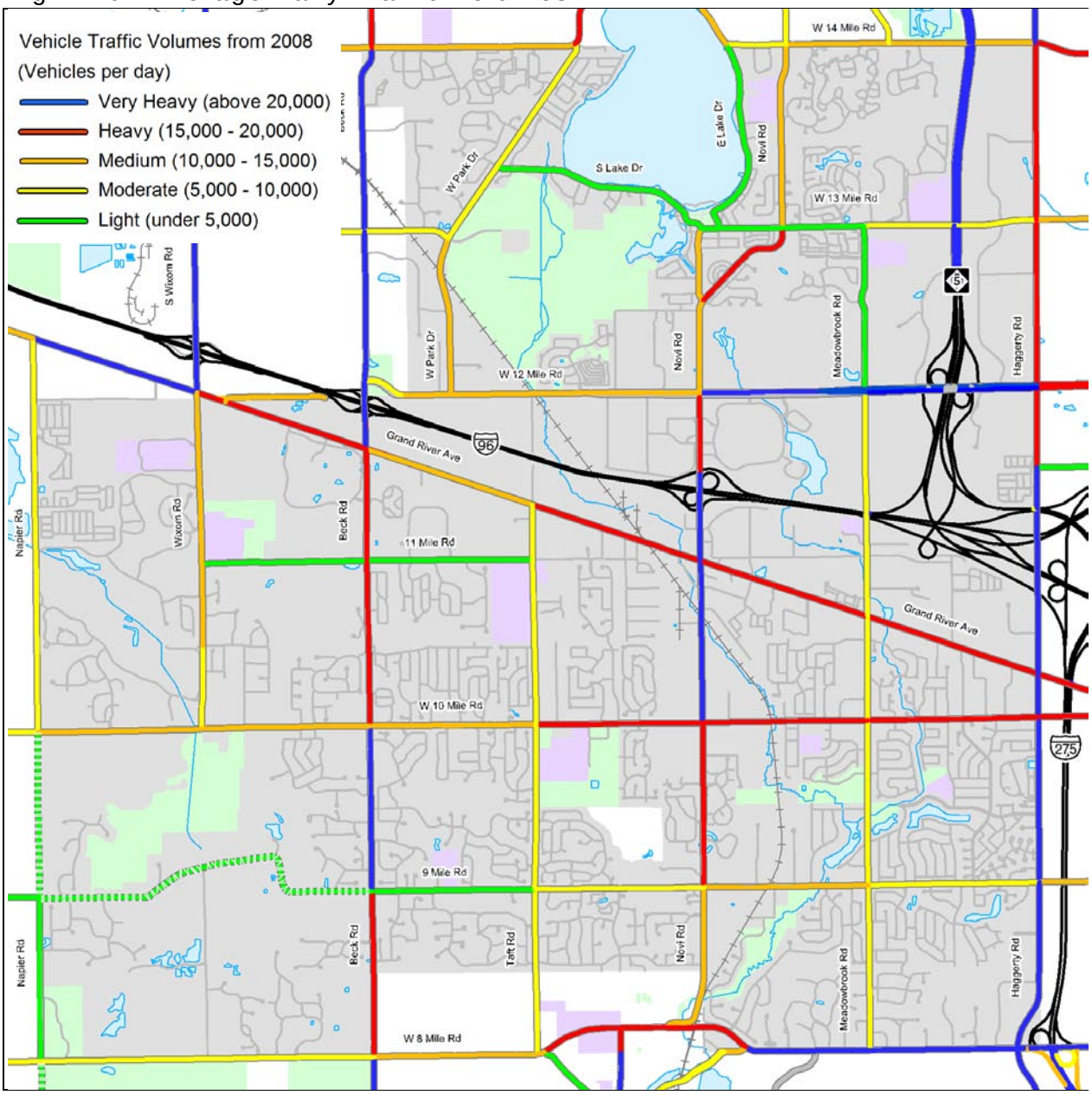


Short –Range – FY 2008-2011 Transportation Improvements (TIP) is a list of all transportation projects receiving federal funding in Southeast Michigan through 2011. The TIP represents the priorities of the cities and transportation agencies for implementing Direction 2035, the region's long range transportation plan.

Long – Range – Direction 2035 is the long-range vision for the proper maintenance and expansion of the transportation infrastructure to meet basic transportation and regional sustainability goals. It serves as a guide for developing a transportation system that is accessible, safe and reliable and contributes to a higher quality of life for the region's citizens. The long-range vision guides implementation of the short-range project in the TIP.

Only Projects on federal-aid eligible roads are mapped.

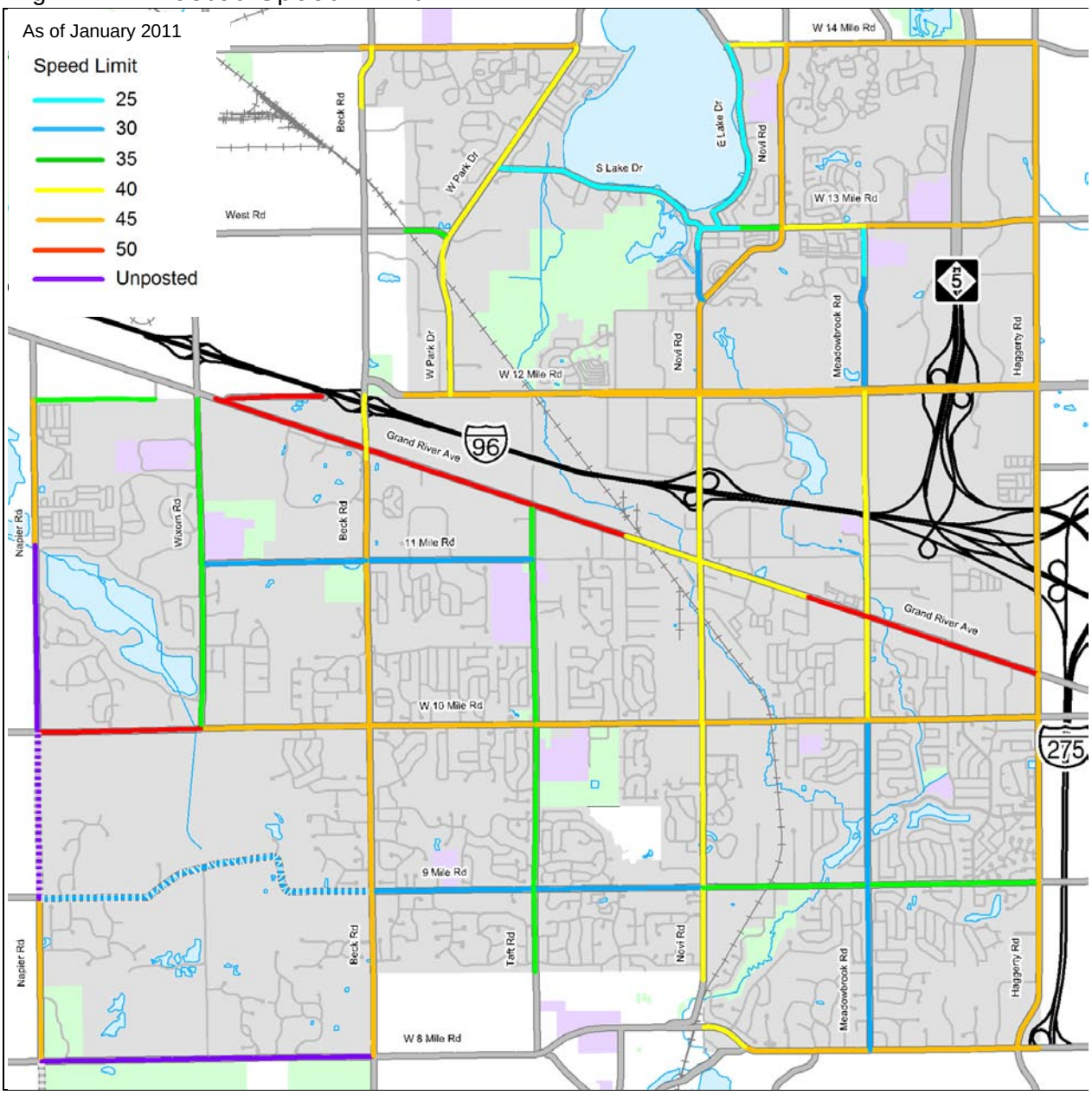
Fig. 2.1J. Average Daily Traffic Volumes



Annual Average Daily Traffic (AADT) is an estimate of traffic volumes. The volumes are based on total two-way traffic over a 24-hour period and may vary by season or day of the week. The volumes are determined from a combination of actual traffic counts and modeling. The map shows 2008 data provided by SEMCOG.

The gradations used generally reflect noticeable changes in the comfort level of bicyclists sharing a roadway with motorists, all other factors being equal.

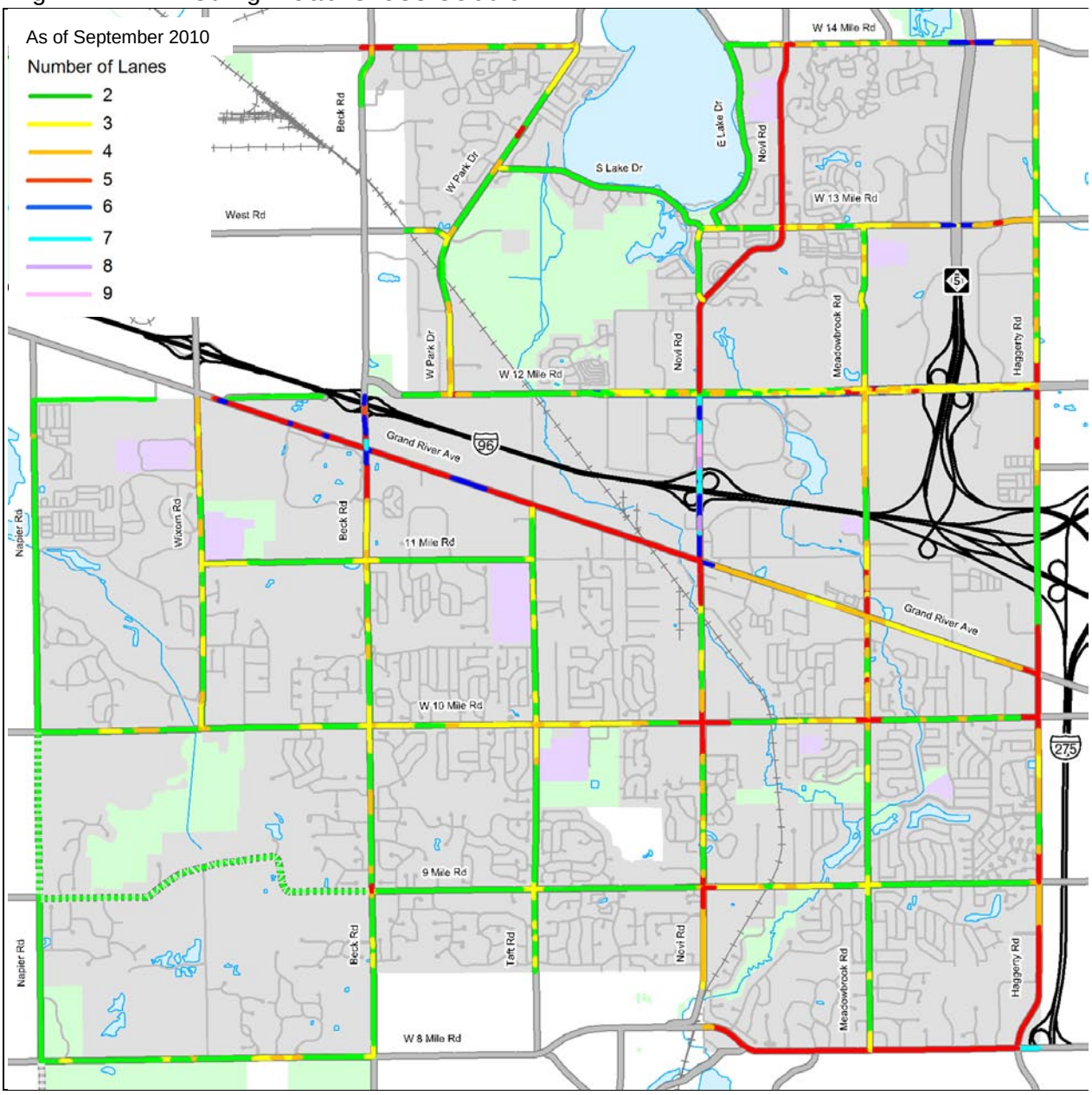
Fig. 2.1K. Posted Speed Limit



Roadways with high speeds can reduce the comfort level for bicycles and pedestrians traveling along a road corridor, and my even discourage bicycle and pedestrian use all together. Actual running speeds are likely higher than posted speeds.

Please note that speed limits along some roads are in the process of changing so some of the speeds listed above may be outdated.

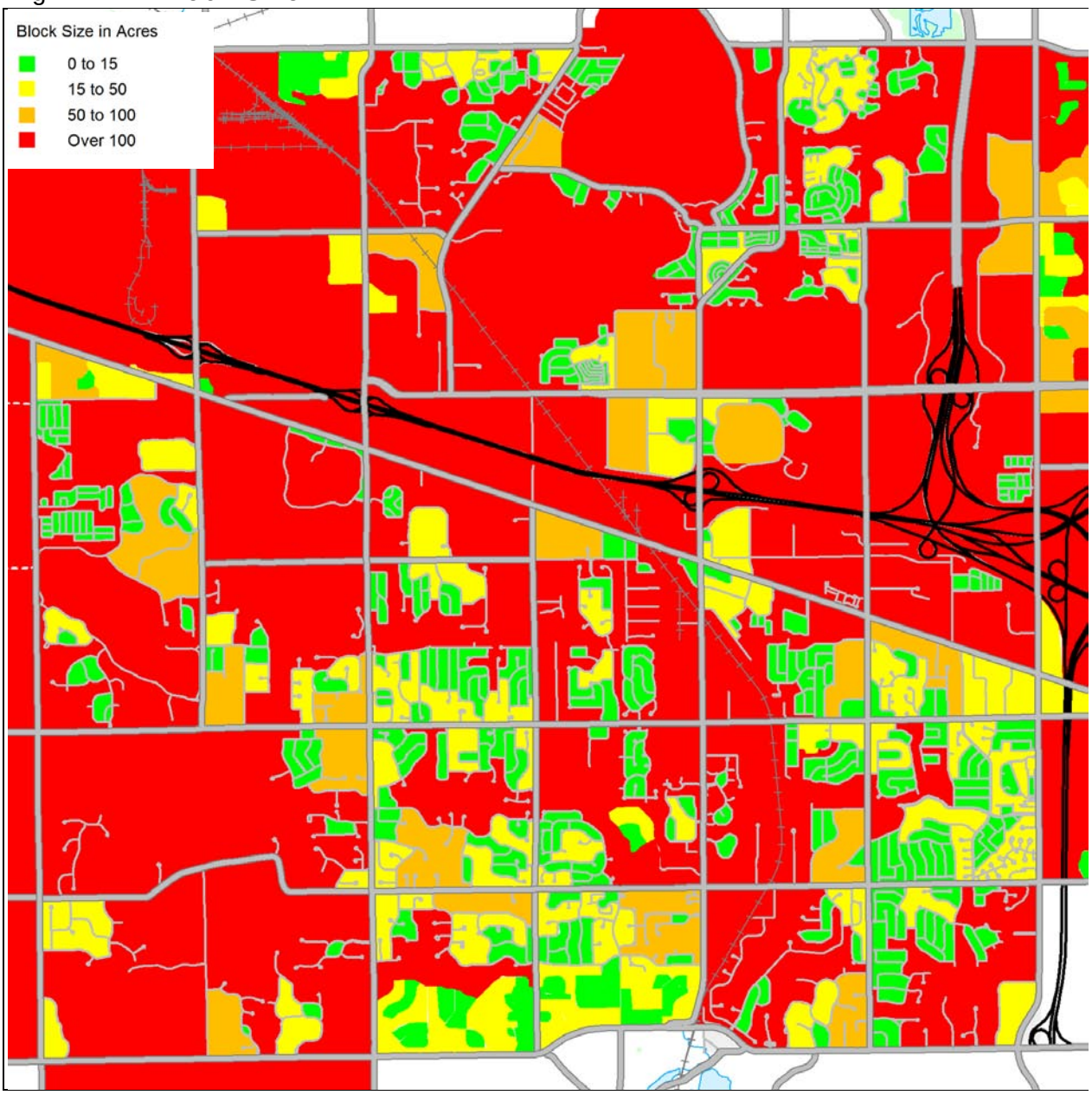
Fig. 2.1L. Existing Road Cross-section



The majority of the roads in the city are two lane roads, although many of these roads have designated turn lanes and by-pass lanes in places. The widest roads for the most part border the freeway corridors.

Generally, roadways with numerous designated turn lanes and by-pass lanes present challenges when trying to incorporate bicycle facilities into the existing road cross-section.

Fig. 2.1M. Block Size



Block size is an excellent measurement of directness of travel and a key indicator in the level of pedestrian activity. A block is defined as an area that a person cannot pass through. These areas usually do not have any sidewalks, roadways or bike paths allowing access between two points. One example is an expressway where you may have to go a mile or more out of your way just to get to the other side.

The majority of the city's landmass is in blocks over 100 acres in size. There are no large contiguous areas where the block size is 15 acres or less in size. Finding ways to create more direct pedestrian travel ways will be key to making Novi a more walkable community.

2.2 The Pedestrian Environment

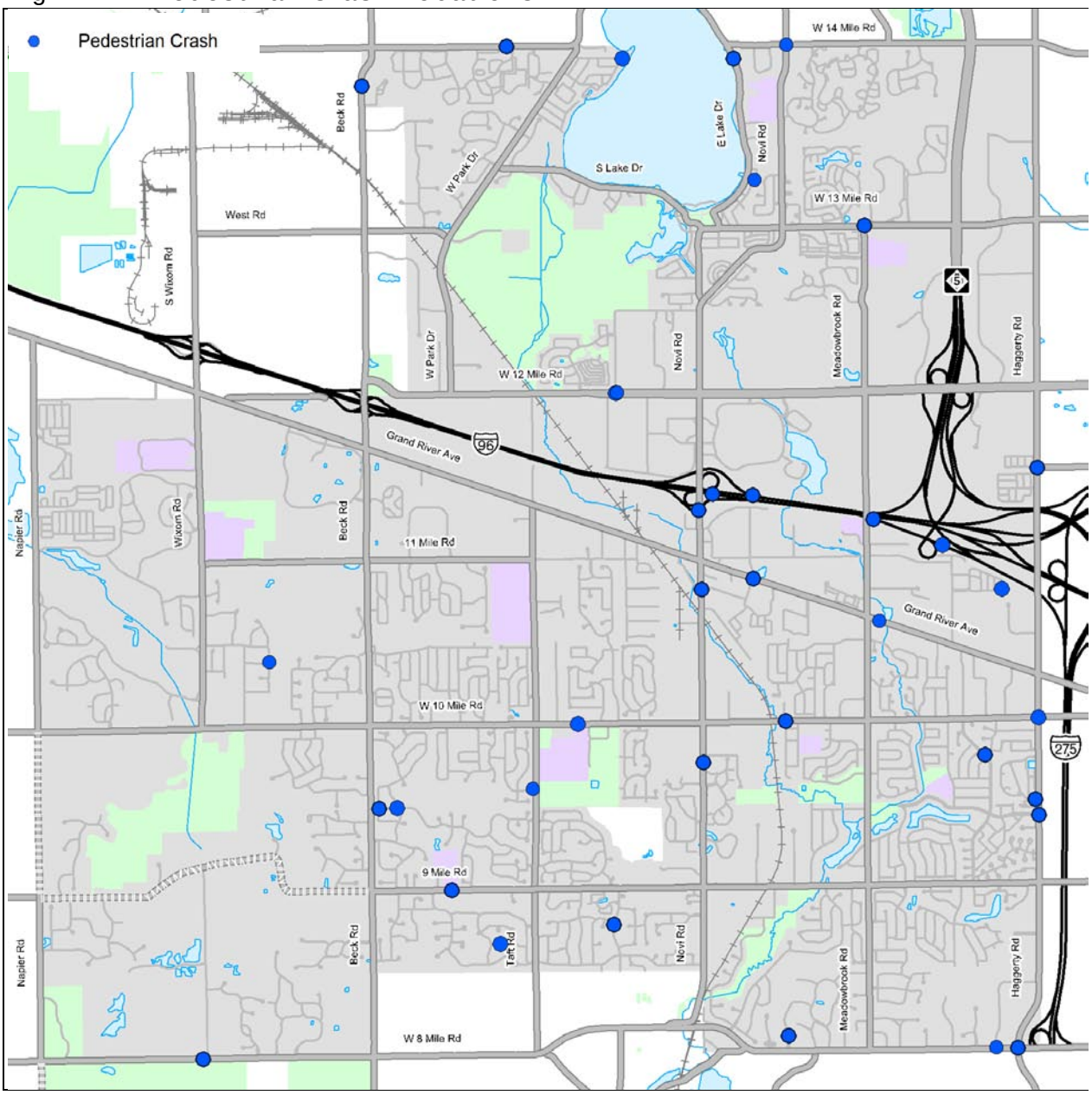
The City of Novi has a partially complete sidewalk system along the major roadways, however there are still significant gaps along major roadways in both the built up and more suburban parts of town. The quality of the pedestrian experience on these sidewalks varies greatly throughout the City. Some 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. Other sidewalks and roadside pathways are set well back from the road and have substantial vegetated buffer.

Another major issue lies with cross-roadway accommodations. There are significant stretches of the major thoroughfares that provide no means to cross the roadway safely. There are also places where logical crossings are not accommodated. Even where there are marked crosswalks, they are often inadequate. Many times the existing crossings are missing key safety features, making them difficult to cross, especially on high speed multi-lane roadways.

The following maps provide a general summary of the existing conditions of pedestrian facilities in the City of Novi:

- Fig. 2.2 A. Pedestrian Crash Locations
- Fig. 2.2 B. Pedestrian Crash Data
- Fig. 2.2 C. Existing Sidewalk Quality
- Fig. 2.2 D. Existing Crosswalk Spacing Analysis
- Fig. 2.2 E. Existing Road Crossing Difficulty Assessment

Fig. 2.2A. Pedestrian Crash Locations



The crashes shown are from a five year period, 2004 – 2009.

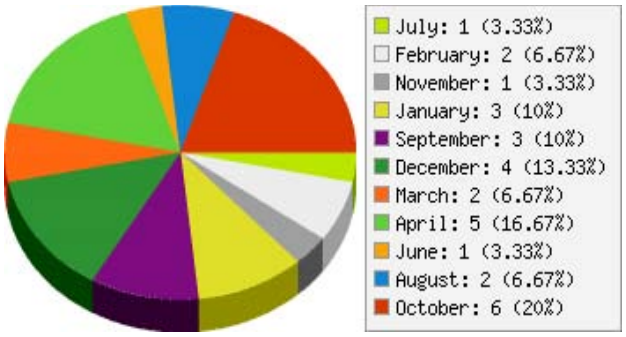
There were 30 pedestrian involved crashes, none were fatal and ten resulted in serious injuries. Drinking or drug use was involved in 3 of the crashes. There was no traffic control at 70% of the crash locations.

The Michigan Traffic Crash Fact website was the source of the data and charts.

Fig. 2.2B. Pedestrian Crash Data

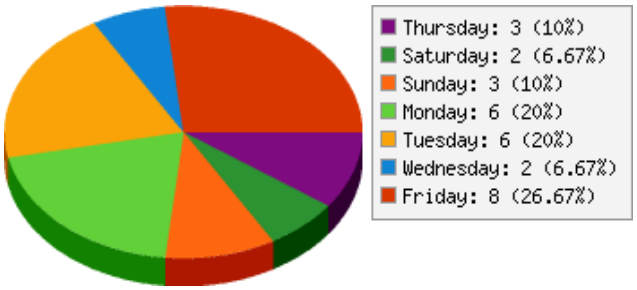
Month of Crash

Pedestrian crashes occurred in every month except February.



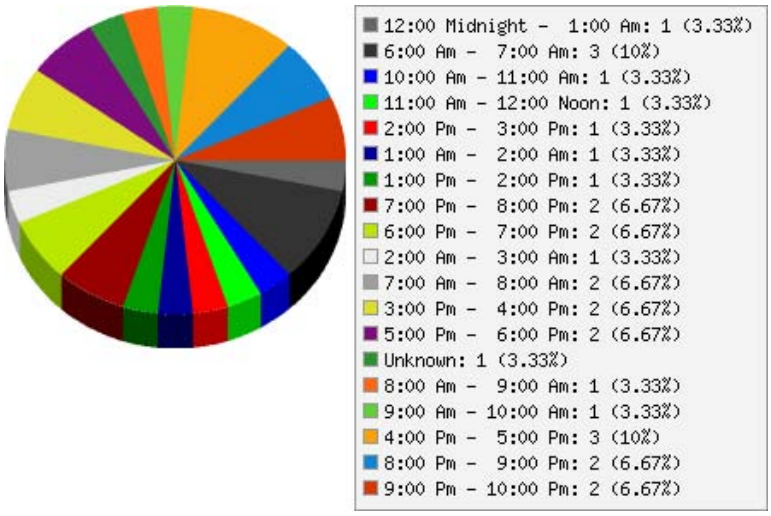
Day of Week

Crashes took place on every day of the week with the most occurring on a Friday.



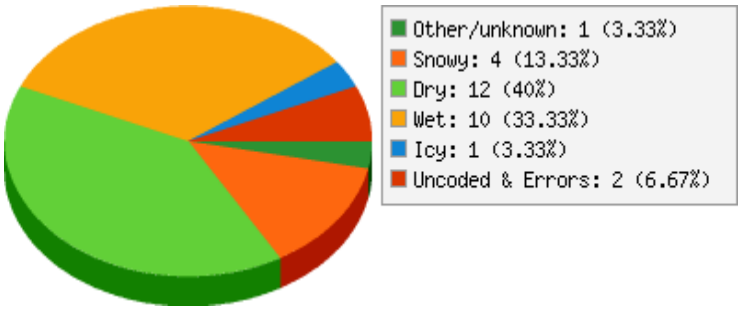
Time of Day

All but one crash took place between 6:00 AM and 10 PM. Half the crashes took place during daylight, 7% took place during dawn and 40% took place in the dark (3% were not coded).



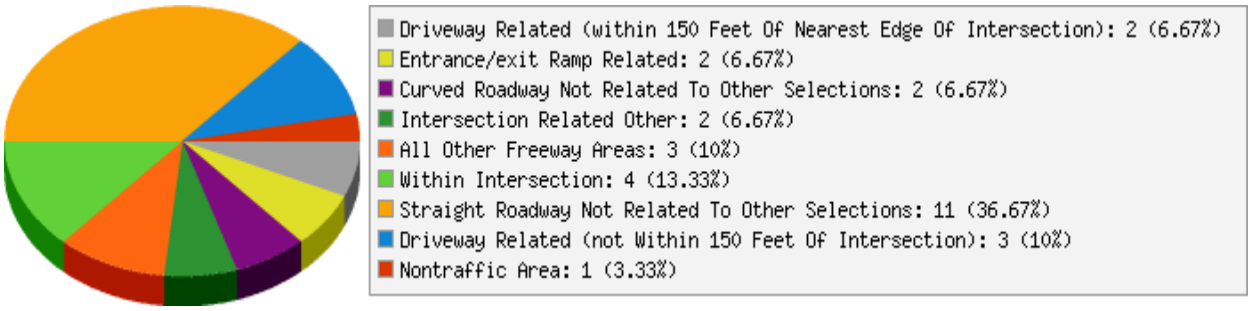
Road Conditions

Wet, Snowy or Icy roads were a factor in about half the crashes.



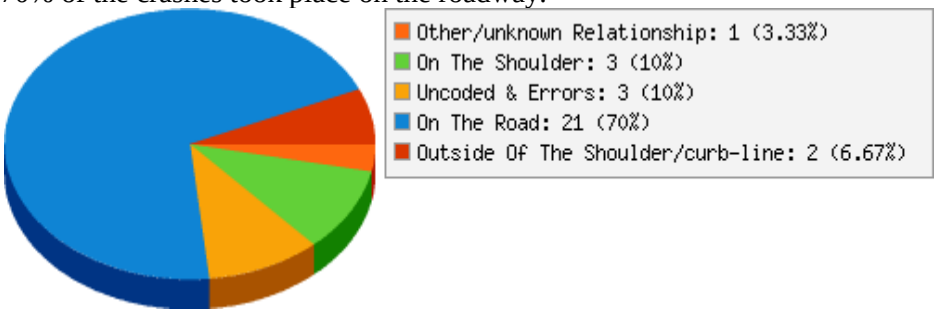
Area of Road at Crash

43% of the crashes are related to an intersection or driveway.



Relation to Roadway

70% of the crashes took place on the roadway.



Sidewalk Quality

A key factor to a pedestrians comfort level on a sidewalk is the degree of separation from the roadway. Elements such as lawn buffers and vertical elements tend to make a pedestrian feel more separated from the roadway, increasing the pedestrian's level of comfort when on a sidewalk.

The sidewalk quality rating system is designed to help identify a pedestrian's level of comfort when on a sidewalk based on the amount of separation from the roadway. The rating system is broken up into five categories A, B, C, D and E. A sidewalk with a rating of "A" has the best pedestrian comfort level and a sidewalk with a rating of "E" has the worst pedestrian comfort level.

A - Rating
Sidewalk is setback from roadway and contains vertical elements such as closely spaced trees and/or light poles.

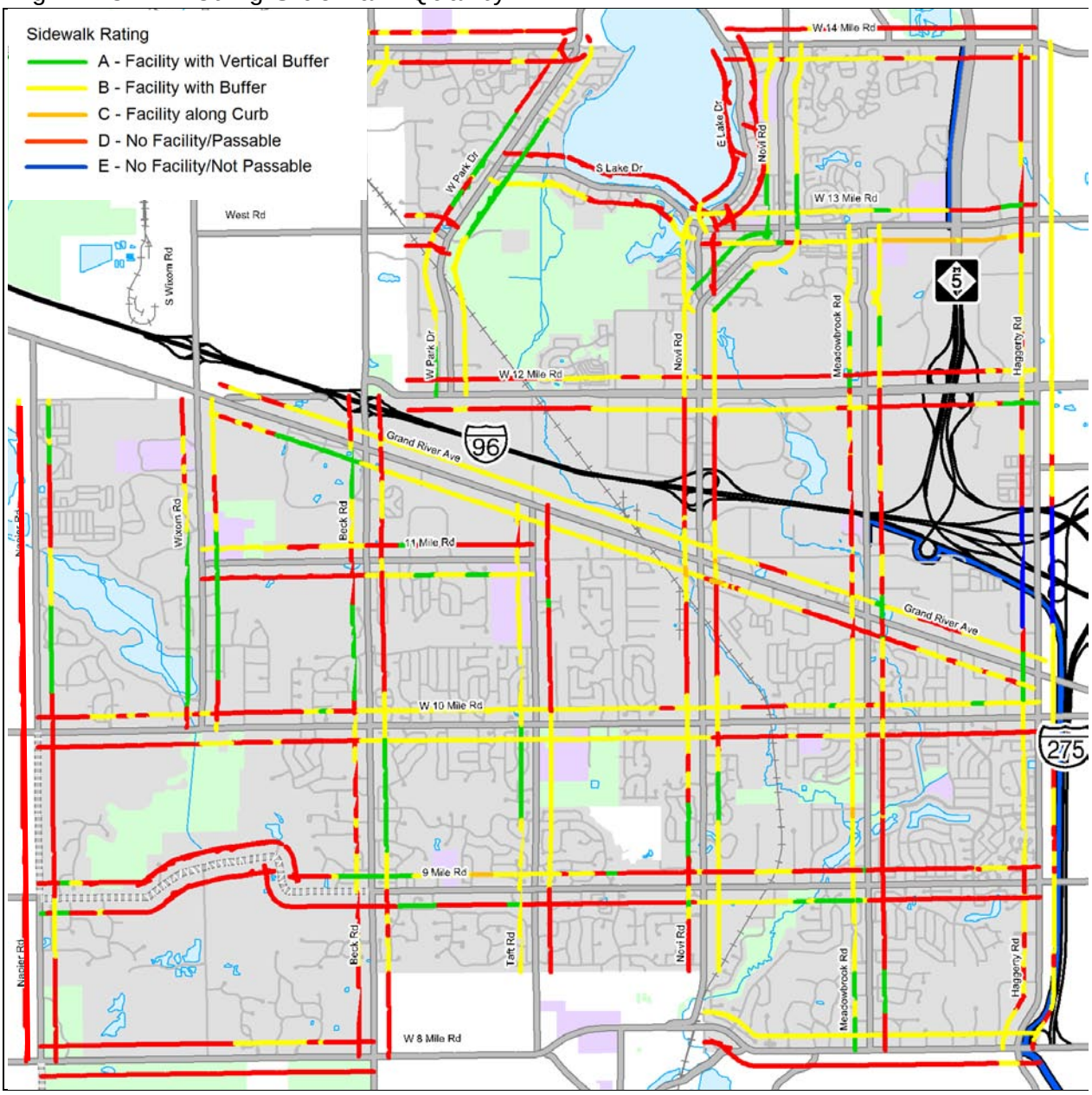
B - Rating
Sidewalk is setback from roadway but contains no vertical elements.

C - Rating
Sidewalk is directly adjacent to the roadway along the curb and has no buffer space or vertical elements.

D - Rating
No sidewalk facility is built, but the area is physically passable by foot.

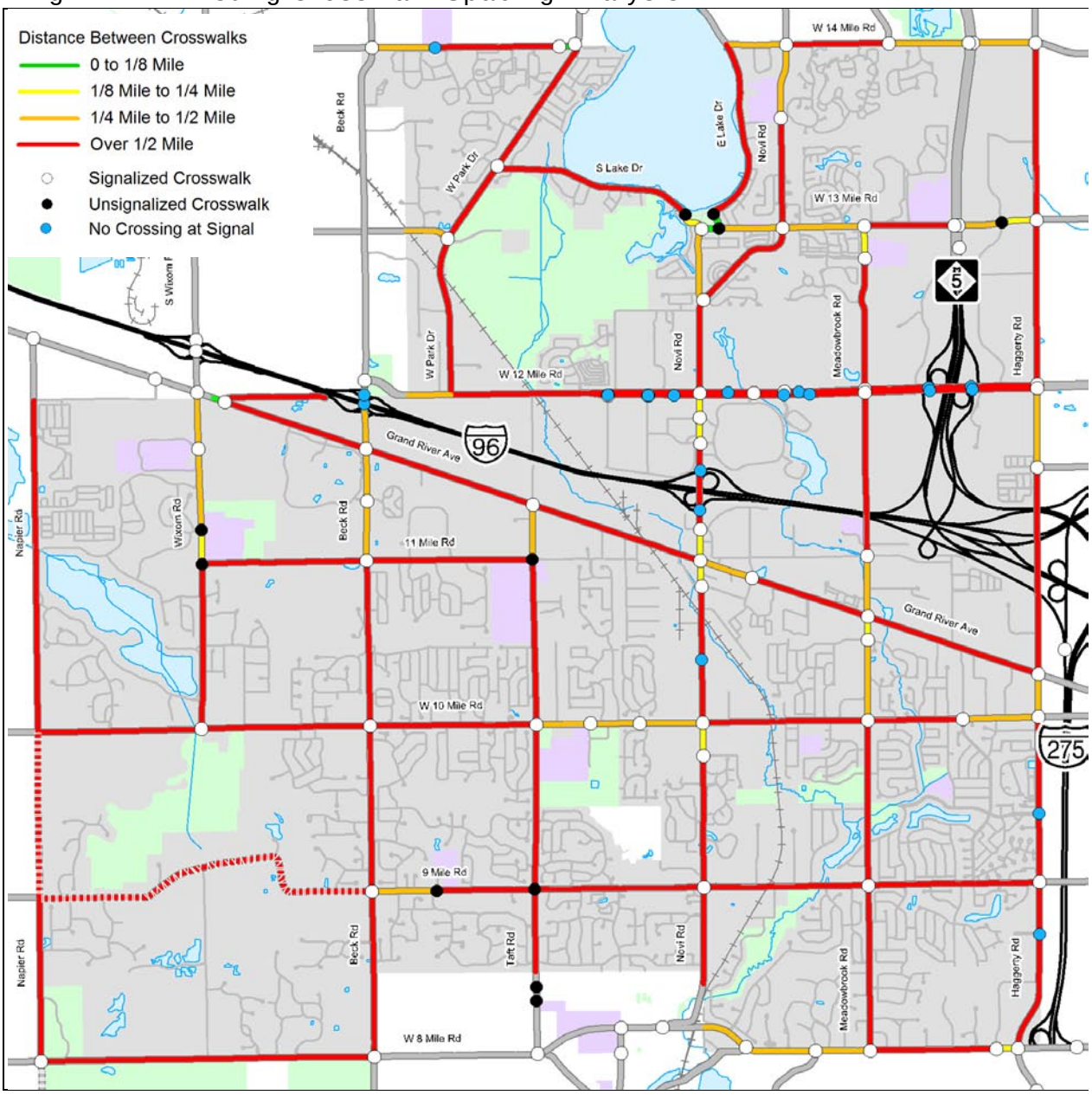
E - Rating
No sidewalk facility is built and the area is not physically passable by foot. Physical barriers such as streams or expressway overpasses usually contribute to this type of situation.

Fig. 2.2C. Existing Sidewalk Quality



A key factor to a pedestrians comfort on a sidewalk is the degree of separation from the roadway. Buffer (lawn extensions) and vertical elements such as trees and light poles increase the pedestrians comfort level.

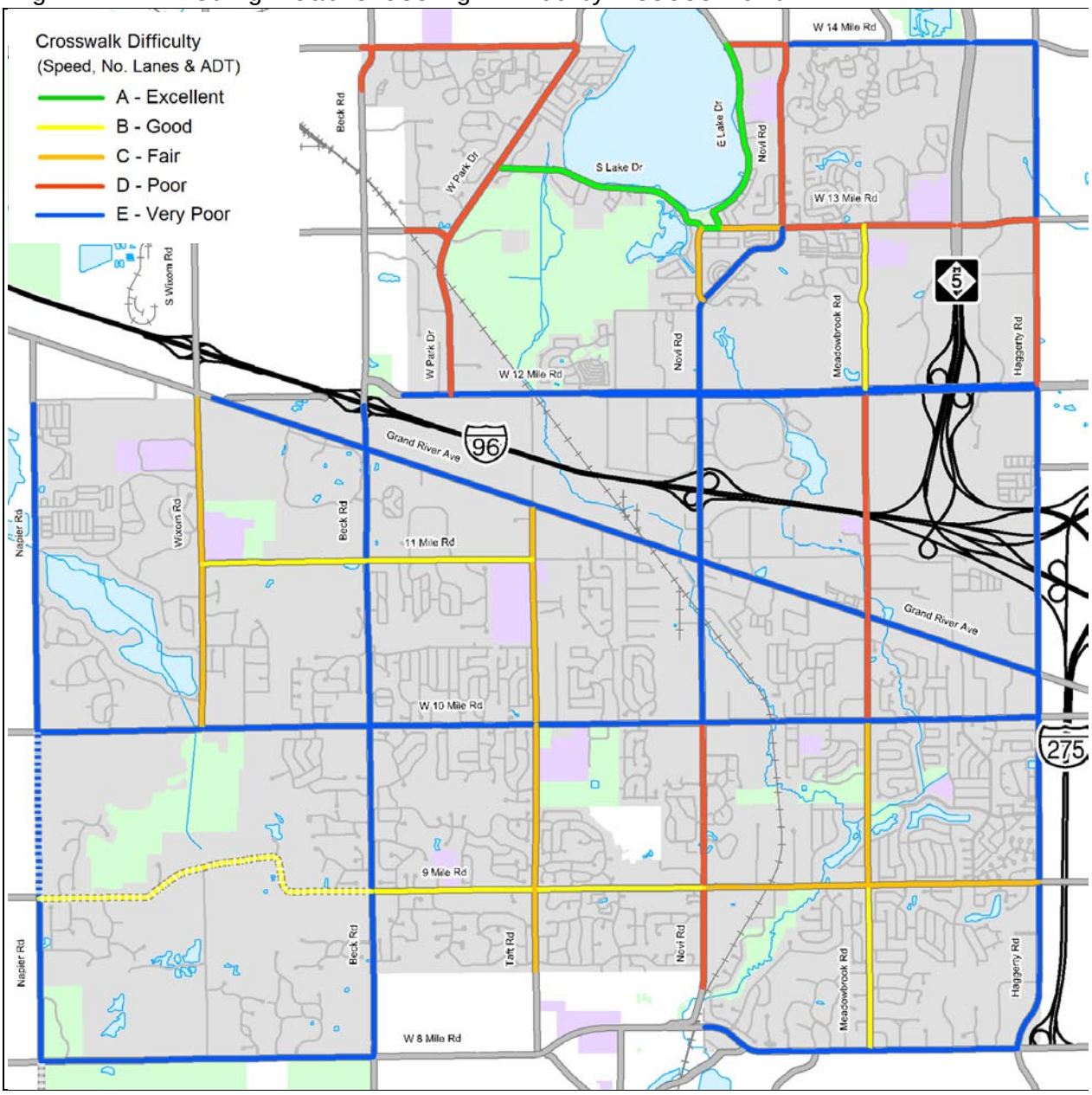
Fig. 2.2D. Existing Crosswalk Spacing Analysis



Crosswalk spacing is a key factor in directness of travel. Most pedestrian trips for personal business (like walking to the store) are about ½ mile long. Where there is demand to cross the road and crosswalk spacing is over 1/8 of a mile apart, midblock crossings are likely to occur. There are numerous stretches or roadway on primary streets within the city with over ½ mile between crosswalks. This analysis measures the distance that a pedestrian would have to travel in order to cross the road at a designated crossing.

This analysis was based on existing conditions. Signalized intersections without pedestrian crossings were not used in this calculation because they do not provide a safe crossing. However, please note that existing signalized crossings that were used in this analysis may not be up to ADA standards, so even if they have a crossing, they may not be accessible to everyone.

Fig. 2.2E. Existing Road Crossing Difficulty Assessment



Road crossing difficulty is a measurement of how difficult a person would typically find it to cross a road at an unmarked mid-block crosswalk. It is based on the number of lanes, speed and average daily traffic. Overall, it is generally difficult to cross with ADT being the most restrictive factor on primary roads in the city.

Grade	Lanes	Speed	ADT
A	2	<30	<5,000
B	3	30	5,000-10,000
C	4	35	10,000-15,000
D	5	40	15,000-20,000
E	6	45+	20,000+

Road crossing difficulty is based on the number of lanes, speed limit and daily traffic volumes. For example a road that has 25,000ADT, 4 lanes and a posted speed limit of 40mph with no existing bike lane would get a E rating. A 5 lane with a speed limit of 40mph receives a D rating, however the 25,000ADT makes it a E rating because the most restrictive rating is applied (please refer to the chart above).

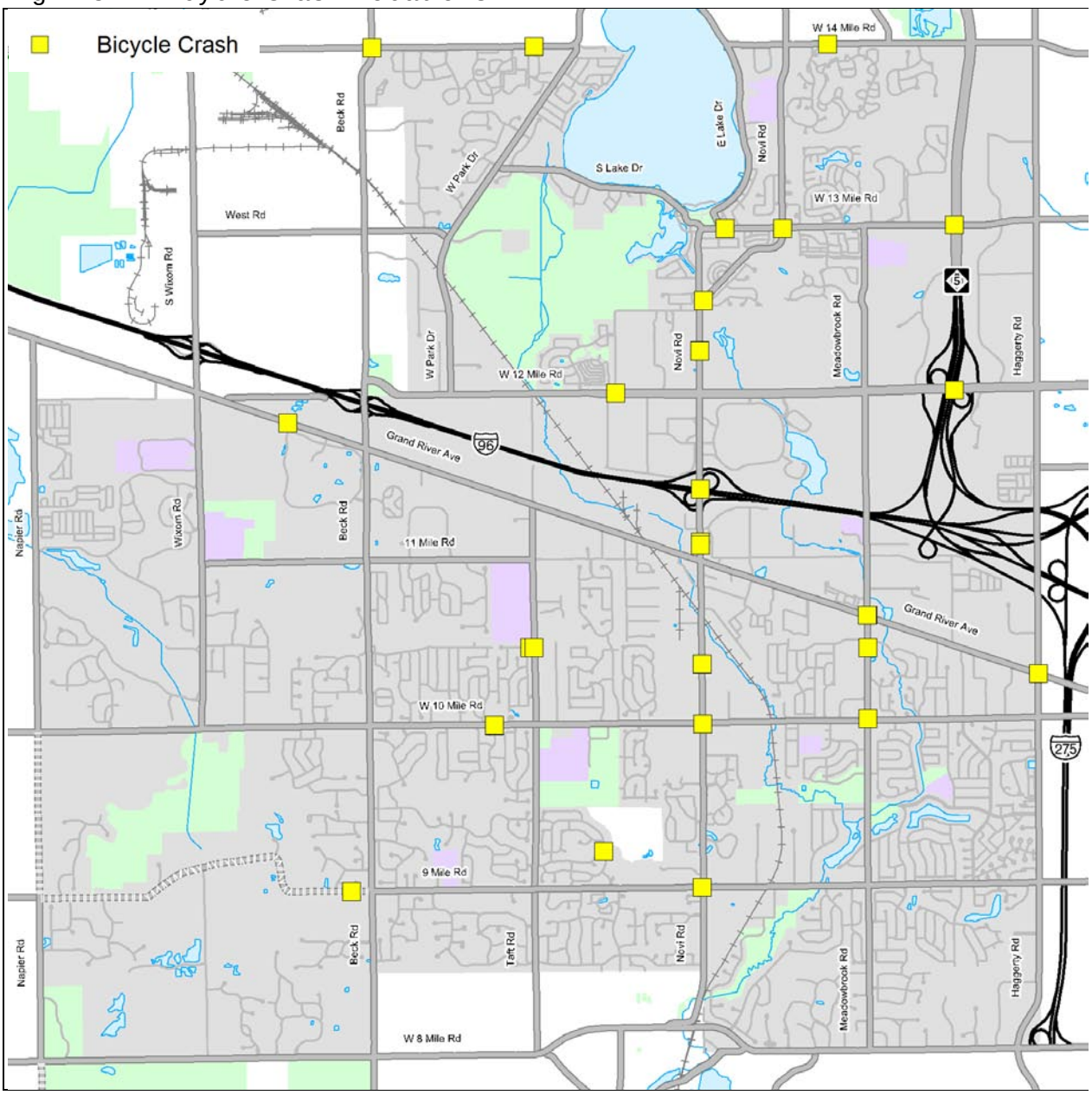
2.3 The Bicycling Environment

The approach to handling bicycles in the City is inconsistent and incomplete. Most of the efforts have been put toward the roadside pathways. There are a few short segments of existing bike lanes in the city. There is a one-way bike lane on South Lake Drive and a two-way bike lane on East Lake Drive with a short pathway connecting the two. There is also a bike lane on Taft Road south of 9 Mile Road. Currently the Pathways along the side of the arterial and collector roads function as the main bicycle facilities. However, this system is incomplete and many bicyclists may prefer to ride in the roadway when commuting across town. 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.

The following maps provide a general summary of the existing conditions in the City of Novi:

- Fig. 2.3A. Bicycle Crash Locations
- Fig. 2.3B. Bicycle Crash Data
- Fig. 2.3C. Sidepath Suitability
- Fig. 2.3D. In-Road Bicycling Quality Assessment

Fig. 2.3A. Bicycle Crash Locations



The crashes shown are from a five year period, 2004 – 2009.

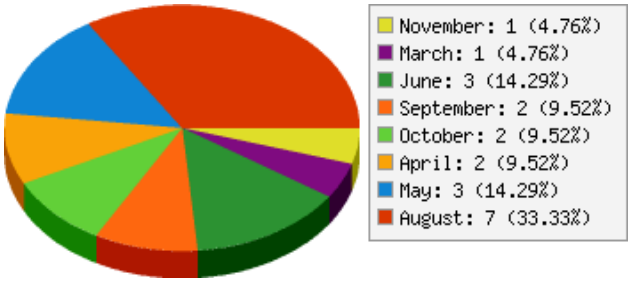
There were 31 bicycle involved crashes, none were fatal and six resulted in serious injury. Drinking or drug use was involved in 1 of the crashes. There was no traffic control at 38% of the crashes; a signal was present at 43% and a stop sign at 19% of the locations.

The Michigan Traffic Crash Fact website was the source of the data and charts.

Fig. 2.3B. Bicycle Crash Data

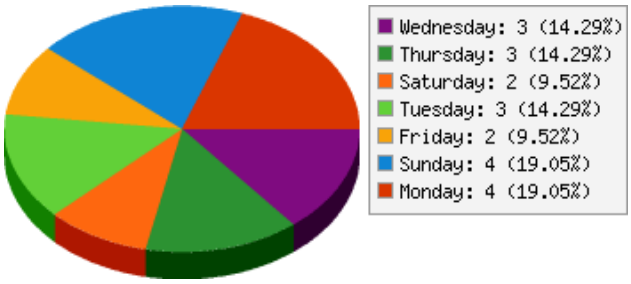
Month of Crash

There were no crashes during the months of December, January, February and March. This is likely due to fewer bicyclists during the winter months and that winter bicyclists are more experienced bicyclists.



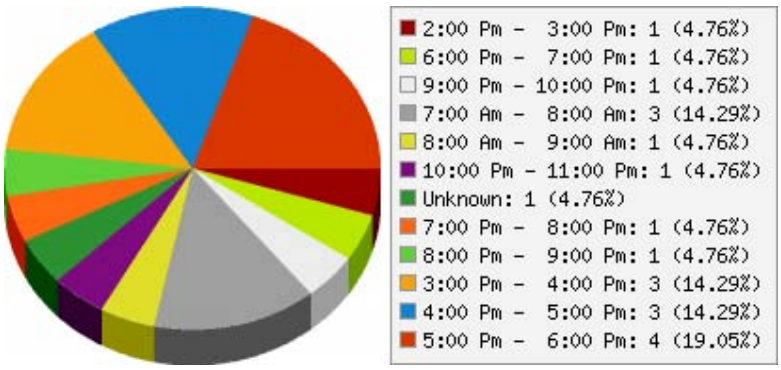
Day of Week

Crashes were evenly distributed throughout the week.



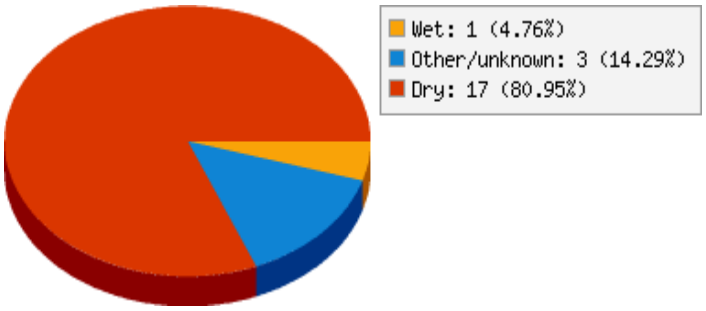
Time of Day

The crashes took place between 7:00 AM and 10 PM. 81% of the crashes took place in daylight, 5% at dusk and 10% took place when it was dark (9% were not coded).



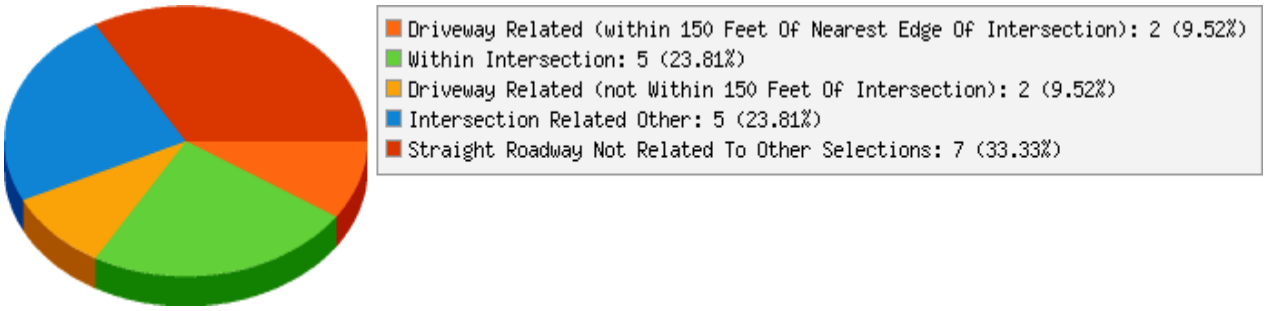
Road Conditions

The road was dry for 80% of the crashes.



Area of Road at Crash

67% of the crashes were related to a driveway or intersection.



Relation to Roadway

86% of the crashes took place in the roadway.

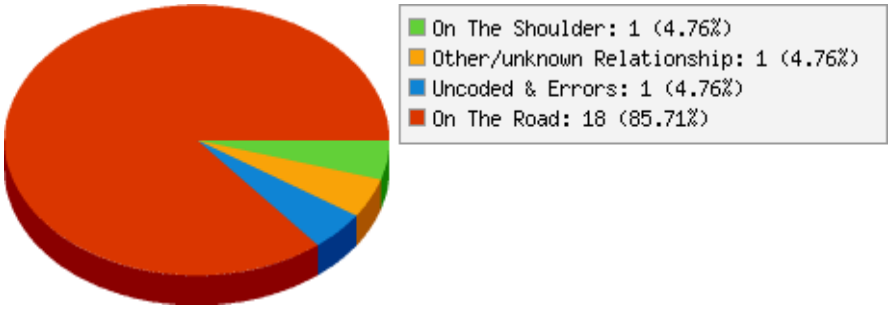
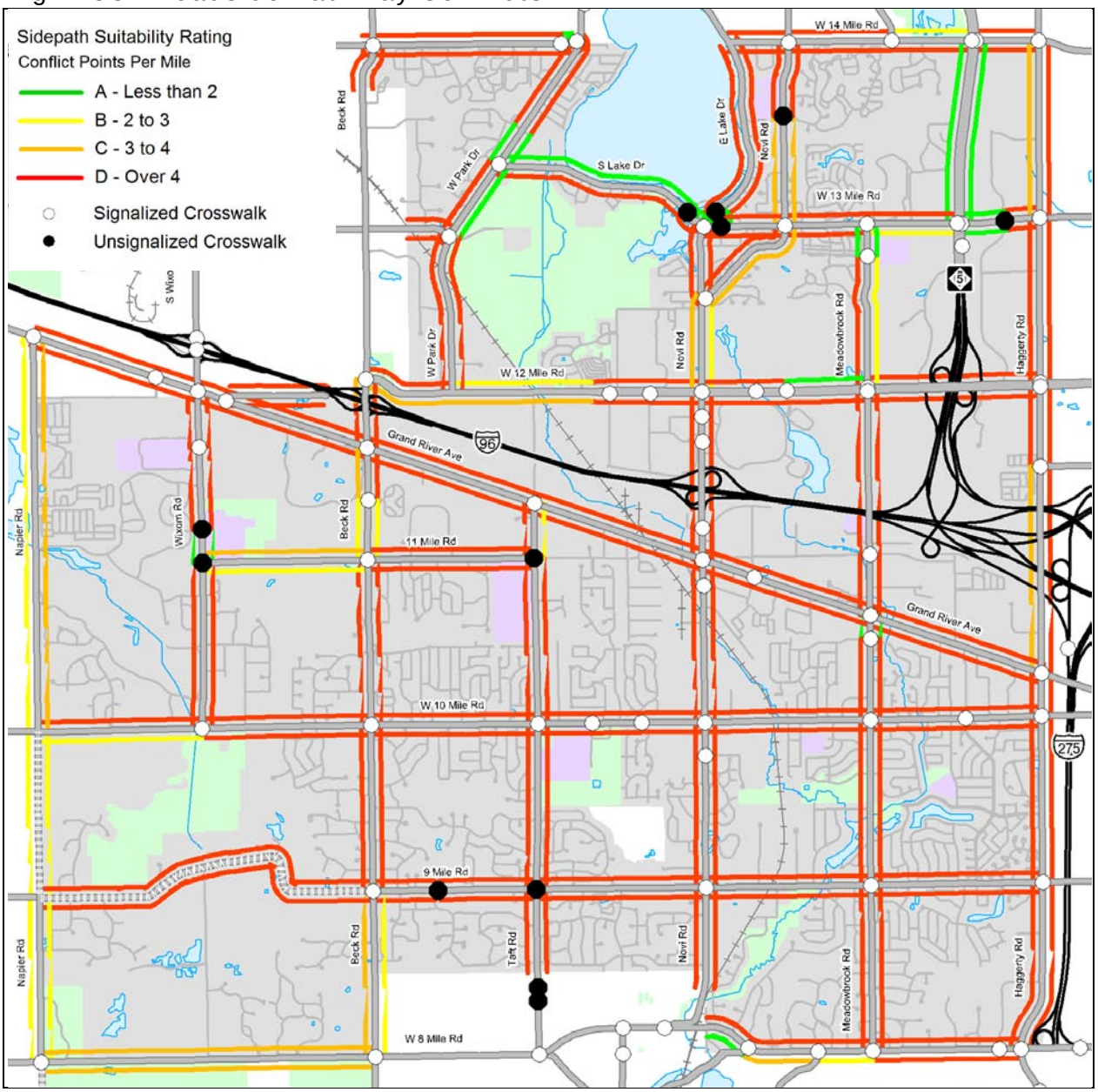


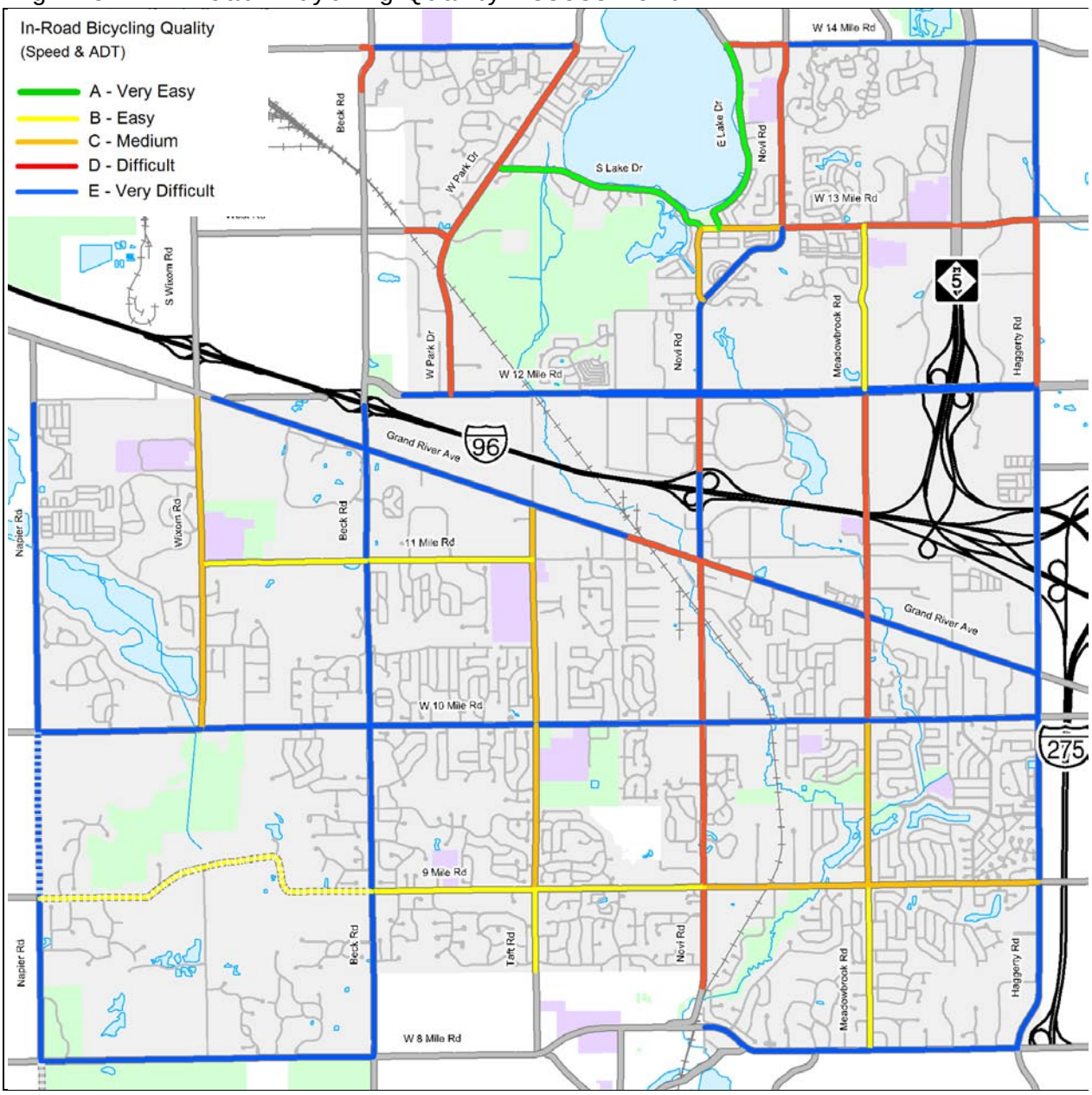
Fig. 2.3C. Roadside Pathway Conflicts



A conflict point is a local road or high traffic volume commercial driveway. For this analysis, each segment of sidewalk between two major roadways was given a rating from A to E based on the number of conflict points (see legend). Ten minor/residential driveways or one local road or high volume driveway was considered equal to one conflict point.

The AASHTO Guide for the Development of Bicycle Facilities generally considers sidewalks undesirable as shared-use paths. This is due to the inherent conflicts between bicycles and motorists where a pathway intersects with driveways and roads. Suitable sidepath locations are uninterrupted by driveways and roadways for long distances and provide safe and convenient road crossing opportunities to destinations on the other side of the road.

Fig. 2.3D. In-Road Bicycling Quality Assessment



In-road bicycling facilities improve the quality of the bicycling experience on busy roads. Quality of the in-road bike facilities is based on speed limit and daily traffic volumes. A road with an existing bike lane has a higher quality; however, there are few existing bike lanes in the city.

Without Bike Lane	With Bike Lane	ADT	Speed Limit
A	A	0 -5,000	25
B	A	5,000 – 10,000	30
C	B	10,000 – 15,000	35
D	C	15,000 – 20,000	40
E	C	20,000 – 25,000	45
E	D	Over 25,000	50

Quality of the in-road bike facilities is based on speed limit and daily traffic volumes. For example a road that has 12,000ADT and a posted speed limit of 40mph with no existing bike lane would get a D rating. An ADT of 12,000 puts the road in the C range, however the 40mph speed limit makes it a D rating because the most restrictive rating is applied (please refer to the chart above).

2.4 Projected Energy Savings

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 and public health benefits. The second goal is to reduce the number of Vehicle Miles Traveled (VMT) and the corresponding reduction in Green House Gas (GHG) emissions . This could include shifting trips from single occupancy motor vehicles to bicycling, walking or transit. 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[1]. 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.

Existing Commuter Mode-split

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

The mode-split is the overall proportion of trips made by a particular mode of travel. This information is generally determined by surveys or census data. When looking at how Novi compares to other cities between 40,000 and 60,000 in population, its pedestrian and bicycle commute numbers are the second lowest. The percent who commute by bike (0.4%) is the third highest of its peers. The percent who walk (0.5%) is the second lowest of its peers. These numbers can likely be attributed to the dispersed land uses in the city which make biking to work a more realistic option than walking to work.

It is likely as Novi continues to develop its commercial core into a more pedestrian friendly environment surrounded by higher density residential development, its percentage of non-motorized trips will rise if appropriate non-motorized linkages are established. As noted earlier, the greatest increase in non-motorized trips will likely come from bicyclists given the land use patterns in the City of Novi.

[1] 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.

Table 2.4A Commute to Work Comparison

Peer Michigan Communities 40,000 to 60,000

			% of Commuters Who:				Percent
Rank	Place	Pop.	Bike	Walk	Use Transit	Don't Drive	Households W/O Car
1	East Lansing	46,704	3.1	22.0	4.4	29.4	10.0
2	Muskegon	40,136	0.5	2.9	1.3	4.7	14.0
3	Battle Creek	53,251	0.2	2.1	1.7	4.1	11.9
4	Midland	41,663	0.4	1.9	0.6	2.8	5.9
5	Lincoln Park	40,008	0.2	1.6	0.8	2.6	8.5
6	Roseville	48,129	0.2	1.1	1.0	2.3	7.1
7	Redford	51,622	0.1	1.1	0.6	1.8	5.8
8	Dearborn Heights	58,264	0.1	1.1	0.4	1.6	6.8
9	Kentwood	45,239	0.1	0.7	0.6	1.4	5.0
10	Portage	44,926	0.1	0.8	0.3	1.3	4.3
11	Novi	47,459	0.2	0.5	0.3	1.0	2.8
12	Bloomfield Township	43,027	0.0	0.29	0.2	0.5	2.2
	Averages	**46,702**	**0.4**	**3.0**	**1.0**	**4.5**	**7.0**

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.

It should be noted that the inclusion of East Lansing in the table as a peer city is not really a fair comparison. University towns such as East Lansing have significantly higher rates of non-motorized trips than non-university town. It does though illustrate the potential of non-motorized transportation to accommodate a large percentage of trips when the physical, social and economic environments are such that bicycling and walking become natural choices.

Table 2.4B Existing to Proposed Condition Comparison

Existing Conditions			
	Primary Motorized Routes		
	Freeways	6	
	Principal Arterials	18	
	Minor Arterial	39	
	Collectors	11	
	Total	**74**	
	Primary Pedestrian Routes		
	Sidewalk / Roadside Path*	31	Total /2 (equivelent of sidewalk both sides)
	Off-Road Trails	2	
	Total	**33**	
	Primary Bicycle Routes		
	Bike Lanes	2	
	Bike Routes	0	
	Off-Road Trails	4	
	Total	**6**	
Proposed Conditions			
	Primary Pedestrian Routes		
	Sidewalk / Roadside Path*	21	Total /2 (equivelent of sidewalk both sides)
	Off-Road Trails	20	
		41	
	Primary Bicycle Routes		
	Bike Lanes	68	
	On-Road Bike Routes	36	
	Off-Road Trails	20	
		124	
Comparisons			
	Pedestrian		
	Existing Miles of Pedestrian Routes	45%	of Existing Miles of Motorized Routes
	Exist. + Prop. Miles of Ped. Routes	100%	of Existing Miles of Motorized Routes
	Exist. + Prop. Miles of Ped. Routes	224%	of Existing Miles of Pedestrian Routes
	Bicycle		
	Existing Miles of Bicycle Routes	8%	of Existing Miles of Motorized Routes
	Exist. + Prop. Miles of Bike Routes	176%	of Existing Miles of Motorized Routes
	Proposed Miles of Bicycle Routes	2167%	of Existing Miles of Bicycle Routes

Table 2.4C Estimated Trip and Greenhouse Gas Reduction

Vehicle Miles Traveled					
	City of Novi Population	52,231	City Estimate		
	Daily Trips per Person	4.03	2010 NHTS		
	Daily Total Number of Trips	210,491			
	Average Vehicle Trip Length	10.10	2010 NHTS		
	Daily Total Vehicle Miles Traveled	527,533			
Reduction in Vehicle Miles Traveled					
			Percent	**Reduction**	**VMT**
	Trip by Type	**Daily total**	**of Total**	**Goal**	**Reduction**
	To or From Work	82,823	16%	2%	1,656
	Work Related Business	15,826	3%	0%	-
	Shopping	103,924	20%	1%	1,039
	All Other Family & Peronsal Business	127,135	24%	2%	2,543
	School/Church	51,698	10%	2%	1,034
	Social and Recreational	140,324	27%	3%	4,210
	Other	4,220	1%	0%	-
		525,951	100%		10,482
	Reduction in Vehilce Miles Traveled	2.0%	Percent		
		10,482	Per Day		
		3,825,960	Per Year		
Projected CO2 Reductions					
	CO2 Emmission Factor	454	Grams Per Mile		
	Daily CO2 Reduction	4,758,866	Grams		
	Daily CO2 Reduction	5.25	Tons		
	Yearly CO2 Reduction	1,915	Tons		

3. Proposed Facilities

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 of any roadway modification and/or proposed bicycle or pedestrian facility.

Proposed Improvements Outside the City of Novi

On some of the illustrations, improvements are proposed for areas outside of the limits of the City of Novi. 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.

Some illustrations also show recommendations for improvements on roadways that are not under the jurisdiction of the City of Novi. Any modifications to roads owned by the state and managed by the Michigan Department of Transportation (MDOT), roads owned by the county road commissions, or privately-owned roads, must be coordinated with and approved by the appropriate agency. See Fig 2.1F Road Jurisdiction Map for road ownership.

Topics:

3.1 Non-Motorized Transportation Network

There is no such thing as a typical pedestrian or bicyclist. A single person's preferences for a walking or bicycle route may vary based on the type of trip. A person's daily commute route will likely favor directness of travel over a scenic route (but not always). An evening or weekend ride, walk or run for recreation and exercise will be based on an entirely different set of criteria. It will likely favor local roads and trails through parks and schools.

Individuals also vary greatly in their tolerance of traffic, hills, weather and numerous other factors. A child will likely choose to keep to local roadways on their way to school provided they have safe ways to cross busy streets. An adult who is just starting to bicycle again will likewise shy away from busy roadways, sticking to residential roads wherever possible. But an experienced bicyclist may choose the busy road for its directness of travel. The solution then is not one dimensional, but rather responds to the needs of the various users and trip types. By doing so the plan addresses the needs of the majority of the community's population, not simply a small interest group.

Bicycle and walking are not exclusive modes of travel either. Most bicycle trips will also include some time as pedestrian. Also, some bicycling and walking trips may be a part of a longer multi-modal journey. For example, someone may ride their bike to a bus and then walk from the bus to their final destination.

For all the reasons listed above, there needs to be a spectrum of non-motorized facilities available that gives the user the choice to choose the route that they feel most comfortable with. Off-road trails, neighborhood connector routes, sidewalk, roadside pathways and bike lanes are some of the most common facilities that make up the network.

The following illustrations demonstrate the different elements that go into creating a non-motorized network along with the proposed non-motorized transportation improvements:

- Overview Map (this is a large fold out map that may be found in the back cover of the report)
- Fig. 3.1A. Spectrum of Non-motorized Links
- Fig. 3.1A. Proposed Bicycle/Pedestrian Focused Corridors
- Fig. 3.1B. Introduction to Auto Focused Corridors
- Fig. 3.1C. Introduction to Road Corridor Types Overview
- Fig. 3.1D. Introduction to Neighborhood Connectors
- Fig. 3.1E. Introduction to Off-Road Trails
- Fig. 3.1F. Proposed Neighborhood Connectors and Trails
- Fig. 3.1G. Proposed Road Crossing Improvements
- Fig. 3.1H. Proposed Regional Trail Connections
- Fig. 3.1I. Proposed Regional Trail Connections (City of Novi)
- Fig. 3.1J. Proposed Sidewalk/Roadside Pathway Improvements

Fig. 3.1A. Spectrum of Non-motorized Routes

A non-motorized system is made up of a variety of routes that provide options for the user to choose their most comfortable route.

PRIMARY LINKS	NEIGHBORHOOD CONNECTORS	OFF-ROAD TRAILS
		
TYPICAL FACILITY TYPES:		
Complete Streets that may include the following: • Bike Lanes & Sidewalks • Sidepaths • Paved Shoulders • Shared-use Arrows • Road Crossing Improvements	Complete Streets that may include the following: • Guided Routes • Named Routes • Bike and Pedestrian Boulevards • Neighborhood Greenways • Crossing Improvements Where Neighborhood Connectors Intersect Primary Roadways	• Foot Trails • Soft-surfaced Trails • Hard-surfaced Trails • Road Crossing Improvements Where Trails Intersect Primary Roadways
CONTEXT AREAS:		
• Urban Suburban and Rural Primary Roads (Arterials and Collectors) • Urban and Suburban typically have bike lanes or shared use arrows paired with sidewalks or sidepaths • Rural typically has paved shoulders	• Urban and Suburban Local and Residential Roads • Connecting Pathways Through Neighborhood Parks and Schools • Provide alternative routes to busy Primary Links	• Major Parks • Waterfronts • Abandoned Rail Corridors • Active Rail Corridors • Transmission Corridors
PRIMARY TRIP TYPES:		
• Daily Transportation to Work and Personal Business	• Mix of Daily Transportation, Safe Routes to School and Close to Home Recreation	• Use Depends on Location • Recreation Destination
TRIP CHARACTERISTCS:		
• Users Typically Segregated Into Mode Specific Facilities Such as Sidewalks and Bike Lanes • Exposure to High Speed and High Volumes of Motorized Vehicle Traffic • Just as Direct a Path of Travel as Using a Motor Vehicle	• More of a Shared Space, Sidewalks May or May Not Be Present • Moderate Exposure to Low Speed and Low Volumes of Motorized Vehicle Traffic • In Some Cases Trips Via Neighborhood Connectors May Be Longer Than the Same Trip Via Complete Streets	• Non-motorized Users Separated from Motorized Vehicle Traffic • Minimal Exposure to Motorized Traffic at Roadway Crossings • Directness of Travel Depends on the Route and What Resources It Connects

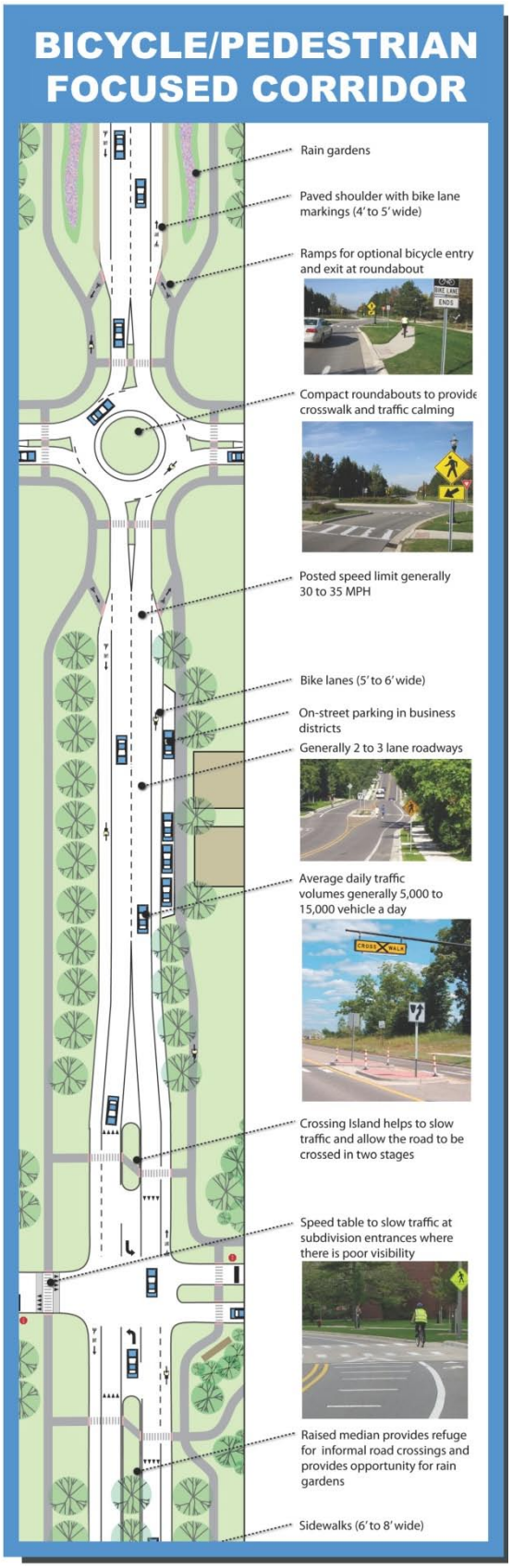
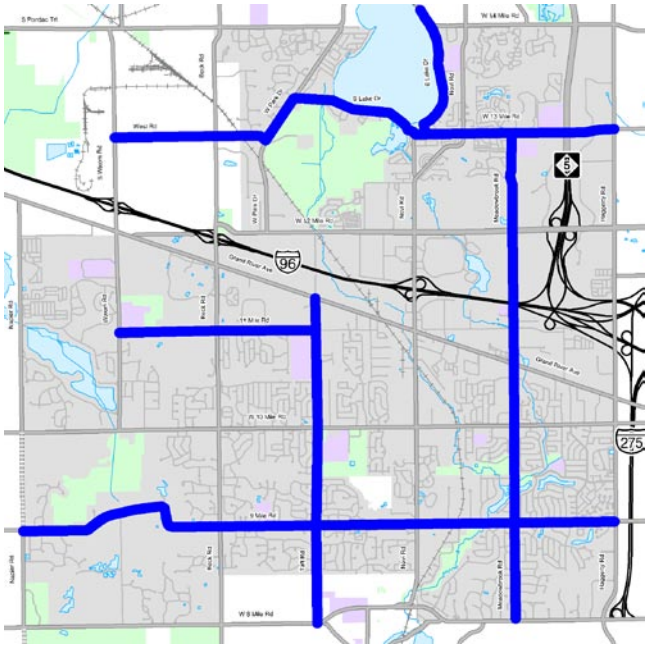


Fig. 3.1B. Primary Links, Bicycle/Pedestrian Focused Corridors

Bicycle/Pedestrian Corridors include:

- E Lake Drive
- S Lake Drive
- W 13 Mile Road
- W Park Drive (Segment)
- West Road
- Meadowbrook Road
- Taft Road
- 11 Mile Road
- W 9 Mile Road



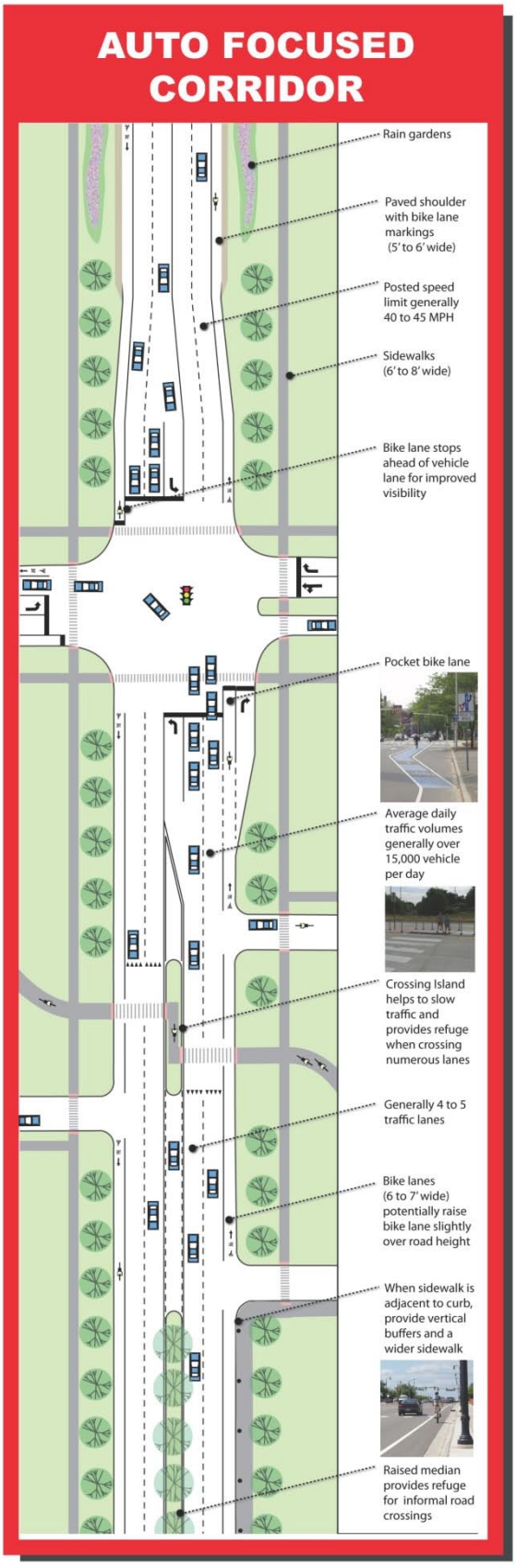


Fig. 3.1C. Primary Links, Auto Focused Corridors

Auto Focused Corridors include:

- Beck Road
- Novi Road
- Haggerty Road
- W 12 Mile Road
- Grand River Avenue
- W 8 Mile Road

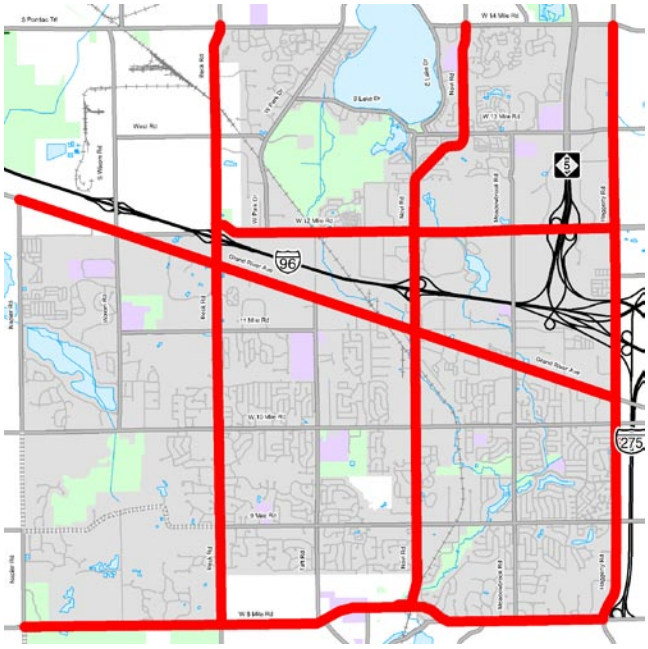
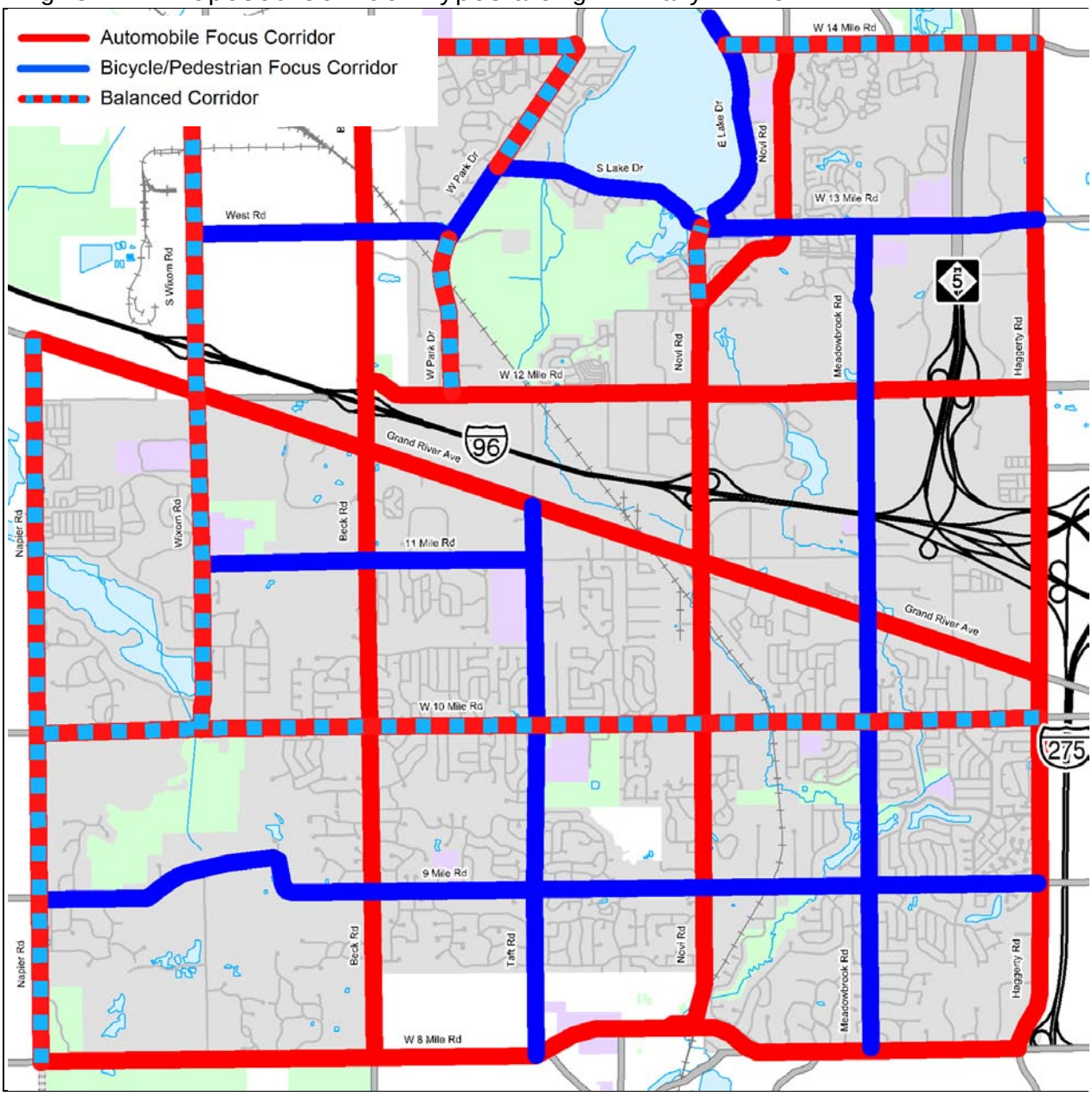


Fig. 3.1D. Proposed Corridor Types along Primary Links



Due to the existing road cross section it is going to be difficult to implement bike lanes in the near term, without paving a shoulder or moving a curb. However, when a road is reconstructed or other opportunities arise, bike lanes and sidewalks should be added to the roadway. Based on public input and existing conditions, this map illustrates the proposed corridor type for each major roadway.

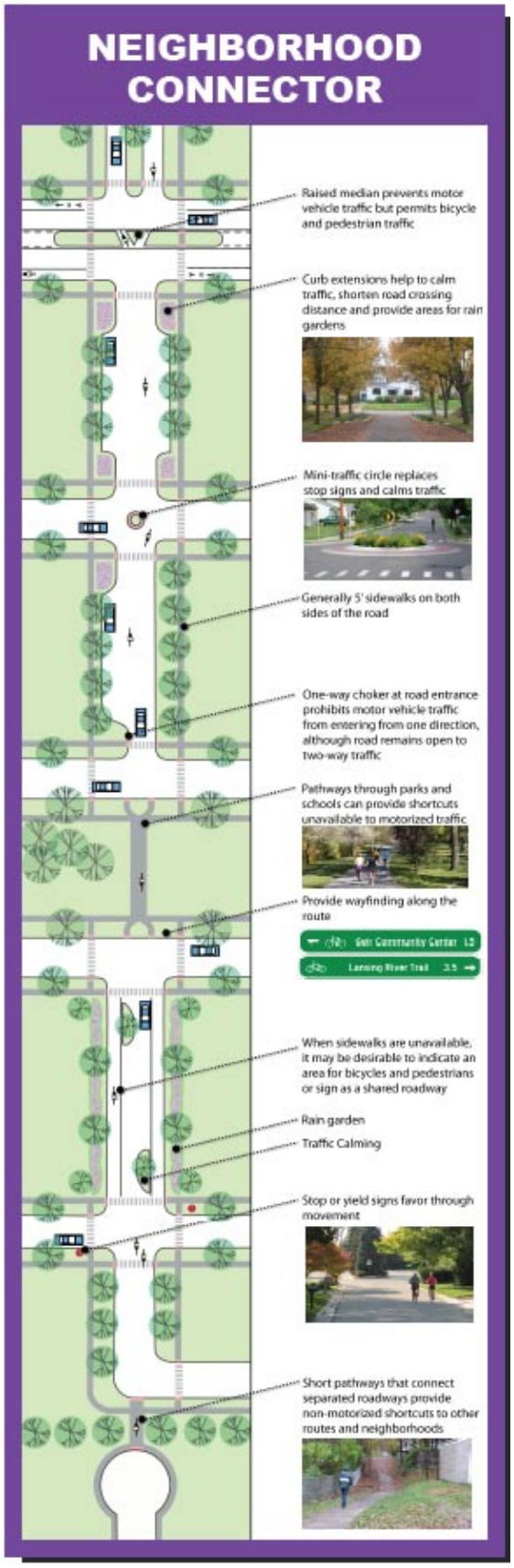


Fig. 3.1E. Neighborhood Connector

Neighborhood connector routes are primarily located on low speed, low traffic volume local roads and connecting pathways. They link neighborhoods to parks, schools and downtowns. Signs provide wayfinding by noting direction and distance to key destinations. Elements such as traffic calming, public art, rain gardens and historic features can be added to enhance the routes.

The local roads in the City of Novi provide great opportunities for neighborhood connector routes, especially for people who prefer to not be along a major arterial or collector road. By incorporating short connecting pathways through schools, parks, and between neighborhoods a tighter network is produced, making it easier for bicyclists and pedestrians to travel through the city.

The connecting pathways are the most critical links in the system, but can also be the hardest to obtain, especially if they pass through private property. It is important to work with the private land owners to obtain easements through these areas.

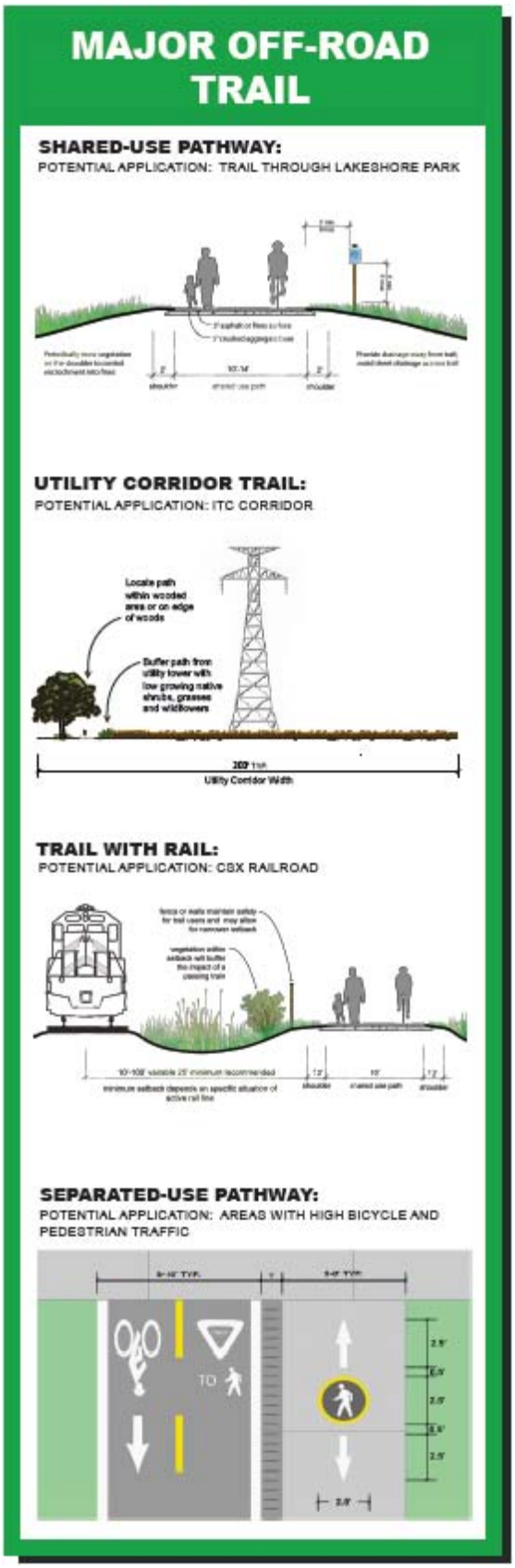


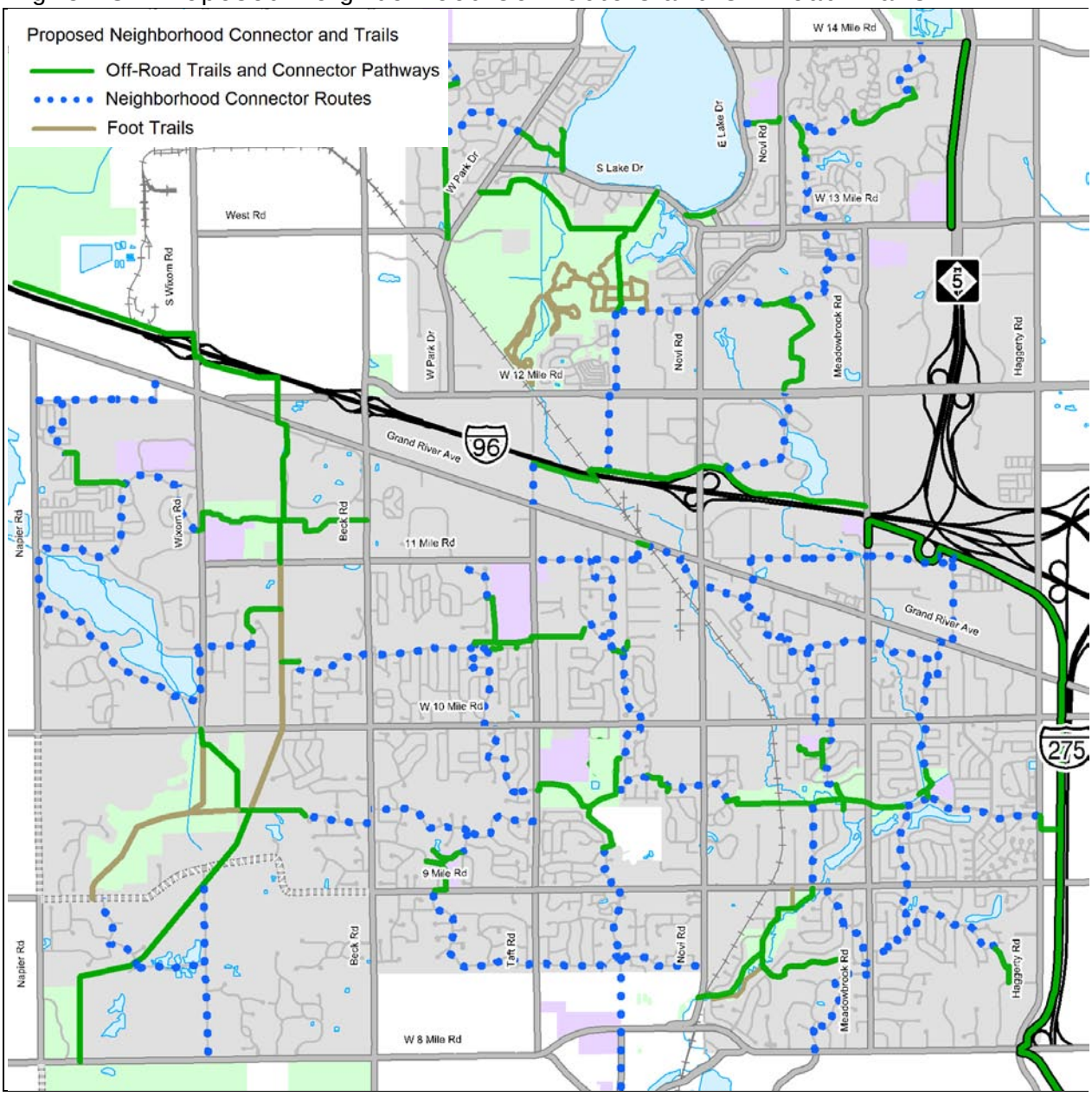
Fig. 3.1F. Major Off-Road Trail

Off-road trails are generally very desirable because they are separated from motorized vehicle traffic. However, they are opportunity based and unless there is an abandoned rail corridor, existing right-of-way or utility corridor they can be difficult to incorporate into a community.

The City currently has two existing off-road trails, the M-5 Metro Trail and the I-275 Metro Trail. The City also has a few opportunities to develop off-road trails within the city. They include the following:

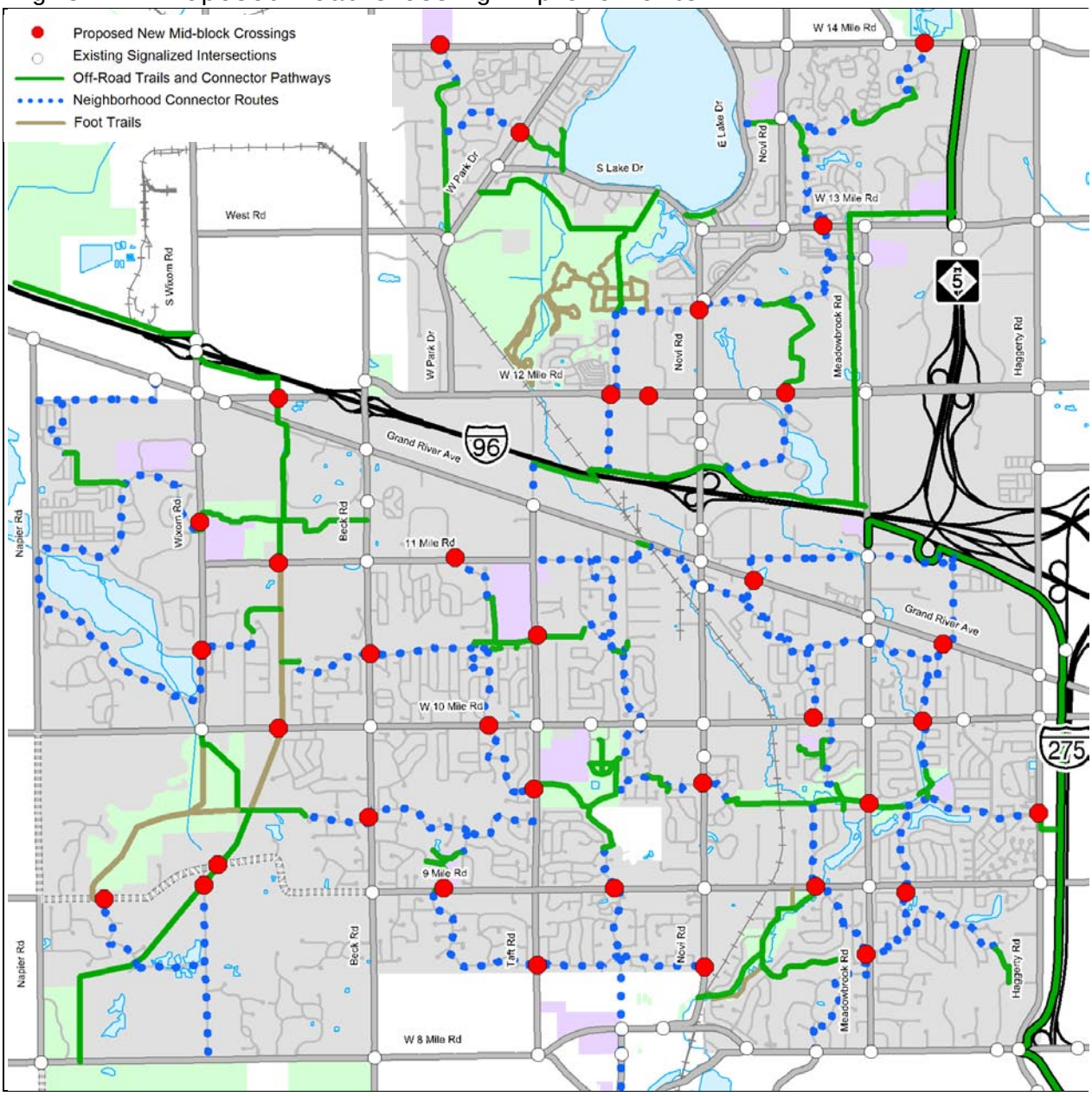
- ITC Corridor
- CSX Railroad Corridor
- I-96 Expressway Right-of-way
- City Owned Parks (e.g. Lakeshore Park, ITC Sports Center & Core Habitat Area)

Fig. 3.1G. Proposed Neighborhood Connectors and Off-Road Trails



The neighborhood connector routes and trails provide connectivity between destinations around the city for bicyclists who would not be comfortable bicycling on the primary road system, even if bicycle lanes were present.

Fig. 3.1H. Proposed Road Crossing Improvements



Road Crossing Improvements are needed in areas where there is a high demand to cross. These areas occur where a bike route crosses a collector or arterial road, a major bus stop or bus shelter is present, there is a long distance between crosswalks, or there is a high demand based on land use and population density. This map illustrates where mid-block crossing improvements are needed. Please note that these are initial recommendations and they need to be study further prior to implementation.

Fig. 3.1l. Proposed Regional Trail Connections

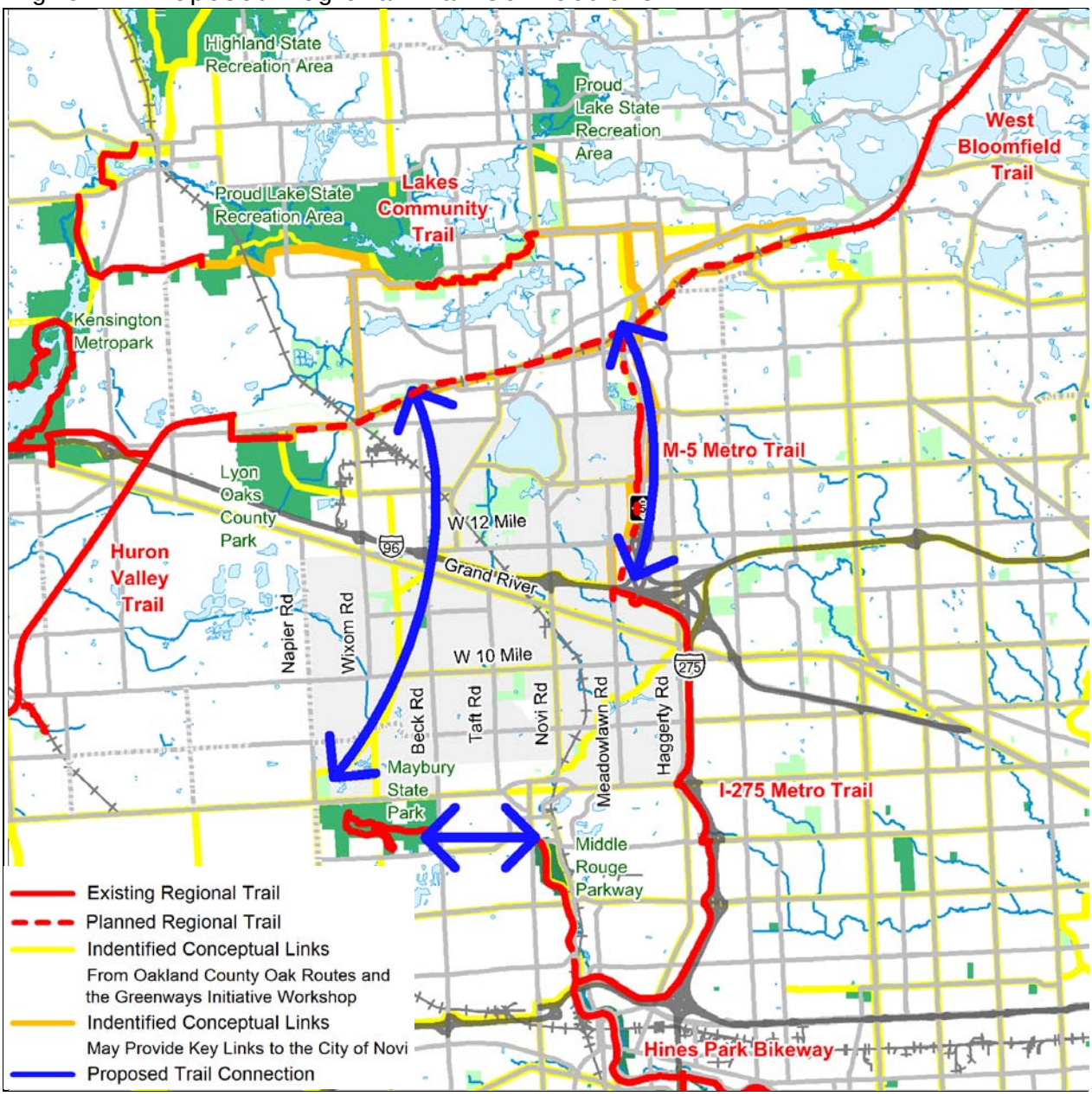
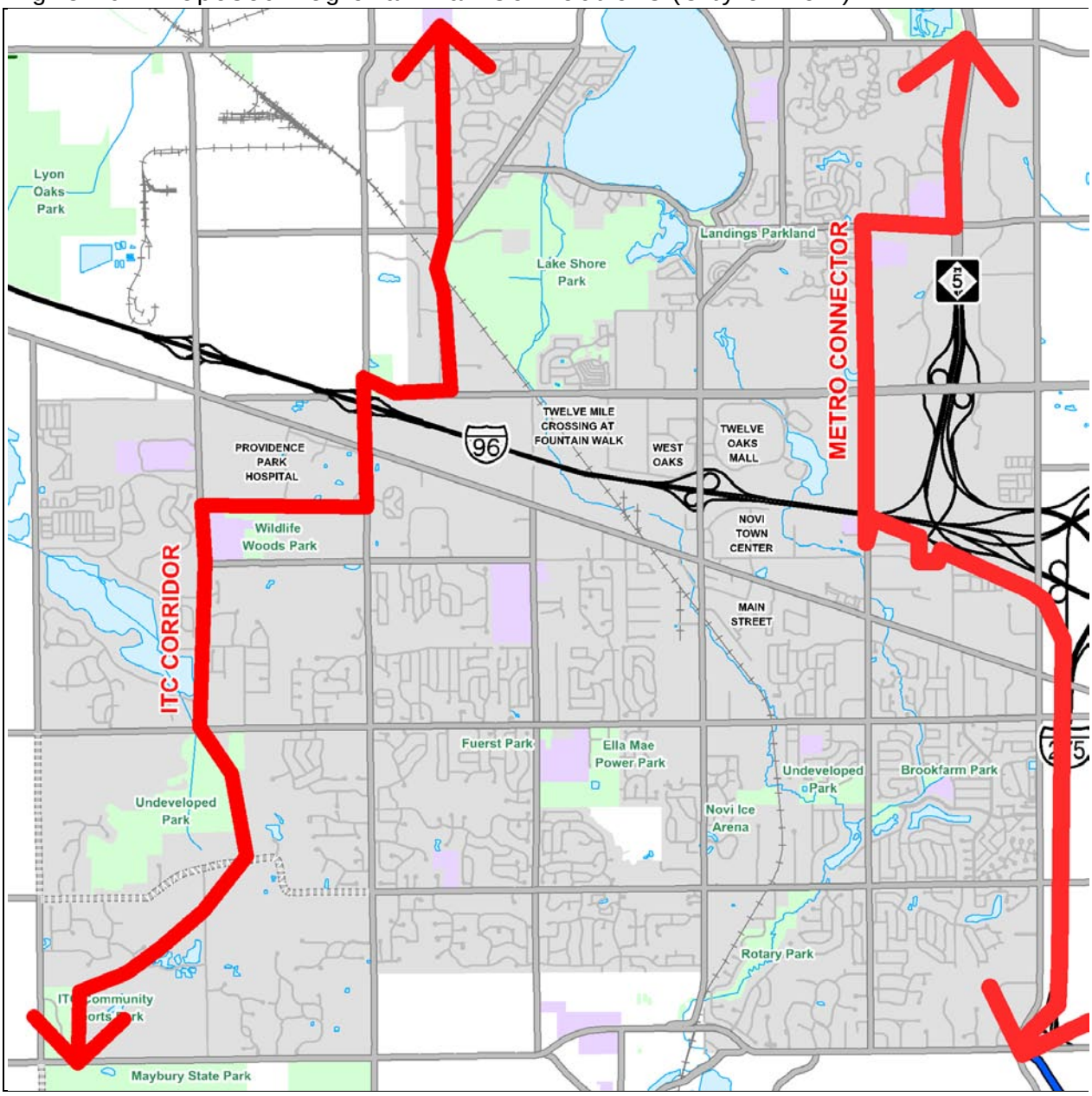
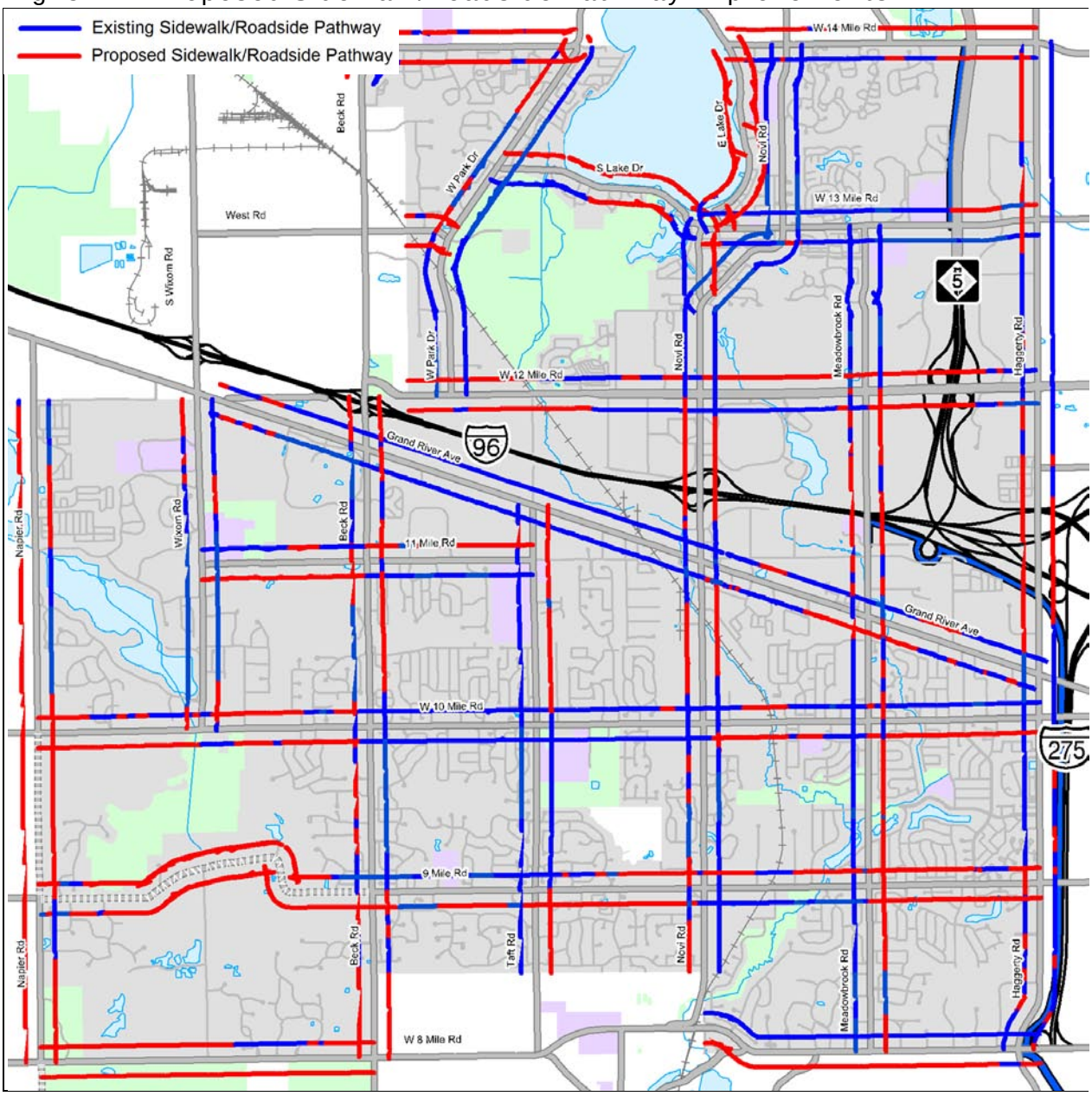


Fig. 3.1J. Proposed Regional Trail Connections (City of Novi)



The proposed ITC Corridor and Metro Connector provide two major regional connections across the City of Novi. The Metro Connector route would consist of a roadside pathway along Meadowbrook Road and 13 Mile. The ITC Corridor is a combination of off-road trails and roadside pathways.

Fig. 3.1K. Proposed Sidewalk/Roadside Pathway Improvements



Ideally, all roads should have sidewalks on both sides of the street. The city currently has 5' sidewalks and 8' roadside pathways. In the future, it would be ideal for sidewalks along major collector and arterial roads to have a minimum width of 6' with a buffer zone and vertical elements such as trees between the sidewalk and road.

3.2 Implementation Plan

The proposed improvements fall into five tasks. The first task is Initial Investments. This task includes project that should be done immediately because they complete critical gaps and address safety concerns.

Initial Investments

- Mostly locally funded project
- Addresses critical gaps in the system
- Addresses safety concerns

After the Initial Investments are completed, the following four tasks should be implemented concurrently as opportunities and funding become available. The four parallel tasks include, Major Corridor Development, Neighborhood Connectors, Sidewalk Gaps, and Construction Integration. Major Corridor Development includes systematic projects that are capital intensive and are of a regional and/or cross community/county significance. Neighborhood Connectors, and Sidewalk Gaps are projects of a local significance that may or may not be as capital intensive and may have some near-term and mid-term solutions. Construction Integration projects include projects that will probably not be done on their own, but will be integrated as part of a larger construction project.

Major Corridor Development

- Cross city bike/pedestrian focused corridors most of which have either regional significance or are important to neighboring communities as well
- High capital investment projects likely supported by federal and state grants
- Generally involve multiple agencies

Neighborhood Connectors

- Locally funded projects
- Low capital investment projects
- Intra-city network oriented

Sidewalk Gaps

- Locally funded projects
- Prioritized to have the most impact for the investment and to respond to public demand
- Extension of the city's current sidewalk prioritization process

Construction Integration

- Projects that can be integrated as part of a larger construction project, such as bike lanes when a road is resurfaced

Some of the improvements include relatively modest changes such as road conversions and signage and others may take longer based on opportunities and available funding. Each task may take multiple years to implement. The speed of the implementation depends on the amount of money the city dedicates to the implementation along with the success of obtaining outside funding.

These tasks were determined based on public input, existing conditions, existing sidewalk and pathway prioritization plan, regional trail plans, geographic distribution and desire to create key cross-community connections. A relative demand analysis was also done to help identify areas where there is the most potential for non-motorized activity.

Cost Estimate Introduction

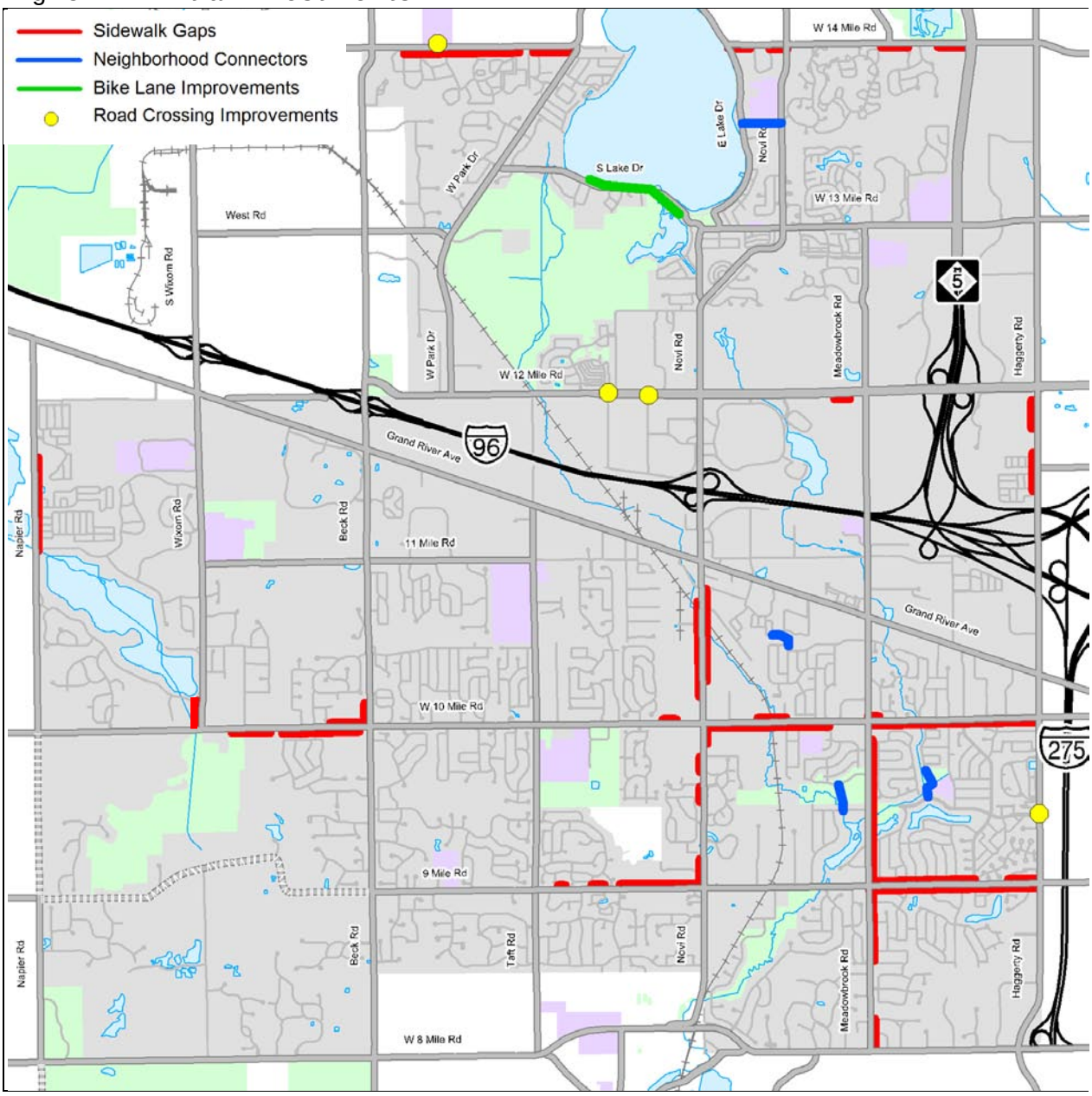
In order to illustrate magnitude of costs and begin planning and budgeting for implementation, planning level cost estimates have been completed for the improvements proposed in the Initial Improvements category as well as the top 3 Major Corridor Development projects. In addition, cost estimates for a handful of "typical" treatments have been developed so that staff can consider these treatments in other areas of the City if so desired.

It should be noted that these estimates are based on concepts only, and while they include healthy (20%) contingencies, they are not based on detailed designs. Quantities were derived from GIS data and aerial imagery. If the City moves forward with implementation, detailed design will be completed and construction cost estimates recalculated at that time.

Acquiring Right –of-Way

Please note that acquiring easements and right-of-way will add to the financial burden of implementation, and can sometimes be as much as the project cost itself. Please refer to the appendix for a detailed breakdown of the cost estimate for the initial investments and top three major corridors where easement issues are reflected.

Fig. 3.2A. Initial Investments



This task focuses on the top sidewalk and pathway gaps and other critical links and safety concerns.

Initial Investments

Complete Sidewalk Gaps
The City of Novi has an existing sidewalk and pathway prioritization process that prioritizes all of the sidewalk gaps in the city. The initial investments include the top 20 sidewalk gaps that are listed in this report.

In addition to the cities top 20 gap improvements the following additional sidewalk gap improvements should be made to help establish long segments of sidewalk and to connect isolated neighborhoods to the system:

- 14 mile between Novi Road and M-5 Trail
- Napier Road build sidewalk on the east side of street between Old Dutch Farms Motor Home Park and Island Lake
- 12 mile on the south side of the street build missing sidewalk gap just to the west of Meadowbrook
- Wixom Road on the west side between 10 Mile Road and Island Lake

Safety Concerns
Road Crossing improvements are needed where there are existing signals with no pedestrian crossing.

- The half-signals along the boulevard portion of 12 Mile Road west of Novi Road
- The intersection of Haggerty and Village Wood Drive
- South Pontiac Trail at Geisler Middle School

The other safety concern that will be addressed is modifying the bicycle and pedestrian pavement markings on South Lake Drive. The existing one-way bike lane on a two-way road presents safety concerns because bicyclists tend to travel the wrong direction in the bike lane, riding against the flow of traffic. There is also a significant amount of pedestrian traffic that uses the shoulder. To address this situation, the paved shoulder will be designated for pedestrian use. Bicyclists will be encouraged to ride in the road with the flow of traffic through the use of Shared-Use Arrows and Share the Road Signage.

Critical Links
Short connecting pathways are important to help link people to nearby neighborhoods, parks and schools. The following short connector pathways should be constructed. Please note that easements may need to be obtained across school property and where conservation easements are located. Each has been labeled as Neighborhood Connector (NC) 1 through 4 to correspond with the cost estimates.

- Link through Hickory Woods Elementary between Novi Road and E. Lake Drive (NC-1). Please note that this segment follows the existing right-of-way and would require access across the school property.
- Link connecting the neighborhood to the north through Brookfarm Park to Brookfarm Elementary (NC-2). Please note that this route would utilize the existing bridge over the creek between Brookfarm Park and Brookfarm Elementary and would connect to the existing walkway at Brookfarm Elementary.
- Link through Undeveloped Park near Meadowbrook Road and Malott Drive connecting the neighborhood to the north to the neighborhood to the south (NC-3). Please note that there is a conservation easement in this park.

- Link connecting subdivision to residential development west of Meadowbrook between 10 Mile Road and Grand River Avenue (NC-4). Please note that there is an existing connection between these neighborhoods, however the city would need to gain access through the private development.

Initial Investments Costs Estimates

Planning level cost estimates for the "Initial Investments" category are summarized in the following table. Details of each estimate can be found in the appendices. Costs are associated with each Segment ID (previously assigned by the City). These are estimates that primarily focus on sidewalk gaps as well as 4 neighborhood connectors identified as priorities during the planning process. Each estimate includes:

- 5% for mobilization
- 20% contingency
- 25% professional fees (design, legal, construction administration)
- For those segments where easements are anticipated in order to construct, an approximate easement size, in square feet, is estimated (included in the appendices). The cost associated with easements will likely differ in each case but must be considered as it will impact the final cost.

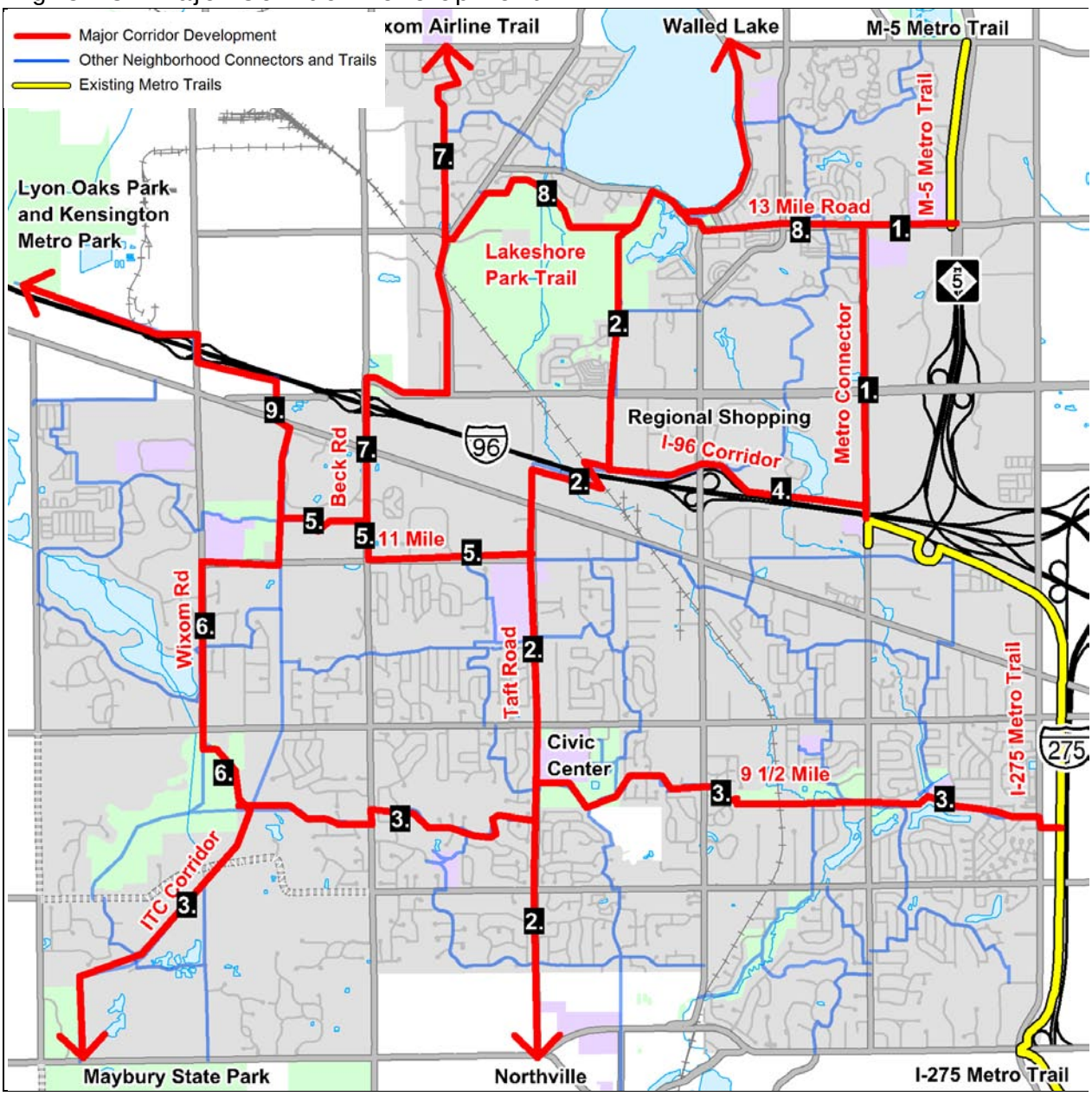
As is depicted in Figure 3.2B., there are 22 sidewalk/path segments included in the Initial Investment Phase with an estimated design and construction cost of $4.85 million. In addition, there are 4 Neighborhood Connector segments proposed in the Initial Investment phase with an estimated design and construction cost of $260,000.

TOTAL INITIAL INVESTMENTS COST ESTIMATE = $5.11 million in addition to the cost of easements

Fig. 3.2B. Initial Investments Cost Estimate Summary

Segment	Priority	Location Description			Cost Estimate
121	19	Nine Mile	South	Between Haggerty and Meadowbrook	$434,224.61
119	13	Meadowbrook	East	Between Eight Mile and Nine Mile	$345,250.78
83	1	Nine Mile	North	Between Haggerty and Meadowbrook	$301,787.50
84	20	Meadowbrook	East	Between Nine and Ten Mile	$673,261.72
81	6	Ten Mile	South	Between Haggerty and Meadowbrook	$503,029.30
80B	10	Ten Mile	North	East of Meadowbrook	$13,681.64
90	8	Ten Mile	South	Between Meadowbrook and Novi Rd	$450,487.11
89	11	Novi Rd	East	Between Ten Mile and Ice Arena	$139,187.50
92	5	Novi Rd	West	Between Nine and Ten Mile	$238,716.80
93	12	Nine Mile	North	Between Novi and Taft	$155,636.72
62	14	Ten Mile	North	Between Novi and Taft	$83,462.89
25	90	Haggerty Rd	West	Between Twelve Mile and I-696	$143,472.66
129	50	Fourteen Mile	South	Between two subdivisions	$97,960.94
1b	71	Fourteen Mile	South	Just west of M-5	$67,171.88
4	39	Fourteen Mile	South	Just west of Novi Rd	$15,052.73
5	54	Fourteen Mile	South	Just east of East Lake Dr	$37,841.80
9	9	Pontiac Trail	South	West of West Park Dr	$272,068.36
55	15	Beck Rd	West	Just north of Ten Mile	$66,323.83
54	15	Ten Mile	North	Just west of Beck	$92,660.16
99	17	Ten Mile	South	Between Beck and Wixom Rd	$304,843.36
44	78	Napier Rd	East	Between Twelve Mile and Island Lake Dr	$379,062.11
48		Wixom Rd	West	Between Ten Mile and Island Lake	$37,585.55
				TOTAL SIDEWALK/PATH GAPS	$4,852,769.92
Neighborhood Connectors					
	NC 1	East Lake Dr to Novi Rd			$68,667.97
	NC 2	Brookfarm Park			$30,214.84
	NC 3	West of Meadowbrook between Nine Mile and Ten Mile			$111,816.02
	NC 4	West of Meadowbrook between 10 Mile and Grand River			$49,321.88
				TOTAL NEIGHBORHOOD CONNECTORS	$260,020.70
				TOTAL INITIAL INVESTMENTS	**$5,112,790.63**

Fig. 3.2C. Major Corridor Development



Major regional, city and countywide connections across the city that provide a backbone to the non-mototrized system.

Major Corridor Development

The following improvements are listed in order of implementation. The order of implementation was developed based on public input, near-term opportunities, demand and where the majority of the population would be served. If opportunities arise for projects lower on the list those project should be completed first.

1) Metro Connector

Provide connection between the existing I-275 Metro Trail and existing M-5 Trail.

- Extend I-275 Metro Trail south (using 10' wide asphalt) to Bridge Street and provide crossing island on Meadowbrook Road
- Complete the gaps in the 8' wide concrete pathway along the west side of Meadowbrook Road between 11 Mile and 13 Mile Roads
- Construct 10' wide asphalt path along the north side of 13 Mile Road between Meadowbrook and the M-5 Metro Trail
- Narrow the travel lanes to 11', pave 5-6' shoulder, and strip for bike lanes on Meadowbrook Road between 11 and 12 Mile Roads
- Improve pedestrian crossing at 12 Mile and Meadowbrook Road intersection
- Provide wayfinding signage to direct users from the M-5 Metro Trail to the I-275 Trail

2) Taft Road Corridor

Provide connection along Taft Road Corridor connecting to Northville to the south and Walled Lake to the north.

- Completion of the sidewalk/path system
- Addition of bike lanes along Taft Road by paving 5-6' wide shoulders and striping/signing
- Improve the following intersections to provide for safe crossings and room for bike lanes. Refer to section 5.4 Subdivision Entrances for more details.
    - Galaway Drive – Subdivision Intersection Design (Figure 5.4AB)
    - Princeton/Byrne – Mid-Block Crossing and Rectangular Rapid Flash Beacon
    - Dunbarton Dr – Subdivision Intersection Design (Figure 5.4AB)
    - White Pine Dr –Subdivision Compact Roundabout (Figure 5.4AD)
    - Addington Lane – Subdivision T-Intersection Design (Figure 5.4AC)
    - Novi High School Entrances – Subdivision T-Intersection Design (Figure 5.4AC)
    - Dover Blvd – Subdivision T-Intersection Design (Figure 5.4AC)
    - Emerald Forest Blvd – Subdivision T-Intersection Design (Figure 5.4AC)
    - Jacob Drive - Subdivision T-Intersection Design (Figure 5.4AC)
    - Entrances to Novi Woods Elementary, Meadows School, and Parkview Elementary – Subdivision T-Intersection Design (Figure 5.4AC)
- Construct 10' wide asphalt trail along Taft Road north of Grand River Avenue

- Construct 10' wide asphalt trail along south side of I-96 corridor, utilize the existing CSX underpass to get under I-96, cross over the CSX railroad, and continue the trail along the north side of I-96 along the ITC property connecting to Fountain Walk Drive
- Extend sidewalk south along Cabaret Drive to connect into proposed trail
- Provide on-street bike route on Cabaret Drive and Dixon Road
- Include a Pedestrian Hybrid Beacon (HAWK) at 12 Mile Road/Cabaret Drive Intersection
- Construct 10' wide asphalt trail through Lakeshore Park to connect to Lakeshore Drive (remain on high ground and avoid existing mountain bike trails as much as possible)
- Include wayfinding signage along route to direct users

Crossing I-96 at the Railroad tunnel may present some challenges. If that is the case evaluate providing a separate non-motorized crossing at Taft Road and the I-96 expressway.

3) 9 ½ Mile Neighborhood Greenway

Provide a connection that parallels 9 and 10 Mile Road along the local roadways using short connecting pathways through schools, parks and undeveloped open space.

- Include road crossing improvements where the proposed route crosses a collector or arterial street including:
  - Novi Road –Compact Roundabout (Figure 5.4AD)
  - Meadowbrook Road – Crossing Island
  - Taft Road - Compact Roundabout (Figure 5.4AD) (also included in Taft Road Corridor Project)
  - Beck Road - Subdivision T-Intersection Design (Figure 5.4AC)
- Provide crossing of railroad near Novi Ice Arena. If crossing is unattainable, provide alternate route on 10 Mile Road by completing sidewalk gaps and providing at-grade railroad crossing..
- Obtain easements and build short connector pathways (10' wide asphalt)
- Provide traffic calming techniques on local neighborhood streets
- Construct the south extension ITC Corridor Trail connecting 9 ½ Mile Neighborhood Greenway South to ITC Park and Maybury State Park
- Include wayfinding signage along route to direct users

4) I-96 Corridor

Provide a connection that parallels 9 and 10 Mile Road along the local roadways using short connecting pathways through schools, parks and undeveloped open space.

- Build trail along north side of I-96 Expressway utilizing MDOT and ITC property
- Provide trail crossing at Novi Road by improving existing intersection
- Work with the adjacent landowners to provide access from the trail to the shopping centers

<u>Long-term:</u>

- Provide trail crossing on Meadowbrook Road when sidewalk gaps along the west side of the road are complete

5) 11 Mile/Beck Road/Providence Park Hospital/ Wild Woods Park

11 Mile Road:

- Complete Sidewalk and Pathway Gaps along 11 Mile Road
- Provide Mid-block Crossings on 11 Mile Road where proposed neighborhood connector route intersection with 11 Mile Road
- Add Shared-use arrows on 11 Mile Road in the near-term until the shoulders are paved and bike lanes can be included

Beck Road:

- Complete Sidewalk and Pathway Gaps along roadway
- Provide Mid-block Crossings

Providence Park Hospital

- Obtain easements to construct pathway between Wixom Road and Beck Road

6) Wixom Road/Undeveloped Park

Wixom Road:

- Complete Sidewalk and Pathway Gaps along roadway
- Provide Mid-block Crossings

7) Beck Road/W 12 Mile Road/W Park Dr/Off-road Trail

Beck Road

- Complete Sidewalk and Pathway Gaps on west side of road
- Add sidewalks to both sides of I-96 overpass (see example image)
- Improve road crossing at Beck Road and W 12 Mile

12 Mile Road

- Complete Sidewalk and Pathway Gaps along north side of W 12 Mile Road

W Park Dr Off-road Trail Extension

- Improve road crossing at W Park Dr and West Blvd
- Building 10’ shares use path along city owned property north of West Blvd
- Provide bike route along Portside Dr to connect trail to S Pontiac Trl

8) Lakeshore Park/13 Mile Road

Lakeshore Park

- Add 10’ shared use path along north side of Lakeshore Park

W 13 Mile Road Corridor

- Complete Sidewalk and Pathway Gaps
- Add Bike Lanes to W 13 Mile Road through road conversions and paving the shoulders

9) ITC Corridor– North Extension

- Obtain easement and construct off-road trail along ITC corridor
- Obtain easement to construct off-road trail along the west edge of Providence Park Hospital where ITC property stops
- Improve road crossing on Grand River Ave
- Work with Wixom to continue trail extension northwest through the Beck Road/I-96 Interchange and over to Lyon Oaks Park (see example)

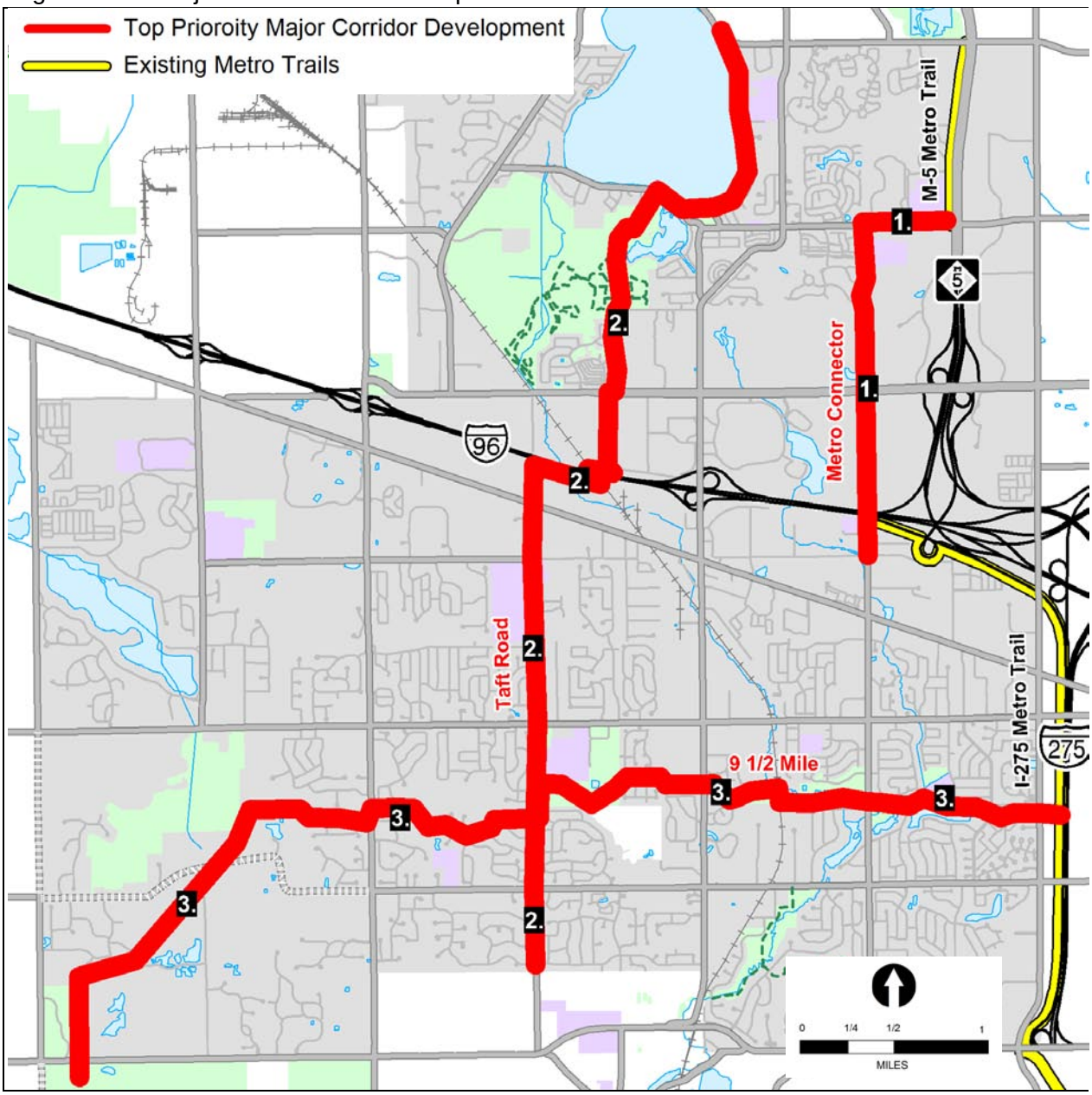
Major Corridor Development Cost Estimates

A number of projects were identified and categorized as a "Major Corridor Development". However, 3 are considered top priority projects (Figure 3.2D.) based on input during the planning process, connecting regional systems, and potential for outside funding assistance.

- Metro Connector
- Taft Road Corridor
- 9 1/2 Mile Neighborhood Connector

The following describes the routes and proposed improvements in more detail and provides a planning level cost estimate. More detail of the planning level cost estimate can be found in the Appendix.

Fig. 3.2D. Major Corridor Development



Metro Connector

The Metro Connector is a high priority project to connect the existing 40+ mile I-275 Metro Trail and the existing M-5 Metro Trail. The proposed connector route is along Meadowbrook Road and 13 Mile Road.

TOTAL METRO CONNECTOR COST ESTIMATE = $718,000 in addition to the cost of easements

This is a good candidate project (or at least parts of it) for outside funding assistance. If grant funds are used, the cost estimate assumes a design exception would be sought to construct 8' wide concrete path along Meadowbrook due to the existing facilities and the addition of bike lanes. Potential funding sources include the MDOT Enhancement Program, the MDNRE Trust Fund, and CMAQ.

Taft Road Corridor

The Taft Road Corridor project is intended to showcase a truly "complete street" within the City of Novi with considerable improvements made to more safely accommodate pedestrians and bicyclists as well as reduce vehicular travel speeds. The Taft Road Corridor has been identified as a "Bicycle/Pedestrian Focused Corridor" and has the potential to serve as a major north-south non-motorized route within the City as well as to Northville and Walled Lake.

TOTAL TAFT ROAD CORRIDOR COST ESTIMATE = $5.25 million in addition to the cost of easements

Due to size and cost, this project would most likely be implemented in phases. This is a good candidate project (or at least parts of it) for outside funding assistance. If grant funds are used, it's anticipated they would be used to construct particular segments of the proposed improvement such as the intersection improvements, the I-96/RR crossing, and/or the addition of bike lanes along Taft Road. The planning level cost estimate includes a $1 million allowance for the I-96/RR crossing. This area will require more detailed analysis and coordination with MDOT, ITC, and CSX before being able to develop a more accurate cost estimate. Potential funding sources for portions of the Taft Road Corridor improvements include MDOT Enhancement, Safe Routes to School, MDNRE Trust Fund, and CMAQ.

9 ½ Mile Neighborhood Connector

Providing a significant east-west non-motorized route between 9 Mile and 10 Mile Roads was discussed, refined, and moved up as a priority during the planning process. The route is desirable as it includes the potential to connect a number of parks, schools, neighborhoods, and undeveloped open space. Portions of the 9 ½ Mile Neighborhood Connector are proposed to follow existing residential streets, with traffic calming measures proposed. The route is also intriguing for its potential to serve as a demonstration of an urban greenway.

TOTAL 9 ½ MILE NEIGHBORHOOD CONNECTOR COST ESTIMATE = $4.97 million in addition to the cost of easements

Due to size and cost, this project would most likely be implemented in phases. This is a good candidate project (or at least parts of it) for outside funding assistance. If grant funds are used, it's anticipated they would be used to construct particular segments of the proposed improvement such as the ITC/Maybury connector or the traffic calming improvements. The planning level cost estimate includes a $500,000 allowance to cross the railroad including approach ramps to meet ADA requirements. The estimate also includes a $400,000 allowance to implement a variety of traffic calming techniques along the local residential streets and $150,000 allowance to develop a coordinated wayfinding system along the entire route. There is a considerable amount of boardwalk anticipated (over 4150 feet). This is a high cost item and has been estimated utilizing the City's standard 8' wide section. If grant funding is sought for this

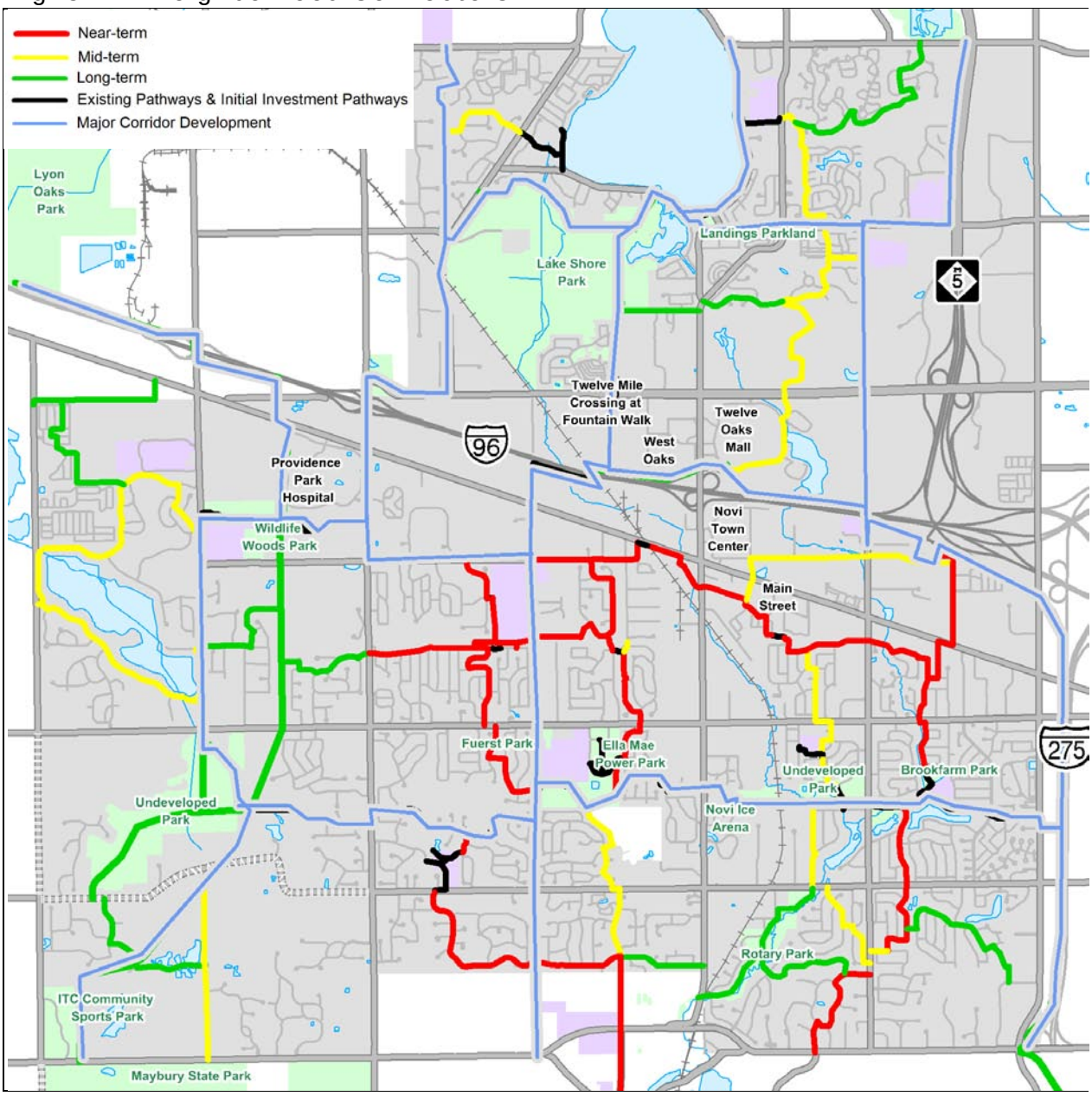
improvement, a 14' wide boardwalk will likely be required, increasing the overall cost. Potential funding sources for portions of the 9 ½ Mile Neighborhood Connector improvements include MDOT Enhancement, Safe Routes to School, MDNRE Trust Fund, and CMAQ.

The following table summarizes the top 3 priority Major Corridor Development projects. The table includes the approximate length of the entire project, a planning level cost estimate, as well as potential funding sources. It should be noted that if the City seeks, for example, MDOT Enhancement funds to complete the Metro Connector project, it may not be as likely that the City would receive additional dollars for the other two projects. Estimates of the possible percentage of funds that the City may be able to seek and obtain for implementation has also been identified based on typical award amounts. In addition, with the City's recent award of MDNRE Trust Fund dollars for the Landings Park project, it may be several years before the City can approach the Trust Fund again for additional projects.

Fig 3.2E. Major Corridor Development Projects (Top 3) Summary

	Length	Planning Level Cost Estimate	Potential Funding Source(s)
Metro Connector	2.5 miles	$718,000	MDOT Enhancement (65%) City of Novi (35%)
Taft Road Corridor	8 miles	$5.25 M	MDOT Enhancement (8%) MDNRE Trust Fund (5%) CMAQ (5%) Safe Routes to School (1%) City of Novi (81%)
9 ½ Mile Neighborhood Connector	7 miles	$4.87 M	MDOT Enhancement (10%) MDNRE Trust Fund (6%) Safe Routes to School (1%) CMAQ (5%) City of Novi (78%)

Fig. 3.2F. Neighborhood Connectors



Neighborhood Connectors

Near-term Neighborhood Connectors

- Build short connector pathways through existing right-of-way and city owned property
- Provide wayfinding and signage along near-term routes
- Implement traffic calming elements along near-term routes
- Implement road crossing improvements where near-term neighborhood connector routes cross a major roadway

Mid-term Neighborhood Connectors

- Build short connector pathways through existing right-of-way city owned property
- Obtain easements to build short connector pathways through private owned property
- Provide wayfinding and signage along mid-term routes
- Implement traffic calming elements along mid-term routes
- Implement road crossing improvements where mid-term neighborhood connector routes cross a major roadway

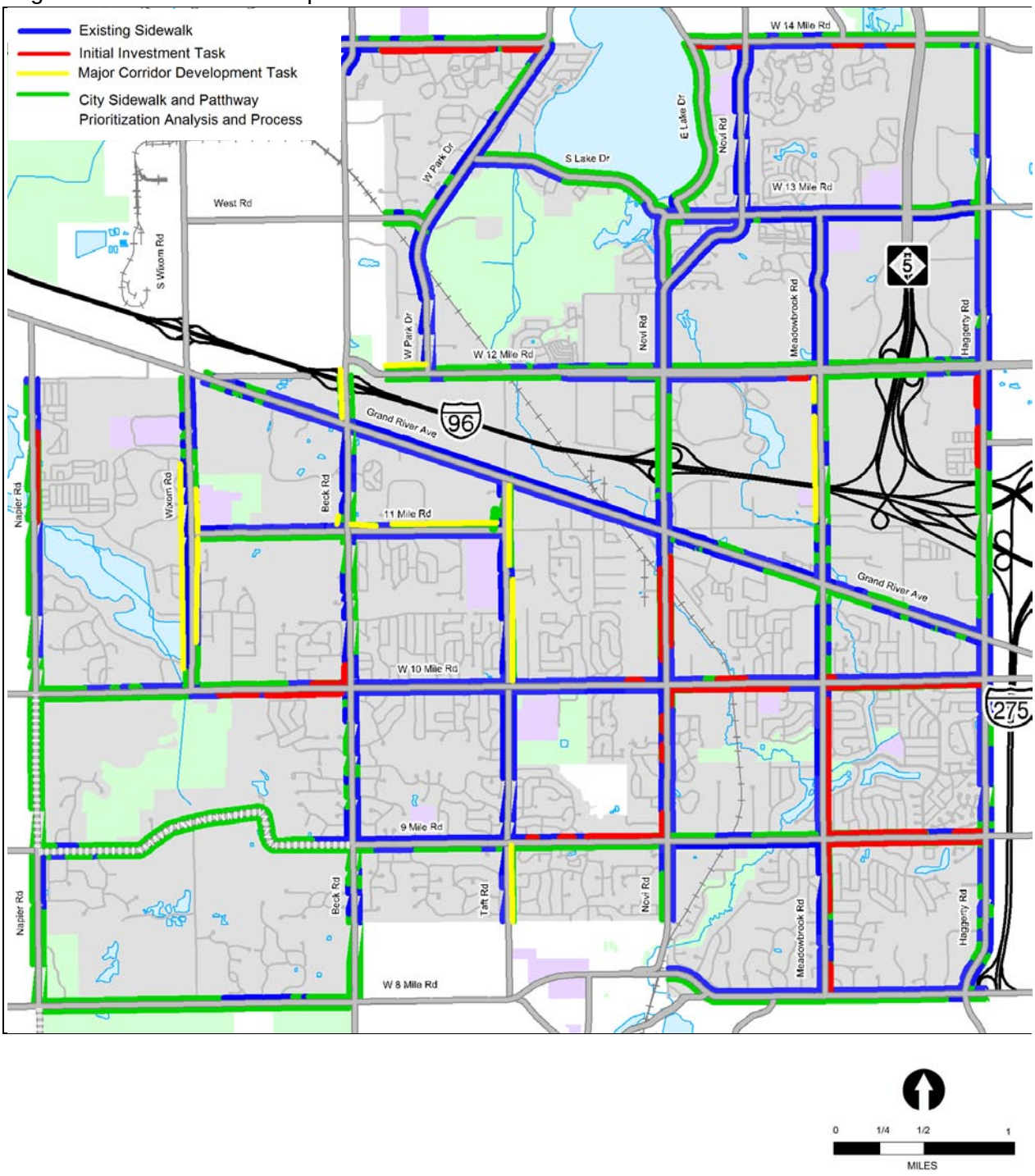
Long-term Neighborhood Connectors

- Obtain easements to build short connector pathways through private owned property
- Provide wayfinding and signage along long-term routes
- Implement traffic calming elements along long-term routes
- Implement road crossing improvements where long-term neighborhood connector routes cross a major roadway
- If there is enough demand consider paving the pathways through Rotary Park
- Build unpaved pathway along ITC corridor and eventually if there is demand consider paving the trail

Sidewalk/Roadside Pathway Gaps

Many of the sidewalk gaps are addressed through the Major Corridors task and the Initial Investments task. The remaining sidewalk gaps that are not addressed by other tasks should be put into the City of Novi's Sidewalk and Pathway Prioritization Analysis and Process to determine when they should be implemented.

Fig. 3.2F. Sidewalk Gaps



Construction Integration

The costs to undertake some non-motorized projects independently of a road reconstruction project would be significant. Thus, in order to maximize the impact of finite resources, the long-term improvements are expected to be implemented as a road is completely reconstructed (not just resurfaced). In general, construction integration improvements:

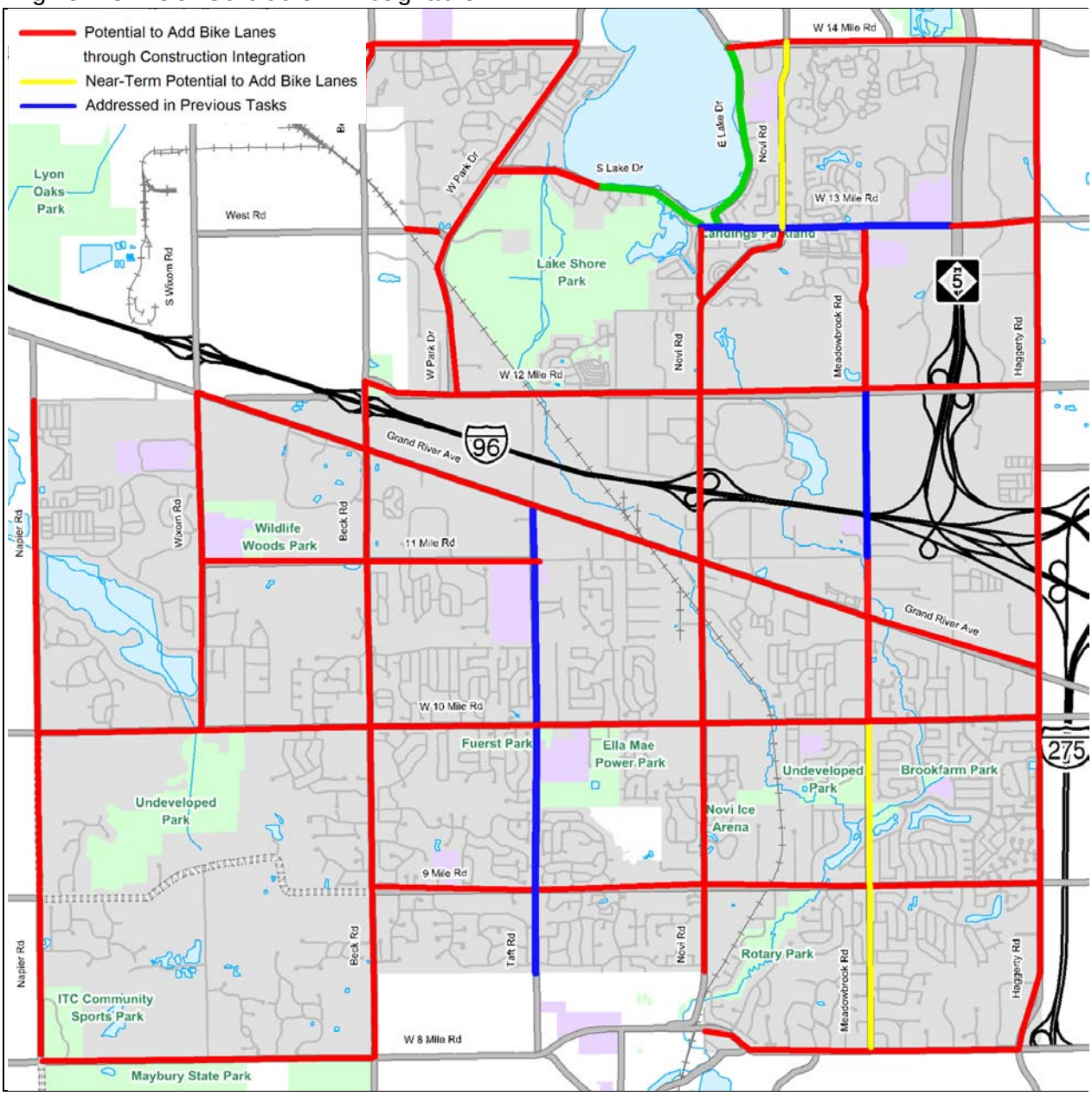
- Are generally implemented when a new road is built or an existing road is completely reconstructed. Reconstruction projects typically include new curb and gutter as well as storm water systems.
- Generally require that a road be widened to accommodate the minimal lane width requirements for all users and may require additional rights-of-way.
- 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.

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. Construction integration projects are very important; however they can be very capital intensive and should be prioritized after the initial investments are made. With the cities adoption of a complete streets ordinance is it assumed that bicycle and pedestrians improvements will be incorporated into all projects as a matter of course.

Construction integration tasks include:

- Add bike lanes along arterial and collector roads that were not addressed in the previous tasks. Many of the roads have potential to add a paved shoulder to obtain bike lanes, however, due to the fluctuation in the number of lanes at intersections and curbs that occur in numerous places along the roadway a simple paving of the shoulder may not be as simple as it seems and it may be more feasible to wait until the road is reconstructed to pave the shoulders and add bike lanes.
- Meadowbrook Road between W 10 Mile Road and W 8 Mile Road may be the best candidate to attempt a near-term bike lane conversion by paving the shoulder and narrowing the traffic lanes and improving the subdivision entrances similar to Taft Road.
- Novi Road between W 13 Mile Road and W 14 Mile may be a candidate for a near-term bike lane by converting it to a three lane road with a median where there are no turning movements.
- Add sidewalks and bike lanes to Novi Road/I-96 interchange(refer to Figure 3.3A for proposed improvements)
- Add bike lanes to Beck Road/I-96 interchange
- If CSX railroad becomes abandoned there may be potential to build a rail-trail along corridor.

Fig. 3.2G. Construction Integration



Potential Funding Sources

There are several potential funding sources to investigate as projects move toward implementation. Some projects have a higher likelihood of receiving outside funding assistance than others. Potential funding sources from outside entities change and evolve on a regular basis. Understanding available funding programs, their requirements and deadlines requires continuous monitoring. A few of the more common funding sources have been detailed here as a reference and resource. These are in addition to traditional funding methods such as the general fund, millages, bonds, Community Development Block Grants, etc.

MDOT Transportation Enhancement Program

Transportation Enhancement (TE) activities are federally funded, community-based projects that expand travel choices and enhance the transportation experience by improving the cultural, historic, aesthetic and environmental aspects of the transportation infrastructure. To be eligible, a project must fall into one of the 12 TE activities and relate to surface transportation. Activities that relate to the implementation of this Master Plan include:

- Provision of facilities for pedestrians and bicycles.
  Includes bike lane striping, wide paved shoulders, bike parking, bus racks, off-road trails, bike and pedestrian bridges and underpasses.
- Paved shoulders four or more feet wide
- Bike lanes
- Pedestrian crosswalks
- Shared use paths 10 feet wide or greater
- Path/trail user amenities
- Grade separations
- Bicycle parking facilities
- Bicycle accommodations on public transportation
- Provision of safety and educational activities for pedestrians and bicyclists
- Programs designed to encourage walking and bicycling by providing potential users with education and safety instruction through classes, pamphlets and signage
- Preservation of abandoned railway corridors (including the conversion and use thereof for pedestrian and bicycle trails).
- Acquiring railroad rights-of-way; planning, designing and constructing multi-use trails; developing rail-with-trail projects; purchasing unused railroad property for reuse.

A minimum 20% local match is required (although more match is preferred) for proposed projects and applications are accepted on an on-going basis.

Michigan Natural Resources Trust Fund

The MNRTF provides funding for both the purchase of land (or interests in land) for recreation or protection of land because of its environmental importance or scenic beauty and the appropriate development of land for public outdoor recreation use. Goals of the program are to: 1) protect Michigan's natural resources and provide for their access, public use and enjoyment; 2) provide public access to Michigan's water bodies, particularly the Great Lakes, and facilitate their recreation use; 3) meet regional, county and community needs for outdoor recreation opportunities; 4) improve the opportunities for outdoor recreation in Michigan's urban areas; and, 5) stimulate Michigan's economy through recreation-related tourism and community revitalization.

All proposals for grants must include a local match of at least 25% of the total project cost. There is no minimum or maximum for acquisition projects. For development projects, the minimum funding request is $15,000 and the maximum is $300,000. Applications are due in April and projects must meet the goals of the Novi Parks and Recreation Master Plan. In addition, with the City's recent award of MDNRE Trust

Fund dollars for the Landings Park project, it may be a few years before the City can successfully approach the Trust Fund again for additional projects.

Congestion Mitigation and Air Quality Improvement Program (CMAQ)
The CMAQ program was created to reduce congestion on local streets and improve air quality. Funds are available to urban communities designated as "non-attainment" areas for air quality. Pedestrian and bicycle projects are eligible for CMAQ funding where they can be shown to divert motor vehicle commuting traffic that would otherwise take place. CMAQ projects on roads must be on federal-aid eligible roads. There is typically a 20% local match requirement. SEMCOG issues a call for applications each year and distributes the funds after review.

DALMAC Fund
Established in 1975 to promote bicycling in Michigan, the DALMAC Fund is administered by the Tri-County Bicycle Association and supported by proceeds from DALMAC. The DALMAC Fund supports safety and education programs, bicycle trail development, state-wide bicycle organizations, and route mapping projects. Applications must be submitted by March 1. They are reviewed by the DALMAC Fund Committee and approved by the Board. Grants are made by May of the year they were submitted. Applications can be found at www.biketcba.org.

KODAK American Greenways Awards
Kodak, The Conservation Fund, and the National Geographic Society, provide small grants to stimulate the planning and design of greenways in communities throughout America. Made possible by a grant from Eastman Kodak, the program also honors groups and individuals whose ingenuity and creativity foster the creation of greenways. The application period typically runs from March 1st through June 1st. Program goals are to: develop new, action-oriented greenways projects; assist grassroots greenway organizations; leverage additional money for conservation and greenway development; and, recognize and encourage greenway proponents and organizations. Maximum grant is $2,500. For more information go to www.conservationfund.org.

Safe Routes to School
The Safe Routes To School Program is a national movement to make it safe, convenient and fun for children to bicycle and walk to school. In Michigan, the program is sponsored by the Michigan Fitness Foundation and has gained momentum over the past few years. Examples of projects and programs eligible for funding include sidewalks, traffic calming, crossing improvements, bicycle and pedestrian facilities, public awareness campaigns, traffic education and enforcement, etc. Schools must be registered and develop a Walking Audit in order to be eligible to apply. SR2S funding is 100 percent federal; no match is required. Projects must be constructed within 2 miles of the school.
www.saferoutesmichigan.org

Bikes Belong
The Bikes Belong Coalition is sponsored by members of the American Bicycle Industry. Their mission is to put more people on bikes more often. The program funds projects in three categories: Facility, Education, and Capacity Building. Requests for funding can be up to $10,000 for projects such as bike paths, trails, lanes, parking, and transit, and safe routes to school. Applications are accepted via email three times per year (April, August and November). More information can be found at www.bikesbelong.org.

3.3 Specific Area Concept Plans

The following concept plans were prepared to show how some of the ideas of the Non-motorized Plan may be applied to specific areas. These concept plans should not be taken as completely developed designs. Rather, they are to illustrate a design idea. The areas shown will require separate design studies that may involve a more detailed investigation of the site conditions including public input and the development of alternatives and draft preliminary plans.

Crossing I-96

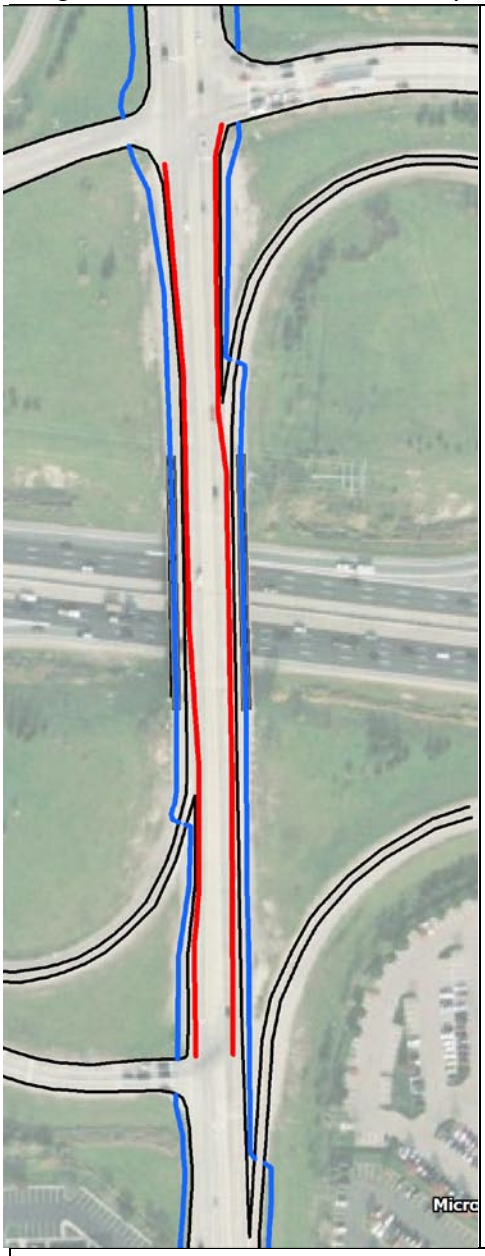
The I-96 expressway creates a significant barrier across the City with only one pedestrian crossing along Wixom Road which is out of the City limits. Novi Road, Taft Road and Meadowbrook Road were identified as major areas of concern for pedestrians and bicyclist who want to cross the expressway and access commercial and recreational destinations on both sides of the expressway. Currently, Novi Road, Beck Road and Meadowbrook Road overpasses do not have any non-motorized facilities and Novi Road and Beck Road are difficult to cross as a pedestrian or bicyclist due to the heavy traffic and free-flowing ramps.

Free-flow ramps pose many dangers to bicyclists and pedestrians. Motor vehicle speeds are high and there are many merging operations taking place commanding the attention of motorists. The I-96 freeway interchanges were all recently rebuilt, so it may be a while until improvements are made at these crossings. When the interchanges are reconstructed, a general design principal would be to bring all ramps perpendicular to the roadway to reduce speeds at crosswalk locations and establish more appropriate intersections for urban and suburban crossings.

The following illustrations demonstrate potential ways to retro-fit the existing expressway crossings to include non-motorized facilities. Please note that these illustrations were developed in coordination with the MDOT Novi Transportation Improvement Study:

- Fig. 3.3A. Novi Road Overpass
- Fig. 3.3B. Meadowbrook Road Overpass
- Fig. 3.3C. Beck Road Overpass
- Fig. 3.3D. Wixom Road Overpass
- Fig. 3.3E. CSX Underpass

Fig. 3.3A. Novi Road Overpass Retro-fit Cross Section



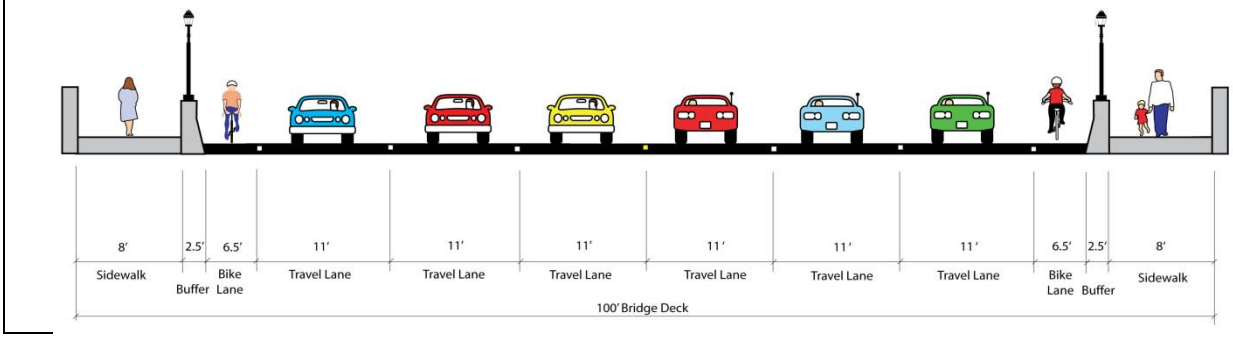
The Novi Road interchange is a daunting environment for bicyclists and pedestrians. But it is a key link between the City's major commercial centers and despite its lack of facilities, pedestrians and bicyclists still use the overpass.

The bridge deck is 100' wide with a large recovery area on the outside and an unused center lane. This provided an opportunity to reallocate space on the bridge deck to accommodate bicycle and pedestrian facilities.

The following list describes basic improvements that could be made to improve bicycle and pedestrians facilities on the bridge:

- Add sidewalk to bridge deck by removing center median and reducing the travel lanes to 11' wide. Please note that due to the existing grade some earthwork would be required to build the sidewalks approaching the bridge deck.
- Until bike lanes can be implemented north and south of the bridge deck on Novi Road provide a 6.5' paved shoulder and allow bicycles to cross the bridge as a pedestrian using the sidewalk.
- Provide high visibility crosswalks at all free-flowing ramps by using the rectangular rapid flash beacon with an advanced warning flash beacon.
- In the future, when the interchange is reconstructed, bring all ramps perpendicular to the roadway to provide a safer crossing environment for pedestrians and bicyclists.

Potential Cross Section:



The City should consider going beyond providing just basic accommodations for bicyclists and pedestrians. The Novi Road interchange is a gateway to the city. It is a major connection between two regional shopping centers and one of the first things (and sometimes the only thing) many people experience when visiting the City of Novi.

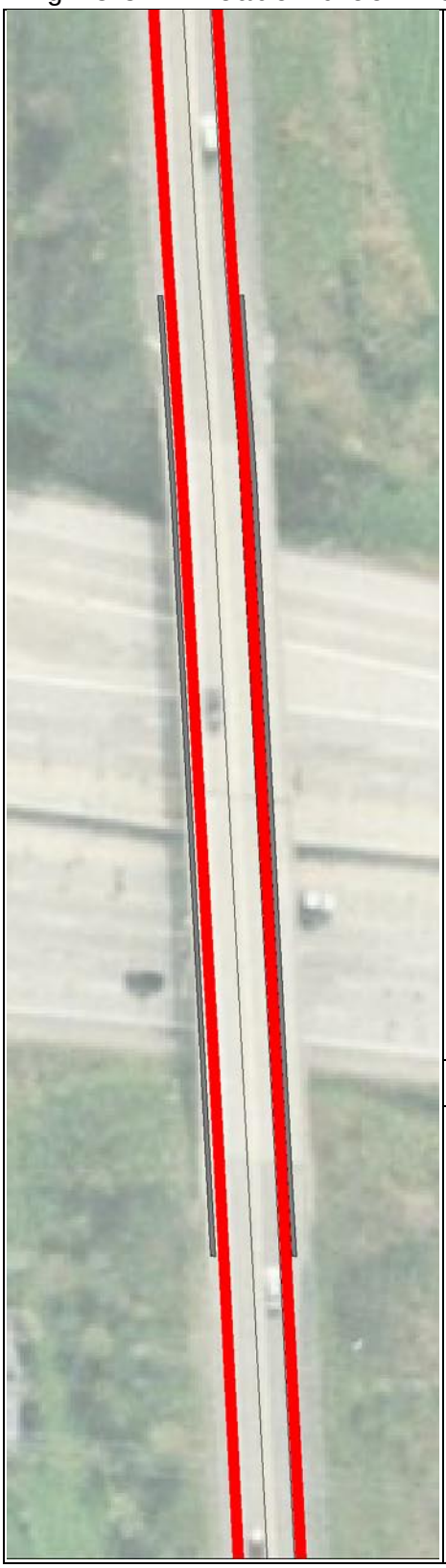
Currently the interchange is utilitarian in nature. However, there is potential to enhance the interchange to create a signature corridor that reflects the character of the city and provides a memorable first impression of the community while simultaneously addressing important bicycle and pedestrian safety concerns.

Many communities have created landmark bridges that are an important part of their identity. Numerous improvements have been completed or are underway on Novi Road north and south of the interchange. Upgrading the bridge would establish a hallmark corridor through the heart of the city that also bears the city's name.

Wabasha Street Bridge in St. Paul Minneapolis

Existing conditions for the Novi Street overpass

Fig. 3.3B. Meadowbrook Road Overpass Retro-fit Cross Section

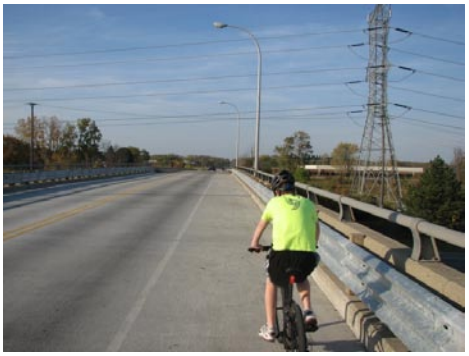


Meadowbrook Road provides the best opportunity to add bicycle facilities to an existing crossing of I-96. Beck Road and Novi road are interchanges and Haggerty Road is comprised of multiple bridges. It also provides a connection between the I-275 Metro Trail and the M-5 Metro Trail.

The following list describes basic improvements that could be made to improve bicycle and pedestrian facilities on the bridge:

- Add 9' bike lanes to both side of the road by paving the shoulder and reducing the travel lanes to 11' wide. The wide paved shoulder will also allow room for pedestrians walking against the flow of traffic over the bridge.
- Provide a crossing island on Meadowbrook just north of Bridge Street by utilizing the existing center turn lane.
- Since Meadowbrook Road provides both a regional trail connection and an everyday commuter connection, when the overpass is reconstructed, there should be a 6' bike lane on both sides of the road and a 10' shared use path should be constructed on the west side of the road..

Bike Lanes



Potential Cross Section:

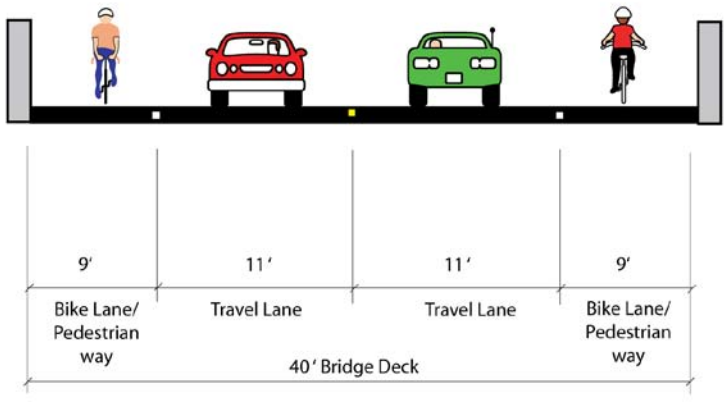
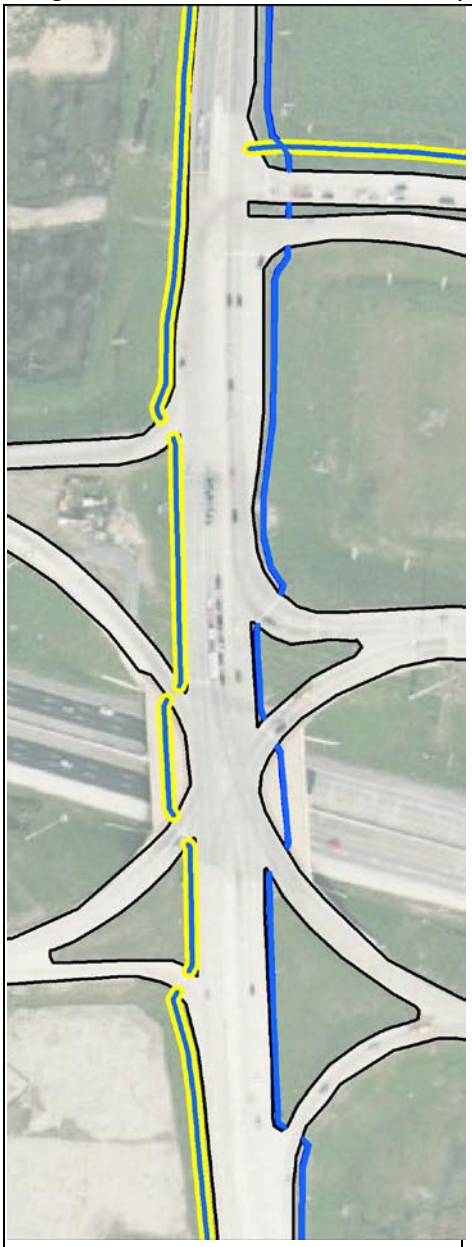


Fig. 3.3C. Beck Road Overpass Retro-fit Cross Section



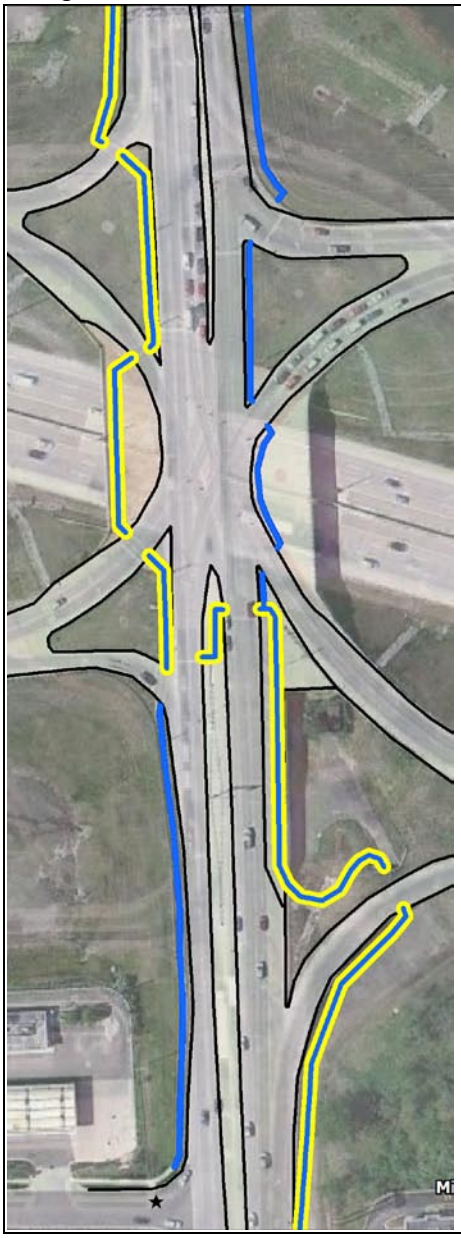
Beck Road was reconstructed in 2005 into a Single Point Urban Interchange and has no bicycle or pedestrian facilities.

The following list describes basic improvements that could be made to improve bicycle and pedestrians facilities on the bridge:

- Add 10’ Shared use path to provide a regional trail connection on the west side of Beck Road. Please note that due to the existing grade some earthwork would be required to build the sidewalks approaching the bridge deck.
- Provide high visibility crosswalks at all free-flowing ramps by using the rectangular rapid flash beacon with an advanced warning flash beacon.
- The 10’ Shared use path will probably be the only non-motorized connection on this bridge for quite some time, as bike lanes are difficult to add to the existing geometry and it may be a while until there is sufficient demand for a sidewalk on the east side of the road.

Sidewalk
Regional Trail Connections

Fig. 3.3D. Wixom Road Overpass Retro-fit Cross Section



Wixom Road was reconstructed in 2007 into a Single Point Urban Interchange and has a 6' sidewalk on the west side. This is the only interchange that provides a pedestrian crossing over the freeway, however it is not in the City of Novi's jurisdiction.

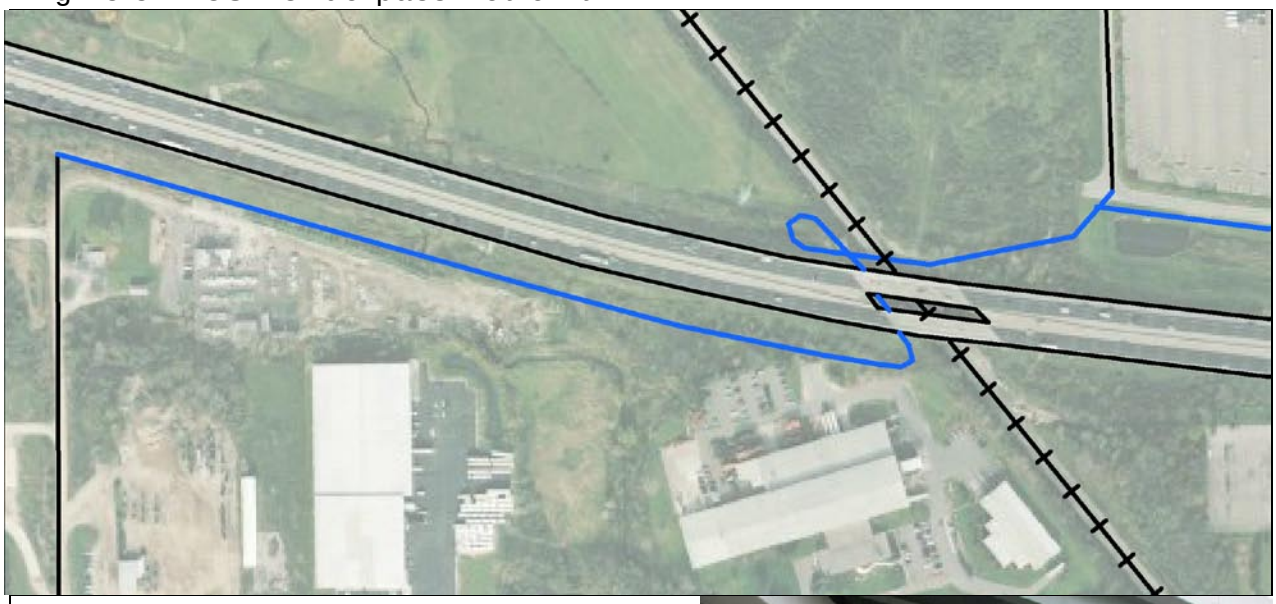
The following list describes basic improvements that could be made to improve bicycle and pedestrians facilities on the bridge:

- Provide high visibility crosswalks on existing sidewalk at all free-flowing ramps by using the rectangular rapid flash beacon with an advanced warning flash beacon.
- When the regional trail connection is implemented utilize the existing tunnel under the I-96 east-bound on-ramp and ramp the pathway up to the bridge deck. Provide a road crossing across Wixom Road using the existing signals and median to link to the existing sidewalk. Then widen the existing sidewalk on the west side of the road to a 10' Shared use path where it provides a regional trail connection.

The recommendations for this overpass were developed from the I-96 Corridor Study.

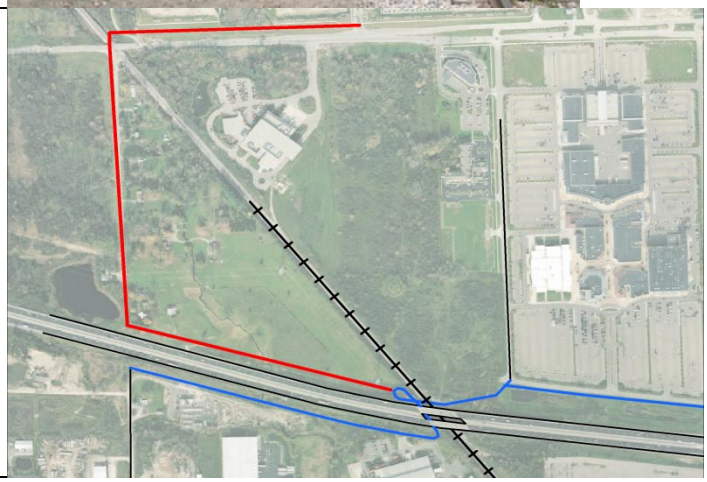
Sidewalk
Regional Trail Connections

Fig. 3.3E. CSX Underpass Retro-fit



Utilize the existing CSX railroad underpass to build a trail along the west side of the railroad. By working with the existing bridge deck or building a separate facility, build a bridge over the railroad to provide a trail crossing to the east to connect to the regional shopping centers.

The alternative route to building a bridge over the railroad would be to take the trail to the west and connect to Taft Road, go north along Taft Road to 12 Mile Road and provide an at-grade railroad crossing along 12 Mile Road. At this point it may be worth exploring the option of building a separate non-motorized bridge over I-96 connecting Taft Road to avoid the CSX railroad altogether.



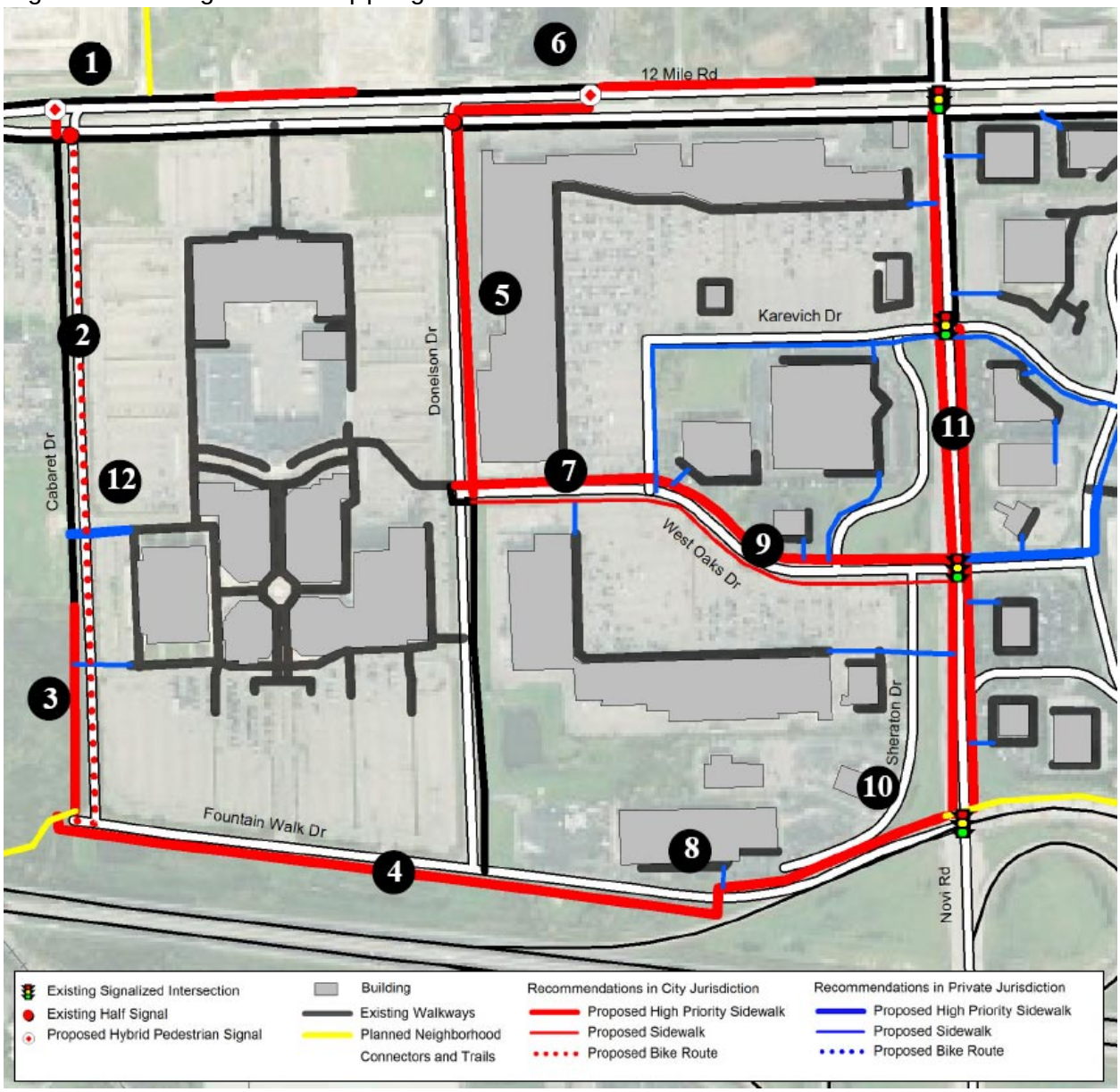
Regional Shopping Center

The regional shopping center is a major destination in the City of Novi and an area that many people refer to as "Downtown Novi". From a non-motorized standpoint it is important to make connections to this destination and to make connections within the shopping center. It is recommended that the private and public entities work together to try and make this area more bicycle and pedestrian friendly.

The following illustrations demonstrate potential ways to incorporate non-motorized facilities within the regional shopping center:

- Fig. 3.3D. Regional Shopping Center West of Novi Road
- Fig. 3.3E. Regional Shopping Center East of Novi Road

Fig. 3.3D. Regional Shopping Center West of Novi Road



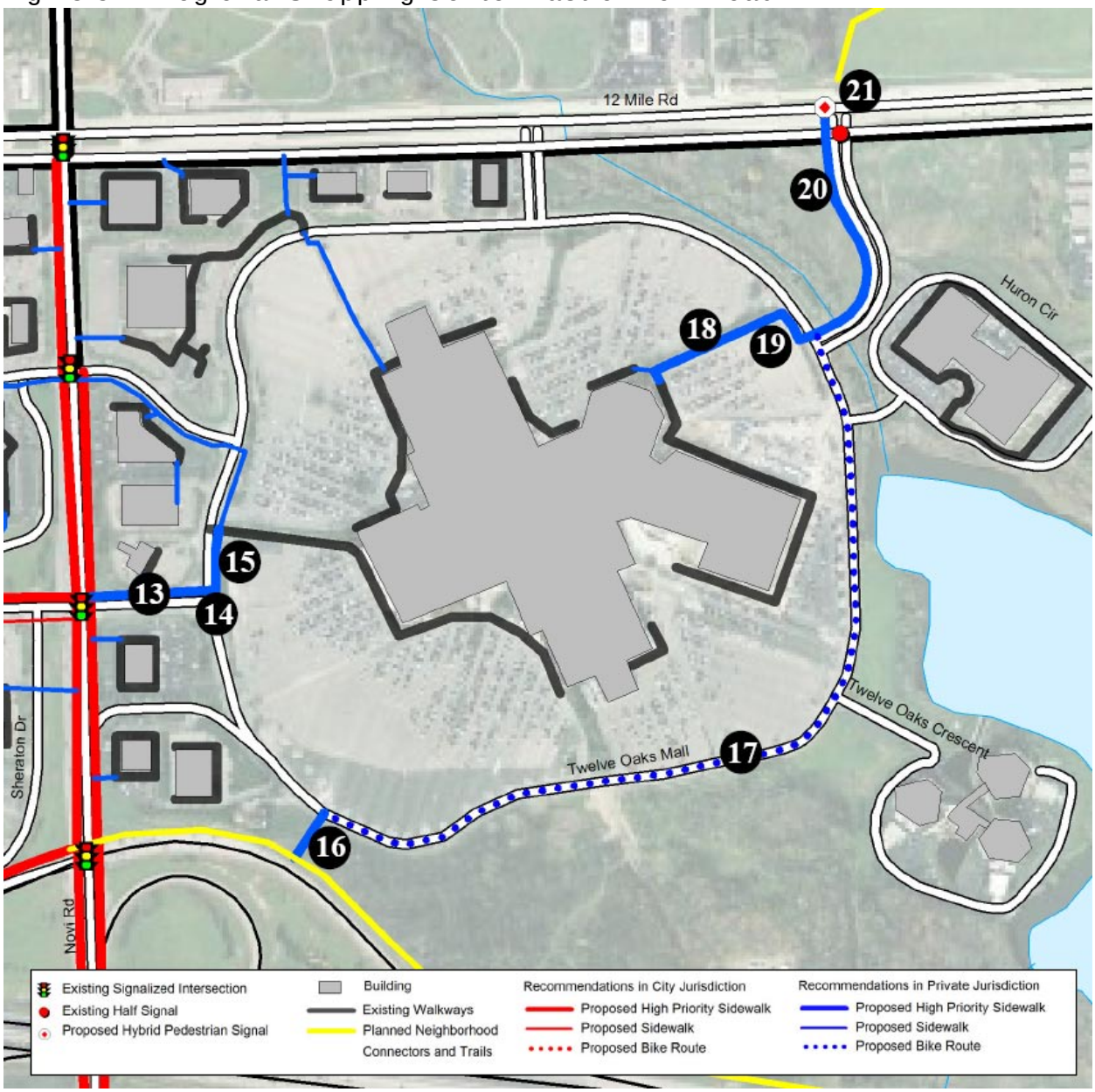
Recommendations for items in Public Jurisdiction:

1. Provide Pedestrian Crossing on 12 Mile by adding a Pedestrian Hybrid Beacon at Cabaret Dr
2. Implement on road bike route on Cabaret Dr
3. Extend 6’ pathway along the west side of Cabaret Dr down to Fountain Walk Dr
4. Build 10’ Shared Use Path along the south side of Fountain Walk Dr
5. Extend 6’ pathway along the east side of Donelson Dr between West Oaks Dr and 12 Mile Road
6. Provide Pedestrian Crossing on 12 Mile by adding a Pedestrian Hybrid Beacon at Carlton Way
7. Provide road crossing on West Oaks Dr
8. Provide road crossing on Fountain Walk Dr between Donelson Dr and Novi Road
9. Build 6’ sidewalk along north side of West Oaks Dr between Donelson Dr and Novi Road
10. Build 10’ Shared Use Path to north side of Fountain Walk over to Novi Road
11. Build Sidewalk along both sides of Novi Road

Recommendations for items in Private Jurisdiction:

12. Build 6’ sidewalk connecting Cabaret Dr to the Existing sidewalks

Fig. 3.3E. Regional Shopping Center East of Novi Road



Recommendations for items in Private Jurisdiction:

13. Build 6’ sidewalk along north side of road
14. Provide Pedestrian crossing at intersection
15. Build 6’ sidewalk along east side of road to connect to existing sidewalk
16. Build 10’ shared use path when trail along I-96 is built
17. Implement on road bike route along drive when I-96 trail connection is made
18. Build 6’ sidewalk
19. Provide pedestrian crossing at intersection
20. Build 6’ sidewalk along west side of road

Recommendations for items in Public Jurisdiction:

21. Provide Pedestrian Crossing on 12 Mile by adding a Pedestrian Hybrid Beacon when neighborhood connector pathway is implemented

4. Proposed Policies

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.

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.

4.1 Complete Streets Policy

Complete Streets Background

States, regions, counties and cities around the country have used various complete street policies to unambiguously endorse and define their support for non-motorized transportation. Complete streets are planned, designed, operated and maintained such that all users may safely, comfortably and conveniently move along and across streets throughout a community. The complete streets concept recognizes that streets serve multiple purposes and that a community's roadways must be designed such that they balance the needs of all of the transportation users. Complete streets are key to creating healthy, active communities and establishing safe routes to school. There has been a concerted move towards complete streets in the United States since the 1990's.

Recently, the US Department of Transportation issued a Policy Statement on Complete Streets. It indicated that it is the DOT's policy to incorporate safe and convenient walking and bicycling facilities into transportation projects. It also noted that it is every transportation agency's responsibility to improve conditions and opportunities for walking and bicycling and integrate improvements for such into the transportation system. It also encourages transportation agencies to go beyond the minimum standards. Part of the DOT recommended actions include:

- Providing accommodations on new, rehabilitated and limited-access bridges
- Collecting data, setting targets and tracking progress
- Maintaining sidewalks and pathways the same way roads are maintained
- Improving facilities as part of maintenance projects

In short the policy states that walking and bicycling should be considered equals with other transportation modes.

In the fall of 2010, The State of Michigan adopted Complete Streets legislation. The complete streets legislation was in the form of two bills. The first bill revised Act 51, addressing transportation issues. The second bill revised Act 33 that addresses planning issues.

Act 51 Revision Highlights:

- Requires interjurisdictional consultation on non-motorized projects and 5-year plans
- Use of established best practices
- Directs MDOT to draft and adopt a complete streets policy as well as develop model polices for local agencies
- Directs MDOT to advise local agencies on non-motorized issues
- Enables interjurisdictional agreements for maintenance

Act 33 Revision Highlights:

- Expands the definition of "streets" to include all legal users
- Expands elements that may be included in a master plan to include all forms of transportation
- Specifies that transportation improvements be appropriate to their context
- Specifies cooperation with road

Numerous local communities have already adopted complete streets resolutions or ordinances. In 2010, the City of Novi adopted a resolution of support for complete streets. The city is currently drafting a more comprehensive ordinance on complete streets that specifically addresses how the city will integrate complete streets into its plans, policies and programs.

National Complete Streets Coalition Model

Since the FHWA model was developed, The National Complete Streets Coalition has taken the idea further and identified ten elements of a comprehensive Complete Streets policy:

1. A vision for how and why the community wants to complete its streets. Specifies that all users including pedestrians, bicyclists and transit passengers of all ages and abilities, as well as trucks, buses and automobiles.
2. Specifies that 'all users' includes pedestrians, bicyclists and transit passengers of all ages and abilities; as well as trucks, buses and automobiles.
3. Encourages street connectivity and aims to create a comprehensive, integrated, connected network for all modes.
4. Is adoptable by all agencies to cover all roads.
5. Applies to both new and retrofit projects, including design, planning, maintenance, and operations, for the entire right of way.
6. Makes any exceptions specific and sets a clear procedure that requires high-level approval of exceptions.
7. Directs the use of the latest and best design standards while recognizing the need for flexibility in balancing user needs.
8. Directs that complete streets solutions will complement the context of the community.
9. Establishes performance standards with measurable outcomes.
10. Includes specific next steps for implementation of the policy.

The adoption of this plan addresses many of the elements.

Policy Recommendations for Complete Streets:

Within One Year:

- Adopt the Non-motorized Transportation Plan
- Draft a Complete Streets Policy that address the ten key elements as defined by the National Complete Streets Coalition and that clearly defines the responsible authorities
- Adopt a Complete Streets Policy
- Develop 5-year non-motorized improvement plan (based on the Non-Motorized Master Plan)
- Meet with MDOT and Oakland County Road Commission to review 5-year plan as it relates to facilities under their jurisdiction

Within Three Years:

- Implement recommended operations procedures
- Establish performance measures
- Begin data collection
- Build a reference library of current best practices
- Establish professional staff training program
- Identify City standard plans and details that need to be revised
- Begin revising standard plans and details

Within Five Years:

- Complete update of standard plans and details
- Evaluate progress

4.2 ADA and Transition Plan

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 to the maximum extent feasible and 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.

Four 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*, November, 2005 (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)
4. *Accessible Public Rights-of-Way, Planning and Designing for Alternations*, July 2007 (Public Rights-of-Way Access Advisory Committee)

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 standards are adopted by the Department of Justice and the U.S. Department of Transportation, the DOT has identified the 2005 draft PROWAG as the current best practice in accessible pedestrian design.

Transition Plan

Title II requires that public entities with 50 or more employees create and regularly update an ADA Transition Plan and make this plan available to the public. The transition plan should at a minimum identify physical barriers and provide a detailed outline to remove those barriers. An ADA coordinator must be designated to coordinate compliance efforts. The following outlines the key elements of a transition plan.

Identification of Physical Barriers

The identification of physical barriers may take place on a number of levels:

- **Complaint-Based** – At the most basic level, there should be a process in place for citizens to register a complaint and for that complaint to receive appropriate evaluation and action.
- **Inventory Based** – More commonly, existing facilities receive a base line documentation that may be accomplished with simple tools such as a smart level, digital camera and a standard recording form. For example, the inventory of sidewalk curb ramps would identify issues such as the presence of a ramp, ramp slope and cross slope and the presence, type and condition of a detectable warning strip. The goal of this inventory is to identify the geographic location, type and severity of barriers. Often this survey would be done using a Global Positioning System and the data stored in a Geographic Information System. This inventory would be completed over time with the most heavily traveled areas completed first and then covering other, less traveled areas in a systematic approach.

- **Survey Based** – In a few cases where there is a high degree of controversy regarding a specific area or facility type, trained surveyors will take detailed field measurements and elevations of the facilities and translate them into survey drawings. This is by far the most expensive identification approach but may be appropriate if construction to remedy the solution is considered likely to occur in the near future.

Outline of Methods to Remove Barriers
A systematic approach for removing barriers should be established.

- **New and Altered Facilities Policy** – There should be in place a policy for how accessibility is achieved for new construction and alterations. This should include addressing how areas adjacent to new construction or alternation projects may be incorporated into a project. For example, when a new construction or alternation project is undertaken, the inventory of physical barriers for the immediate surrounding areas should be consulted to see if limited targeted improvements in adjacent areas would make a much larger area accessible. If so, those changes should be incorporated into the project.
- **Prioritization of Routes** – As it will be many years before new construction and alterations will provide accessible routes along all public right-of-ways, a process should be established to identify which routes should be upgraded independent of new or altered facilities. This would be based on the inventory of the physical barriers, citizen complaints and relative demand. This way, key routes such as those in the downtown, near schools and public buildings may be targeted improvements independently of new construction or alternation projects.

Schedule for Implementation
After the routes are prioritized, general costs of removing the barriers should be determined. Then using those costs, the removal of barriers should be integrated into the city's capital improvement plan.

Policy Recommendations for ADA Compliance:

The City of Novi is in the process of preparing an ADA transition plan.

Within One Year:

- Establish an interim transition complaint based transition plan.
- Designate an ADA coordinator.

Within Three Years:

- Have an inventory based transition plan in place.
- Integrate the transition plan into the capital improvement plan.

Within Five Years:

- Complete the inventory of physical barriers.
- Have made substantial progress in removing barriers in the most highly traveled corridors.

4.3 Safe Routes to Schools

The challenges to getting more children to walk and or bike to school are significant. 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.[1] The number of children walking or biking to school has dropped 37% in 20 years.[2] This drop in the number of children walking and bicycling to school can be attributed to many factors that have changed over the past 20 years:

- Increase in availability of before and after-school programs.
- Increase in the number of schools of choice, private schools and charter schools.
- Increase in the number of grade-based elementary schools.
- Increase in the number of children bused to school who live within walking distance due to real or perceived safety concerns.
- Fewer children living in each home.

These factors have combined to simultaneously reduce the total number of children who attend their neighborhood school, reduce the number of kids who walk and spread out the times children arrive at and depart from school. The result is a loss of the critical mass of children walking to school and the perceived safety in numbers.

These factors are combined with the fact that there is also an increase in the number of two-wage earner families where both wage-earners are leaving for work in the morning. This makes dropping a child off at school on the way to work the easy and seemingly logical choice. We have now entered a period in time where choosing to have a child walk to school is considered a political statement or some act tantamount to child neglect rather than the default choice.

While the challenges to getting more children to walk and bicycle to school are significant, the consequences of doing nothing are even more challenging. 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.

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.[3] 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.[4]

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

In an effort to reverse these alarming trends, the CDC 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.

Michigan's Safe Routes to School (SR2S)

Michigan has a model Safe Routes to School program that is managed by the Michigan Department of Transportation (MDOT) in partnership with the Michigan Fitness Foundation which provides training, administrative and technical support. The center for Michigan SR2S program's website www.saferoutesmichigan.org has extensive information on how a school may start a SR2S program.

The website describes the six step SR2S planning process:

1. Register a school on the website.
2. Designate a SR2S coordinator.
3. Establish a SR2S team comprised of school officials, students and their parents and local officials.
4. Survey the students and parents to understand the issues.
5. Perform a safety assessment of the physical environment.
6. Develop an action plan.

Beyond describing the planning process Michigan's SR2S program offers technical assistance and support to schools. These include:

- A SR2S Handbook with a wealth of information including templates and forms useful in implementing a program.
- Providing training programs.
- Walk to School Day kits.
- Newsletters.
- Direct technical assistance.

The City's Role in SR2S Programs

The City of Novi is a key partner in any Safe Routes to School Program. SR2S school teams typically include a local law enforcement official or officer and a representative from the local road authority. These officials provide the technical expertise to help the team implement some of the programs and physical improvements.

The City of Novi has worked with Walled Lake, Novi, and Northville schools on school pedestrian issues in the past and uses quarterly traffic safety meetings as the venue for these discussions. School speed zones have been established at two Walled Lake schools and sever improvements were made at Village Oaks School to provide a safer environment for walking children.

A typical SR2S program addresses issues such as the education of parents and students as well as improvements to the physical conditions on the school grounds. But much of the SR2S physical improvements take place on facilities outside of the school's jurisdiction and must be undertaken in

partnership. Likewise the city's non-motorized network identifies key routes that transverse school grounds. Thus, both entities must work together in order to meet their shared goals.

Novi'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 surrounding School Districts to evaluate how best to spend transportation dollars, looking at busing, 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[1]:

- 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.

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

Key Programs to Continue for School Transportation

The City of Novi has some good existing policies and programs that support the non-motorized system. The following policies and programs should be reinforced and continued.

- Meadowbrook Elementary in the Walled Lake School District had a Safe Routes to School Program; however it was only somewhat successful. The City and School District should work together through quarterly traffic safety meeting with police, planning, engineering, traffic consultant, and road commission to figure out why this program did not work and see if there are ways to remedy it.

- City should continue to enforcement speeding in school zones and yielding to pedestrians in the crosswalks within school safety zone.

- The City should continue to ensure that within school safety zones, all safety design guidelines are in place and current with national safety guidelines.

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

Policy Recommendations for School Transportation

The City of Novi and the Surrounding School Districts should jointly explore the following options.

Within One Year:

- The City and the School Districts should develop maintenance standards as well as fix defects and gaps in public sidewalk system adjoining school sites.
- Encourage the School District to consider the safest routes to school for children when adjusting school boundaries.
- The City and the School District should develop a cost-share policy for the construction and maintenance on pathways that are part of the Cities Non-motorized System and traverse school property.
- The City and School District should develop a strategic implementation plan for pathways and trails that are part of the Cities Non-motorized System that traverse school property.

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 with the state-wide program.
- School Districts should perform formal evaluations of how pedestrians and bicyclists are accommodated to all school grounds and prepare action plans to address deficiencies.
- School Districts should encourage walking and bicycling to school as a part of the physical education and well being of the students.
- School Districts should try to eliminate the need for all "Safety Busing" by remedying the hazards that currently warrant the safety bussing.

Within Five Years:

- School Districts 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.

4.4 Bike Parking

The lack of a secure parking space discourages many people from using their bikes for basic transportation. When sufficient bike parking is not provided, theft becomes a concern and it leads to bikes being locked up to sign post, benches and other street furniture. When bicycles are parked in these spaces, they often disrupt pedestrian flow because the bikes impede the walkway. Bicycles also get impounded by local enforcement when parked in these areas causing an even greater deterrent to bicycle use. Bicycle parking needs to be visible, accessible, plentiful and convenient. If any of these criteria are not met, there is a good chance cyclist will not use the facilities and will park their bike wherever they feel it will be safest.

Definition of a Bicycle Parking Space- A bicycle parking space is an area two feet by six feet or the area occupied by a bicycle when using a bicycle parking device as designed.

Short-Term Bicycle Parking - Short-term bicycle parking is defined as a rack to which the frame and at least one wheel can be secured with a user-provided U-lock or padlock and cable. This type of parking is appropriate for short term parking at locations such as shopping areas, libraries, restaurants and other places where typical parking duration is less than two hours.

Long-Term Bicycle Parking- A long-term bicycle parking space is defined as protecting the entire bicycle and its components from inclement weather and theft or vandalism. It is to be located where it will serve the needs of cyclist who need to leave their bicycles unattended for extended periods of time, such as employees, tenants or residents.

Uncovered Bicycle Racks

Uncovered Bicycle Racks are the primary bike parking approach for areas where people are expected to park their bikes for only a few hours.

Design-Generally, bicycle racks of the inverted "U" design are considered the best models. Alternative designs may be considered for special situations, although they should function similar to the inverted "U" design, providing at least two contact points for a bicycle and be a shape and size that would permit locking of a bicycle through the frame and one wheel with a standard U-Lock or cable.

Location- Bicycle racks should be located on every city block where there is retail within a commercial district. The hoops should be placed on a hard surface with ample lighting and high visibility (e.g. in front of a store window) to discourage theft and vandalism. Racks should be placed to avoid conflicts with pedestrians, usually installed near the curb and away from building entrances and crosswalks. When racks are installed in public spaces there needs to be at least 5 feet of clear sidewalk space in order to allow for pedestrian flow.

Covered Bicycle Parking

Covered Bike Parking is desirable for both long-term and short-term bicycle storage. Basic bicycle racks should be placed under an overhang whenever possible, and specific covered bicycle parking should be created when needed. Covered Bicycle Parking should be available in areas where bikes are kept for an extended period of time, such as apartment buildings or at large commercial centers where employees and customers will utilize the covered spaces.

Design- The covering for bicycle parking will vary depending on the location. In addition to a roof, complete or partial side enclosures should be provided to minimize exposure to windblown rain and snow. The design of the racks is the same as for the basic uncovered bicycle hoops. When creating covered parking, there is also the opportunity to incorporate a green roof or solar panels into the rooftop to add to the functionality of the structure.

Location- Covered Bike Parking should be incorporated whenever there is opportunity to do so. Long-term covered bike parking should be located within 400 feet of the building it is intended to serve. Centralized locations further than 400 feet are also acceptable.

Enclosed and Secured Bicycle Parking

Enclosed and Secured Bicycle Parking is best for areas where bikes are kept for extended periods of time, such as apartment buildings and near places of employment. These types of facilities are usually placed within existing parking structures and come with extra bicycle parking amenities.

Design- Enclosed and Secured Bicycle Parking generally consists of an enclosed room or fenced off-area where access is controlled through a doorway. The configuration of the bike racks will vary based on the space, but in general they are designed to maximize the number of bicycles that may be fit in the space. Double tier bike racks and hanging bike racks are used to provide the majority of the bike storage. A few standard inverted "U' hoops should be provided and reserved for atypical bicycle designs that may not be accommodated by the other racks.

When bike racks are located within a parking decks there should be a safe means of egress to the parking area. If bicycles must access the space via a gate controlled access point, care should be taken to minimize conflicts with the gate arm. The gate arm should be shortened to allow a 4' wide pathway for bicycles. The end of the gate arm should be rounded and covered with foam. The pathway for bicycles should be clearly marked on the pavement. This pathway should be 3' wide and be located at least one foot from the end of the gate. Users of enclosed secured bike parking that is accessed via gate control should be provided instruction on how to safely navigate around the gate.

Access Control- Is by identification badge reader and for a specific location only.

Location- Generally within parking decks, but individual facilities may be established.

Amenities- Will vary by site. Ideally these include compressed air, lockers, a bench and a vending machine that dispenses basic bicycle supplies such as tubes and repair kits.

User Costs- Generally $60 to $80 per year rental plus $20 account set-up fee.

In Novi, Enclosed and Secured Bicycle Parking would work best at areas with high concentrations of people, such as at Hospital's or Regional Shopping Centers where the facilities are targeted toward employees.

Bike Station

Bike Stations are premium secured bike parking and maintenance facilities intended for transit stations located in high density areas. They are intended primarily to serve transit riders who will disembark and then retrieve their bike and continue onto their final destination. They will also serve as a centralized bike parking solution for bicyclists who are not using the transit station but whose final destination is near the bike station.

Amount of Parking- Based on the expected number of transit users and a survey of potential users.

Design- The bike parking and maintenance areas are restricted to employees only.

Access Control- The bike station is opened and attended while the transit station is open.

Location- Generally within parking decks.

Amenities- Compressed air, lockers, benches, changing room, showers and bicycle repair shop. The changing room and showers may be omitted if most of the users are expected to arrive via transit.

User Costs- Generally $60 to $80 per year rental plus $20 account set-up fee or an hourly charge for parking. Repair cost at market rate.

At this point the City of Novi does not have the density to support a Bike Station in the City.

Bike Lockers

Bike Lockers are individual premium bike parking solution intended for remote and lower density areas where enclosed and secured bike parking is not available or feasible. Given the cost, appearance and space requirements of bike lockers they are only appropriate for limited locations.

Design- There is substantial variability in the designs of the bike lockers. Typically, individual bike lockers have an interior diagonal divider and doors on either end such that they may accommodate two bicycles. Bike Lockers may be arranged in row, in a circular pattern and stacked.

Access Control- Typically via a key.

User Costs- Generally around $60 per year rental plus a $20 key deposit.

On-Street Bicycle Parking

On-Street Bicycle Parking consists of movable bike racks that take the place of on-street motor vehicle parking. These racks are temporary and can be experimented with and moved as needed. They can also be used on a seasonal basis and can be removed during the winter.

Design- On-Street Bicycle Parking Racks are the size of a standard vehicle parking space and hold about 12 bicycles. These Racks are bolted into the pavement and can be removed when needed.

Location- These racks should be placed in active areas where it is difficult to accommodate sidewalk bicycle parking due to the competing demand for café tables and pedestrian walking space within the sidewalk area. Urban public spaces where there is on-street parking, such as Main Street would be a good location to test these facilities once non-motorized facilities are provided to this area.

Bicycle Parking Requirements

Currently the City of Novi does not have any bicycle parking requirements in the City Code. The code should be revised and updated as necessary to address the following issues:

- Require a minimum of 4 bicycle parking spaces at each commercial development or multi-family dwelling.
- For each multi-family dwelling require half of the bicycle parking spaces to be covered if the site is required to have 16 or more spaces based on the existing code description.
- Incentives should be provided to commercial and multi-family dwellings for providing covered and secured bicycle parking (e.g. reduction of vehicular parking and/or density bonus could be offered).
- Incentives should be provided to commercial and multi-family dwellings for providing covered bicycle parking over uncovered bicycle parking when not required to by code (e.g. reduction of vehicular parking and/or density bonus could be offered).
- Explore the idea of required bicycle parking facilities being credited toward provision of motor vehicle parking. Each ten required bicycle parking spaces, or fraction thereof, may be substituted for one code required motor vehicle parking space.
- 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 the 2nd Edition of Bicycle Parking Guidelines; these serve as a good model or may be referenced. The report may be found at http://www.apbp.org/resource/resmgr/publications/bicycle_parking_guidelines.pdf
- Require hoops on every block with retail in a downtown/commercial zone.

Policy Recommendations for Bicycle Parking:

Within One Year:

- Update the City code to include bicycle parking requirements and design standards.

Within Three Years:

- Implement the bicycle parking requirements and design standards.

4.5 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.

The City of Novi Code requires that property owners maintain the sidewalk adjacent to their property. Currently the city relies on complaint-based process to identify sidewalks in need of repair. This process corrects some problems, but may leave others untouched. It is recommended that the city develop a citywide inspection program to identify and cite hazardous sidewalks. The program should evaluate different areas of the city each year and property owners should be notified if their sidewalk is not in compliance with city regulations. If a property owner does not make the required repairs, the City should make the repairs and assess the property for cost. This may be integrated into a comprehensive citywide asset management system that also addresses ADA issues.

For asphalt shared use paths, an asset management system should be created to track condition and repairs. The surface should be inspected every other year to make sure the surface is appropriate for all users and to determine what repairs and preventative maintenance operations should be scheduled.

In addition to the sidewalk and path surface evaluation programs, a systematic tree and brush trimming program for sidewalks along major streets and shared use paths should be undertaken. Overhanging vegetation can greatly reduce the usable width of a walkway, cause injury to users and obstruct views. There should be a 2 foot clear zone on each side of the walkway and a vertical clearance of 8 feet above the walkway. Routine trimming should be done at least twice a year to keep the sidewalk clear of vegetation.

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 large portions of the City impassable to many mobility impaired pedestrians or those pushing strollers or grocery carts.

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 comparable amounts of annual snow to Novi, (Boulder-60", Madison-42", Novi-41") have bicycle mode-shares significantly higher than Novi. Both Minneapolis and Madison have higher bicycle commuting rates than San Diego[1].

[1] 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.

The City currently has a sidewalk snow removal policy in place that should be continued and built upon. City policy should treat the removal of snow from sidewalks and off-road pathways with equal importance as the removal of snow from streets. Areas of special concern are curb ramps at intersections and pedestrian crossing islands. Crossing islands are not the responsibility of an adjacent property owner, so they require clearing by City staff. Additional attention may be needed to identify "orphan" areas, such as over freeways or along other public rights-of-way to ensure that these areas are cleared by the appropriate agency. Shared-use Trails should also be included in snow removal because they provide a non-motorized route of travel.

Crosswalks

While motorists can tolerate bumpy roads, uneven pavement surfaces at intersection crosswalks can be hazardous for pedestrians. The City should develop criteria 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.

Bicycle Lanes

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 should repaint its pavement markings on all roadways, including bike lanes and crosswalks on a yearly basis. This type of maintenance is important to retain high contrast and visibility. The City should avoid multiple layers of thermoplastic because it results in rough surfaces for bikers. 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.

Signalized Intersections

Bicyclists and Pedestrians in many cases, cross the road in very different fashions. Bicyclists in the roadway most likely will treat the intersection the same as a vehicle, merging across lanes and making a left turn from the center turn lane. 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. Since many bicycles function similar to vehicles at intersections it is important that signals are able to detect bicycles even when no motor vehicles are present. The City should develop a system to identify and replace the signals that do not identify bicycles at an intersection.

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.

Key Programs to Continue for Maintenance of Non-motorized Facilities

The City of Novi has many good existing policies and programs that support the non-motorized system. The following policies and programs should be reinforced and continued.

- The City has a sidewalk snow removal policy in place. Residents are responsible for the snow removal on their property within 24 hours after the end of each accumulation of snow greater than 2 inches. This policy should be enforced and continued.
- The City should continue enforcing the street sweeping policy to keep the bike lanes clear of debris.
- The city should continue to refresh pavement marking on all roadways, including bike lanes and crosswalks, yearly to maintain high contrast and visibility.

Policy Recommendations on Maintenance of Non-motorized Facilities

Within One Year:

- The City should develop a multi-year maintenance schedule as part of the annual striping program for updating signs and refreshing pavement markings on Trails and Bike Routes to maintain high contrast and visibility and help bicyclist and pedestrians navigate.
- The City should develop a citywide inspection program to identify and cite hazardous sidewalks.
- The City should develop a comprehensive citywide asset management system addresses regular inspections, preventative maintenance and ADA issues.
- Establish a dedicated website form for non-motorized service requests.
- Develop an educational campaign encouraging property owners to clear curb ramps and bus stops when shoveling their sidewalks.
- Establish a policy for maintenance and snow removal of crossing islands.
- Establish a policy to integrate all of the non-motorized facilities that are part of the Network Plan into the current snow removal program.

Within Three Years:

- Initiate a program that provides maintenance contact information, either on stickers or signs, to be placed on pedestrian signals.
- 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, specifically on local roads and private drives. 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 and maintaining crossing islands, shared-use trails and off-road pathways of snow and ice.
- The City should develop a program that monitors the condition of sidewalks along Arterials and Collectors on a yearly basis.

Within Five Years:

- 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.

4.6 Sidewalk/Roadside Pathway Completion

Sidewalks are the unsung heroes of a non-motorized system. They are usually the first facilities to be constructed and provide a backbone to a complete non-motorized network. Sidewalks are one of the key components to a walkable community and policies and programs need to be established to support the installation of these facilities.

In general, sidewalks should be installed by developers when constructing new buildings or homes and by the local city, county or state agency during a roadway improvement project. Every city handles sidewalk installation differently, but the important thing is to have policies in place that require the installation of sidewalks in both existing and newly developed areas.

Sidewalks/Roadside Pathways along Arterial and Collector Roads

There are usually many destinations along arterial and collector roads so it is important to have a complete sidewalk and/or pathway on both sides of the street.

In 2006, the City of Novi approved a Pathway and Sidewalk Prioritization Analysis and Process that provides an inventory of the existing, scheduled and proposed pathways and sidewalks along the arterial and collector roads. Since the program began, the City of Novi completed almost 20,000 feet of pathway and sidewalks and developers completed over 10,000 feet of pathways and sidewalks in the City of Novi.

This plan builds upon the prioritization system to establish sidewalks along key corridors across the city. [Expand this section based on recommendation]

Sidewalks in Residential Neighborhoods

Local sidewalks are critical to the walkability of a neighborhood. In many communities, local sidewalks are where a majority of daily recreation takes place. Daily activities such as jogging, dog walking, and socializing occur along local neighborhood streets so it is important to provide a safe alternative to the roadway where these activities can take place.

There are many neighborhoods in the City of Novi that have an incomplete sidewalk system along the local roadways. The current policy for sidewalk construction applies to new construction, not to existing subdivisions where there are many gaps or no sidewalks at all within the entire development. Also in many of the newly constructed subdivisions, sidewalk construction is not required until the house is completed. Due to the current economic downturn, many of the new subdivisions are only partly built out, creating many gaps in the sidewalk system where houses have not been built yet.

City Policy should be updated to include the following:

> In New Construction of Subdivisions, given the development may take up to 10 years to complete, sidewalks must be complete at the time the road is being built.
>
> In Existing Subdivisions where there are sidewalk gaps, or no sidewalks are present, establish a process for completing the sidewalk system. It is suggested that if 2/3 of the occupied households vote to complete the sidewalk system that is being constructed with cost assessed to the landowners who segments are incomplete.

Key Programs to Continue for Sidewalk/Roadside Pathway Completion

The City of Novi has many good existing policies and programs that support the non-motorized system. The following policies and programs should be reinforced and continued.

- The City has a Pathway and Sidewalk Prioritization Analysis and Process that has been successful in installing sidewalks and pathways along arterial and collector roadways. The prioritization should be continued and updated every five years.

Policy Recommendations on Sidewalk/Roadside Pathway Completion

Within One Year:

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

Within Three Years:

- Establish the process for neighborhoods to complete their sidewalk system.

Within Five Years:

- Update the cities Pathway and Sidewalk Prioritization Analysis and Process and track its progress.

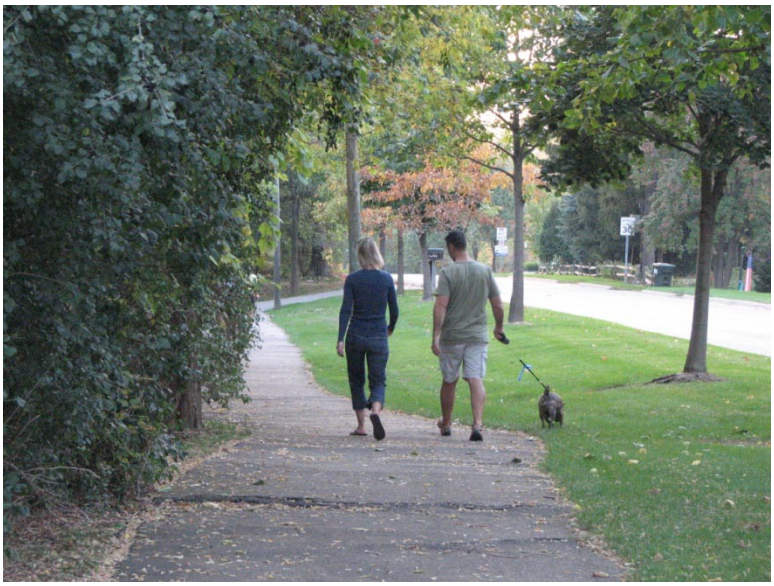
5. Design Guidelines

These design guidelines should be consulted when planning new facilities or reconstructing or modifying existing facilities.

Topics:

5.1 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 influencing the nature of 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 45 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. The availability and convenience of mid-block and signalized crossings as well as the nature of the roadway been crossed strongly influence the decision to walk, the safety of the walk and the decision to make that walk again in the future.

Pedestrian Quality/Level of Service

In order to make recommendations on appropriate for pedestrians, the pedestrian quality of service model that was developed by Sprinkle Consulting, Inc. was utilized. The model is based on data gathered from a wide cross section of users who evaluated numerous real world scenarios. A simplified version of this model has been incorporated in the 2010 Highway Capacity Manual's multi-model level of service evaluation. The following summarizes the key factors for pedestrians.

Key Factors (in order of statistical significance):

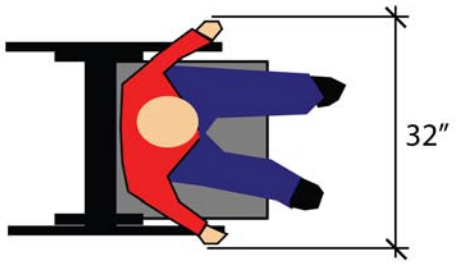
1. Presence of a sidewalk
2. Amount of lateral separation between pedestrians and motor vehicles
3. Presence of physical barriers (such as trees) and buffers (including parking) between pedestrians and motor vehicles
4. Motorized vehicle volume
5. Motorized vehicle speed

Pedestrian Spatial Requirements and Sidewalk Width

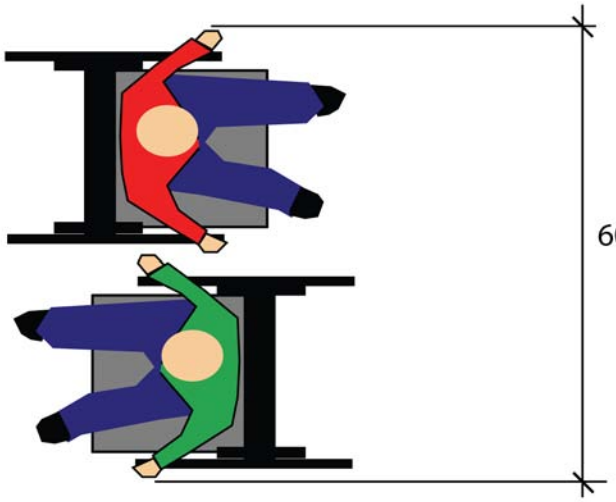
Pedestrian spatial requirements vary greatly given the variety of pedestrians. More significant than the size differential between individuals, the various mobility aids utilized have a major impact on how much space is required. Pedestrians who use crutches, walkers, wheel chairs, scooters or guide dogs require more space than pedestrian not using any of those aids. 2'-6" (30") is generally considered the bare minimum necessary for a person using a wheel chair. Thus 3' (36") is considered the narrowest a sidewalk should be at any point and only then for short distances. 4' (48") is required for a person with a guide dog.

For two pedestrians to comfortably walk side by side or pass each other, a five foot wide sidewalk is required. This is reflected in AASHTO Guidelines. With an aging population and the fact that most pedestrians will use some type of mobility aid at some time, sidewalk widths should accommodate the ability for two people to comfortably pass each other, even if they are using some type of mobility aid. Thus, a 6' wide sidewalk is considered more appropriate, especially when along collector and arterial streets where there is more pedestrian traffic. This has the added advantage of an adult walking with a child or someone walking a dog being able to pass another adult without having to do so single file. Where occasional bicycle traffic is to be encountered, an eight foot wide sidewalk is a more appropriate width and this is typically used along primary roads.

Figure 5.1A Wheelchair Spatial Requirements



Single Wheelchair Passage



Two Wheelchairs Passing

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.

5.2 Key Factors for 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 alongside 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

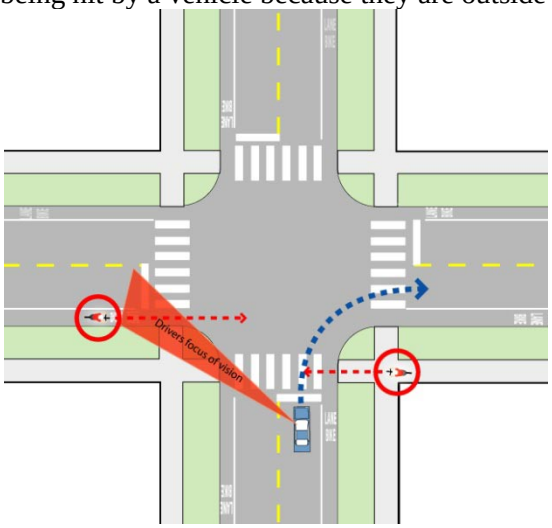
One of the most significant drawbacks to bicycling on sidewalks as opposed to bicycling in the roadway is the loss of right-of-way when traveling along collectors and arterials. When riding in the roadway of a major road, the vehicular traffic on side streets that do not have a traffic light generally yield to the bicyclists on the main road. If riding on a sidewalk, the bicyclist generally ends up yielding at 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

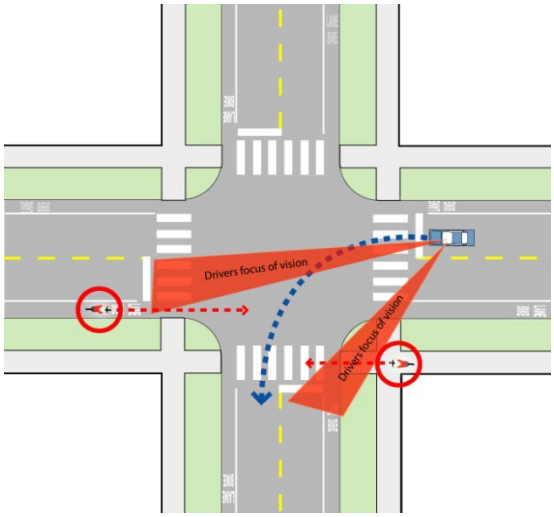
Bicycles traveling in the opposite direction of traffic on sidewalks have significantly greater chance of being hit by a vehicle because they are outside of the driver's typical field of view.



Car turning right

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

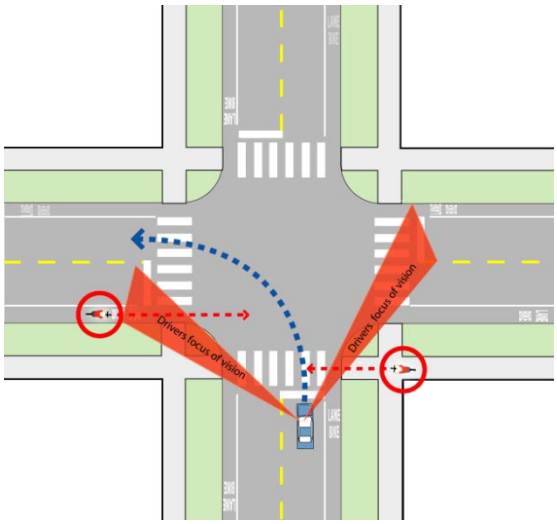
Bicyclist on Sidewalk Bikeway/Sidewalk is not in the driver's focus of vision and can't easily be seen until just before impact.



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.

Bicycle Quality/Level of Service

In order to make recommendations on appropriate bike lane widths, the bicycle quality of service model that was developed by Sprinkle Consulting, Inc. was utilized. The model is based on data gathered from a wide cross section of users who evaluated numerous real world scenarios. A simplified version of this model has been incorporated in the 2010 Highway Capacity Manual's multi-model level of service evaluation. The following summarizes the key factors for bicyclists.

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

Bicycle Spatial Requirements

Bicycle spatial requirements vary greatly given the variety of bicycle styles out there. Tricycles, tandems, recumbent all have different special requirement. For a typical two wheel bicycle, a stationary bicyclist is only about 2' wide. But when in motion, the bicyclist requires 5' of width to operate. The extra space is required for essential maneuvering and to provide a comfortable lateral clearance. Thus, a path that is capable of having two bicyclists comfortably pass each other needs to be 10' wide.

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.

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.

5.3 Travel Along Road Corridors

Our roadway network has been designed primarily to move cars safely, efficiently, and with minimal disruption. This network includes major arterial streets that place cars in multiple lanes moving at high speeds for long distances. These major transportation corridors usually present tremendous challenges when we try to retrofit them with nonmotorized facilities. There are two primary types of nonmotorized movements related to road corridors:

- Travel Along the Road Corridor (Axial Movements) that utilizes sidewalks, shoulders, 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. Restricting bicycles to a path along a roadway—while potentially a legal option—is fraught with safety concerns. This diminishes the attractiveness of using a bicycle for transportation.

Multi-Modal Corridor Width Requirements

While primary roads are classified as Principal Arterials, Minor Arterials, and Collectors, there is not always 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

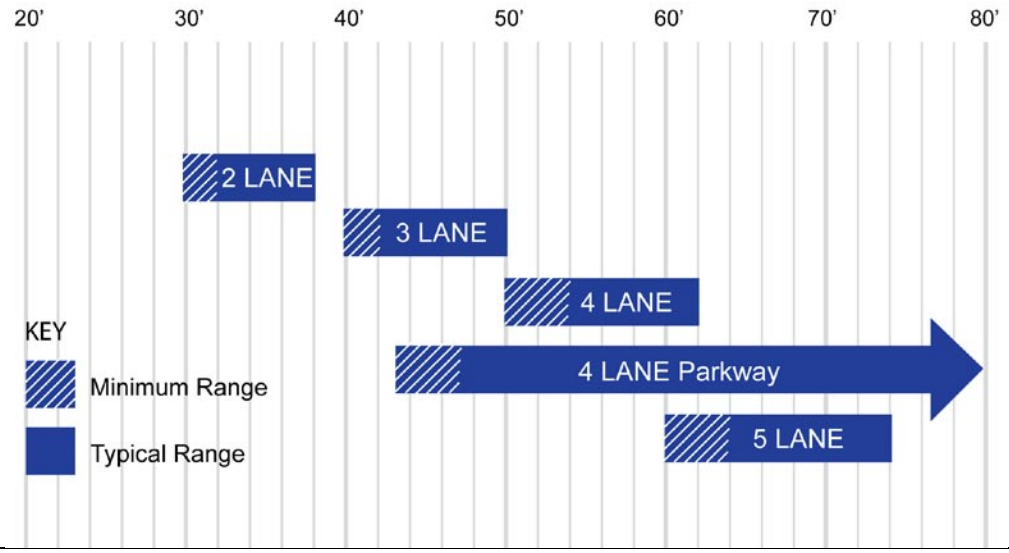
There are various configurations of overall road widths depending on individual lane widths. For instance, a road may have anywhere from ten to twelve foot travel lanes and five to eight foot Bike Lanes. Variation in any or all of these widths has an impact on overall road width.

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 increase speed of motor vehicles. With high speed roads, wider Bike Lanes are desirable to increase the lateral separation between motor vehicles and bicycles.

Fig 5.3A, Multi-Modal Roadway Width Requirements, illustrates the range of widths for typical multi-modal road types. The Minimum Range is based on AASHTO minimum guidelines. The Typical Range begins based on generally preferred minimums. The upper range is based on the maximum dimensions that would typically be encountered for motor vehicle and Bike Lanes.

Fig 5.3A. Multi-Modal Roadway with Bike Lanes Width Requirements



Multi-modal ROW Widths

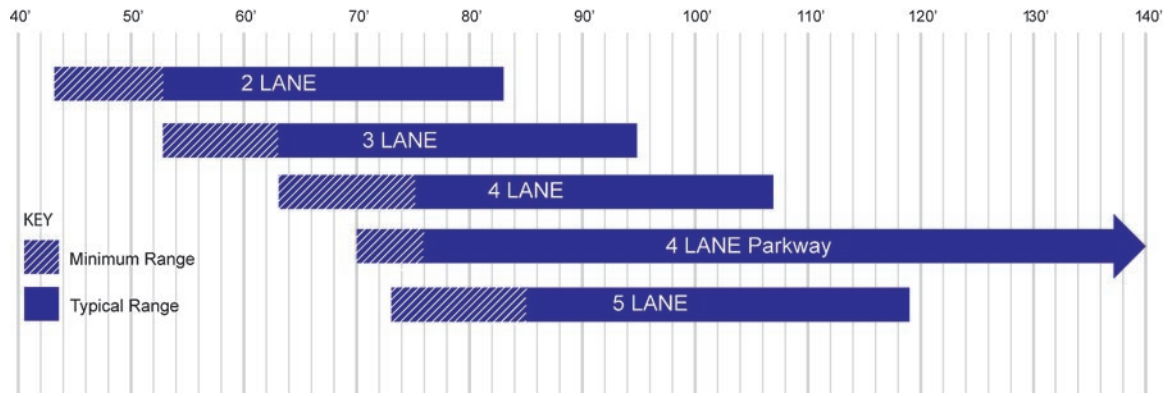
In addition to the road, the ROW contains sidewalks/path, the buffer area between the sidewalk and the road and space for a median if any. There is tremendous variation within some variables such as the buffer and the median distance.

Fig 5.3B, Multi-Modal ROW Width Requirements, illustrates the range of widths for typical multi-modal ROWs. If ROW is greater than any of the given scenarios, then all those that fall within that width are feasible. For instance, a ROW of 66' is capable of accommodating a two or three lane road. The two lane road would simply have more opportunities for flexibility than the three lanes. Note that it is not always preferable to go to the maximum allowable ROW width. Bigger is not necessarily better. 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 increases ROW requirements, though in some circumstances the space would be deducted from the buffer.
- Speed – as noted under Multi-Modal Roadway Widths, higher speeds generally increase the need for a wider road. Higher speeds also make a wider buffer more desirable.

Fig 8.3B. Multi-Modal Right-of-Way Width Requirements



5.4 Developing Complete Street Cross Sections

Integrating bicycle and pedestrian facilities into existing roadways takes into account the road's context, the type of road, the desired motor vehicle speeds, the anticipated amount of motor vehicle traffic and the available ROW. Roadways that are designated as having a focus on bicycle and pedestrian traffic (See Section 3.1) should be designed such that motorists naturally travel the roadway at the desired speed range of 30 to 35 MPH. This may be accomplished by the combination of narrow motor vehicle travel lanes, street trees close to the edge of the roadway and introducing elements into the roadway such as medians and crossing islands that interrupt long straight stretches of roadway.

The following is an overview of the key design of each segment of roadway.

Sidewalk Guidelines

- Sidewalks should be a minimum of 5' wide as per AASHTO guidelines. 4' wide sidewalks may be used if a 5' wide passing spaces for wheelchair users are proved at reasonable intervals but this is not recommended.
- If sidewalk is placed at the back of a curb (curb-attached sidewalk) then the sidewalk should be a minimum of 6' wide.
- It is recommended that all sidewalks along all Arterial and Collector roadways be at least 6' wide.
- It is recommended that at least one sidewalk along all Arterials and Collectors be at least 8' wide and that the location of the wider sidewalk/road side pathway be consistent from segment to segment.
- It is recommended that when a sidewalk/road side pathway is used as a link in a regional trail system, that it conform to AASHTO guidelines for Shared-Use Paths having a minimum with of 10' with 2' shoulders.

Buffer Width

- Buffers should be a minimum of 2' on Collectors and 5' on Arterials as per AASHTO Guidelines.
- A 5' wide buffer is generally considered the minimum to accommodate street tree plantings
- A 6' wide buffer is considered the desirable minimum with along Collector roadways
- A 9' wide buffer is considered the desirable minimum along Arterial roadways

Buffer Plantings/Street 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.

Bike Lane:

- Generally roads with ADT's below 3,500 vehicle per day do not require bike lanes as the traffic flow is such that motorists can generally pass bicyclists without waiting for oncoming traffic to clear.
- 5' minimum as measured from face of curb to edge line with a minimum of 3' ridable surface outside of the gutter plan.
- If the seam between the gutter pan and the road surface is not smooth than a mimumum of 4' of ridable surface should be provided.
- 4' minimum as measured from the edge of pavement to the edge line when no curb is present.
- 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 and 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.

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.

On-Street Parking

When adding parking the parking lane should be set at 7' measured form face of curb..) 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.

Sidewalk/Roadside Pathway Marking and Signing

In instances where existing sightlines and visibility are limited use an advanced warning sign to notify walker and bicyclist of an approaching subdivision entrance or busy drive. Only use a stop sign at the drive on extreme cases where warranted.

Fig 5.4A Urban Multi-Modal Roadway Design Guidelines

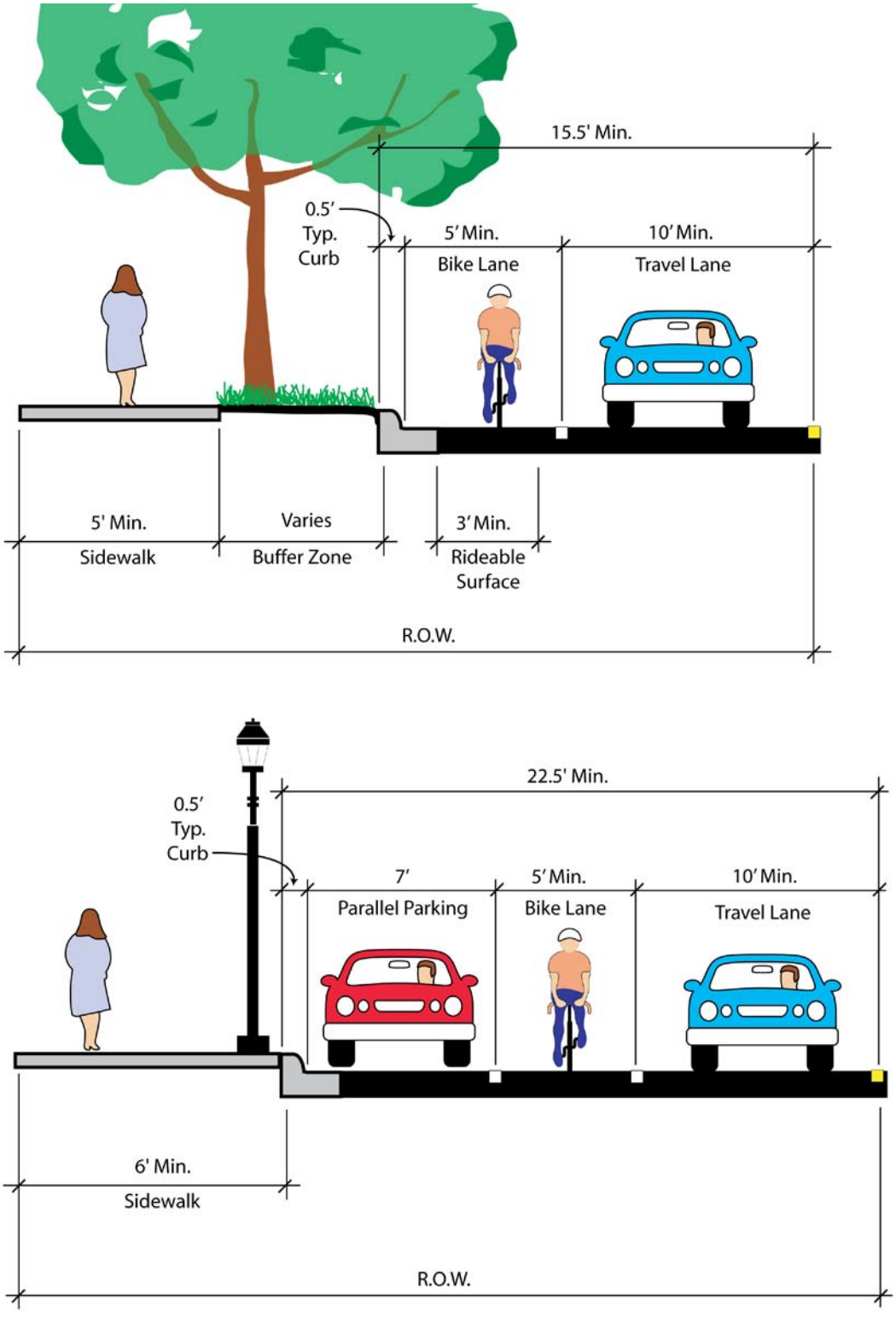


Fig 5.4B Urban Bike Lane Sizing Chart

The following chart indicated the minimum bike lane width necessary to maintain a bicycle quality/level of service of C or above.

12' Travel Lanes

	Urban 2 Lane Road:					Urban 4 Lane Road:					
No. of Lanes	2	2	2	2	2	4	4	4	4	4	4
Design ADT	3,500	5,000	10,000	15,000	20,000	15,000	20,000	25,000	30,000	35,000	40,000
25 mph	5	5	5	5	5	5	5	5	5	5	5
30 mph	5	5	5	5.5	6	5	5	5.5	5.5	5.5	6
35 mph	5	5	5.5	6	6.5	5	5.5	5.5	6	6	6
40 mph	5	5	5.5	6	6.5	5.5	5.5	6	6	6.5	6.5
45 mph	5	5.5	6	6.5	6.5	5.5	6	6	6.5	6.5	6.5
50 mph	5	5.5	6	6.5	7	6	6.5	6.5	6.5	6.5	7
55 mph	5	5.5	6	6.5	7	6	6.5	7	7	7	7

11' Travel Lanes

	Urban 2 Lane Road:					Urban 4 Lane Road:					
No. of Lanes	2	2	2	2	2	4	4	4	4	4	4
Design ADT	3,500	5,000	10,000	15,000	20,000	15,000	20,000	25,000	30,000	35,000	40,000
25 mph	5	5	5	5.5	5.5	5	5	5	5.5	5.5	5.5
30 mph	5	5	5.5	6	6.5	5	5.5	6	6	6	6.5
35 mph	5	5	6	6.5	6.5	5.5	6	6	6.5	6.5	6.5
40 mph	5	5	6	6.5	7	6	6	6.5	6.5	7	7
45 mph	5	5.5	6.5	7	7	6	6.5	6.5	7	7	7
50 mph	5	5.5	6.5	7	7.5	6	6.5	7	7	7	7.5
55 mph	5	6	6.5	7	7.5	6.5	6.5	7	7	7.5	7.5

10' Travel Lanes

	Urban 2 Lane Road:					Urban 4 Lane Road:					
No. of Lanes	2	2	2	2	2	4	4	4	4	4	4
Design ADT	3,500	5,000	10,000	15,000	20,000	15,000	20,000	25,000	30,000	35,000	40,000
25 mph	5	5	5	6	6	5	5	5.5	6	6	6
30 mph	5	5	6	6.5	7	5.5	6	6.5	6.5	6.5	7
35 mph	5	5.5	6.5	7	7	6.5	6.5	6.5	7	7	7
40 mph	5	5.5	6.5	7	7.5	6.5	6.5	7	7	7.5	7.5
45 mph	5	6	7	7.5	7.5	6.5	7	7	7.5	7.5	7.5
50 mph	5	6	7	7.5	8	6.5	7	7.5	7.5	7.5	8
55 mph	5	6.5	7	7.5	8	7	7	7.5	7.5	8	8

Notes

1. Size is based on an 18” wide gutter pan. If the gutter is only 1’ wide or there is no gutter the width may be reduced by 0.5’.
2. Bike lane sizing is based on 3% truck traffic. For every 1% increase in heavy vehicles add approximately 8” to 9” of additional bike lane width.
3. In urban areas, where there is a demand for on-street parking and none exists, bike lanes 7’ and over may experience illegal parking.

Fig 5.4C Rural Multi-Modal Roadway Design Guidelines

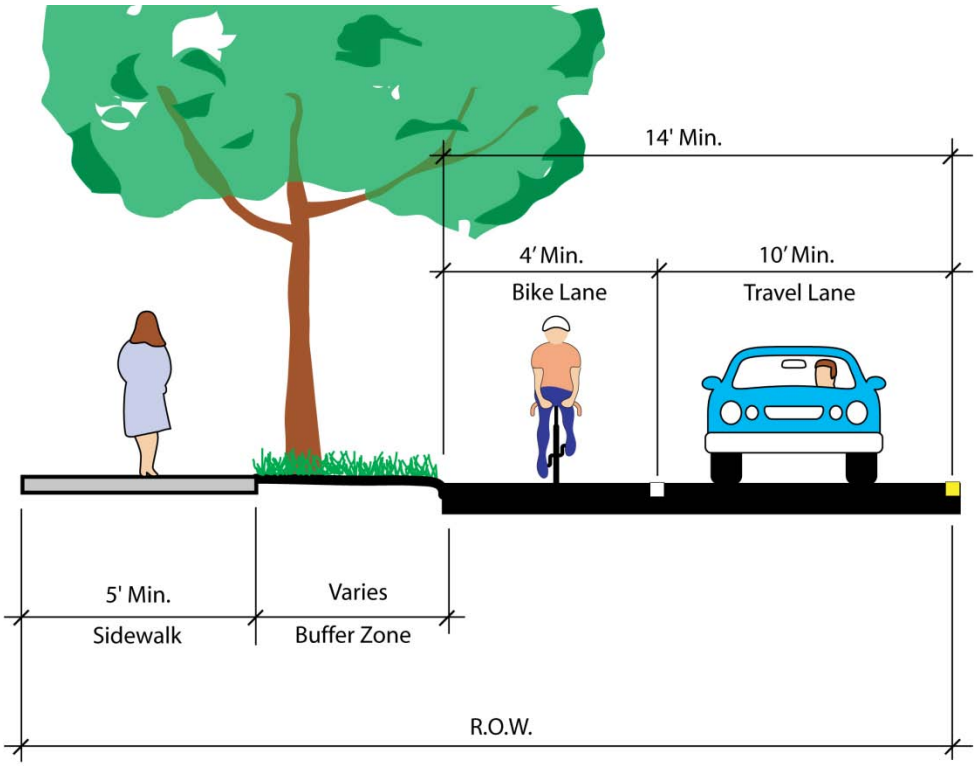


Fig 5.4D Rural Bike Lane Sizing Chart

The following chart indicated the minimum bike lane width necessary to maintain a bicycle quality/level of service of C or above.

12' Travel Lanes

	Rural 2 Lane Road:					Rural 4 Lane Road:					
No. of Lanes	2	2	2	2	2	4	4	4	4	4	4
Design ADT	3,500	5,000	10,000	15,000	20,000	15,000	20,000	25,000	30,000	35,000	40,000
25 mph	4	4	4	4	4	4	4	4	4	4	4
30 mph	4	4	4	4	4.5	4	4	4	4	4	4.5
35 mph	4	4	4	4.5	5	4	4	4	4.5	4.5	4.5
40 mph	4	4	4	4.5	5	4	4	4.5	4.5	5	5
45 mph	4	4	4.5	5	5	4	4.5	4.5	5	5	5
50 mph	4	4	4.5	5	5.5	4.5	5	5	5	5	5.5
55 mph	4	4	4.5	5	5.5	4.5	5	5.5	5.5	5.5	5.5

11' Travel Lanes

	Rural 2 Lane Road:					Rural 4 Lane Road:					
No. of Lanes	2	2	2	2	2	4	4	4	4	4	4
Design ADT	3,500	5,000	10,000	15,000	20,000	15,000	20,000	25,000	30,000	35,000	40,000
25 mph	4	4	4	4	4	4	4	4	4	4	4
30 mph	4	4	4	4.5	5	4	4	4.5	4.5	4.5	5
35 mph	4	4	4.5	5	5	4	4.5	4.5	5	5	5
40 mph	4	4	4.5	5	5.5	4.5	4.5	5	5	5.5	5.5
45 mph	4	4	5	5.5	5.5	4.5	5	5	5.5	5.5	5.5
50 mph	4	4	5	5.5	6	4.5	5	5.5	5.5	5.5	6
55 mph	4	4.5	5	5.5	6	5	5	5.5	5.5	6	6

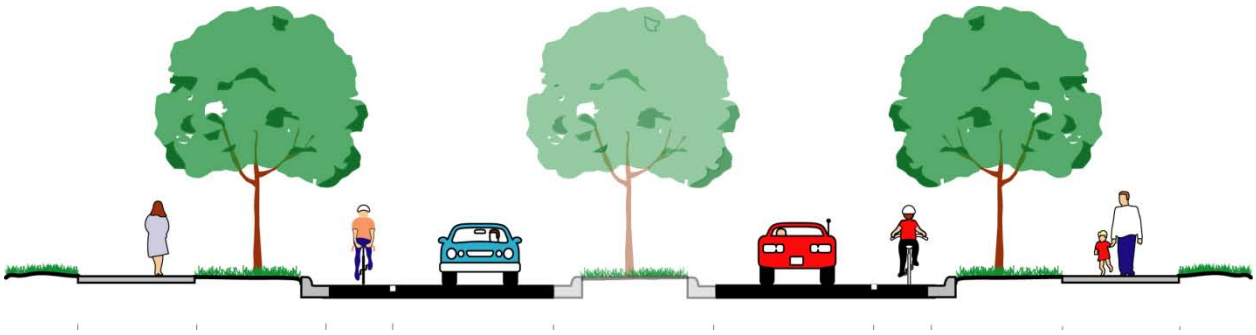
10' Travel Lanes

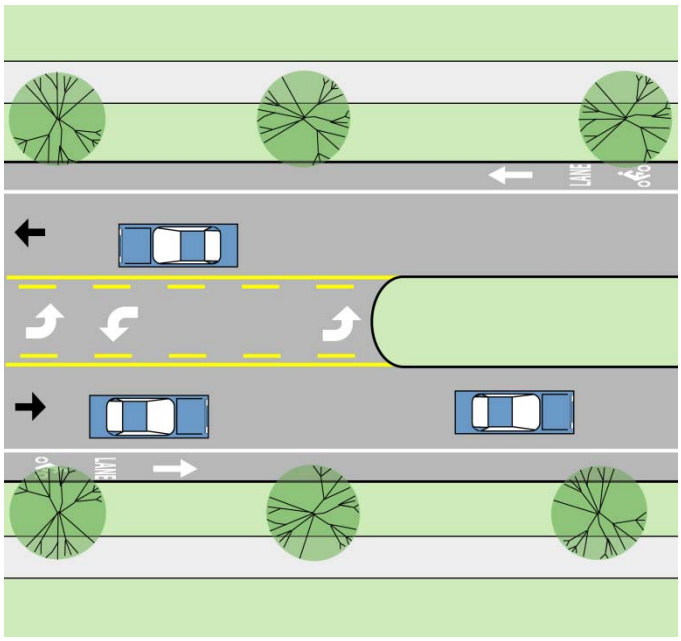
	Rural 2 Lane Road:					Rural 4 Lane Road:					
No. of Lanes	2	2	2	2	2	4	4	4	4	4	4
Design ADT	3,500	5,000	10,000	15,000	20,000	15,000	20,000	25,000	30,000	35,000	40,000
25 mph	4	4	4	4.5	4.5	4	4	4	4.5	4.5	4.5
30 mph	4	4	4.5	5	5.5	4	4.5	5	5	5	5.5
35 mph	4	4	5	5.5	5.5	5	5	5	5.5	5.5	5.5
40 mph	4	4	5	5.5	6	5	5	5.5	5.5	6	6
45 mph	4	4.5	5.5	6	6	5	5.5	5.5	6	6	6
50 mph	4	4.5	5.5	6	6.5	5	5.5	6	6	6	6.5
55 mph	4	5	5.5	6	6.5	5	5.5	6	6	6.5	6.5

Notes

1. The reduction in width in comparison to the Urban Bike Lane Sizing Chart is due to the lack of curb.

Use of Medians





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.

5.5 Transitions Between On and Off-Road Bicycle Facilities

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.

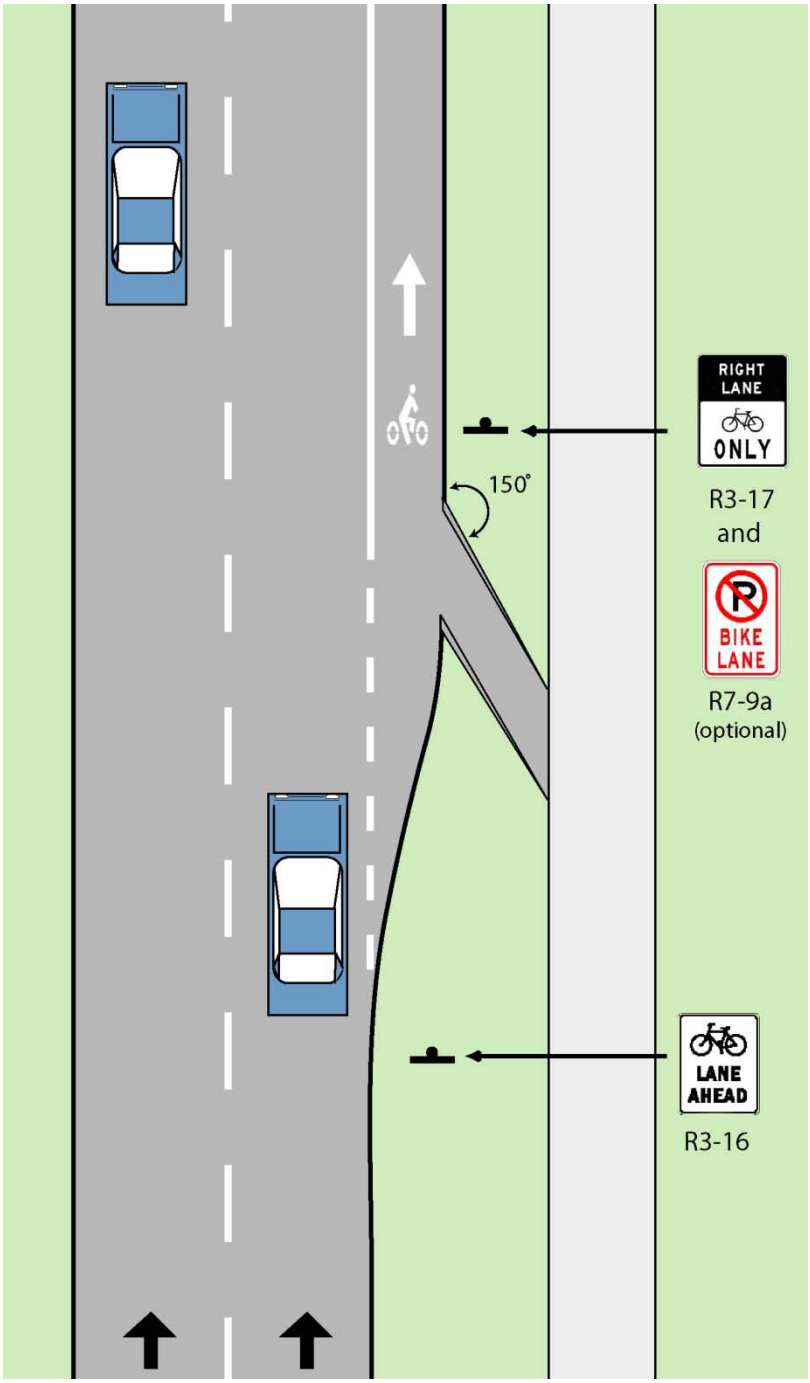
The transition points between sidewalk bikeways and bike lanes, presents a number of challenges. This underscores the importance of making the non-motorized system as consistent as possible. When bringing bicyclists into the roadway as shown in Fig 5.2A (next page), the entrance point needs to be protected. 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 feet wide path is not feasible. Each direction for bicycle use requires 4 feet. 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. 5.5A. Bicycle Entrance Ramp from Sidewalk Bikeway to Bike Lane Design Guideline



Applications

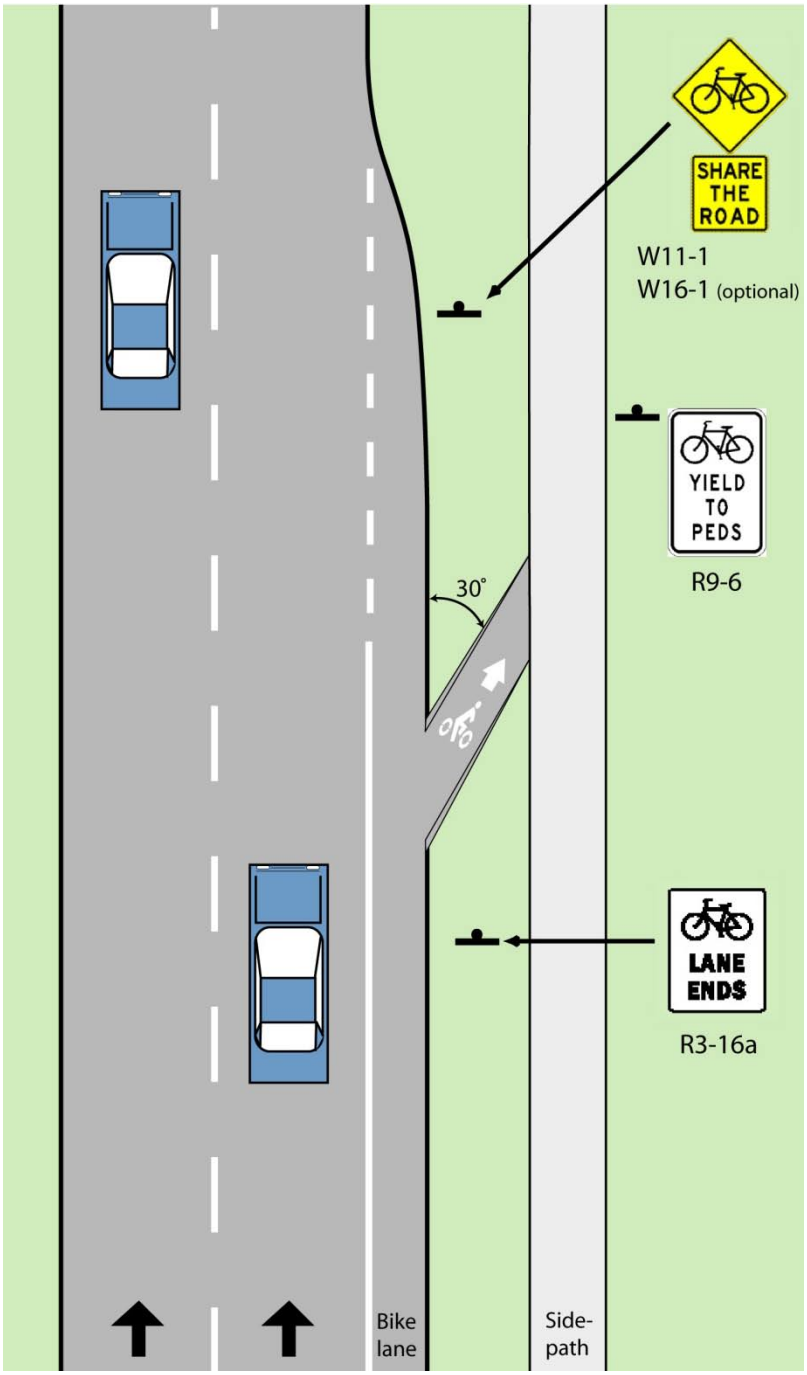
The bike entrance ramp is used to provide easy transition from a sidewalk bikeway to a bike lane or to allow a bicyclist to enter the roadway to make a turn as a vehicle.

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 the roadway from the sidewalk bikeway given the sharp angle of entry. As the road is flared, dashed pavement markings should be used to indicate the beginning of the bike lane and an area where bikers in the roadway can merge into the bike lane.

Fig. 5.5B. 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.

5.6 Modifying Existing Facilities

Novi'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-modal 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

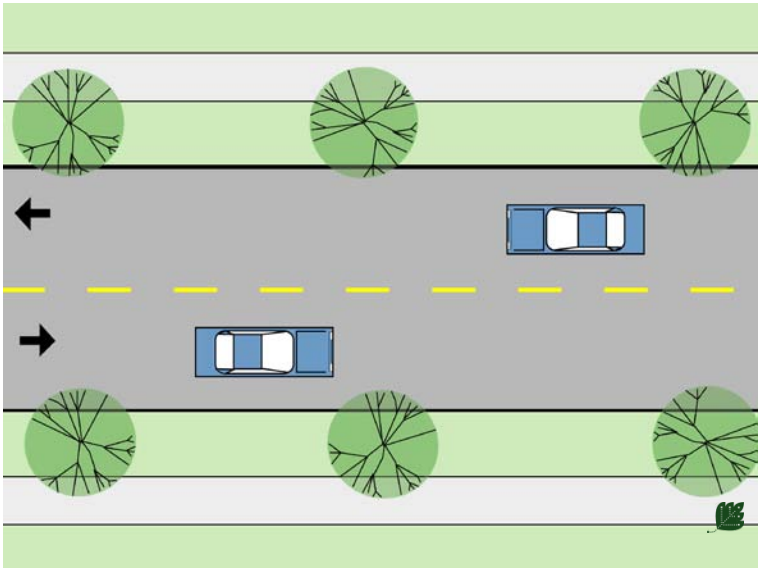
The narrowing of high speed four and five-lane roads to accommodate bike lanes has some specific conversion issues. Given the higher volumes of traffic, higher speeds and higher number of heavy vehicles on many of these roadways, it is desirable to keep the motor vehicle lane widths as close to an 11' minimum as possible. On some of Novi'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 in the near-term.

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.

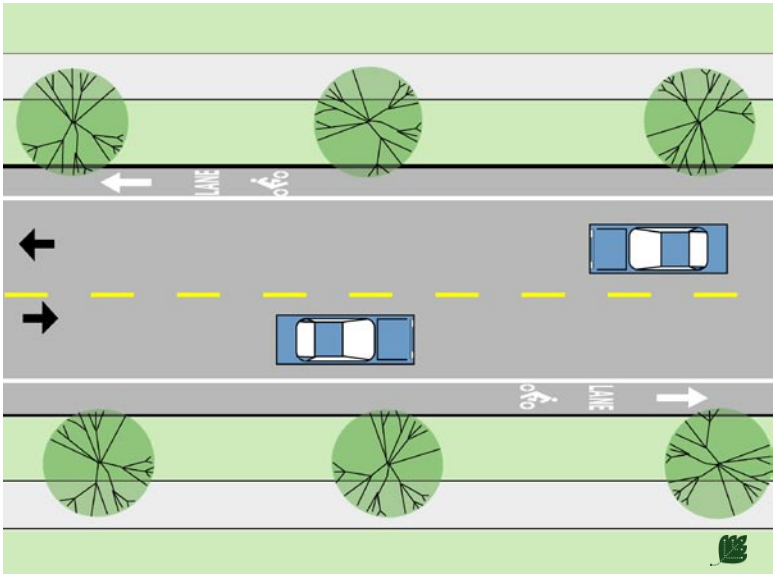
When there is not a bike lane in the road, the bicyclist should be provided the option to use a sidewalk or to bike in the road. Exit and entrance ramps should be used to ease the transition between on-road and off-road facilities.

Fig. 5.6A. 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

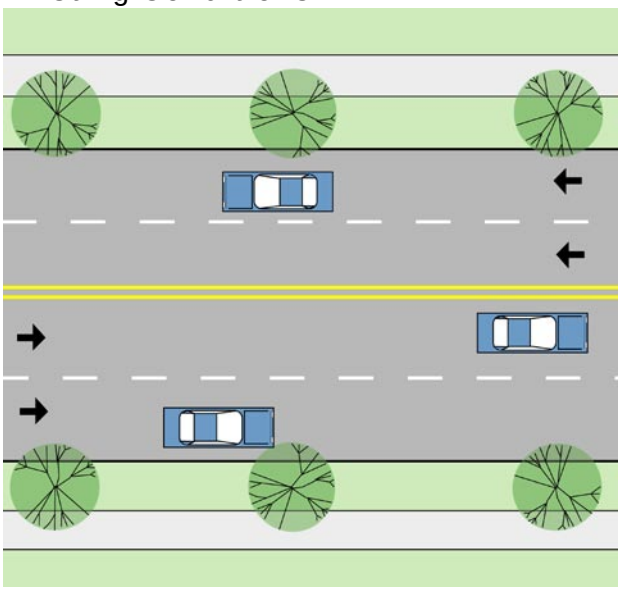
In general, lane narrowing to provide for bicycle lanes may be considered in the following situations:

- 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

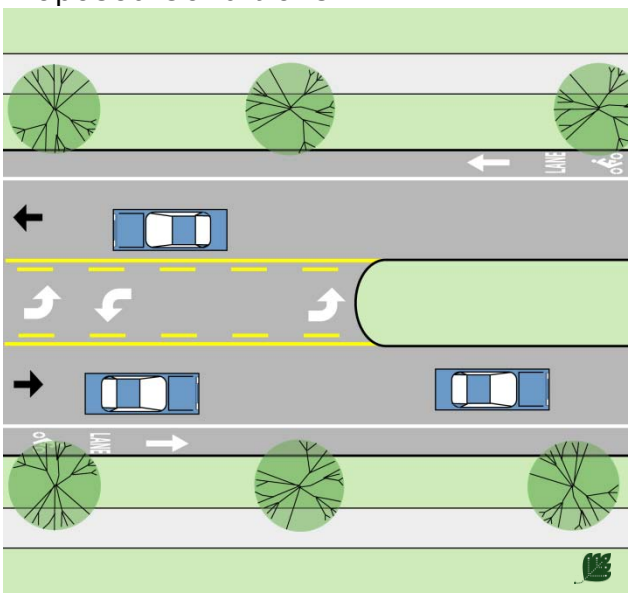
Higher speed roads may require additional width; see notes on multi-modal roadway design guidelines.

Fig. 5.6B. 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.

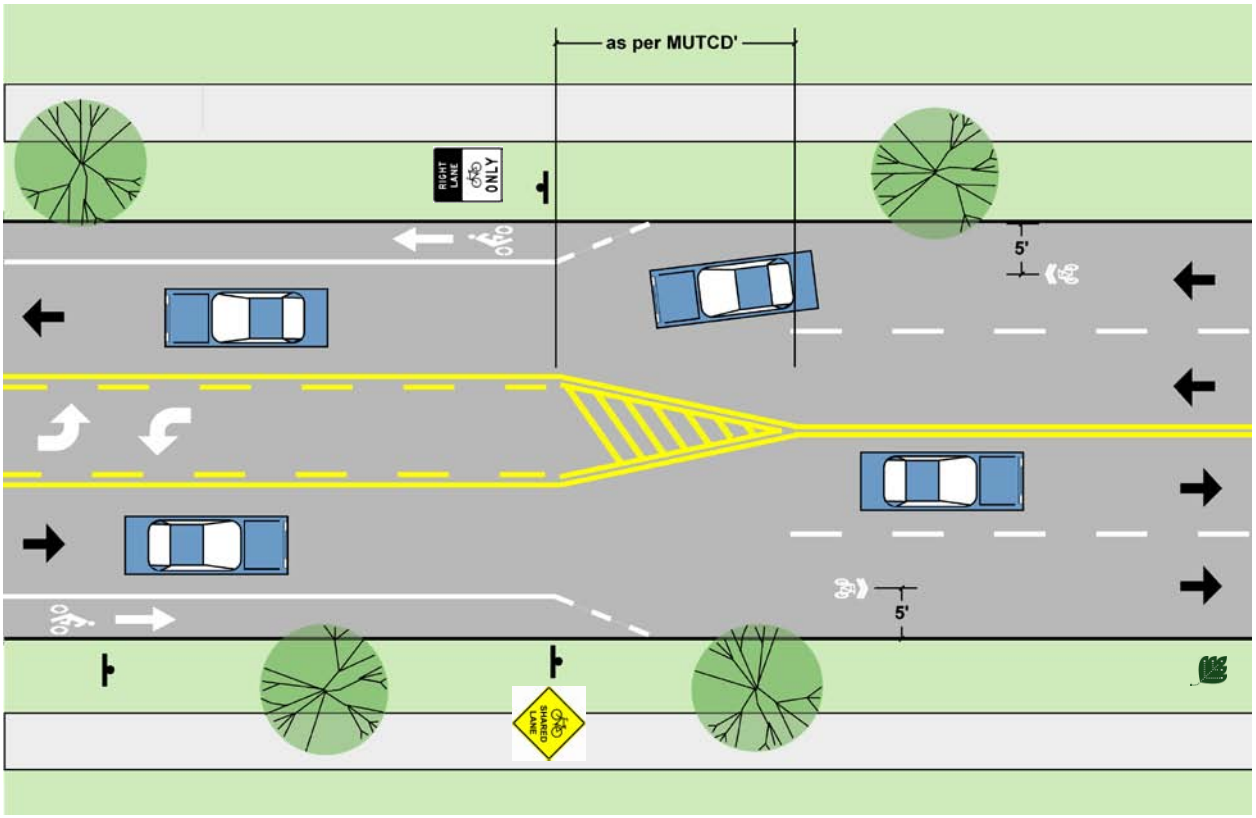
Application

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.

Fig. 5.6C. 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.

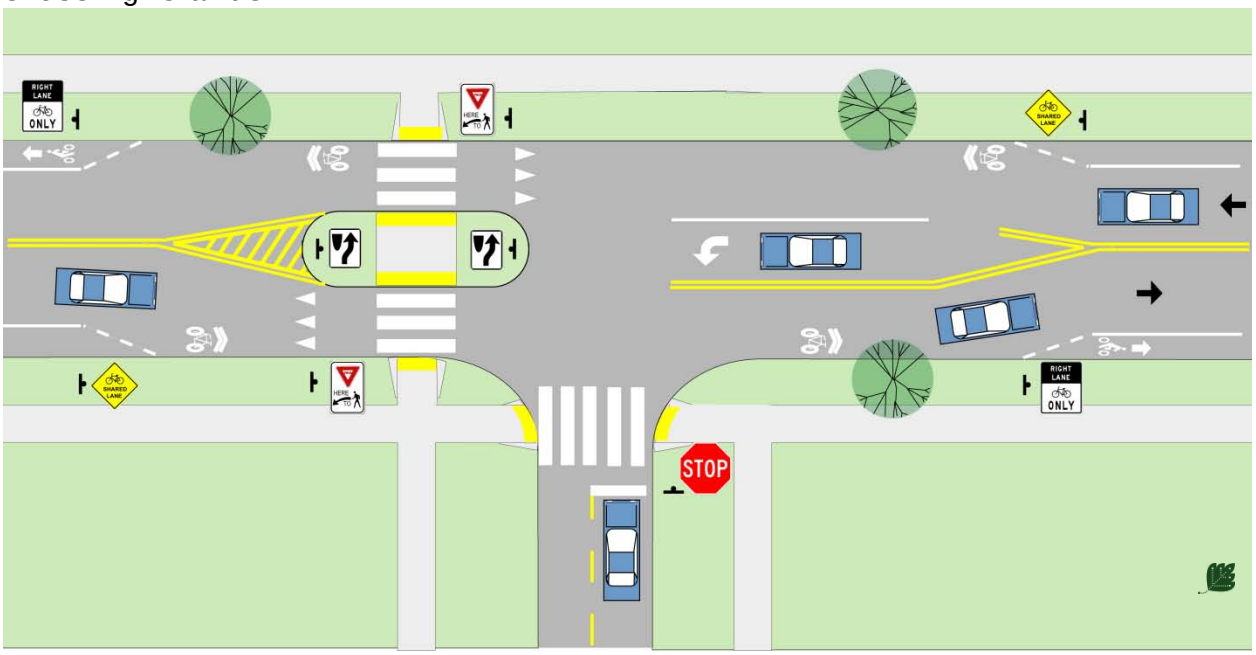
Application

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.

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. 5.6D. 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.