

APPENDIX D: WAITE PARK CITY PROFILE

The City of Waite Park has grown from its historic roots as a railroad hub to become a primary center for retail and commercial activity within the MPA. Today, as the point at which MN 23 and CSAH 75 come together, Waite Park's significance to the region continues to grow along with the challenges of its position. While focused on responding to these demands, the "City with a Smile" retains its small-town values and strong neighborhood ties. The city strives to provide community facilities and services to support a good quality of life to be enjoyed by all.

DEMOGRAPHICS

According to the U.S. Census Bureau's 2014-2018 American Community Survey (ACS) Five-Year Estimates, the City of Waite Park has a population that has grown 16.1% since 2000.

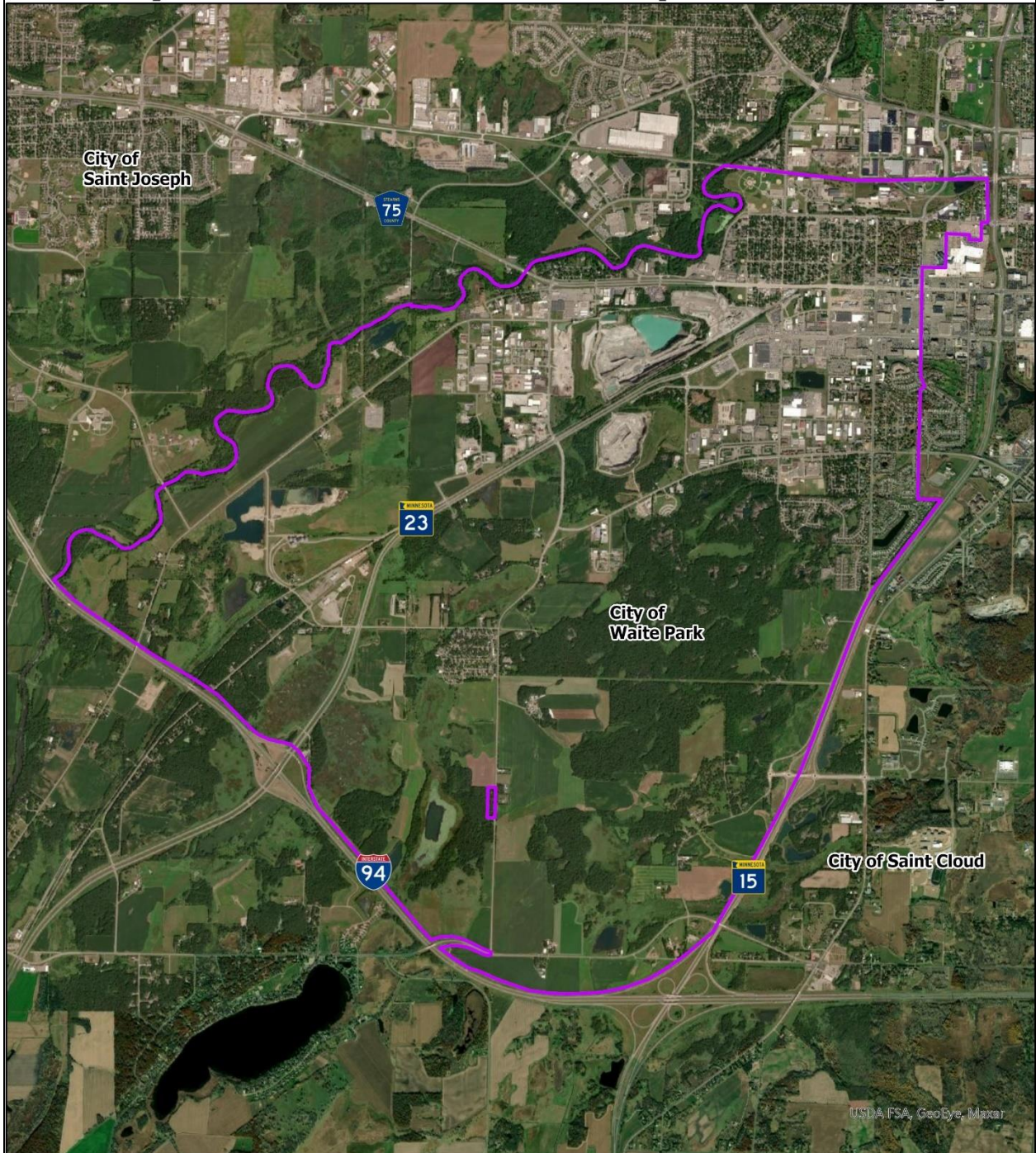
The City of Waite Park strives to provide equitable service to all segments of the community in its transportation planning investments. The APO tracks specific population demographic subsets known as traditionally underrepresented populations at a regional level. This includes the following:

- People-of-Color (Black/African American alone; American Indian and Alaska Native alone; Asian alone; Native Hawaiian and other Pacific Islander alone; some other race; two or more races; Hispanic or Latino descent regardless of race).
- Persons with low-income.
- People with disabilities.
- People with limited English-speaking capabilities.
- Households without access to a motor vehicle.
- Persons over the age of 65.
- Persons under the age of 18.

A look at these demographics finds that within Waite Park, many of these groups make up a large share of the City's population, more so than other cities in the MPA. People-of-color comprise about a third of the city's population. A large proportion of households (over 15%) are low income, and about 8% of households are without access to a vehicle.

See Figure D.2 below for details.

City of Waite Park Municipal Boundary



Legend

City of Waite Park Municipal Boundary



03/10/2021

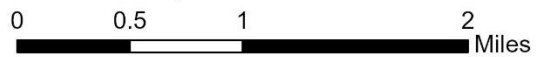


FIGURE D.1 – CITY OF WAITE PARK.

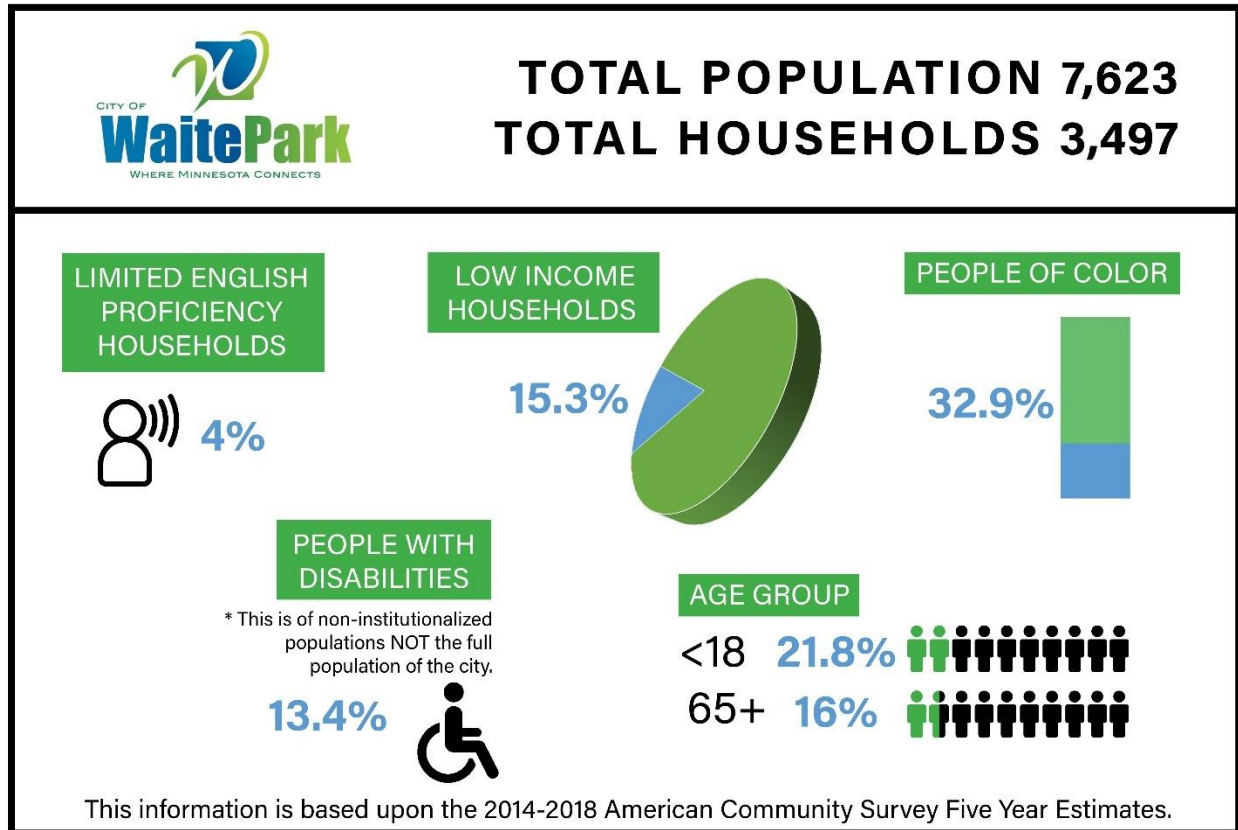


FIGURE D.2 – DEMOGRAPHIC PROFILE FOR THE CITY OF WAITE PARK.

EXISTING LAND USES

How cities use the land within their boundaries (i.e., residential, commercial, industrial, etc.) impacts the transportation network and the modes of travel available or desirable to users. Land use can play a role in developing a transportation system that is mode-friendly to both motorized and non-motorized users.

Based on the land use inventory developed with the City’s 2005 Comprehensive Plan, updated to account for newly annexed areas, the city identified existing and proposed land uses as shown in Figure D.3.

The characteristic of Waite Park is a high concentration of commercial and light industrial uses along MN 23 and CSAH 75. Much of the remaining developed areas of the city are a mix of single-family (shown as suburban residential) and multiple-family residential uses.

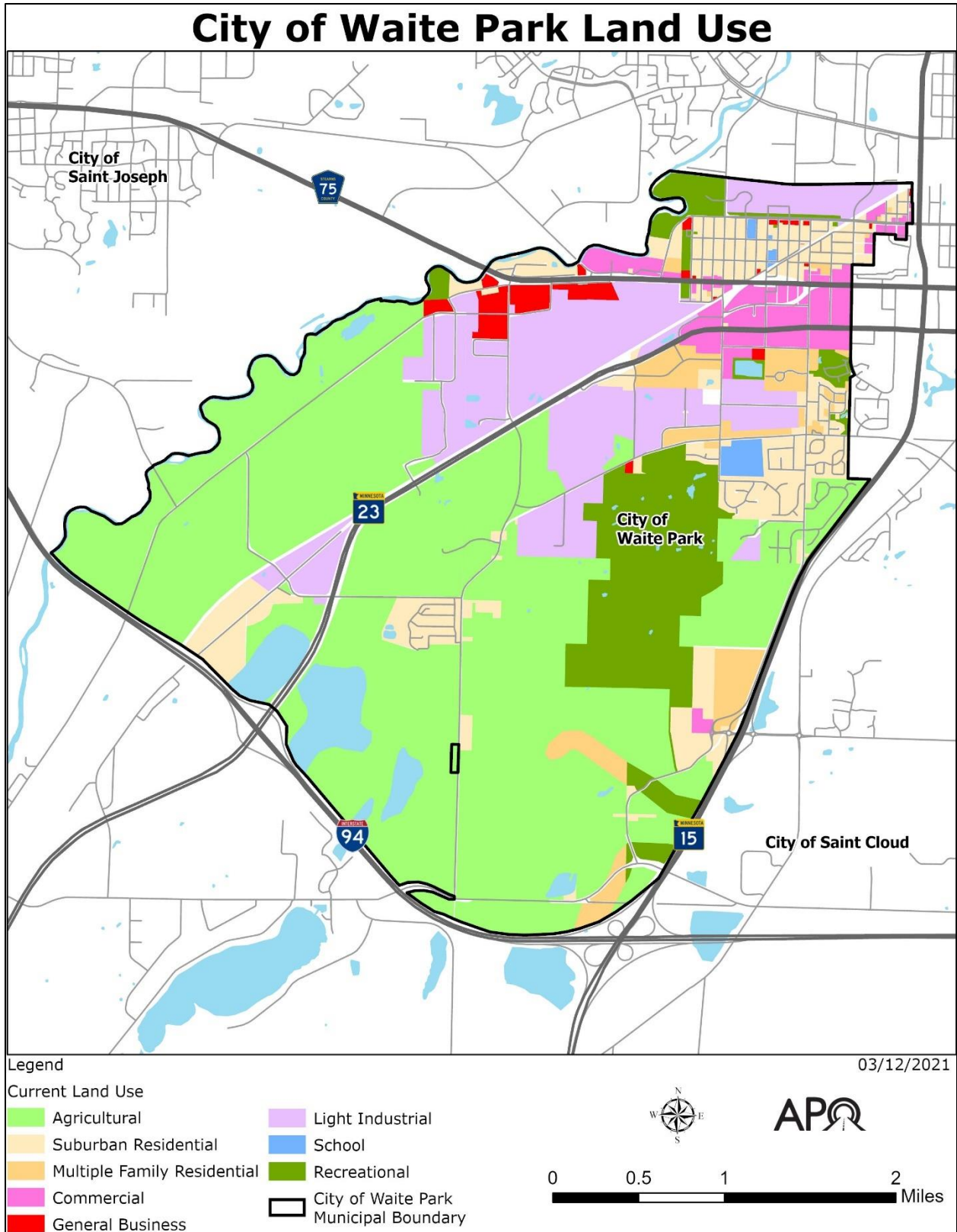


FIGURE D.3 – LAND USES WITHIN THE CITY OF WAITE PARK.

Understanding how the city plans to develop in the future will inform the type of transportation system needed. Residents and visitors will only reach these destinations through the transportation network that is available to them.

TYPES OF ACTIVE TRANSPORTATION INFRASTRUCTURE

Waite Park has a variety of infrastructure designed specifically for active transportation users. Some are integrated into the roadway network, such as bike lanes (on-road facilities). Others are separated from the roadway network, such as sidewalks and shared use paths (off-road). Complementing the on- and off-road active transportation network is the transit network operated by Saint Cloud Metro Bus. Bicyclists and pedestrians can rely on both the on- and off-road network and the Metro Bus system to reach their destinations.

ON-ROAD FACILITIES

The City of Waite Park has one on-road bicycle facility along Second Avenue S. This 1.8 mile signed bike lane starts south of Stearns County Road 137/Seventh Street S and ends when the roadway becomes Graniteview Road.

OFF-ROAD FACILITIES

Shared Use Paths and Trails

There are 19.5 centerline miles of shared use paths within the city (See Figure D.4). This includes the Lake Wobegon Trail, a regionally significant facility with connections to Saint Joseph, Saint Cloud, and cities west beyond the MPA. This facility was extended from Saint Joseph to Waite Park in 2018 and provides access to the Healthy Living Trail from Rivers Edge Park.

Many southside areas of the city are served with shared use paths, particularly those along Seventh Street South and 28th Avenue S. Nearby paths provide many neighborhoods access to the City's parks, recreational areas, and schools.

In addition to shared use paths, Stearns County's Quarry Park and Nature Preserve (located within Waite Park) is home to several unpaved trails.

Sidewalks

Approximately 29.2 miles of sidewalk are located throughout much of the developed core of Waite Park. A sidewalk grid between CSAH 75 and Third Street N serves older neighborhood areas and the McKinley School. Much of the remaining city sidewalks are along southside collector routes.

City of Waite Park Active Transportation Facilities

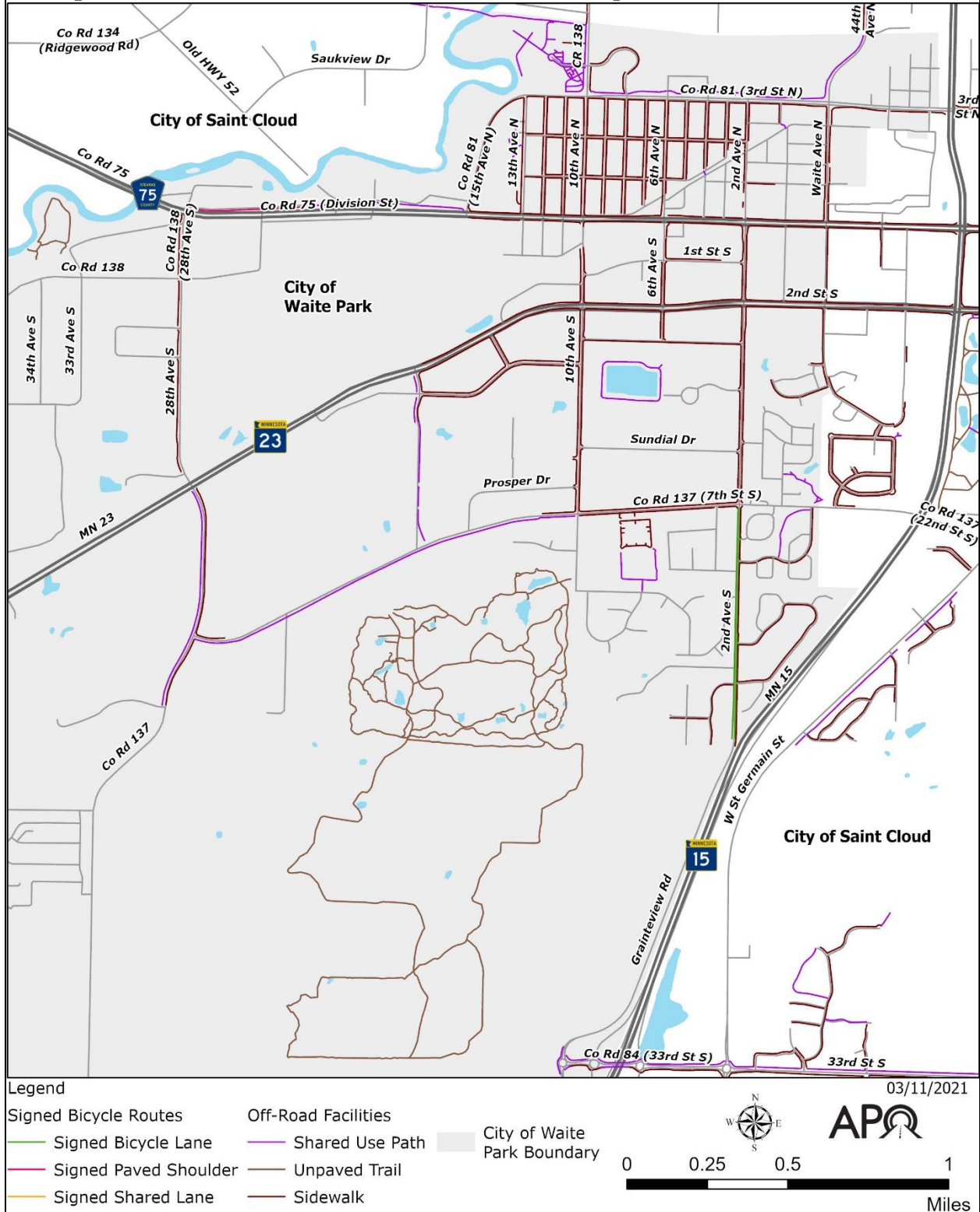


FIGURE D.4 – ON- AND OFF-ROAD ACTIVE TRANSPORTATION FACILITIES IN WAITE PARK BY TYPE AND LOCATION.

TRANSIT SERVICES AND INFRASTRUCTURE

As the urban public transit provider, Saint Cloud Metro Bus is responsible for the daily management, operation, and maintenance of Fixed Route (FR) and Dial-a-Ride (DAR) systems within Saint Cloud, Waite Park, Sartell, and Sauk Rapids.

FIXED ROUTE SERVICE

Metro Bus provides fixed route transit service to the City of Waite Park seven days a week through routes 1, 2, 3, and 5. Crossroads Center in Saint Cloud is a primary transfer site and connection point to other Metro Bus routes.

Routes 1 and 2 provide service to roughly the same area of north Waite Park; however, they operate from opposite directions. These are primarily east/west routes and include stops at McKinley School River's Edge Park.

Route 3 is a loop that circulates through much of the developed area of Waite Park. Route 3 connects southside neighborhoods to Waite Park's commercial district along with providing access to the Stearns County Service Center, Tri-CAP, and Quarry Park.

Route 5 provides access to the southern residential portion of the city and stops at destinations such as WACOSA, Goodwill, and Cash Wise Foods.

All fixed route transit stops on each Metro Bus route are signed. Many of these stops, particularly on the east side of Waite Park, include benches and shelters.

Figure D.5 shows how the Metro Bus routes are laid out and connected. Figure D.6 shows the location of transit stops and how close they are to active transportation infrastructure. While transit stops in Waite Park typically include sidewalk access, there are few bicycle facilities to continue trips from the bus stop to homes and various destinations.



FIGURE D.5. METRO BUS FIXED ROUTE SERVICE WITHIN THE CITY OF WAITE PARK.

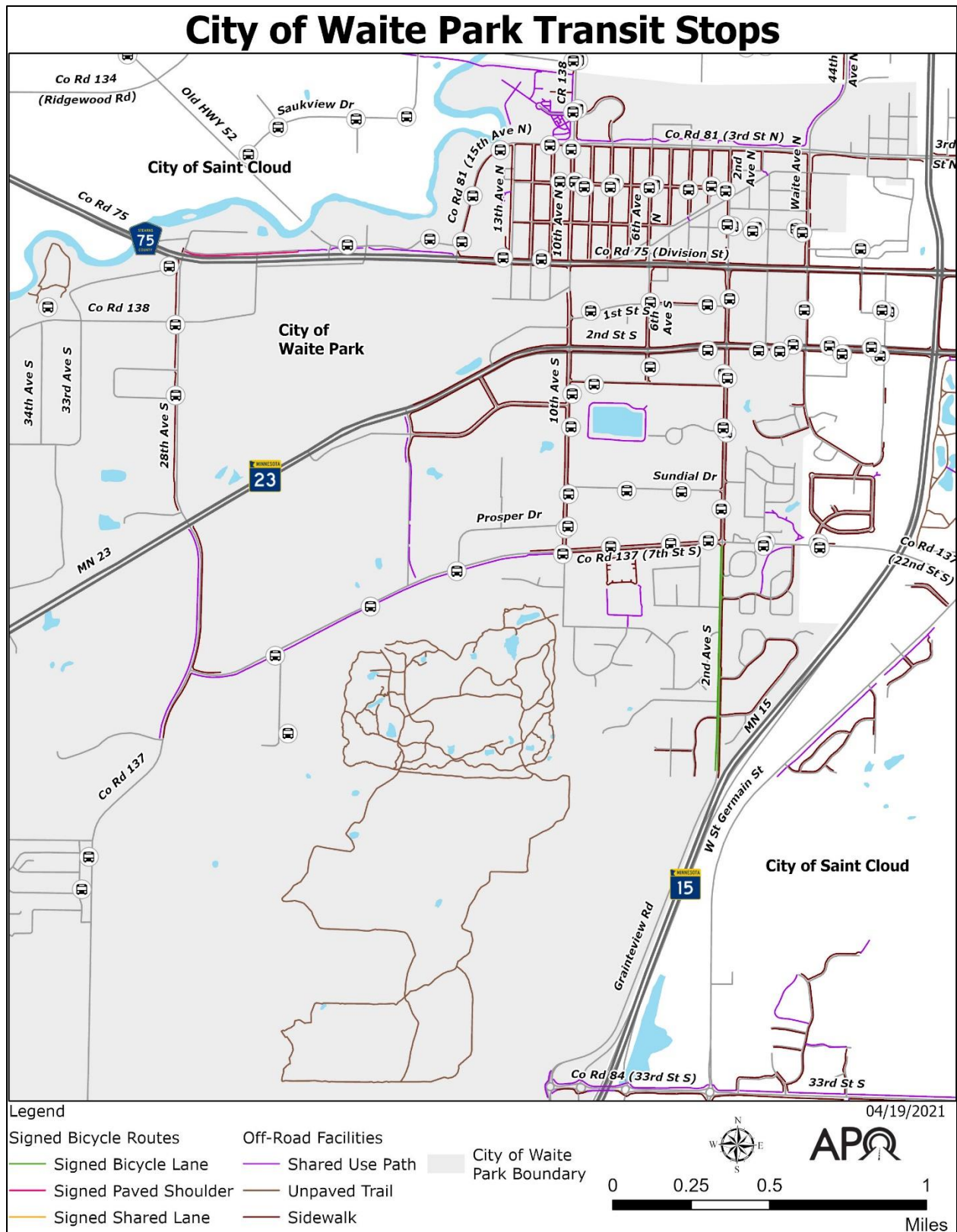


FIGURE D.6. TRANSIT STOPS IN RELATION TO THE ACTIVE TRANSPORTATION SYSTEM IN WAITE PARK.

OTHER TRANSIT SERVICES

Metro Bus also offers additional transit service for Waite Park residents. Dial-a-Ride (DAR) is an operator-assisted paratransit service provided for those unable to use fixed routes. The DAR service area has a three-quarter mile buffer around all four fixed bus routes.

CONDITION OF ACTIVE TRANSPORTATION INFRASTRUCTURE

If the existing active transportation infrastructure is in poor condition, it may cause safety issues, inconvenience for the user, or result in the underutilization of the facility. Keeping the system in good condition assures safety and a comfortable experience.

Data on the current pavement conditions for the on- and off-road active transportation facilities within the City of Waite Park was collected from areawide surveys performed for the APO as discussed in Chapter 2 of the ATP.

ON-ROAD FACILITIES

Pavement Condition and Striping

In 2019 GoodPointe Technology collected pavement and striping condition data for Second Avenue S, the only existing on-road facility in Waite Park.

Pavement condition was evaluated using a Digital Inspection Vehicle (DIV) – a specialized vehicle equipped with cameras and laser sensors to detect pavement distress and roughness. As shown in Figure D.7, the pavement on Second Avenue S was found to be in good to very good condition.

Striping conditions of on-road facilities were rated from a visual inspection. In contrast to the high marks for pavement quality, bike lane striping along Second Avenue S was noted as being in fair to poor condition. See Figure D.8 for a more detailed look.

OFF-ROAD FACILITIES

Condition of Off-Road Shared Use Paths

The Parks & Trails Council of Minnesota completed a pavement condition assessment of almost all shared uses paths within the APO in 2020. The Council used a specially equipped electronic bicycle with instruments aboard to record the “bumpiness” of the pavement throughout the MPA.

Approximately 20% of all shared use paths in Waite Park were rated as “rough” or “very rough” conditions. This includes the paths around Discovery Community School, those near several of the city’s parks, and those within some neighborhood areas. About 19% of the pavement on the City’s shared use paths was rated as “fair.” Locations and their condition ratings are shown in Figure D.9.

City of Waite Park Bicycle Route Pavement Condition

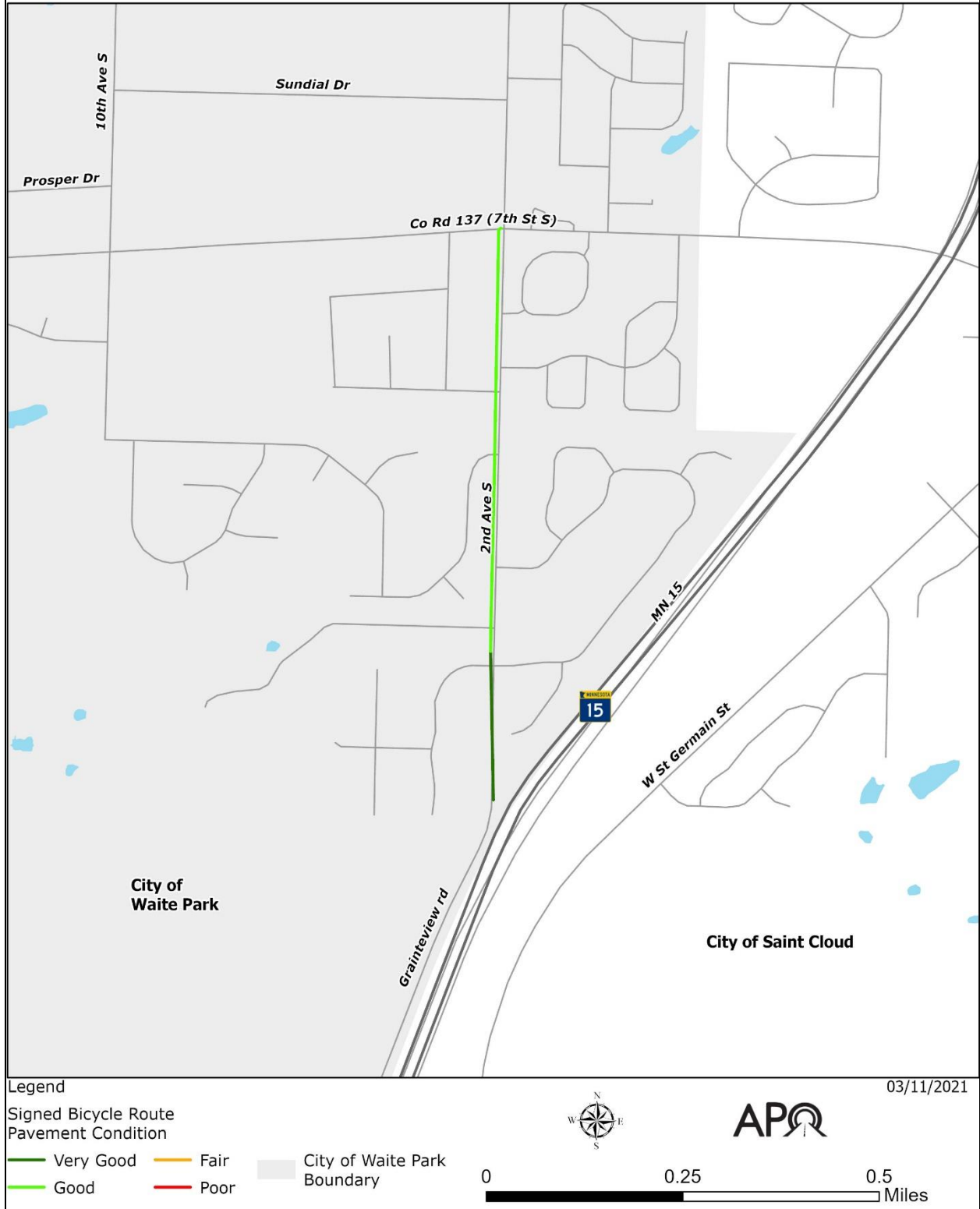


FIGURE D.7 – 2019 ON-ROAD BIKE LANE PAVEMENT CONDITIONS IN WAITE PARK.

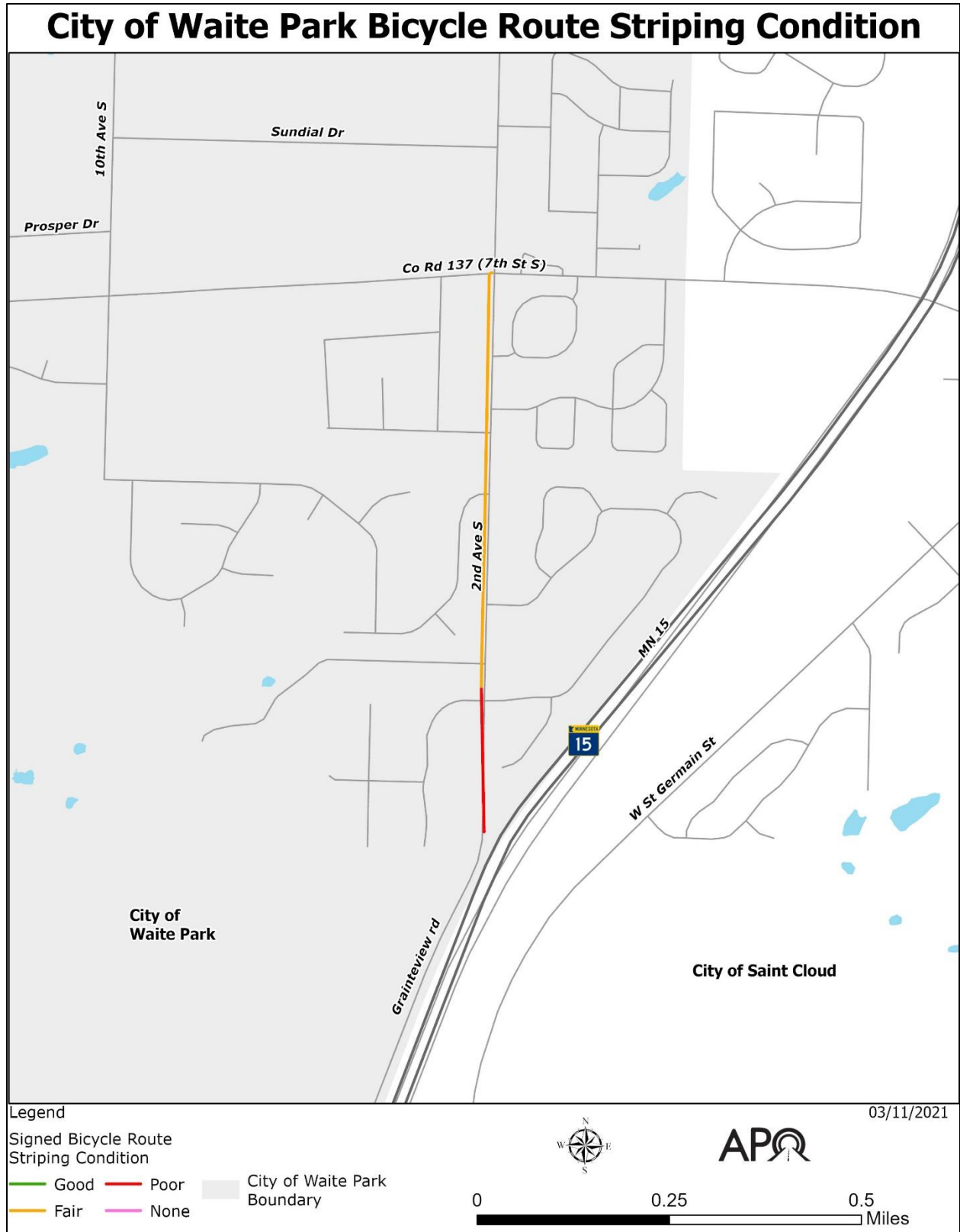


FIGURE D.8 – STRIPING CONDITION OF SIGNED BICYCLE ROUTES WITHIN WAITE PARK.

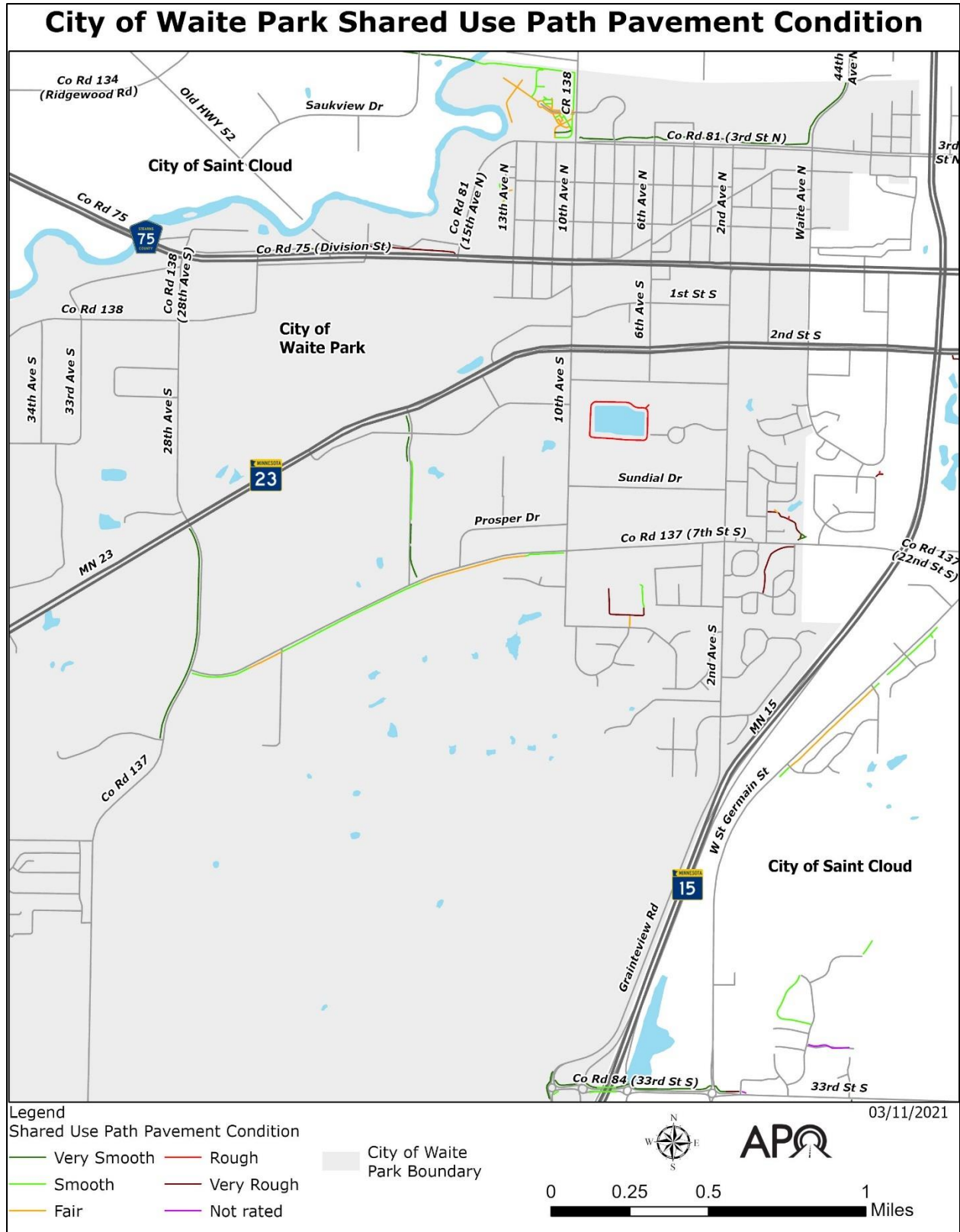


FIGURE D.9 – SHARED USE PATH PAVEMENT CONDITION BY LOCATION WITHIN THE CITY OF WAITE PARK.

WAITE PARK PLANS FOR ACTIVE TRANSPORTATION

The [2005 Comprehensive Plan](https://bit.ly/3qLLU7L) (https://bit.ly/3qLLU7L) and the [2007 Transportation Plan](https://bit.ly/3ET4zDJ) (https://bit.ly/3ET4zDJ) for the City of Waite Park provide the current planning framework for transportation. These plans stress the importance of a usable and growing transportation network for the city, including trails and sidewalks.

Both plans emphasize sustaining a transportation system that appropriately balances access and mobility needs. In Waite Park, Division Street and Second Street S are heavily traveled commuting routes serving essential mobility needs while also providing access to Waite Park businesses and area residents. Ensuring pedestrian safety at busy intersection crossings from high volumes of vehicular traffic along these corridors is identified as a primary concern.

In addition to the two city specific plans, APO staff also reviewed the [2007 Feasibility Study for Stearns County Rails with Trails](https://bit.ly/3FXXLGa) (https://bit.ly/3FXXLGa) document. This study outlined possible implications for Waite Park as the county seeks to expand the regional network.

2005 COMPREHENSIVE PLAN

The 2005 Comprehensive Plan represents Waite Park's goals and strategies for land use and orderly development. Implementation of these goals is a joint responsibility of members of the public, the City Council, its staff and advisory boards, and prospective developers. The Comprehensive Plan states that the APO, Stearns County, and MnDOT also have a role in the development and redevelopment of Waite Park.

Active Transportation Needs as Identified in Comprehensive Plan

While the Comprehensive Plan recognizes that Division Street (CSAH 75) serves a vital mobility need, steps are needed to minimize its impact as a fragmenting barrier within the community. Traffic congestion levels particularly on Division Street, 10th Avenue, and Second Street S (MN 23) are identified as pedestrian crossing safety issues.

Developing nonmotorized transportation alternatives to mitigate congestion was one of the many goals outlined in the city's comprehensive plan.

The plan goes on to state parks, trails, and other public facilities will be improved. This includes the development of trails and pathways to overcome highway barriers and connect neighborhoods, parks, and commercial areas throughout the city. Facilities used by bicycles and pedestrians are to be integrated into a system network that is usable and attractive.

The 2005 plan recommends greater system connectivity and a future grade-separated pedestrian crossing of CSAH 75. Given limited financial resources and other areas of need, a separated crossing is not considered a high priority by the city.

2007 TRANSPORTATION PLAN

Waite Park's 2007 Transportation Plan was developed to identify future transportation alternatives that would further serve the needs of Waite Park. The significance of MN 23 and CSAH 75 as high mobility corridors with growing impacts is noted. However, the focus is on developing the future roadway network, not on a plan to serve active transportation needs better. This plan was not intended to, nor does it present precise solutions that may alleviate traffic congestion or improve safety on existing arterials and collectors.

2007 STEARNS COUNTY RAILS WITH TRAILS FEASIBILITY STUDY

This study prepared for the Stearns County Parks Department in 2007 examined the feasibility of alignments through Waite Park to complete shared use path connections for the Lake Wobegon Trail and the ROCORI Trail. This study recommended the 2018 connection of the Lake Wobegon Trail from Saint Joseph to Waite Park. In addition, this study examined alternatives for connecting the ROCORI Trail through the City of Waite Park. A recommended alignment for the ROCORI Trail would follow County Road 138, 28th Avenue, and cross CSAH 75 to connect with the Lake Wobegon Trail at River’s Edge Park. While the findings of the 2007 study are relevant, further analysis may be needed to determine if this alignment and crossing location remains the best alternative for a regional connection.

CITY ORDINANCES

Along with various citywide planning efforts, [Waite Park City Code](https://bit.ly/3d9FWYH) (https://bit.ly/3d9FWYH) has established several ordinances pertaining to the active transportation system and its users.

City Ordinance 58 outlines provisions for active transportation with new street construction or reconstruction. With the construction of streets, the subdivision code calls for a minimum of 6-foot sidewalks designed to city standards. The City Council takes its recommendations for platting and improvements to the transportation network from the Planning Commission (City Code 58.6). Typically, the city has asked for sidewalks or shared use paths on at least one side of collector and arterial routes in developing areas.

The occupants or owners of any building or lot have responsibility for maintaining abutting sidewalks. Sidewalks shall be kept clear of snow and ice, to be removed daily by noon. Failure to comply with snow and ice removal is considered a misdemeanor. (City Code 31).

The city’s ordinance requires pedestrians to cross streets at signalized intersections where they are available. Vehicles are to yield to pedestrians at crosswalks, otherwise pedestrians shall yield the right-of-way to vehicles. (City Code 60.10).

By Minnesota law (Sec 169.222), bicyclists have the same rights and responsibilities as the drivers of motor vehicles, and therefore have the right to use any public roadway but must also obey all traffic laws.

SYSTEM USAGE

Understanding bicycling and walking behavior complement information on the available active transportation network within the City of Waite Park. It is essential to know how many people use the system, where they need and/or desire to go, and how well current facilities address those needs.

BICYCLE AND PEDESTRIAN COUNTS

APO staff regularly place a MnDOT-owned portable bicycle and pedestrian counter along shared use path locations throughout the MPA, including three spots within the City of Waite Park.

The MnDOT counter uses two different types of counters simultaneously. The Pneumatic TUBE counter uses two sets of tubes placed perpendicular to traffic. When a cyclist passes

over the tubes, this counter can record that cyclist and determine which direction that person was heading. Meanwhile, the PYRO-Box utilizes infrared technology to measure people's body heat who pass in front of its sensor. This counter, much like the TUBE counter, can identify travel directions. When used in conjunction with the TUBE counter, APO staff can calculate pedestrian traffic from the PYRO-Box by subtracting the bicyclists from the total count.

With these portable counters, APO staff monitors usage of shared use paths for one week intervals at specified locations:

1. The Lake Wobegon Trailhead at the Sauk River in River's Edge Park.
2. Healthy Living Trail north of Third Street N near Sixth Avenue N.
3. County Road 137 at 28th Avenue S.

All three of these locations are ideally counted each summer. However, the portable counters are owned by MnDOT. As a result, various agencies and jurisdictions can (and have) utilized the counters throughout the year, impacting the consistency in obtaining data. As a result, two of the three locations (as shown in Figure D.11) were counted in 2020.

Location	Dates Counted (2019)	Weekday Average Bike	Weekday Average Pedestrian	Weekend Average Bike	Weekend Average Pedestrian
Lake Wobegon Trail Head	05/13 – 05/19	2	149	2	14
Healthy Living Trail	05/20 – 05/26	5	41	3	87
County Road 137	06/17 – 06/23	2	57	1	33

FIGURE D.10 – 2019 BICYCLE AND PEDESTRIAN COUNTS FROM THE THREE WAITE PARK LOCATIONS.

Location	Dates Counted (2020)	Weekday Average Bike	Weekday Average Pedestrian	Weekend Average Bike	Weekend Average Pedestrian
Healthy Living Trail	07/15 – 07/21	7	119	4	137
County Road 137	06/24 – 06/30	1	88	1	140

FIGURE D.11 – 2020 BICYCLE AND PEDESTRIAN COUNTS FROM TWO OF THE THREE WAITE PARK LOCATIONS.



FIGURE D.12 – LOCATION WHERE THE APO REGULARLY DEPLOYS AUTOMATIC BICYCLE/PEDESTRIAN COUNTERS IN WAITE PARK.

The APO’s counts indicate that shared use paths receive much usage, particularly from pedestrians. The counter on the Lake Wobegon Trail recorded the highest number of users in 2019, averaging over 110 pedestrians per day in the summer months.

Figure D.13 shows the most recent one-week winter seasonal counts on the Lake Wobegon Trail at River’s Edge Park for pedestrians and bicycles. As the graph shows, the number of people using this facility in the Spring can be correlated to outside temperatures.

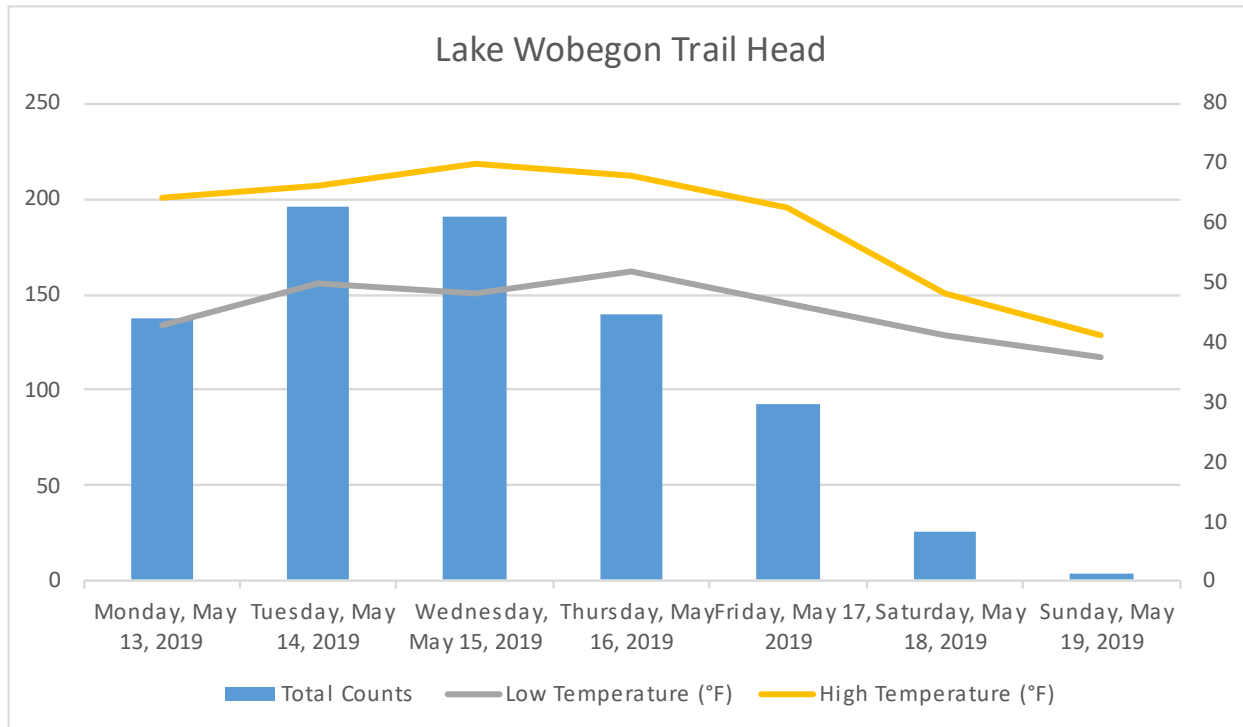


FIGURE D.13 – 2019 SPRING COUNTS AT THE LAKE WOBEGON TRAIL IN COMPARISON TO DAILY HIGH AND LOW TEMPERATURES.

DESTINATIONS

Common destinations for active transportation users include schools, food assets, employers, and parks. These destinations are shown in Figure D.14. Food assets are grocery stores/supermarkets, specialty food stores, meat markets, convenience stores, and non-profit community food services. Employers listed have 100 or more full- and/or part-time employees.

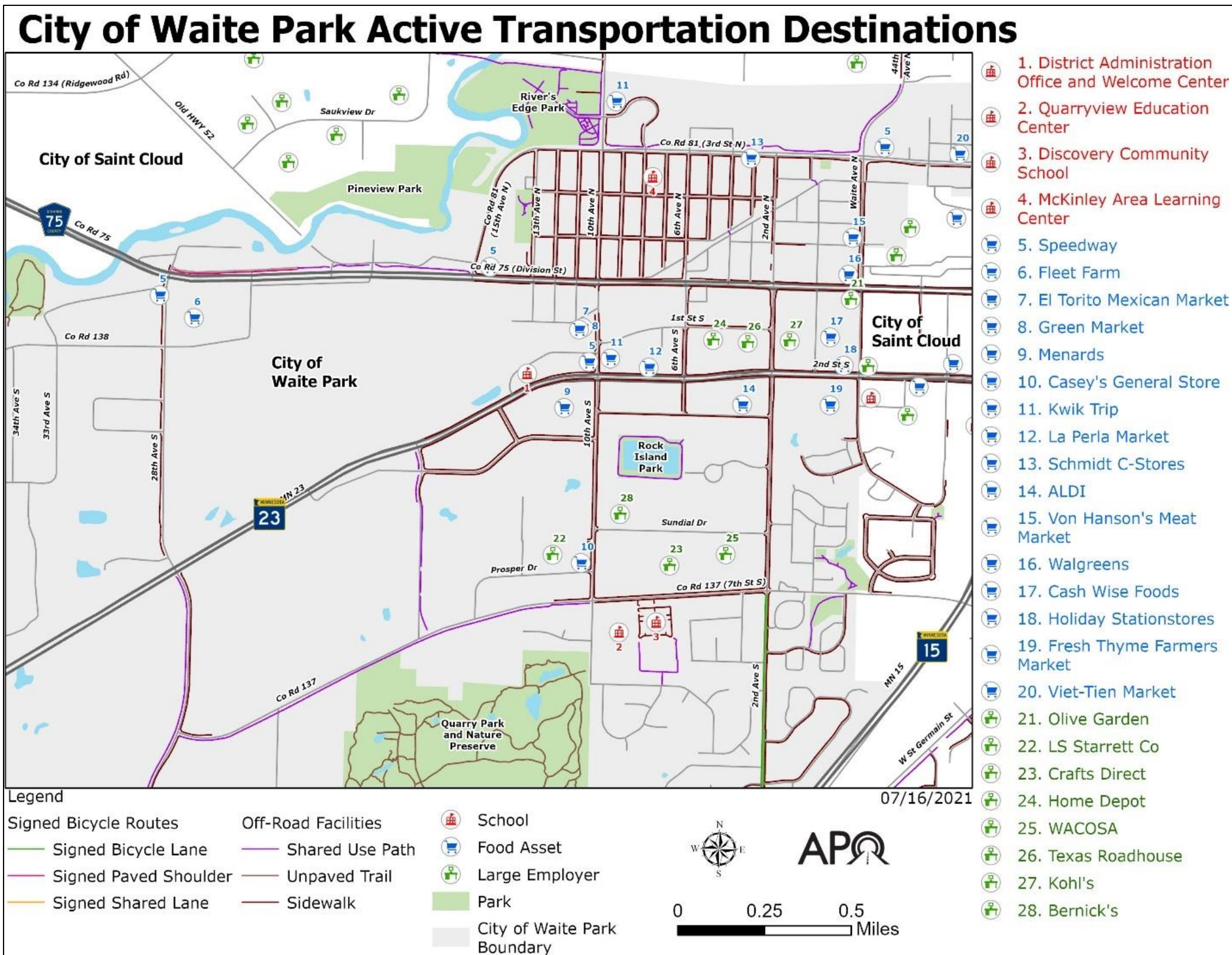


FIGURE D.14 – DESTINATIONS FOR ACTIVE TRANSPORTATION USERS WITHIN THE CITY OF WAITE PARK.

Schools

Included among Waite Park’s largest employers, the St. Cloud Area School District 742 operates three public school facilities within Waite Park. Discovery Community School and Quarryview Education Center are located adjacent one another. Also within the Waite Park City limits is the main district office.

Name	Address	Grades Served	Approximate Number of Students Served
Discovery Community School	700 Seventh St. S	PK-5	524
Quarryview Education Center	800 Seventh St. S	Early Childhood/ Community Education	2,900
McKinley Alternative Learning Center	216 Eighth Ave. N	9-12	1,250

FIGURE D.15 – PUBLIC SCHOOLS LOCATED WITHIN THE CITY OF WAITE PARK.

According to city staff, residents of Waite Park have cited safety concerns with street crossings and traffic speeds in the Seventh Street S area near Discovery School and the Third Street N area near McKinley ALC. While a mix of sidewalks and shared use paths has expanded over time to improve access and safety for students who bike or walk to each school, gaps remain in some areas.

Food Assets

As shown in Figure D.14, grocery stores and other food providers, are prevalent through the CSAH 75 and MN 23 commercial district. Large market centers such as Cash Wise and ALDI’s are among these food assets as are many specialty markets and convenience stores.

Waite Park’s food assets are often along an active transportation facility, typically a sidewalk. However, pedestrians and cyclists often need to cross roadways with many fast-moving cars to get to these destinations.

Large Employers

Among the City’s largest employers are the public schools and larger food stores such as Cash Wise. In addition, large employment centers include retail outlets along the Second Street S corridor, such as Kohl’s, Home Depot, and Menards. Several large employers (Crafts Direct, the LS Starrett Co., and WACOSA) are in the commercial area around Sundial Drive.

Most of the City’s large employers are located on or near Metro Bus fixed routes with access to nearby sidewalks or shared use paths.

Parks

The City of Waite has approximately 767 acres of parkland. Much of this acreage is found within Stearns County’s Quarry Park and Nature Preserve. The city maintains Rivers Edge Park and several small neighborhood parks scattered throughout.

The larger parks within Waite Park generally have access to nearby sidewalks or shared use paths. Quarry Park receives much usage from pedestrians and bicyclists with its extensive network of natural surface trails. As a result, residential areas near these larger parks are more likely to have active transportation facilities.

The city's smaller neighborhood parks have a varying degree of sidewalk access.

SAFETY

According to the Minnesota Department of Public Safety (DPS), fatalities, serious injuries, and minor injuries involving bicyclists and pedestrians are rising within the Saint Cloud MPA.

Specifically, within the City of Waite Park, DPS crash data shows 34 crashes involving active transportation users and vehicles have occurred in the 10 years between 2010 and 2019. See Figure D.16 for locations and severity.

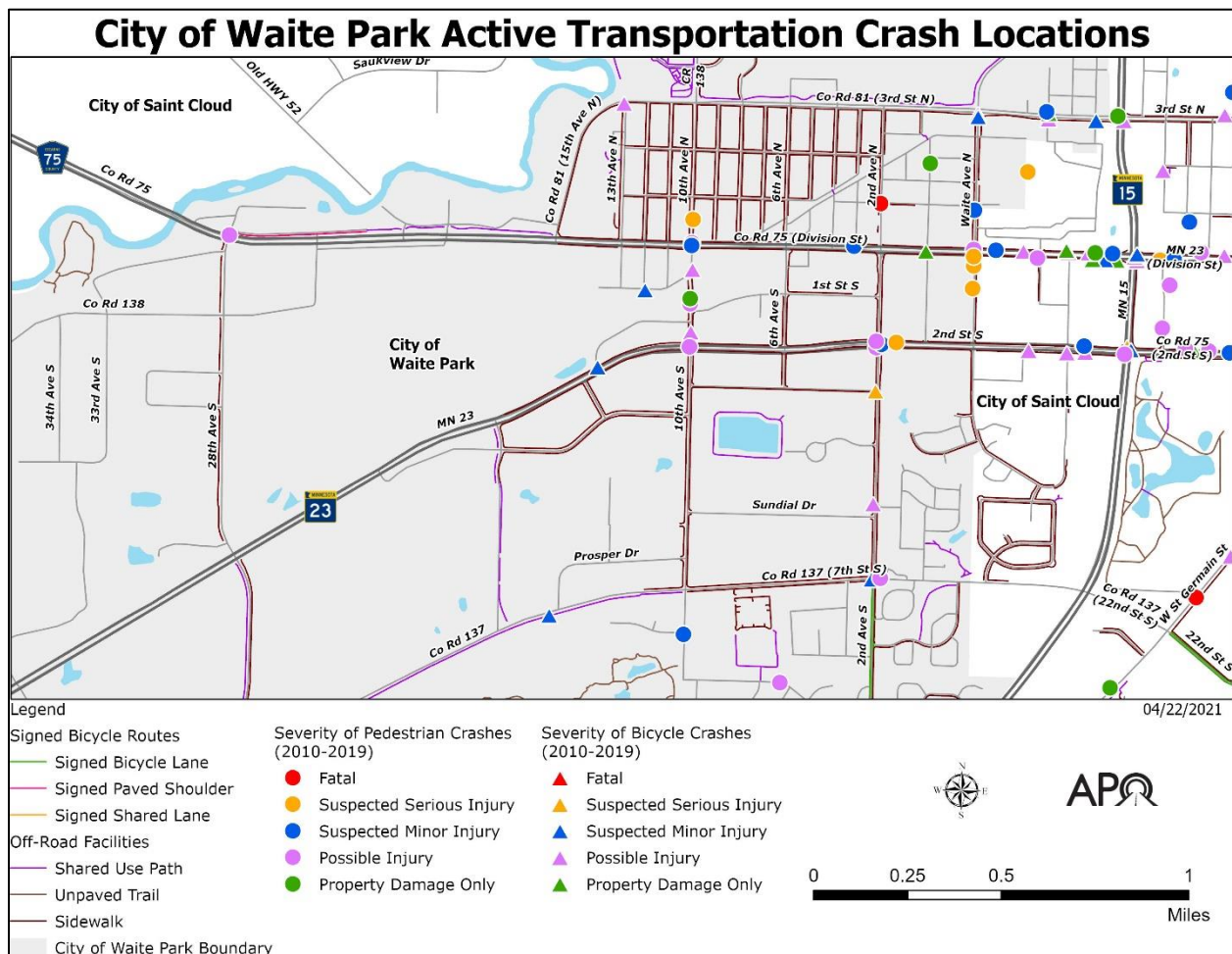


FIGURE D.16 - LOCATIONS WITH CRASHES INVOLVING BICYCLES AND PEDESTRIANS WITHIN THE CITY OF WAITE PARK (2010-2019).

High concentrations of crashes are found along Division Street and Second Street S. In addition, collector routes such as 10th Avenue S and Waite Avenue N have also experienced a number of crashes. While most resulted in minor injuries, it is essential to note that during this time frame, there was a pedestrian fatality on Second Avenue N and three crashes with

serious injuries to pedestrians on Waite Avenue S between Division Street and Second Street S.

Crash history was reviewed to determine locations where crashes appear to be more likely to occur and whether there may be an engineering solution or partial solution to help mitigate the crashes.

Crash reports indicate that the driver did not see the pedestrian or cyclist of the vehicle in many cases. In many of these crashes, the active transportation user was not using a crosswalk. It is unclear from the DPS crash reports whether physical conditions at the crash locations were a contributing factor or if physical changes to the facilities may help mitigate future crashes.

PROGRAMMED AND PLANNED IMPROVEMENTS

The City of Waite Park maintains a Capital Improvement Program (CIP), identifying short-term projects and long-range concepts designed to improve active transportation facilities. The CIP also indicates anticipated future revenues that may be available to implement such projects.

One such project identified in the city's CIP is the construction of a shared use path that extends west from Rivers Edge Park to the frontage road on Division Street.

Among long-term planning considerations for the city's active transportation network is a connection to the ROCORI Trail with a crossing of CSAH 75. Such a crossing was the recommendation of a study prepared for the APO. While the City and the County have not yet identified a preferred alignment, the shared use path west of Rivers Edge Park in the City's CIP may be part of this envisioned regional facility.

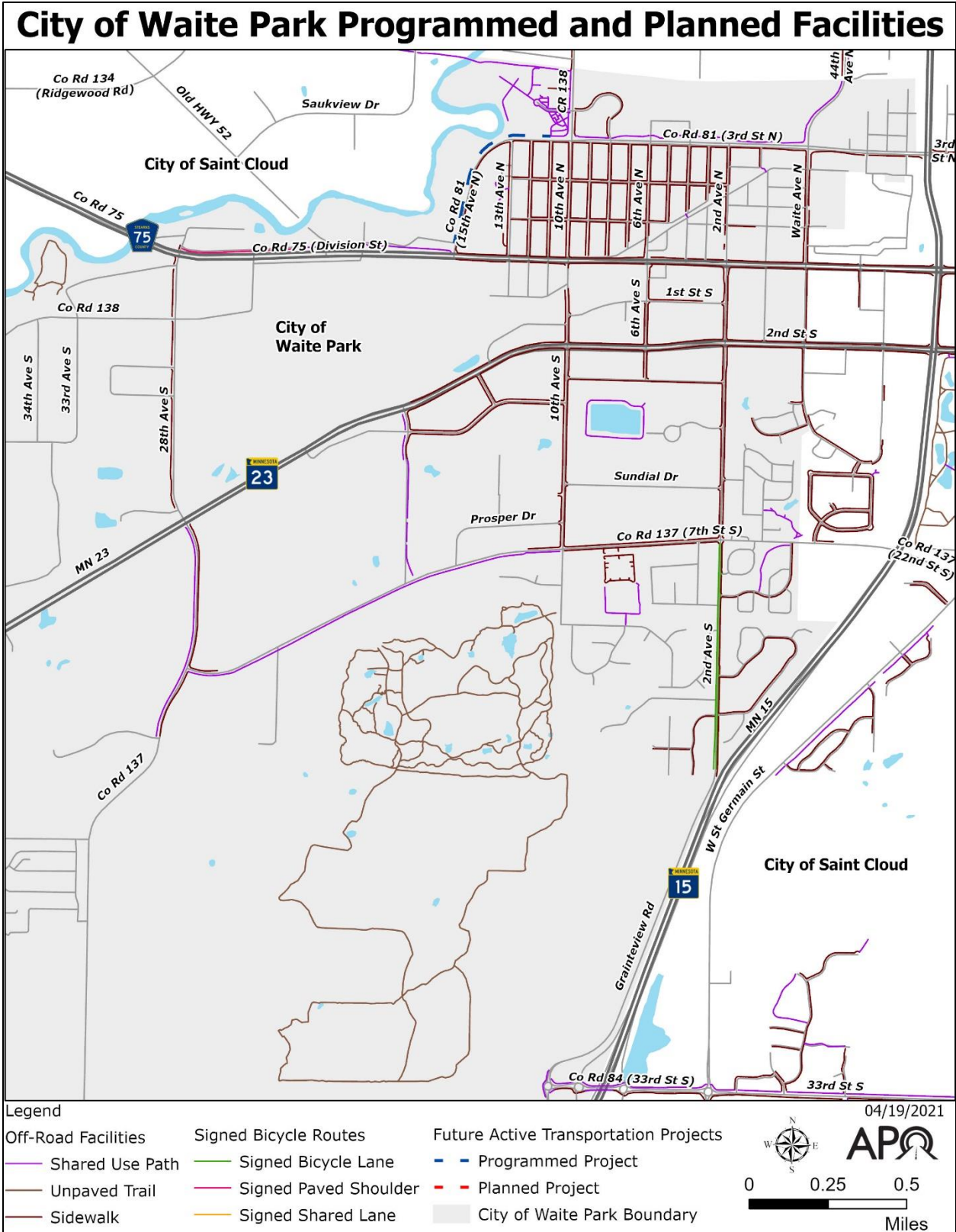


FIGURE D.17 – EXISTING NETWORK WITH PROGRAMMED AND PLANNED FACILITIES WITHIN THE CITY OF WAITE PARK.

ACTIVE TRANSPORTATION NEEDS ASSESSMENT

APO staff performed a citywide analysis of facility and other needs for active transportation users to supplement and inform current city planning efforts. The intent of this assessment, conducted in coordination with city staff and representatives, was to identify active transportation needs within the city and assist in prioritizing those needs in the event funding becomes available.

GOALS AND OBJECTIVES FOR ACTIVE TRANSPORTATION

The regional goals and objectives for active transportation as adopted by the APO provide a starting point for the Waite Park needs assessment.

Those goals were:

1. Improve bicycle and pedestrian safety and comfort.
2. Improve active transportation connections to desired destinations.
3. Improve the condition of active transportation infrastructure.
4. Provide equitable access to active transportation facilities for all people of all abilities.
5. Promote an interconnected regional active transportation network.

The evaluation factors were equally applied for assessing needs within each city and across the MPA. The goals, objectives, and factors used to evaluate services and needs relative to each objective are detailed in Chapter 4. Performance ratings from the evaluation of factors for Waite Park are shown in Figure D.18.

NEEDS ASSESSMENT METHODOLOGY

From the goals and objectives framework, APO staff, in coordination with Waite Park city staff and community volunteers, developed the following methodology to address critical gaps in the current active transportation system. It should be noted that while this process does not account for every gap or need in the network, it does focus on addressing gaps utilizing existing data as it relates to the region's active transportation goals and objectives.

The APO's active transportation needs assessment methodology was broken into three phases. Beginning with an in-depth analysis of transportation networks, APO staff identified issues and needs within individual communities across the region. This cursory review led to a more detailed analysis of active transportation needs for focus areas identified within each city and ultimately the identification of jurisdictional-level project recommendations – Phase 2. In the final phase, local and regional needs identified in the previous phases were prioritized according to the degree goals and objectives would be addressed.

Waite Park			2019
Number of Non-Motorized Fatalities and Suspected Serious Injuries Five Year Rolling Average			0.6
Percentage miles of arterials & collectors that have a sidewalk or shared use path (SUP) on at least one side			48.6%
Percent of destinations that fall within distance categories	Schools	0 Ft (Asset Served by AT Facility)	100.0%
		1-310 ft (One block or less)	0.0%
		311-930 ft (Two to three blocks)	0.0%
		> 931 ft (Four or more blocks)	0.0%
	Food Assets	0 Ft (Asset Served by AT Facility)	88.9%
		1-310 ft (One block or less)	80.0%
		311-930 ft (Two to three blocks)	15.0%
		> 931 ft (Four or more blocks)	5.0%
	Large Employers	0 Ft (Asset Served by AT Facility)	62.5%
		1-310 ft (One block or less)	0.0%
		311-930 ft (Two to three blocks)	25.0%
		> 931 ft (Four or more blocks)	12.5%
	Parks	0 Ft (Asset Served by AT Facility)	60.0%
		1-310 ft (One block or less)	0.0%
		311-930 ft (Two to three blocks)	0.0%
		> 931 ft (Four or more blocks)	40.0%
Transit Stops	0 Ft (Asset Served by AT Facility)	69.7%	
	1-310 ft (One block or less)	12.1%	
	311-930 ft (Two to three blocks)	10.6%	
	> 931 ft (Four or more blocks)	7.6%	
Percent of street crossings that do not meet full ADA standards			86.7%
Miles of Active Transportation facilities per 1,000 residents in EJ/Title VI Sensitive Areas in comparison to non-sensitive areas			5.2:8.5
Percent mileage of Regional Priority bicycle facilities that do NOT exist			73.3%
Percent of on-road bicycle facilities with poor pavement			0.0%
Percent of SUP with rough/very rough pavement			19.4%

FIGURE D.18 – WAITE PARK PERFORMANCE REPORT CARD (2019).

Phase 1: Evaluating Needs for the City of Waite Park

Considered along with the factors were the comments from the APO’s initial public input along with comments from city staff. Areas where multiple issues were revealed when the factors were applied became the focus of further review and analysis.

Phase 2: Analysis of Waite Park Focus Areas

From the process described for the review of needs and gaps for the City of Waite Park, the following areas were identified as priority areas for improvement.

- 10th Avenue S area.
- Waite Avenue area.
- Second Avenue S area.

These three focus areas all have very similar characteristics. All are high volume minor arterials or collectors which active transportation users often cross to reach their destinations. In addition, these focus areas intersect with at least one of the two arterials within Waite Park – Division Street/CSAH 75 and Second Street S/MN 23.

Being able to assure that pedestrians and bicyclists can safely cross CSAH 75, MN 23, and other heavily used routes in Waite Park has been identified in the City’s plans and regional transportation studies as an ongoing challenge. Given the growing vehicle traffic in Waite Park, these safety issues have increased significantly. The history of crashes with the potential for more dangerous conflicts between vehicle and active transportation users, coupled with the need to improve access, led to identifying these focus areas.

These three focus areas have many destinations for active transportation users. While there is often a connecting facility network within these areas to get to these destinations, their ability to cross heavily used roads are the prevailing concern safely.

APO staff working in conjunction with city staff for each focus area further analyzed needs and issues and worked to identify possible solutions.

However, due to the unique challenges facing Waite Park, APO staff sought assistance from the Minnesota Department of Transportation's (MnDOT’s) Bicycle and Pedestrian Safety Engineer. Based on current facilities and conditions, vehicle traffic speeds and volumes, destinations served, and other factors, MnDOT staff and their consultants offered their analysis relative to Federal Highway Administration (FHWA) and MnDOT guidelines.

Many of the suggested recommendations for these three focus areas were taken from the MnDOT analysis found at the end of this profile.

10th Avenue S Area

This focus area, as shown in Figure D.20, follows 10th Avenue S from Division Street to Seventh Street S (CR 137). Key cross street intersections within this area include Division Street, Second Street S, Sundial Drive, and Seventh Street S.

This area was chosen due to a high level of activity from all transportation modes, the history of crashes, and the number of destinations often sought by bicyclists and pedestrians.

10th Avenue South Focus Area

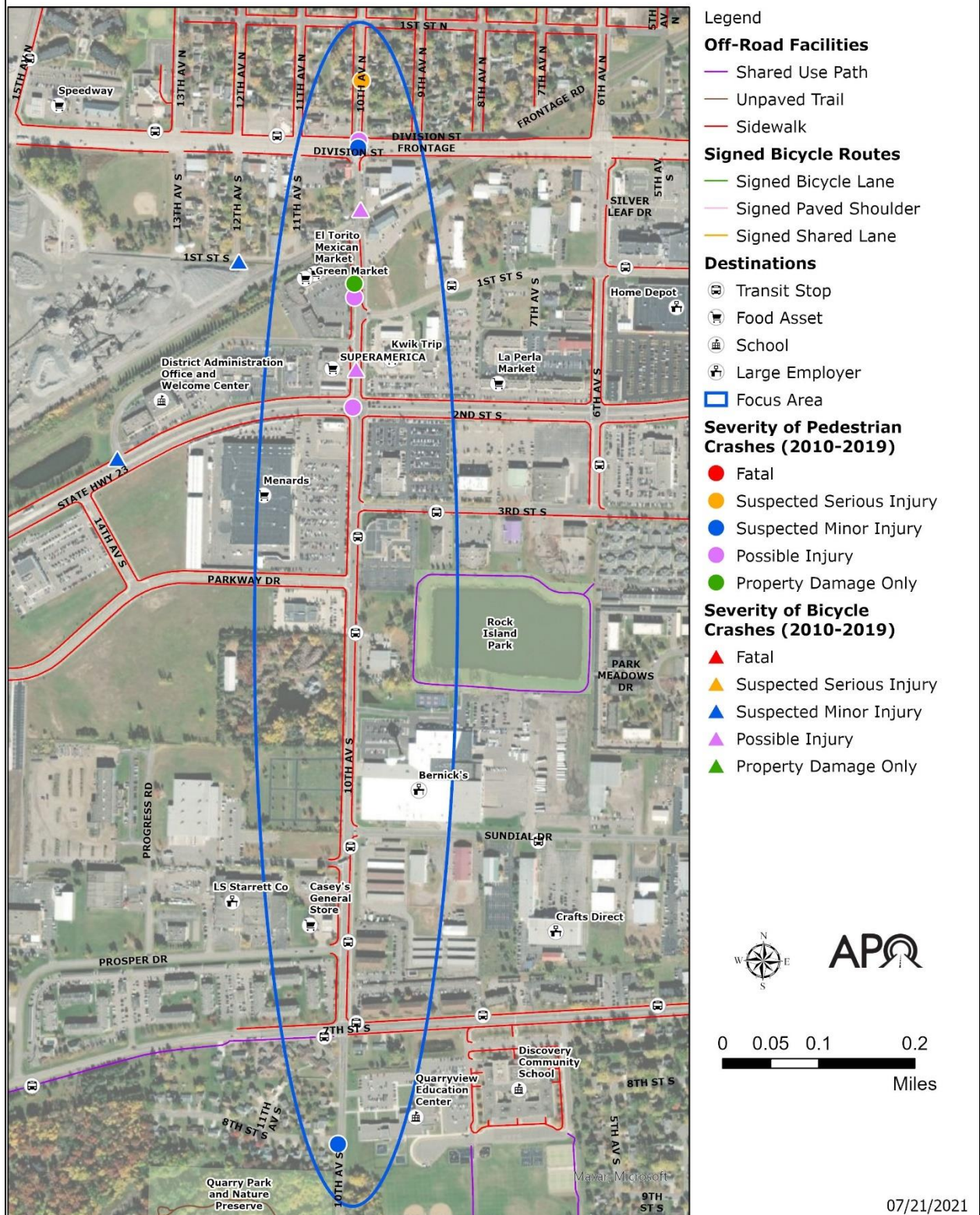


FIGURE D.20 – CITY OF WAITE PARK'S 10TH AVENUE S AREA OF FOCUS.

NEEDS AND ISSUES

The 10th Avenue S area has many destinations for active transportation users including many food assets along with Menards (retail) and Bernick's (warehouse). The main concern for this corridor is the high volume of traffic and the safety of active transportation users who travel along or across 10th Avenue S to reach these destinations.

Approximately 14,000 vehicles per day travel on 10th Avenue S between Division Street and Second Street S. The average daily volume drops to 5,700 vehicles south of Second Street S. The posted speed on 10th Avenue S north of Second Street S is 30 mph, increasing to 40 mph south of this roadway. About 10,000 vehicles per day utilize the cross streets (Division Street and Second Street S) with a large number of vehicles turning onto or off of 10th Avenue S.

Within the few blocks that separate Division Street and Second Street S, seven crashes have involved pedestrians and bicyclists between 2010 and 2019. A review of the crash reports for crashes within the focus area indicates that vehicle drivers often do not see pedestrians. Whether crashes are due to inattention or a facility flaw is difficult to determine, though the number of crashes suggests improvements are needed.

There are many Metro Bus transit stops between Second Street S and Seventh Street S. However, there are a limited number of crosswalks along the 10th Avenue S corridor. The only crossings with pedestrian-activated signals are at the Division Street and Second Street S intersections. Those who utilize transit services at these locations will often be crossing 10th Avenue in an area where there may be heavy vehicle traffic with no crosswalks.

While sidewalks are in place along most of 10th Avenue S, they are not designed or intended for use by bicyclists. There are gaps in the sidewalks north of the railroad tracks (10th Avenue N).

RECOMMENDATIONS

- In the near term, consider reconfiguring the four lanes on 10th Avenue S along the segment south of Second Street S to three lanes and add bicycle lanes with restriping. This could be incorporated with a mill and overlay or safety project. Bicycle lanes act as a buffer and improve comfort for pedestrians walking adjacent to higher-speed traffic.
- Consider filling the sidewalk gaps on 10th Avenue S between Division and Second Street S. Jog the sidewalk, so the new crossing is perpendicular to the railroad tracks.
- With street reconstruction, consider a three lane section with a 10-foot shared use path and buffer area with plantings, street lighting, or signage. With the three lane section, consider adding crosswalks with median pedestrian refuge islands at T-intersections.
- If the configuration on 10th Avenue is to remain a four lane, implement crossing devices that assist pedestrians by increasing driver awareness, such as Rectangular Regular Flashing Beacons (RRFBs) or Pedestrian Hybrid Beacons (PHBs).
- Consider adding a leading pedestrian interval (LPI) at signalized intersections to improve visibility and increase crossing time.

Waite Avenue Area

The Waite Avenue focus area (as found in Figure D.21) starts from the intersection with Third Street N and ends just south of Second Street S near Thielman Lane. Within this corridor are intersections with roadways garnering heavy vehicle traffic – Third Street N, Division Street, and Second Street S. In addition, entrances to major trip generators like Crossroads Center, Cash Wise, and Marketplace Shopping Center are located along this corridor.

This area was chosen due to the high level of vehicle traffic, the history of crashes, crossing safety, and the number of desired destinations.

NEEDS AND ISSUES

Waite Avenue experiences a high traffic volumes which poses safety risks to those who need to cross Waite Avenue and its cross streets to reach their destinations. The average daily traffic on Waite Avenue ranges from 7,700 to 8,400 vehicles. Vehicle traffic volumes approaching Waite Avenue from the east on Division and Second Street S average 14,000-15,000 per day. The volume of vehicle turning movements at each intersection is also very high.

There have been nine crashes along Waite Avenue involving pedestrians and bicyclists between 2010 and 2019. Three of these serious injury crashes occurred in just the one block between Division Street and Second Street S.

There are sidewalks along at least one side of Waite Avenue, but they are not designed to be shared with bicycles. Only a limited number of locations provide crosswalks for active transportation users. The only signal-controlled intersections are at Third Street N, Division Street, and Second Street S.

RECOMMENDATIONS

- Pedestrian safety would be improved on the north end of Waite Avenue with an additional crosswalk either at First Street N or Second Street N. Ideally, a crosswalk would be more beneficial at Second Street N due to the existing traffic signal and ADA curb cuts in place. However, First Street N could be considered due to existing transit stops.
- Consider reconfiguring the four lanes on Waite Avenue south of Second Street S to three lanes and add bicycle lanes with restriping. This could be incorporated with a mill and overlay or safety project. Bicycle lanes act as a buffer and improve comfort for pedestrians walking adjacent to higher-speed traffic.
- Consider completing sidewalks on both sides of Waite Avenue.
- With street reconstruction, consider a three lane section with a 10-foot shared use path and buffer area with plantings, street lighting, or signage.
- If the configuration remains a four lane, implement crossing devices that assist pedestrians by increasing driver awareness, such as Rectangular Regular Flashing Beacons (RRFBs) or Pedestrian Hybrid Beacons (PHBs).
- Consider adding a leading pedestrian interval (LPI) to improve visibility and increase crossing time at the signalized intersections.

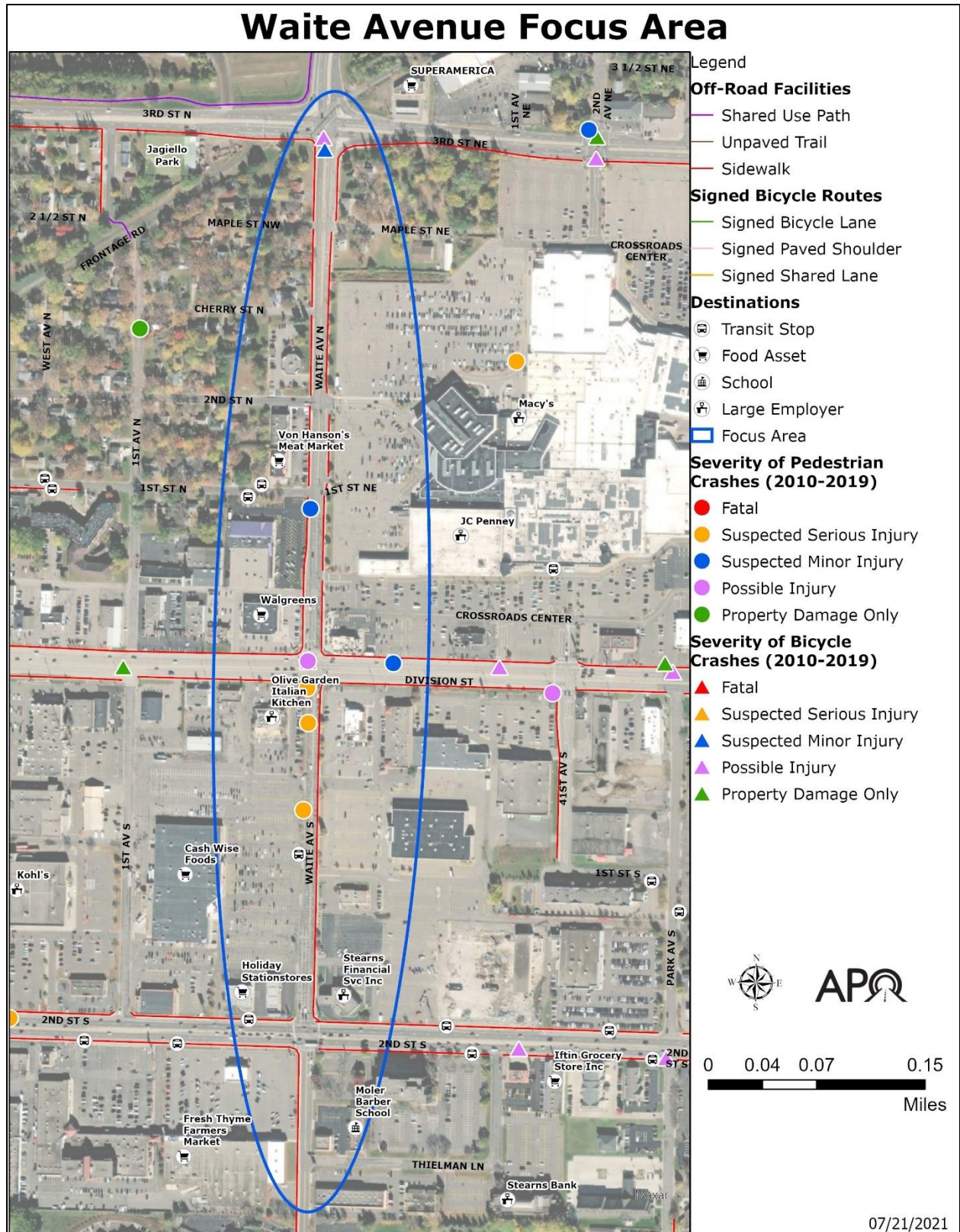


FIGURE D.21 – WAITE AVENUE AREA OF FOCUS IN THE CITY OF WAITE PARK.

Second Avenue S Area

The Second Avenue S focus area (see Figure D.22) spans the roadway from its intersection with First Street S to the intersection with Aspen Circle. Major cross streets along this corridor include Second Street S, Third Street S, Park Meadows Drive, Sundial Drive, and Seventh Street S.

Given the crash history and traffic volume on Second Avenue S, there is a concern for pedestrian and bicycle safety. This area was also chosen due to its larger residential area and proximity to many large employers.

NEEDS AND ISSUES

Roadway traffic volumes along Second Avenue S are highest near the intersection with Second Street S, averaging 9,500 vehicles per day. Vehicle traffic volumes diminish further south along Second Avenue S, averaging 6,400 vehicles per day. However, while traffic volumes are less along the southern section of this corridor, there are a large number of vehicles turning off at the Second Street S/Second Avenue S intersection to access various retail stores.

Several Metro Bus stops span this corridor. However, many who use the bus at these locations lack facilities and safe crossings. There are signed bicycle lanes south of Seventh Street S but only sidewalks to the north of Seventh Street S. Except for Third Street S, there are no active transportation facilities connecting streets along Second Avenue S. There are also a limited number of crosswalks with only the intersection at Second Street S providing a signal-controlled crossing.

Coupled with the high vehicle traffic, the Second Avenue S corridor – particularly south of Third Street S – is highly residential. Several apartment complexes can be found along this stretch of roadway. In addition, many of these residential areas have been identified by ACS data as having sizeable low-income household populations. Concerns have been raised about the safety of individuals living in the area crossing Second Avenue S or accessing some of the busier cross streets.

Safety issues along Second Avenue S have been documented through the history of active transportation related crashes. Between 2010 and 2019 three serious injury crashes have occurred at the intersection of Second Avenue S/Second Street S. During this time frame a cyclist was killed at the intersection of Second Avenue S/Third Street S.

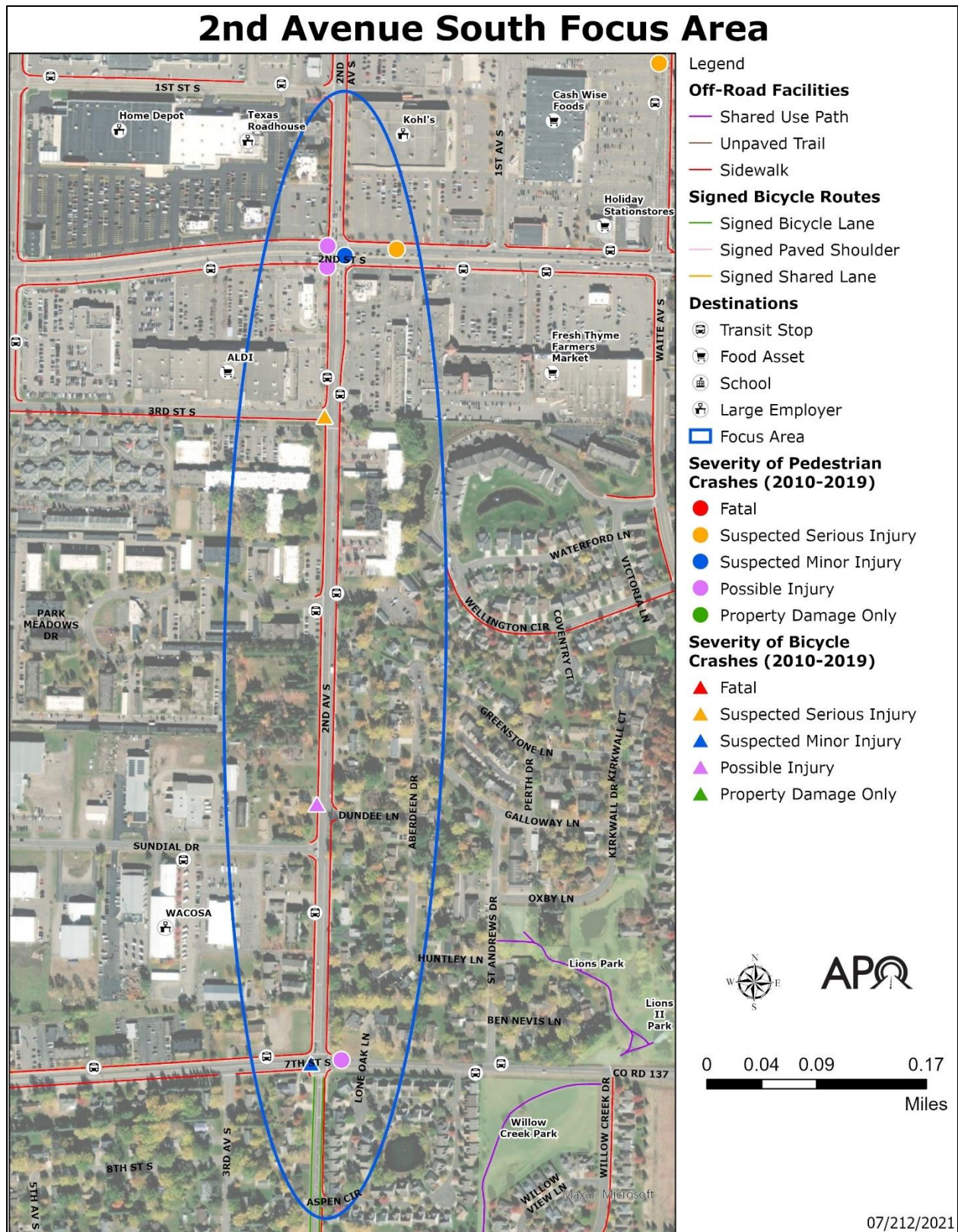


FIGURE D.22 – SECOND AVENUE SOUTH AREA OF FOCUS IN WAITE PARK.

RECOMMENDATIONS

- Adding a sidewalk connection on the south side of Sundial Drive from 10th Avenue S to Second Avenue S would serve transit stops and provide needed pedestrian access to large employers and other businesses.
- Consider reconfiguring the four lanes on Second Avenue S to three lanes and add bicycle lanes with restriping. This could be incorporated with a mill and overlay or safety project. Bicycle lanes act as a buffer and improve comfort for pedestrians walking adjacent to higher-speed traffic.
- With street reconstruction, consider a three lane section with a 10-foot shared use path and buffer area with plantings, street lighting, or signage.
- If the configuration remains a four lane, implement crossing devices that assist pedestrians by increasing driver awareness, such as Rectangular Regular Flashing Beacons (RRFBs) or Pedestrian Hybrid Beacons (PHBs).
- At the signalized intersections on Second Street S, consider adding a leading pedestrian interval (LPI) to improve visibility and increase crossing time.

Phase 3: Evaluating Needs for the Region

The final phase of the needs analysis was to identify improvements to the regional facility network within the City of Waite Park. These projects would assist in achieving an interconnected active transportation network that satisfies regional needs.

Regional bicycle facilities will logically connect cities and other parts of the planning area outside Waite Park and include potential links to areas outside the planning region. Projects that connect the area regionally will provide an approximate spacing of two miles between facilities. In structuring a regional system, the preference is to complete gaps with shared use paths over on-road facilities.

Recommended regional facilities to extend the existing system within Waite Park include a future shared use path connection to the ROCORI and Glacier Lakes Trail that aligns with Seventh Street S (County Road 137). This path is proposed to continue north along 10th Avenue to connect with the Lake Wobegon Trail with the reconstruction and widening of 10th Avenue. The future regional bikeway network would also include the proposed alignment for the Southwest Beltway.

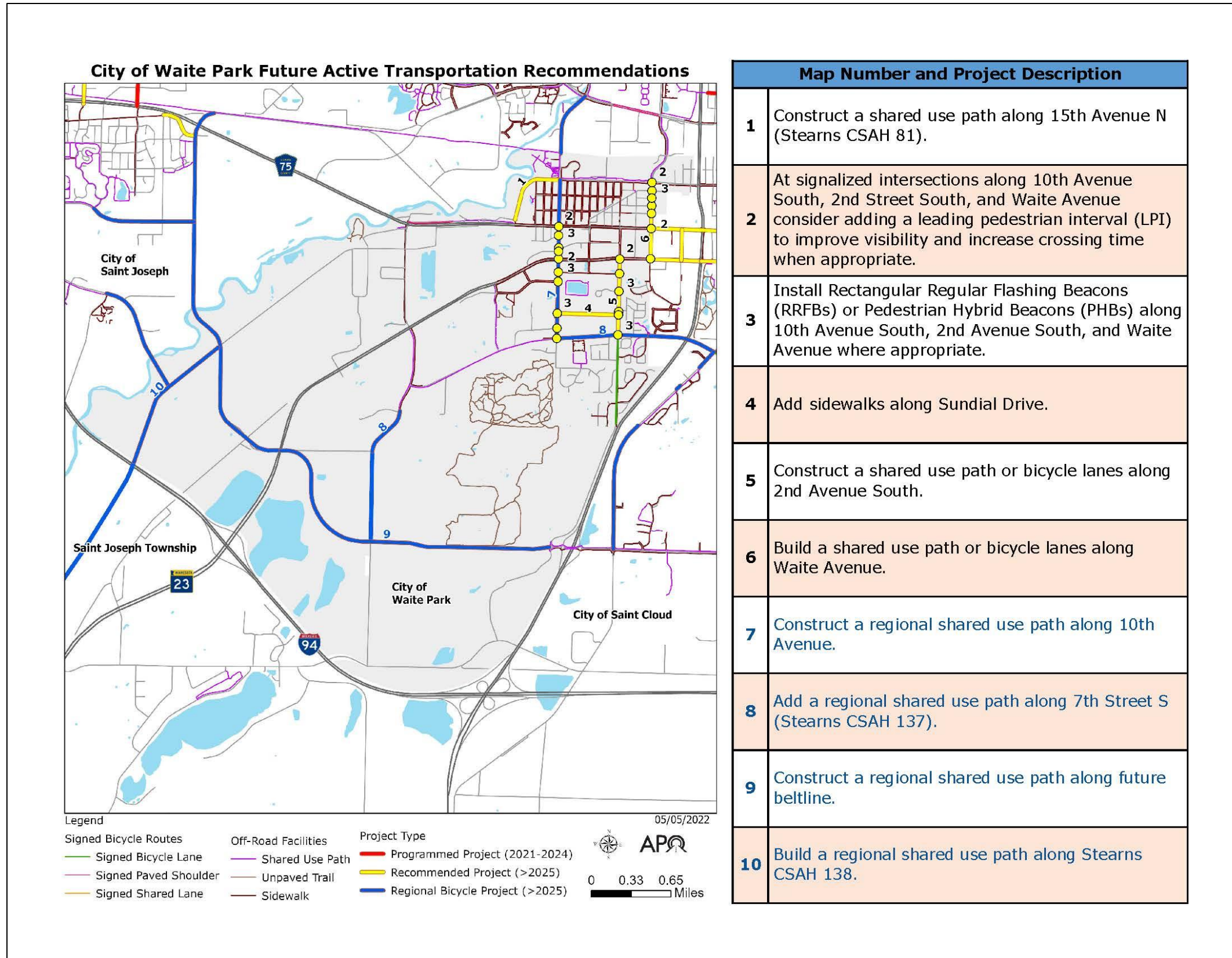


FIGURE D.23 – PROGRAMMED AND RECOMMENDED PROJECTS FOR THE CITY OF WAITE PARK.

DRAFT REGIONAL ACTIVE TRANSPORTATION PLAN PROJECT SURVEY INPUT

The draft regional active transportation plan project survey was available for public comment between June 15 and July 15, 2022, via ArcGIS Survey123. The survey asked participants to rate each proposed project from one to five stars, one being the lowest priority and five being the high priority. Below are the results for the City of Waite Park Projects. More information on the public input process can be found in Appendix F.

Project Number	Average Stars
Waite Park Project 1	3.0
Waite Park Project 2	3.2
Waite Park Project 3	3.0
Waite Park Project 4	2.5
Waite Park Project 5	2.9
Waite Park Project 6	2.9

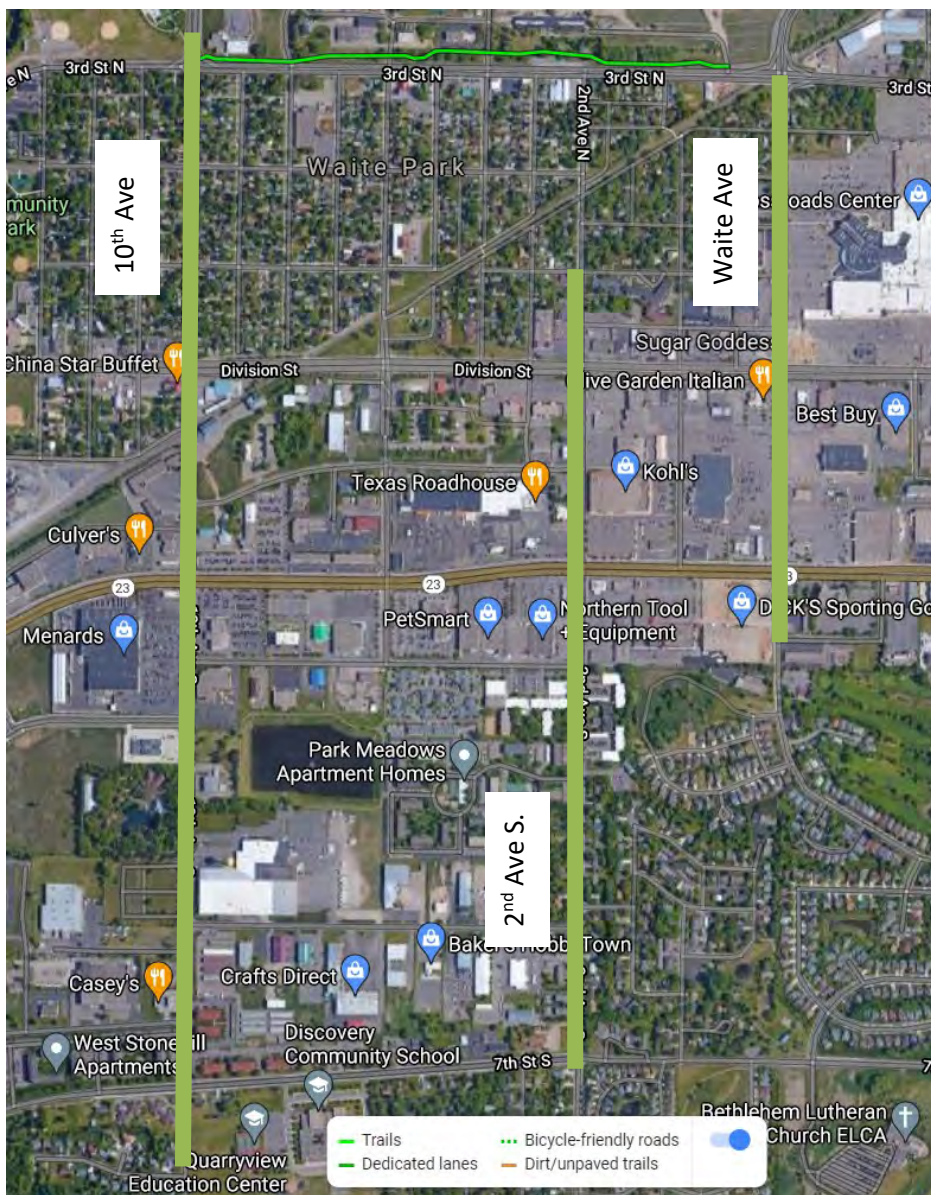
FIGURE D.24 – PROJECT SUREVY RESULTS.

Public Comments
The current Metro Bus system is excellent.
Stop wasting Taxpayers money.
7th St So has VERY inconsistent shoulders. They continue to narrow to nothing at intersection of 2nd St. So.

FIGURE D.25 – PUBLIC COMMENTS.

WAITE PARK

The purpose of this document is to provide non-motorized transportation improvement recommendations to the St. Cloud Area Planning Organization (APO) on three roadway areas of focus. These areas of focus intersect upcoming MnDOT projects. The recommendations are provided as suggested safety improvements to compliment the MnDOT projects and improve the non-motorized conditions based on information provided by the APO. The recommendations are for local consideration.



RECOMMENDED IMPROVEMENTS

Roadway Cross Section

Consider roadway reconfigurations for all three roadways. The cross sections provided on page 7 through 8 show a possible near-term and long-term alternative to provide non-motorized facilities within an existing 80-ft ROW section.

FHWA suggests that roadways under 20,000 ADT can be good candidates for 4 to 3-lane conversions, with a maximum threshold of 25,000 ADT.¹ All roadways AADTs are within this threshold. Examples of roadway reconfigurations around the country are available that provide crash reductions, manage vehicle speeds to be within the posted and desired speed limit, and provide increased vehicle throughput and faster overall corridor travel times by removing turning vehicles from the travel lane. There are also multiple safety benefits for people walking and bicycling.

It may be helpful to establish a hierarchy of modes for each roadway in collaboration with the community (example: pedestrian, bicycle, transit, vehicles). Also determine the City's desired bikeway network and facility type for each roadway.

A It is recommended to gather public support for the desired roadway cross section by providing community-wide education regarding safety and other benefits. Consider starting the 3-lane section on Waite Avenue North where the maximum AADT is lowest at 8,400.

Near-term recommendation (page 7):

Within a restriping mill and overlay or safety project, consider restriping the 4-lane roadway to be a 3-lane section including on-street bicycle lanes. The bicycle lanes act as a buffer and provide more comfort and an increased feeling of safety for a person walking adjacent to higher speed traffic.

Long-term recommendation (page 7-8):

Within an urban reconstruction project, consider a 3-lane section including shared use paths or sidepath and a buffer with grass and street trees, pedestrian level street lighting, or a furniture zone. The shared use path or sidepath is recommended to be a minimum of 10-ft to accommodate people walking or bicycling in the same space. Additional width is desired if adjacent to the back of curb.

Intersection Considerations

Two methods to evaluate the need for non-motorized facilities include counting the amount of people currently walking or biking (Streetlight) and evaluating how many people may walk or bike if improved facilities existed (SPACE).

- The Suitability of Pedestrian and Cycling Environment (SPACE) analysis is a tool used to evaluate potential non-motorized user demand. It includes information such as the percent of people in age groups that are more likely to rely on walking and biking. Higher scores indicate a higher likelihood that there is a need for non-motorized facilities and may indicate a higher likelihood of a safety concern, especially for scores above 51. All scores at the intersections were at or above 58.
- Streetlight data is a tool to evaluate the current level of use; however, data is not available at this time for this area of Waite Park. Streetlight is currently updating their bicycle and pedestrian data, and the data may become available in the near future. This data could provide information on relative use of the crossings along the corridor.
- As an alternative, video counts can be performed to gather existing crossing activity in order to prioritize needs.

B The recommended intersection treatments vary depending on the characteristics of the roadway. Use Table 1, Application of pedestrian crash countermeasures by roadway feature from the FHWA *Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations* as a guide to evaluate the appropriate treatments. The recommendations below are based on this FHWA guidance. The table is included for reference on page 8.

Based on outreach done for the Statewide Pedestrian System Plan, people want more time to crossroads, curb extensions, and pedestrian refuge islands to feel safer.²

At signalized intersections, consider adding a leading pedestrian interval (LPI) to improve visibility and increase crossing time.

If the 3-lane section is not chosen, it is recommended to implement more advanced crossing assistive devices such as RRFBs or PHBs in combination with other treatments using Table 1 as a guide. Consider a PHB or RRFB at the locations shown on the map.³ Identify the best crossing location with the highest existing and potential pedestrian activity. Conduct video counts of pedestrian activity to help prioritize locations. If the 3-lane roadway is implemented, these locations can still be considered based on need; however, they may not be as necessary.

With the 3-lane section, consider pedestrian crossings with median pedestrian refuge islands at T-intersections. A benefit of the 3-lane roadway is that at T-intersections, where only one direction of left turn lane is needed, a median pedestrian refuge island can be provided on the approach without the turn lane (See exhibit on page 5). The treatment allows people walking and bicycling to cross one direction of traffic at a time. As shown on the exhibit, signing and marking can be used in combination with the refuge island.

Page 4 below provides an evaluation of each intersection to assist with evaluating the priority of need for crossing enhancements.

Jog the sidewalk at the railroad tracks so the new crossing is perpendicular to the tracks.

C Along 10th Avenue North, consider filling the sidewalk gaps, on both sides of the roadway, following desires lines.

Along Waite Ave, consider filling the sidewalk gaps, on both sides of the roadway.

¹ FHWA. https://safety.fhwa.dot.gov/road_diets/

² MnDOT. [Statewide Pedestrian System Plan \(minnesotawalks.org\)](https://www.mn.gov/statewide-pedestrian-system-plan)

³ MnDOT. "Pedestrian Crossing Facilitation." 15-01-T-01. Issued March 2015. <https://techmemos.dot.state.mn.us/TechMemo.aspx>

RECOMMENDED IMPROVEMENTS

Along 2nd Avenue North outside of the focus area within the 2-lane section and shoulders, consider bump-outs or curb extensions:



- 2-1/2 Street North
 - 2nd Street North (north of the RR tracks)
 - 2nd Street North (south of the RR tracks)
 - 1st Street North
-

10th Avenue – from 3rd Street North to 7th Street South*

Intersection	1 st St. S.	3 rd St. S.	Parkway Dr.	Sundial Dr.	Prosper Dr.	8 th St. S.
Crashes present 2010-2019 (Yes or No)	Yes	No	No	No	No	Yes
SPACE score	63	63	63	58	58	58
Origins-Destinations	Yes: Green Market Mexican Market Super America Kwik Trip	Yes: Menards Transit stops	One side: Rock Island Park	One side: Transit stop Bernick's	Yes: Casey's General Store Transit stop - Apartments	Yes: School Homes
4-lane treatment recommendation	PHB or RRFB	PHB	PHB	PHB	PHB	PHB
3-lane treatment recommendation	Pedestrian refuge island or RRFB	Pedestrian refuge island or PHB	Pedestrian refuge island or PHB	Pedestrian refuge island or PHB	Pedestrian refuge island or PHB	Pedestrian refuge island or PHB

*Maintain existing crossings on all legs of the signalized intersections

2nd Avenue South – from 1st Street South to 7th Street South*

Intersection	1 st St. S.	3 rd St. S.	Park Meadows Dr.	Sundial Dr.
Crashes present 2010-2019 (Yes or No)	Yes	Yes	No	Yes
SPACE score	63	63	58	58
Origins-Destinations	Yes: Kohl's Transit stops	Yes: Aldi Transit stops	Yes: Homes Transit stops	Yes: Homes Transit stops
4-lane treatment recommendation	PHB or RRFB	PHB or RRFB	PHB or RRFB	PHB or RRFB
3-lane treatment recommendation	Pedestrian refuge island or RRFB	Pedestrian refuge island or RRFB	Pedestrian refuge island or RRFB	Pedestrian refuge island or RRFB

*Maintain existing crossings on all legs of the signalized intersections

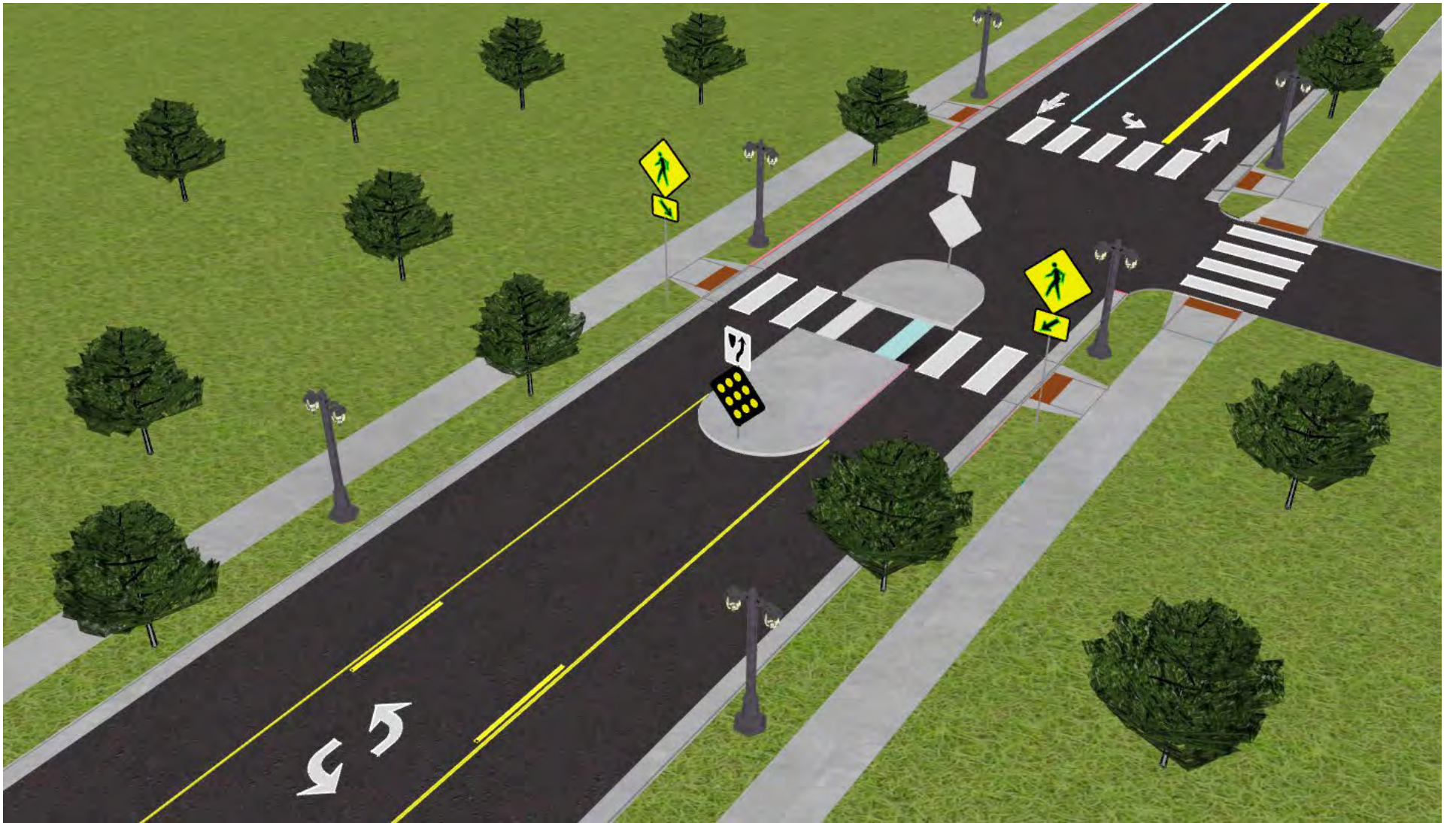
Waite Avenue – from 3rd Street North to Thielman Lane*

Intersection	Maple St. NE	Cherry St.	2 nd St. N.	1 st St. N.	1 st St. S.	Midblock – Division St. and TH 23/2 nd St S.	Thielman Ln.
Crashes present 2010-2019 (Yes or No)	No – but close	No	No	Yes	No – but close	Yes	No
SPACE score	58	58	58	58	58	63	63
Origins-Destinations	Yes: Homes both sides	Yes: Mall parking lot	Yes: Mall parking lot	Yes: Meat market Mall Transit stops	Yes: Cash Wise foods Transit stop	Yes: Cash Wise foods Transit stop	Yes: School Fresh Thyme Stores
4-lane treatment recommendation	PHB or RRFB	PHB or RRFB	PHB or RRFB	PHB or RRFB	PHB or RRFB	PHB or RRFB	PHB or RRFB
3-lane treatment recommendation	Pedestrian refuge island or RRFB	Pedestrian refuge island or RRFB	Pedestrian refuge island or RRFB	Pedestrian refuge island or RRFB	Pedestrian refuge island or RRFB	Pedestrian refuge island or RRFB	Pedestrian refuge island or RRFB

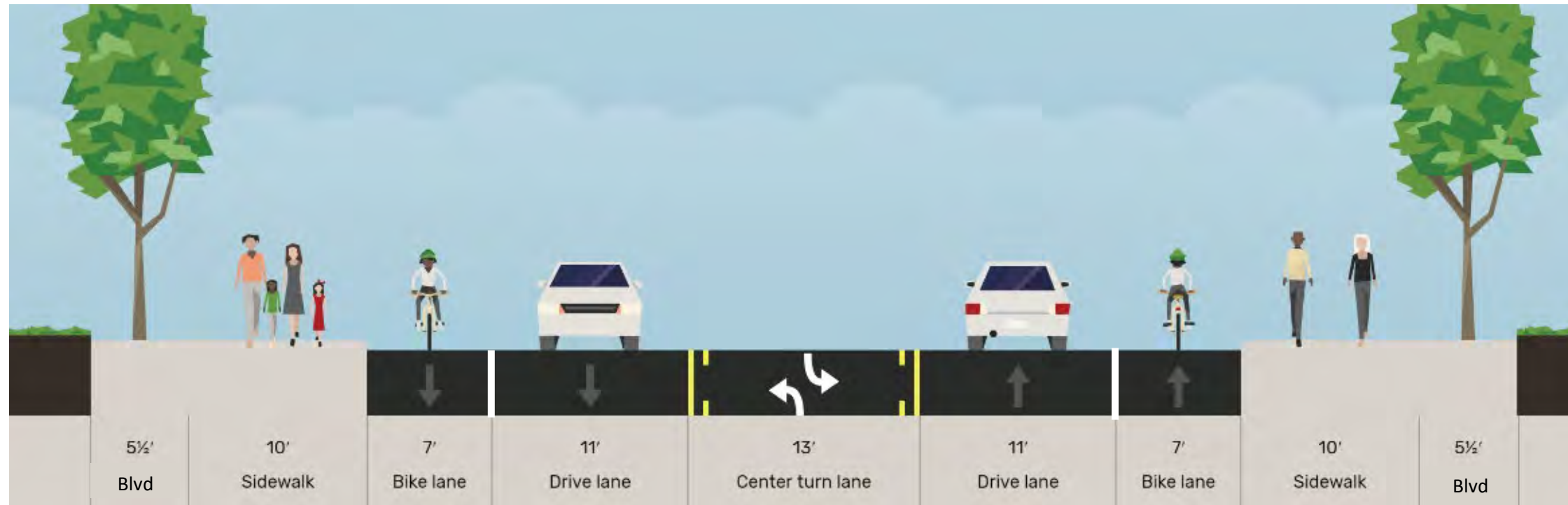
*Maintain existing crossings on all legs of the signalized intersections



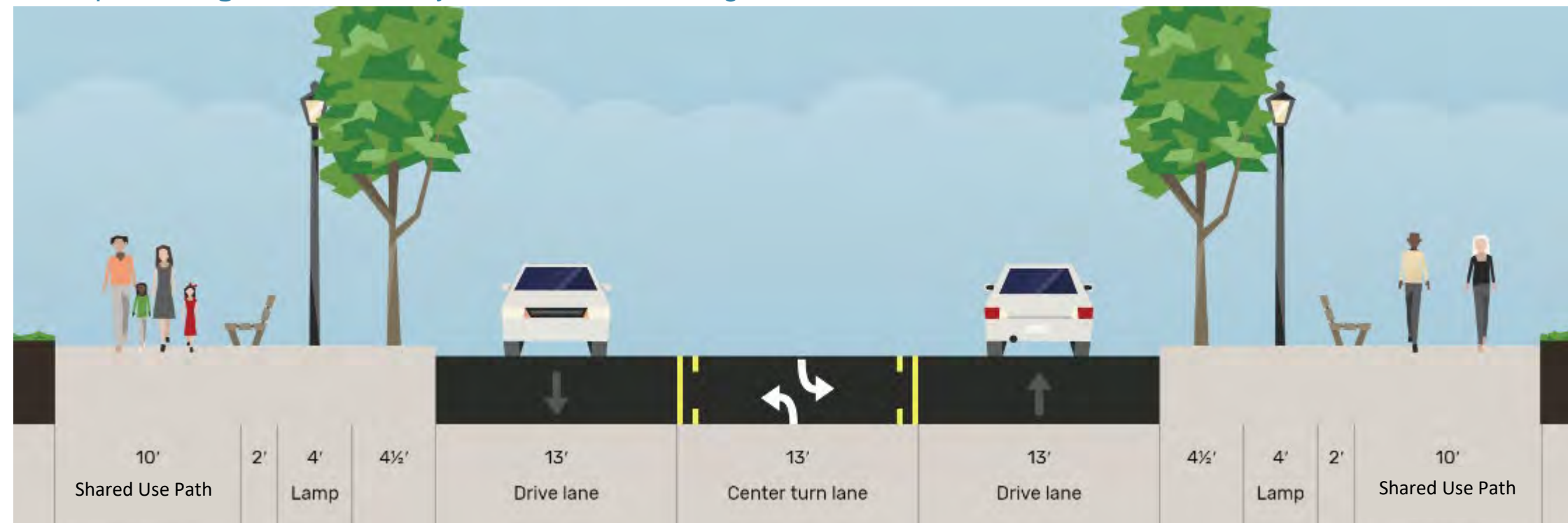
Concept for T-intersection Pedestrian Crossing



Concept: **Near-Term** Roadway Reconfiguration along 10th Avenue North, 2nd Avenue North or Waite Avenue

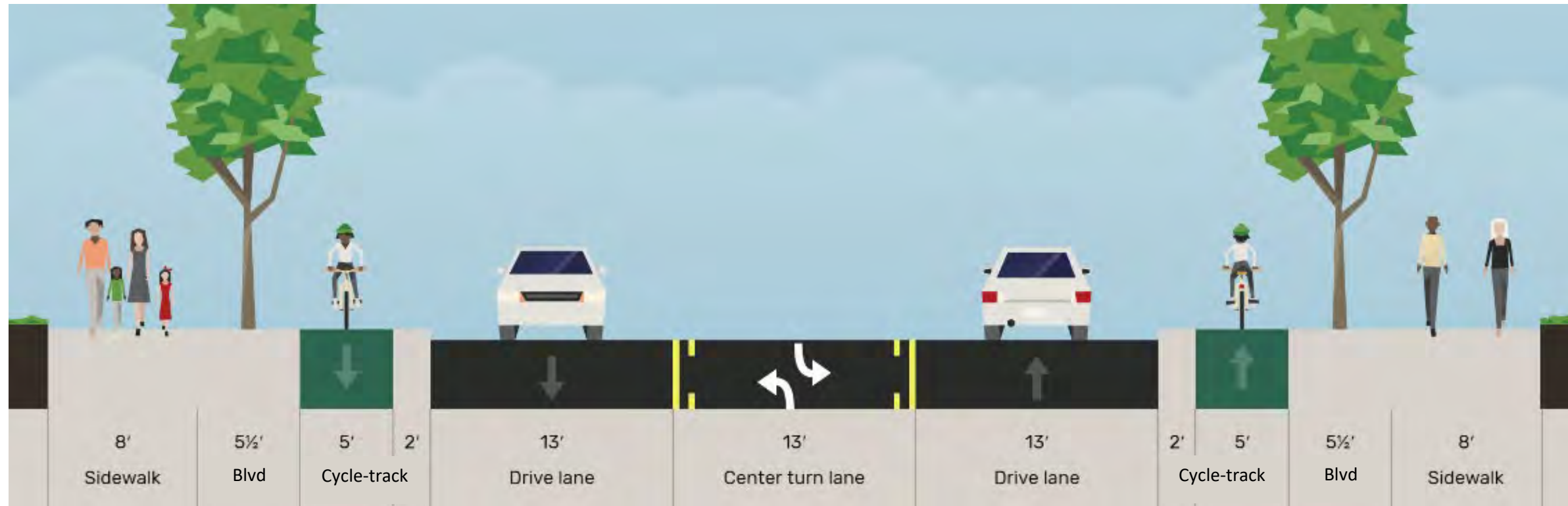


Concept 1: **Long-Term** Roadway Reconstruction along 10th Avenue North, 2nd Avenue North or Waite Avenue



Source: Streetmix.net (Use Google Chrome)

Concept 2: Long-Term Roadway Reconstruction along 10th Avenue North, 2nd Avenue North or Waite Avenue



Source: Streetmix.net (Use Google Chrome)

Table 1. Application of pedestrian crash countermeasures by roadway feature.

Roadway Configuration	Posted Speed Limit and AADT								
	Vehicle AADT <9,000			Vehicle AADT 9,000–15,000			Vehicle AADT >15,000		
	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph	≤30 mph	35 mph	≥40 mph
2 lanes (1 lane in each direction)	① 2 4 5 6	① 5 6 7 9	① 5 6 7 9	① 4 5 6 7 9	① 5 6 7 9	① 5 6 7 9	① 4 5 6 7 9	① 5 6 7 9	① 5 6 9
3 lanes with raised median (1 lane in each direction)	① 2 3 4 5	① 3 5 7 9	① 3 5 7 9	① 3 4 5 7 9	① 3 5 7 9	① 3 5 7 9	① 3 4 5 7 9	① 3 5 7 9	① 3 5 9
3 lanes w/o raised median (1 lane in each direction with a two-way left-turn lane)	① 2 3 4 5 6 7 9	① 3 5 6 7 9	① 3 5 6 9	① 3 4 5 6 7 9	① 3 5 6 7 9	① 3 5 6 9	① 3 4 5 6 7 9	① 3 5 6 9	① 3 5 6 9
4+ lanes with raised median (2 or more lanes in each direction)	① 3 5 7 8 9	① 3 5 7 8 9	① 3 5 8 9	① 3 5 7 8 9	① 3 5 7 8 9	① 3 5 8 9	① 3 5 7 8 9	① 3 5 8 9	① 3 5 8 9
4+ lanes w/o raised median (2 or more lanes in each direction)	① 3 5 6 7 8 9	① 3 5 6 7 8 9	① 3 5 6 8 9	① 3 5 6 7 8 9	① 3 5 6 7 8 9	① 3 5 6 8 9	① 3 5 6 7 8 9	① 3 5 6 8 9	① 3 5 6 8 9
<p>Given the set of conditions in a cell,</p> <ul style="list-style-type: none"> # Signifies that the countermeasure is a candidate treatment at a marked uncontrolled crossing location. ● Signifies that the countermeasure should always be considered, but not mandated or required, based upon engineering judgment at a marked uncontrolled crossing location. ○ Signifies that crosswalk visibility enhancements should always occur in conjunction with other identified countermeasures.* <p>The absence of a number signifies that the countermeasure is generally not an appropriate treatment, but exceptions may be considered following engineering judgment.</p>									
<ul style="list-style-type: none"> 1 High-visibility crosswalk markings, parking restrictions on crosswalk approach, adequate nighttime lighting levels, and crossing warning signs 2 Raised crosswalk 3 Advance Yield Here To (Stop Here For) Pedestrians sign and yield (stop) line 4 In-Street Pedestrian Crossing sign 5 Curb extension 6 Pedestrian refuge island 7 Rectangular Rapid-Flashing Beacon (RRFB)** 8 Road Diet 9 Pedestrian Hybrid Beacon (PHB)** 									

*Refer to Chapter 4, 'Using Table 1 and Table 2 to Select Countermeasures,' for more information about using multiple countermeasures.

**It should be noted that the PHB and RRFB are not both installed at the same crossing location.

Resources:

MnDOT offers resources for integrating safe walking and bicycling into projects. [Minnesota Walks](#) identifies destinations people want to walk and priority populations that face additional challenges with the transportation system. The [Statewide Bicycle System Plan](#) identifies state goals and priorities for bicycling and the [Statewide Pedestrian System Plan](#) for pedestrians. Please refer to the following resources for more information.

- [Statewide Pedestrian System Plan \(minnesotawalks.org\)](#)
- MnDOT 4 to 3-lane conversion information, including Minnesota Case Studies <https://www.dot.state.mn.us/trafficeng/safety/threelane.html>
- MnDOT Technical Memorandums <https://techmemos.dot.state.mn.us/>
 - Performance-Based Practical Design Guidelines. 18-09-TS-07. Issued October 2018.
 - Pedestrian Crossings Facilitation. 15-01-T-01. Issued March 2015.
 - MnDOT Land Use Contexts: Types, Identification, and Use. 18-07-TS-05. Issued July 2017.
- [MnDOT Design and Engineering, Policies and practices.](#)
- [MnDOT Bicycle Facility Design Manual.](#) February 2020.
- [MnDOT Traffic Engineering Manual, Chapter 13 Non-Motorized Facilities](#) includes guidance on pedestrian crossings
- [MnDOT Bicycle Design and Engineering Guidance](#)
- [Pedestrian accommodations through work zones](#)

Additional Resources:

- FHWA Bikeway Selection Guide. February 2019. Pg. 25. https://safety.fhwa.dot.gov/ped_bike/tools_solve/docs/fhwasa18077.pdf
- Guide for Improving Pedestrian Safety at Uncontrolled Crossings Locations. 2017. Selecting Countermeasures: pg. 15-21. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/guide_to_improve_uncontrolled_crossings.pdf

Please contact Sonja Piper, Pedestrian and Bicycle Safety Engineer (sonja.piper@state.mn.us) or Amber Dallman, Pedestrian, Bicycle and Transit Planning Supervisor (amber.dallman@state.mn.us) with questions.

General Strategy List

- ✓ **Sidewalks**
- ✓ **Shared Use Path**
- ✓ **Improved Crosswalks**
- ✓ **Center Left Turn Lanes**
- ✓ **Lowered Traffic Speeds**
- ✓ **Curb Extensions/Bump-out**
- ✓ **Curb Cut with Ramps**
- ✓ **Pedestrian Refuge and Crossing Islands**
- ✓ **Adjusted Lane Widths**
- ✓ **Signalized Timing Improvement**
- ✓ **Improved Rail Crossing**
- ✓ **Bike Lanes**
- ✓ **Landscaping**
- ✓ **Lane Removal**

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BICYCLE FRIENDLY EDGELINE RUMBLES

Longitudinal rumble strips and stripes are grooves cut into the paved shoulder that alert motorists if they have left their travel lane.

A rumble stripe is a rumble strip that contains a pavement marking stripe.

Rumble strips are outside the edge/fog line.



Source: www.adventurecycling.org/bicycle-tourism/national-advocacy-projects/rumble-strips/

NEED

Provide placement that does not interfere with non-motorized uses.

BENEFITS

The edgeline rumbles reduce the number of road departure crashes by alerting drivers to the road edge and keeping drivers on the road.

Installing the edgeline rumbles correctly ensures there is space for people bicycling to use the shoulder and do not jar the bicyclist forcing unsafe movements.

DESIRED (STANDARD)

Maximize the distance of the rumbles from the bicycle travel path.

MINIMUMS (CONSTRAINED)*

Install rumbles along the paint line, or within 2 feet of the outer edge of the paint line if the paved shoulder is 6 feet or wider.

Provide a minimum clear path of 4 feet from the rumbles to the outside edge of the paved shoulder.

Provide a minimum clear path of 5 feet from the rumbles to the adjacent curb, guardrail, or another obstacle.

* Review MnDOT Technical Memorandums 17-12-TS-05, 17-08-T-02, and 11-02-T-02.

BICYCLE LANES

A bicycle lane is “a portion of the roadway or shoulder designated for exclusive or preferential use by people using bicycles. Bicycle lanes are distinguished from the portion of the roadway or shoulder used for motor vehicle traffic by striping, marking, physical barrier or other similar technique.”¹

On-road bicycle lanes provide a designated space for the exclusive use of bicycles, creating a separation of vehicles by size, weight and speed. The safest applications are on roadways with moderate speeds, moderate volumes of traffic and fewer heavy commercial vehicles. As speeds, volumes, and trucks increase, providing a buffer becomes critical.^{2,3,4}

A buffered or separated bicycle lane provides either a painted or a physical buffer between the bicycle and vehicle traffic, and provides a greater shy distance between them. This encourages bicycling by contributing to either real and/or perceived safety among people using the bicycle facility.⁵

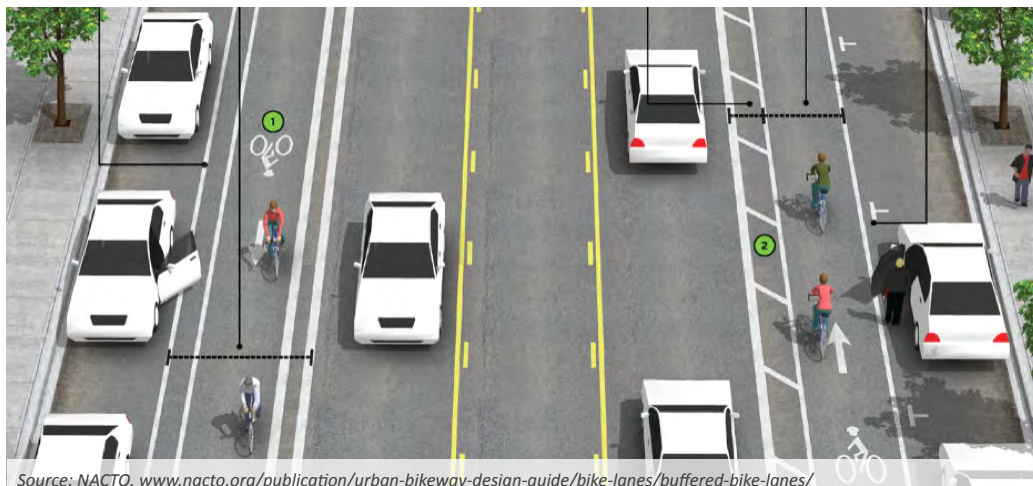
Shared paved shoulders can be designated as a bicycle lane. See Strategy Sheet on Shared Paved Shoulders.

1, 2 MnDOT Bikeway Facility Design Manual. March 2007. <http://www.dot.state.mn.us/bike/pdfs/manual/manual.pdf>

3 MnDOT. Minnesota's Best Practices for Pedestrian/Bicycle Safety. September 2013. pg. 32-37. <http://www.dot.state.mn.us/research/TS/2013/201322.pdf>

4 AASHTO Guide for the Development of Bicycle Facilities. 2012. (For purchase only).

5 FHWA. Separated Bike Lane Planning and Design Guide. May 2015. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/separated_bikelane_pdg/separatedbikelane_pdg.pdf



Source: NACTO. www.nacto.org/publication/urban-bikeway-design-guide/bike-lanes/buffered-bike-lanes/

NEED

Provide bicycle facilities to:

- Balance the needs of all transportation users and achieve “complete streets.”
- Address the vulnerability of people using the roadway on a bicycle.
- Encourage safety by providing designated space for all modes of transportation.

BENEFITS

Bicycle lanes can:

- Improve conditions for bicyclists on roadways with higher speeds or traffic volumes. More width results in better conditions for the bicyclists.
- Increase motorist comfort by providing more consistent separation between bicyclists and passing vehicles.
- Organize modes of traffic by their speed, which eliminates the slowing of vehicle traffic because of a bicycle in the lane.
- Improve sight distance for motorists at driveways.
- Provide a buffer area between sidewalks and traffic lanes.

Space for bicycle facilities can be provided by narrowing vehicle travel lanes, which may reduce vehicle speeds and have a traffic calming effect.

6 MnDOT Bikeway Facility Design Manual. March 2007. pg. 81-94. <http://www.dot.state.mn.us/bike/pdfs/manual/manual.pdf>

7 MnDOT Bikeway Facility Design Manual. March 2007. pg. 83. <http://www.dot.state.mn.us/bike/pdfs/manual/manual.pdf>

8 MnDOT Bikeway Facility Design Manual. March 2007. pg. 81-94. <http://www.dot.state.mn.us/bike/pdfs/manual/manual.pdf>

9 NACTO. <https://nacto.org/publication/urban-bikeway-design-guide/bike-lanes/buffered-bike-lanes/>

DESIRED (STANDARD)

A buffered bicycle lane with 5-ft width (not including the gutter pan) with a buffer as described below.⁶

Provide a painted buffer with two solid striped lines. Paint a striped hatch if the buffer is 3-ft wide or wider. Bollards are also beneficial and can be removed in winter for snow removal. Physical protection such as a concrete barrier is ideal when high speed vehicular traffic is adjacent to the bicycle lane.

Parking lanes can also be used as a buffer space between traveling vehicles and the curb line. Bicycle lanes are recommended to be 6 feet next to parking lanes.⁷

Drainage grates and gutter seams should not be included in the usable width.

MINIMUMS (CONSTRAINED)

A bicycle lane with 4-ft width (not including the gutter pan). More width is preferred.⁸

If a buffer is provided the minimum width is 18 inches marked with two solid white lines.⁹

CROSSWALKS

A marked crosswalk is a type of pavement marking that shows people walking the recommended location to cross the roadway and alerts approaching motorists to where people may be crossing the street.¹

In MN, a legal crosswalk does not necessarily have to be marked at an intersection. State laws define a legal crosswalk as the extension of the sidewalks across a road, whether it has a marked crosswalk at the intersection or not.²

Marked crosswalks are often installed at signalized intersections, at a school zone crossing (whether signalized or not), and at unsignalized locations where engineers determine there are enough people crossing to justify a marked crossing. Mid-block crossings are sometimes necessary and must be marked according to the law.³ Marked crosswalks are accompanied with ADA compliant facilities as required, including ramps, landings, pedestrian signal heads, APS, and other facilities.⁴

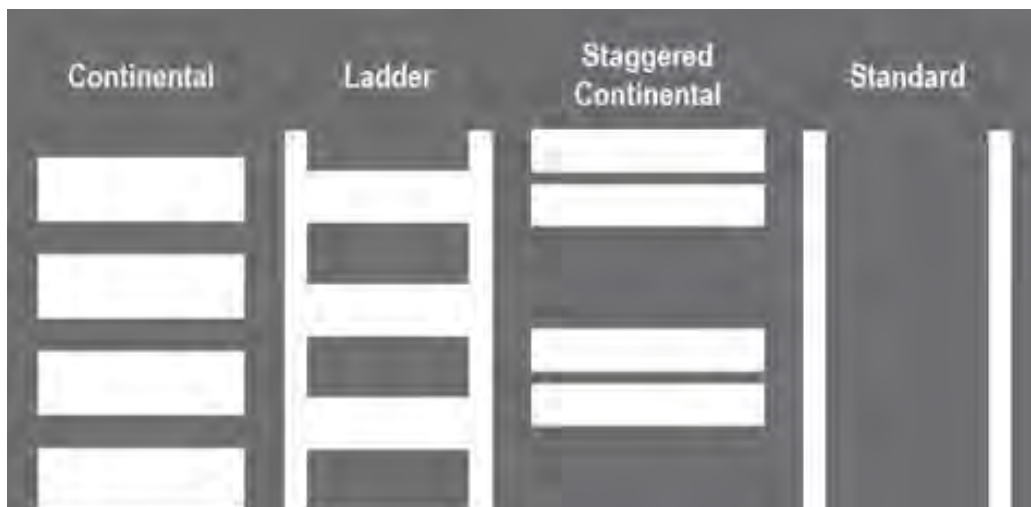
Crosswalks can be combined with additional crossing treatments including (but not limited to): overhead lighting, raised crosswalks or crosswalk visibility enhancements, median refuge islands, pedestrian hybrid beacons, curb extensions, or pedestrian rectangular rapid flashing beacons (RRFBs).⁵

1,2 *Minnesota's Best Practices for Pedestrian/Bicycle Safety*. September 2013. www.dot.state.mn.us/research/TS/2013/201322.pdf

3 <https://www.fhwa.dot.gov/publications/research/safety/04100/01.cfm>

4 *MnDOT. Accessibility*. www.dot.state.mn.us/ada/design.html

5 *Minnesota's Best Practices for Pedestrian/Bicycle Safety*. September 2013. www.dot.state.mn.us/research/TS/2013/201322.pdf



NEED

Examples of when crosswalk markings are needed include:⁶

- Intersections or connecting sidewalk, trail or shared use path.⁷
- Locations with high crash rates or high predicted crash rates.
- When there are destinations such as convenience stores, grocery stores, restaurants or anywhere people need to go and often walk.
- If sidewalks don't exist but there is evidence that people are walking in the area such as worn paths.
- Around schools, often shown in a Safe Routes to School Plan.

BENEFITS

Crosswalks help make pedestrians more visible. They can help people decide where to cross, reduce vehicle speeds and enhance the pedestrian crossing environment.

Crosswalks alert drivers to a potential location to expect a pedestrian.

6 *MnMUTCD*. www.dot.state.mn.us/trafficeng/publ/mutcd/mnmutcd2018/mnmutcd_entiredoc.pdf

7 *Traffic Engineering Manual: Non-Motorized Facilities*. June 2015. www.dot.state.mn.us/trafficeng/publ/tem/2015/chapter13.pdf

8 *MnMUTCD*. www.dot.state.mn.us/trafficeng/publ/mutcd/mnmutcd2018/mnmutcd_entiredoc.pdf

Sources:

Minnesota's Best Practices for Pedestrian/Bicycle Safety. September 2013. www.dot.state.mn.us/research/TS/2013/201322.pdf

Traffic Engineering Manual: Non-Motorized Facilities. June 2015. www.dot.state.mn.us/trafficeng/publ/tem/2015/chapter13.pdf

MnMUTCD. www.dot.state.mn.us/trafficeng/publ/mutcd/mnmutcd2018/mnmutcd_entiredoc.pdf

DESIRED (STANDARD)

10 ft or more in width.

High visibility striping pattern such as the continental or ladder.

Combine the crosswalk with other crossing enhancements and standard requirements.⁸ See Crosswalk Visibility Enhancements Strategy Sheet.

Place the striping outside of the vehicle path to avoid wearing.

MINIMUMS (CONSTRAINED)

The minimum requirements vary by municipality.

Match the width of connecting or adjacent sidewalks, shared use paths, or shoulder.

Align the crosswalk with ADA compliant ramps and avoid skew.

Provide with ADA compliant facilities.

CROSSWALK VISIBILITY ENHANCEMENTS

Crosswalk visibility enhancements, or pedestrian crash countermeasures, make crosswalks and pedestrians more visible to motorists, and encourage people to use crosswalks. Both FHWA¹ and MnDOT² provide resources to select appropriate countermeasures for a project.



Source: https://safety.fhwa.dot.gov/ped_bike/step/resources/

NEED

When vehicle speed is an issue; often improvements that lower speeds also provide visibility enhancements for non-motorized users, such as with curb extensions.

When physical conditions such as parked cars or horizontal and vertical roadway curvature reduce visibility at crosswalks and contribute to higher crash rates.

When there are poor lighting conditions.

BENEFITS

Crosswalk visibility enhancements can reduce crashes by 23-48 percent.³

Specific benefits of each type of countermeasure can be found in FHWA's Crash Modification Factor Clearinghouse.⁴

DESIRED (STANDARD)

Enhancements listed as appropriate for the type of project.

MINIMUMS (CONSTRAINED)

High visibility crosswalk markings and signing.

Sources:

Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations. FHWA. 2017. www.fhwa.dot.gov/innovation/everydaycounts/edc_4/guide_to_improve_uncontrolled_crossings.pdf

Minnesota's Best Practices for Pedestrian/Bicycle Safety. September 2013. www.dot.state.mn.us/research/TS/2013/201322.pdf

MnDOT Office of Traffic Engineering: Crosswalk Marking.

MnMUTCD. www.dot.state.mn.us/trafficeng/publ/mutcd/mnmutcd2018/mnmutcd_entiredoc.pdf

Safe Transportation for Every Pedestrian (STEP). June 2018. [www.safety.fhwa.dot.gov/ped_bike/step/resources/](https://safety.fhwa.dot.gov/ped_bike/step/resources/)

Traffic Engineering Manual: Non-Motorized Facilities. June 2015. www.dot.state.mn.us/trafficeng/publ/tem/2015/chapter13.pdf

TYPE OF ENHANCEMENTS

High-visibility marking such as a ladder design improves visibility of the crosswalk compared to standard parallel lines.

Parking restriction on the crosswalk approach improves the sightlines for motorists and people crossing.

STOP or YIELD markings and signs in advance of crosswalks further enhance crosswalk visibility. On multiple lane roadways they also help prevent multiple-threat crashes by requiring motorists to stop further from the crosswalk.

Curb extensions and refuge islands improve sight distance between drivers and pedestrians, as well as narrow the crossing distance for pedestrians.

In-street STOP or YIELD signs improve driver yielding rates. They can be used in the roadway or in conjunction with a refuge island.

Street lights or pedestrian level lights at intersections and crosswalks or continuous lighting along roadway corridors increases visibility of non-motorized and motorized traffic.

Raised crosswalks are an extension of the sidewalk height into the roadway, which requires vehicles to slow down. Raised crosswalks should be avoided on major truck routes, emergency routes and arterial streets, and should consider large vehicle noise, bus transit routes, snow clearing and drainage issues.⁵

1 Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/guide_to_improve_uncontrolled_crossings.pdf

2 MnDOT Pedestrian Crossing Facilitation Technical Memorandum No. 15-01-T-01. <https://techmemos.dot.state.mn.us/mn.us/research/TS/2013/201322.pdf>

3 Crosswalk Visibility Enhancements. https://safety.fhwa.dot.gov/ped_bike/step/docs/TechSheet_VizEnhancemnt_508compliant.pdf

4 CMF Clearinghouse. <http://www.cmfclearinghouse.org/index.cfm>

5 MnDOT Best Practices for Pedestrian and Bicycle Safety. September 2013. <http://www.dot.state.mn.us/stateaid/trafficsafety/reference/ped-bike-handbook-09.18.2013-v1.pdf>

CURB EXTENSIONS

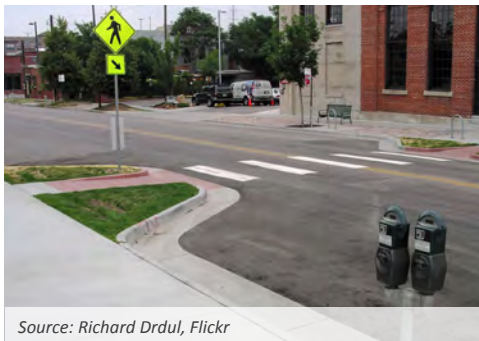
A curb extension, or “bumpout,” is an extension of the sidewalk into the roadway, which reduces the effective roadway width and crossing distance for pedestrians, reduces their exposure to vehicle traffic, and improves the ability of pedestrians and motorists to see each other.

Typically, a curb extension is on a roadway with a parking lane, and parking setback restrictions are already in-place at the intersection. The curb extension typically extends to the edge of the parked vehicles.

Consider the amount of heavy truck or bus traffic when determining the curb radius or providing a curb extension. Mountable curb extensions for large or heavy vehicles are optional; however, a mountable curb may encourage fast turning. Larger vehicles are not always expected to turn from a right lane to another right lane – the vehicle can encroach into adjacent lanes safely where volumes are low and/or vehicle speeds are slow. Adjacent stop bars can also be adjusted to provide more space.

When designing, consider the design vehicle versus the control vehicle.¹

¹ Performance-Based Practical Design Guidelines. MnDOT Technical Memorandum No. 18-09-TS-07.

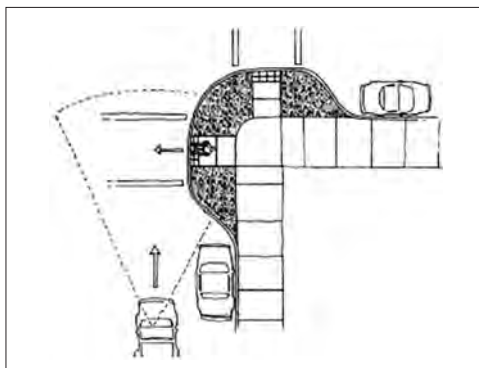


ABOVE Permanent bumpout: full reconstruction

NEED

Use curb extensions:

- To reduce the roadway crossing distance.
- To improve the safety and comfort for users of all ages and abilities to cross the roadway.
- When parking limits the sight distances for pedestrians and motorists.



Source: MnDOT Best Practices for Pedestrian and Bicycle Safety. pg. 12. September 2013. <http://www.dot.state.mn.us/stateaid/trafficsafety/reference/ped-bike-handbook-09.18.2013-v1.pdf>

DESIRED (STANDARD)

5-ft radius on both roadways.

1:5 taper to the established curb line.

ADA compliant pedestrian ramps.

Locate drainage structures outside of the curb extension.

Grass or low-level landscaping can be used to improve drainage conditions.

Colored concrete is optional.

Source: Minnesota’s Best Practices for Pedestrian/Bicycle Safety,



ABOVE Temporary bumpout: mill and overlay

BENEFITS²

Curb extensions:

- Improve the visibility of pedestrians by positioning them in front of parked cars, traffic, signs and streetlights.
- Reduce the time and distance pedestrians are in the street and exposed to traffic.
- Improve sight lines and visibility of pedestrians near parked vehicles by moving the vehicles back from an intersection.
- Calm traffic by restricting street widths, sending a visual cue to drivers to reduce speeds. A tight curb radii further calms traffic by requiring slower turning speeds.
- Often improve emergency access as intersections are kept clear of parked cars. Fire engine and other emergency vehicle drivers can climb a curb, but they would not be able to move around a parked car. At mid-block locations, curb extensions can keep fire hydrants clear of parked cars and make them more accessible.
- Can be used to place landscaping and street furniture where sidewalks are otherwise too narrow.

² Some cities have deployed curb extensions in a temporary condition to explore their effectiveness. Additional information for a pilot location on 7th Street S and Chicago Avenue in Minneapolis, including photos, can be found at <http://www.dot.state.mn.us/trafficeng/pub/tem/index.html>

MINIMUMS (CONSTRAINED)

1:2 taper to the established curb line.

ADA compliant pedestrian ramps.

Locate drainage structures outside of the ADA compliant pedestrian ramps and flares.

PEDESTRIAN FACILITIES at TRAFFIC SIGNALS



Traffic signals are used at locations where there are high traffic volumes intersecting so people walking or biking must be aware of traffic in multiple directions. Less conventional intersection designs can further increase the complexity for non-motorized users.

Traffic signals are effective at stopping traffic to allow people to cross; however, turning conflicts exist between motorists, people walking or biking and other users.

Traffic signals sometimes have long cycle lengths that make crossing inconvenient.

The approach used at each traffic signal should meet the needs of all the users.

Also consider that the number of people currently walking and biking may be limited by their comfort level on the roadways. Improving the conditions may increase those that choose a non-motorized option.

There are many ways that traffic signal timings can be changed to create a friendlier non-motorized user environment:

- Countdown timers are flashing timers installed with pedestrian indication lights that provide the number of seconds remaining during the pedestrian phase. Countdown timers have become common and are used at most traffic signals.
- A leading pedestrian interval provides people 3 to 5 seconds ahead of the vehicle's green light, allowing people a head start and the ability to enter the crosswalk before right-turning vehicles can turn into the crosswalk.
- Prohibiting right turns on red. Motorists trying to turn right on a red light sometimes look left to see vehicles but not right to see pedestrians. They also sometimes encroach on the crosswalk while waiting to make their turn.
- Using pedestrian phase recall at traffic signals allows people to walk with the traffic at any time, without relying on pushing the button.
- Provide enough crossing time for the types of people commonly using the crossing. As an example, increase the crossing time in areas with senior housing or at school crossings.
- Consider not using flashing yellow arrows when the pedestrian phase in conflict with it is activated. If there is a high number of people using the crossing it can be difficult for motorists turning left to find a gap in both traffic and pedestrians.

NEED

Adequate crossing time is needed for people of all ages and ability to cross the roadway. The minimum crossing time is 3.5 ft/sec from the pedestrian push button to the far side.

Enhanced pedestrian visibility is needed when there is a high number of turning vehicle conflicts.

BENEFITS

Improving traffic signal timings to be more pedestrian friendly may increase the number of people walking and biking.

Leading pedestrian intervals have been shown to reduce pedestrian-vehicle crashes as much as 60%.¹

Countdown timers have also been shown to reduce the number of crashes.²

DESIRED

Additional improvements described above that are appropriate for the intersection and improve the comfort and safety of non-motorized users.

MINIMUMS

Include pedestrian signal heads with countdown timers.

Provide pedestrian crossing times that allow people to cross the roadway in one phase.

Provide timings that accommodate the types of people using the crossings; sometimes the average walking speed is slower than the standard 3.5 feet per second.

1, 2 www.dot.state.mn.us/stateaid/trafficsafety/reference/ped-bike-handbook-09.18.2013-v1.pdf

PEDESTRIAN HYBRID BEACON (PHB/HAWK)

A pedestrian hybrid beacon system, also known as a high-intensity activated crosswalk, is a beacon installed at mid-block crosswalks that requires vehicles to stop for people crossing, similar to a traffic signal.

For motorists it consists of two side-by-side red lenses on top with a single yellow lens below. For non-motorized traffic it consists of typical pedestrian signal heads with a walk, don't walk and countdown timer displays.

The beacon remains dark until the pushbutton is activated by a person needing to cross the roadway. The beacon then flashes a sequence of amber warning beacons followed by a red stop beacon for vehicle traffic, which requires motorists to stop for pedestrians at the crosswalk.¹

Pedestrian hybrid beacons are used in conjunction with signs and pavement markings.



Source: FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations. 2017. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/guide_to_improve_uncontrolled_crossings.pdf

NEED

PHBs are typically used on roadways with higher AADTs and speeds and multiple lanes of traffic.²

PHBs are intended for mid-block crossings, but can be installed at intersections using engineering judgment.

BENEFITS

A 2015 study showed:³

- Vehicle-pedestrian crashes were reduced by 69 percent.
- Total crashes were reduced by 29 percent.
- Serious injury and fatal crashes were reduced by 15 percent.

PHBs can reduce pedestrian crashes by 55 percent.⁴

PHBs control traffic in a similar way as traffic signals. They are considered an FHWA proven pedestrian crash countermeasure.⁵

Drivers		Pedestrians	
... will see this	... will do this	... will see this	... will do this
	Proceed with Caution		Push the Button to Cross
	Slow Down (Pedestrian has activated the push button)		Wait
	Prepare to Stop		Continue to Wait
	STOP! (Pedestrian in Crosswalk)		Start Crossing
	STOP! Proceed with Caution if Clear		Continue Crossing (Countdown Signal)
	Proceed if Clear		Push the Button to Cross

Source: MnDOT Best Practices for Pedestrian and Bicycle Safety. September 2013. <http://www.dot.state.mn.us/stateaid/trafficsafety/reference/ped-bike-handbook-09.18.2013-v1.pdf>

DESIRED (STANDARD)

MUTCD compliant design.

1 MnDOT Best Practices for Pedestrian and Bicycle Safety. September 2013, pg. 13-15. <http://www.dot.state.mn.us/stateaid/trafficsafety/reference/ped-bike-handbook-09.18.2013-v1.pdf>

2 FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations. 2017, pg. 16. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/guide_to_improve_uncontrolled_crossings.pdf

3 FHWA Proven Safety Countermeasures. Pedestrian Hybrid Beacons. October 2017. https://safety.fhwa.dot.gov/provencountermeasures/ped_hybrid_beacon/

4 FHWA Safe Transportation for Every Pedestrian (STEP). June 2018. https://safety.fhwa.dot.gov/ped_bike/step/resources/

5 Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations. 2017, pg. 16. https://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/guide_to_improve_uncontrolled_crossings.pdf

PEDESTRIAN RECTANGULAR RAPID FLASHING BEACON

RRFBs are a strategy to enhance safety by increasing driver awareness of pedestrians in crosswalks.

RRFBs consist of two rapidly and alternately flashing rectangular yellow indications that are attached to supplement the pedestrian warning sign (W11-2) or school crossing sign (S1-1) at a crosswalk.

The RRFB uses an irregular flash pattern similar to emergency flashers on police vehicles.

The RRFB is activated either manually when a pedestrian pushes a button or passively by an automatic pedestrian detection system. A speech push-button says, “Yellow lights are flashing” when the RRFB is activated.

RRFBs are installed with ADA compliant sidewalk and curb ramps connecting to a sidewalk or trail network.

The RRFB is often used with high visibility crosswalk marking, raised islands, advance STOP or YIELD signs, and other enhanced crosswalk treatments.



Source: MN Best Practices for Pedestrian/ Bicycle Safety September 2013



Source: MN Best Practices for Pedestrian/ Bicycle Safety September 2013, NACTO

BENEFITS

Studies^{3,4} show that RRFBs increase yielding compliance dramatically, and yielding rates did not decline over time. Compliance rates are higher than any system other than those that include a red indication, such as a traffic signal.

The studies^{3,4} also show that drivers yield or slow down further in advance of the crosswalk with RRFBs than with standard round yellow flashing beacons. This is important on multilane roads for numerous reasons:

- To decrease the likelihood of multiple threat crashes⁵ by increasing the visibility of the pedestrian by motorists in the adjacent lane.
- To reduce the risk of a vehicle approaching a yielding vehicle and attempting to pass without seeing the crossing pedestrian.
- To decrease the chance that a yielding vehicle is struck from behind and propelled forward into the crossing pedestrian.

RRFBs increase driver awareness of the presence of pedestrians, and they allow for normal traffic flow when not actuated.

RRFBs can also include software to count the number of activations, providing helpful information about non-motorized users for engineers and planners.

Source: FHWA-SA-09-009

³ MnDOT Traffic Engineering Manual. Chapter 13. June 2015. <http://www.dot.state.mn.us/trafficeng/publ/tem/2015/chapter13.pdf>

⁴ Van Houten, R., R. Ellis, and E. Marmolejo. “The Use of Stutter Flash LED Beacons to Increase Yielding to Pedestrians at Crosswalks.” Presented at the Transportation Research Board Annual Meeting, Washington, DC, 2008.

⁵ http://www.pedbikeinfo.org/topics/crash_scenarios.cfm

NEED

Consider an RRFB when:

- There are moderate traffic speeds, moderate traffic volumes and/or multiple lanes of traffic for pedestrians to cross.
- There is a high volume of non-motorized traffic, although consider that poor existing crossing conditions may discourage people from crossing.
- Motorist yielding compliance is low.

RRFBs can be used at any mid-block or uncontrolled intersection crossing. Mid-block crossings can be considered when a signalized crossing or uncontrolled intersection crossing is more than 1/8 of a mile walking distance from the potential mid-block crossing

Refer to the [Traffic Engineering Manual \(TEM\)](#)¹ and the Pedestrian Crossing Facilitation Technical Memorandum No. 15-01-T-01 (included in TEM)² for more information.

¹ <http://www.dot.state.mn.us/trafficeng/publ/tem/index.html>

² FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations. 2017. http://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/guide_to_improve_uncontrolled_crossings.pdf

PEDESTRIAN REFUGE and CROSSING ISLANDS

Raised areas that are constructed in the center portion of a roadway that can serve as a place of refuge or protection for pedestrians who cross the road mid-block or at an intersection. After crossing to the center island, pedestrians wait for motorists to stop or for an adequate gap in traffic before crossing the second half of the street.

They are referred to as medians, pedestrian refuge islands, refuge islands, crossing islands or pedestrian islands.

Pedestrian islands may be appropriate at both unsignalized and signalized crossing locations.



Source: NACTO



Source: www.pedbikeinfo.org/planning/facilities_crossings_sliplane.cfm

NEED

When signal timings, roadway width and/or number of lanes do not provide adequate crossing time for all ages and abilities.

Highly desirable for midblock pedestrian crossings on roads with four or more travel lanes, especially where speed limits are 35 mph or greater and/or where annual average daily traffic is 9,000 or higher.¹

¹ FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations. 2017. http://www.fhwa.dot.gov/innovation/everydaycounts/edc_4/guide_to_improve_uncontrolled_crossings.pdf

BENEFITS

Pedestrian refuge islands can reduce pedestrian crashes by 32%.²

Medians provide a simplified crossing maneuver by allowing pedestrians to concentrate on only one direction of traffic at a time, creating the equivalent of two narrower one-way streets instead of one wide two-way street to cross.

Medians provide space for landscaping that can be used to change the visual cues of the roadway and reduce driver speeds.

A pedestrian refuge island can improve safety and comfort by providing pedestrians with the option of waiting in the median area before beginning the next stage of the crossing.

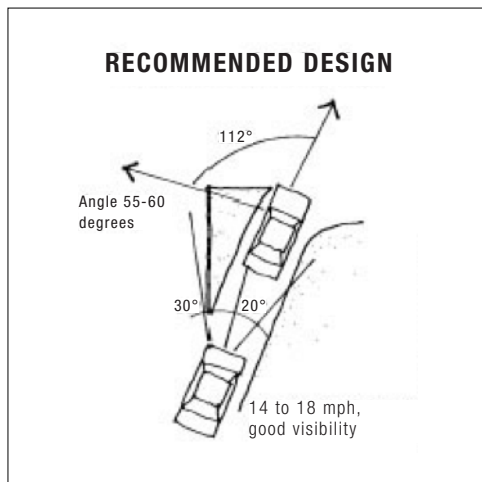
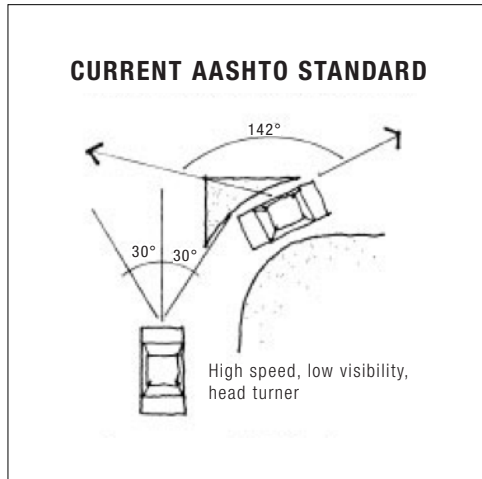
Improves pedestrian safety, especially on multi-lane arterials. One example found 39 to 46% reduction in pedestrian-vehicle crashes at unsignalized crosswalks on multi-lane roads.³

Having raised medians, or median islands, typically reduces motor-vehicle crash rates (such as head-on crashes) as well as pedestrian crash rates. Medians that are only painted do not provide the same safety benefits as raised ones.

² FHWA Safe Transportation for Every Pedestrian (STEP). June 2018. http://safety.fhwa.dot.gov/ped_bike/step/resources/

³ MnDOT Best Practices for Pedestrian and Bicycle Safety. September 2013. <http://www.dot.state.mn.us/stateaid/trafficsafety/reference/ped-bike-handbook-09.18.2013-v1.pdf>

PEDESTRIAN REFUGE and CROSSING ISLANDS
CONTINUED



Source: FHWA, Mark Brown @CompletedStreet

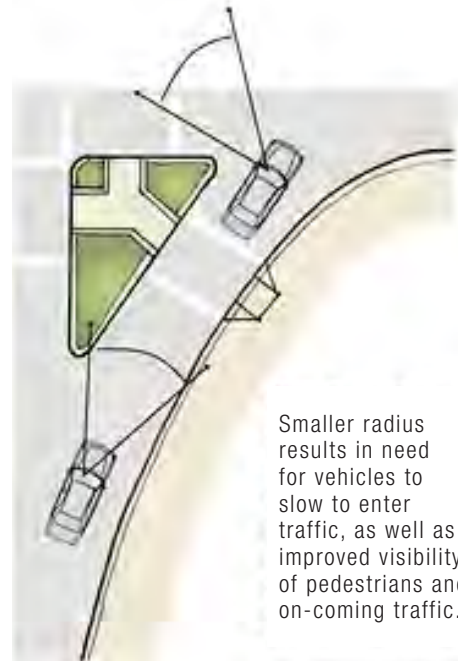
DESIRED (STANDARD)

Pedestrian refuge and crossing islands at crosswalks or RRFBs of multi-lane roadways.

Use with crosswalk visibility enhancements.

Provide curb extensions where road width/parking lane allows an 8-ft wide curb extension.⁴

⁴ MnDOT Bikeway Facility Design Manual, March 2007. <http://www.dot.state.mn.us/bike/pdfs/manual/manual.pdf>



Source: FHWA, Mark Brown @CompletedStreet

MINIMUMS (CONSTRAINED)

Raised medians must:

- Be fully accessible by curb ramps or cut through.
- Provide tactile cues for pedestrians with visual impairments to indicate the border between the pedestrian refuge area and the motorized vehicle roadway.
- Minimum of 6 feet wide.⁵

Landscaping in medians should not obstruct the visibility between pedestrians and approaching vehicles. Winter maintenance should be considered to keep the pedestrian route clear of snow.

⁵ MnDOT Roadway Design Manual. <http://roaddesign.dot.state.mn.us/roaddesign.aspx>

ROADWAY RECONFIGURATION

A common roadway reconfiguration converts an existing four-lane, undivided roadway to two through lanes and a center, two-way left turn lane. Roadway reconfigurations are also called road diets or road reallocations

There are numerous possible reconfigurations, including taking width from a three-lane roadway to add bicycle lanes, or converting a five-lane roadway to three driving lanes with diagonal parking and separated bicycle lanes. The intent is to accommodate all roadway users while increasing safety and improving quality of life.

Roadway reconfigurations can include pedestrian refuge islands¹, medians, crosswalk visibility enhancements², curb extensions³, on-street parking with restrictions at crosswalk approaches, widened sidewalks, landscaped buffers, bicycle lanes, and/or transit lanes.

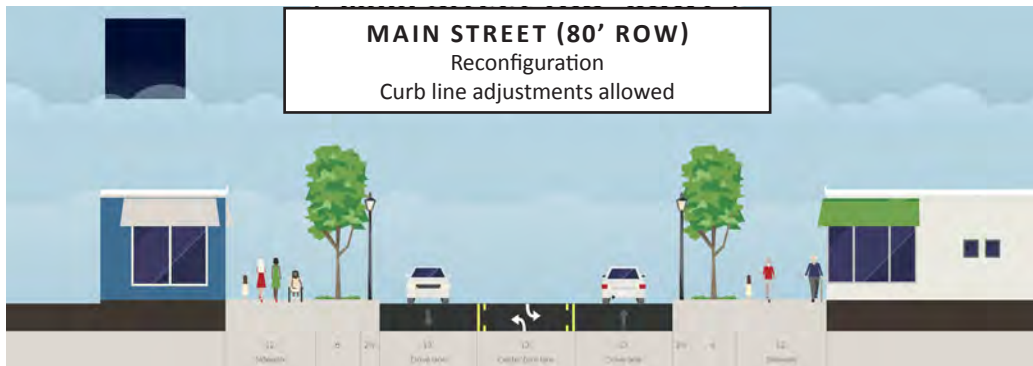
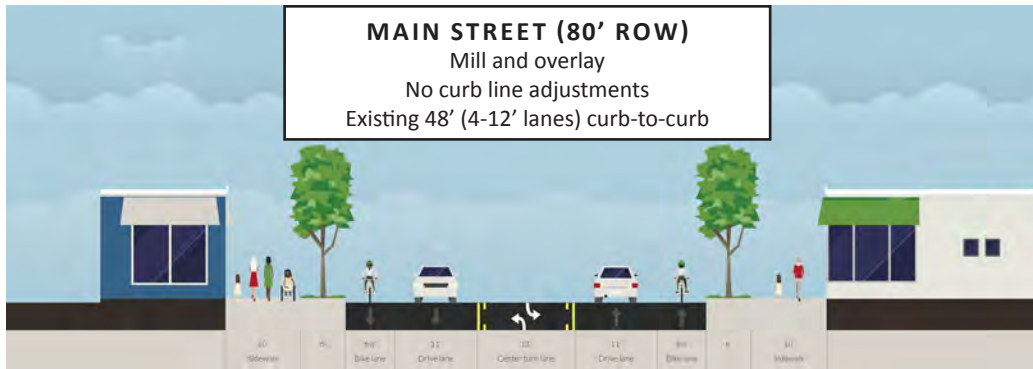
Suitable roadways have daily traffic volumes between 8,000 and 24,000 vehicles. In some instances, reconfigurations have been successful on roads as high as 25,000 vehicles. With higher traffic volumes, more traffic analysis should be done to validate operations.⁴

1 http://safety.fhwa.dot.gov/provencountermeasures/ped_medians/

2 http://safety.fhwa.dot.gov/ped_bike/step/docs/TechSheet_VizEnhancemt_508compliant.pdf

3 <http://nacto.org/publication/urban-street-design-guide/street-design-elements/curb-extensions/>

4 https://safety.fhwa.dot.gov/road_diets/guidance/info_guide/ch3.cfm#335



Source: Streetmix.net



Source: www.wherethesidewalkstarts.com/2012_11_01_archive.html

NEED

Consider a roadway reconfiguration when:⁴

- An existing four-lane roadway has a high crash frequency and moderate traffic volumes, including turning traffic.
- Seeking to integrate and serve multiple types of roadway users.

4 MnDOT Land Use Contexts: Types, Identification and Use. June 2018. MnDOT Technical Memorandum 18-07-TS-05. <http://techmemos.dot.state.mn.us/>

* Depends on engineering standards for roadway type and class, and vehicle types. Refer to the MnDOT Roadway Design Guide and the Performance-Based Practical Design Policy (www.dot.state.mn.us/policy/operations/op012.html).

DESIRE: BALANCED VEHICLE AND NON-MOTORIZED FACILITIES

10- to 11-ft travel lanes in urban areas or city limits. Begin cross section planning using 10-ft travel lanes, which encourages slower speeds yet does not negatively impact operations.

10- to 11-ft turn lanes in urban areas or city limits. Begin cross section planning using 10-ft travel lanes.

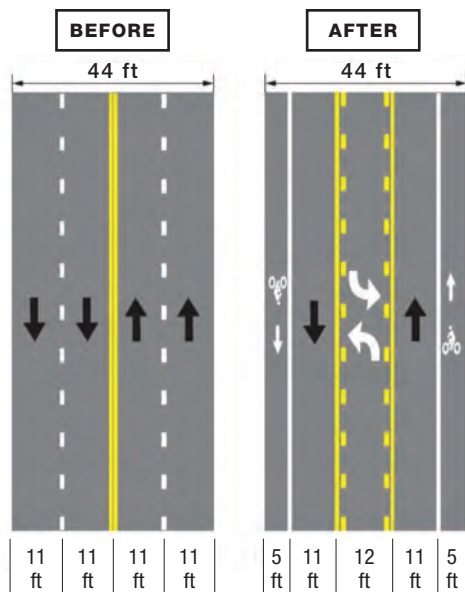
7- to 8-ft parking lanes in urban areas or city limits.

6-ft bicycle lane with buffer.

5- to 9-ft wide sidewalks; more width is preferred.

Up to a 14-ft shared use path, depending on use, with a buffer from vehicle lanes, as right of way allows.

ROADWAY RECONFIGURATION CONTINUED



Source: American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*, Fourth Edition, 2012.

MINIMUM NON-MOTORIZED FACILITIES WITH MAXIMUM ROADWAY WIDTHS^{5, 6}

12-ft travel lanes in urban areas or city limits; less width is preferred to encourage slower speeds.

8- to 12-ft parking lanes in urban areas or city limits, less width is preferred.

5-ft bicycle lanes; more width is preferred.

5-ft sidewalks; more width is preferred.

1-ft buffer against building face for doors, more width is preferred.

8-ft shared use path, if used, for two-way traffic.

⁵ MnDOT Roadway Design Manual. <http://roaddesign.dot.state.mn.us/roaddesign.aspx>

⁶ Performance Based Practical Design. September 2018. MnDOT Technical Memorandum 18-09-TS-07. <http://techmemos.dot.state.mn.us/>

BENEFITS

Roadway reconfigurations can:

- Decrease the lane crossing distance and pedestrian exposure time.
- Reduce the speed differential and overall vehicle speeds. Lower travel speeds can reduce potential crash severities for all users.
- Reduce crashes. A road diet has shown a 29% reduction in all roadway crashes.⁷ Road reconfigurations can reduce total crashes by 19% to 47% depending on the area.⁸
- Reduce vehicle-pedestrian, vehicle-bicycle, and vehicle-vehicle conflicts. They also have been shown to reduce crashes involving drivers under 35 and over 65 years of age.⁹

Adding a two-way center left-turn lane can:

- Provide a place for both motorists and bicyclists to turn left, thus reducing the incidence of left-turn and rear-end crashes.
- Reduce the incidence of sideswipe crashes because motorists will no longer change lanes to pass a vehicle waiting to turn left from the left-most travel lane.
- Improve visibility for left-turning motorists, who only have to clear one travel lane to complete their turn.

Reducing the number of travel lanes to just one lane in each direction substantially reduces the likelihood of multiple-threat¹⁰ crashes. This safety benefit applies to pedestrians, left-turning motorists and bicyclists.

Roadway reconfigurations promote “complete streets” by better integrating space for all roadway users, allowing designers to “do more with less.” They provide potential space for installing curb extensions and widening sidewalks, and adding bicycle, transit and/or parking lanes.

⁷ MnDOT Best Practices for Pedestrian and Bicycle Safety. September 2013. pg. 30. <http://www.dot.state.mn.us/stateaid/trafficsafety/reference/ped-bike-handbook-09.18.2013-v1.pdf>

⁸ NCHRP 17-25, Safety Effects of Four-Lane to Three-Lane Conversions.

⁹ FHWA, “Evaluation of Lane Reduction ‘Road Diet’ Measures on Crashes.” FHWA Report No. FHWA-HRT-10-053. (Washington, D.C.: 2010).

¹⁰ http://www.pedbikeinfo.org/topics/crash_scenarios.cfm

Other resources:

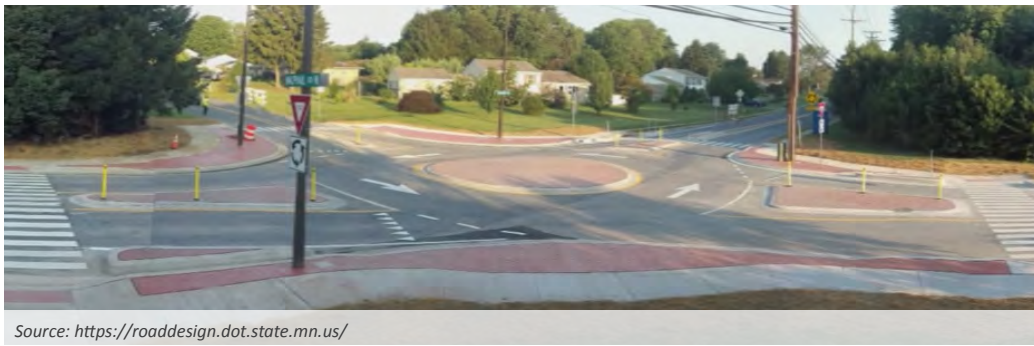
FHWA: http://safety.fhwa.dot.gov/road_diets/

NACTO: <http://nacto.org/publication/urban-bikeway-design-guide/>

MnDOT Bikeway Facility Design Manual. <http://www.dot.state.mn.us/bike/pdfs/manual/manual.pdf>

MnDOT Roadway Design Manual. <http://roaddesign.dot.state.mn.us/roaddesign.aspx>

ROUNDAABOUT/ MINI- ROUNDAABOUT



Source: <https://roaddesign.dot.state.mn.us/>

Roundabouts and mini-roundabouts are intersection design techniques intended to control traffic, reduce conflicts between traffic movements and lower speeds. Because of the reduced conflict points and lower speeds, they are a safer type of intersection design.

Roundabouts are usually built with a circular raised island and splitter medians on all approaches to help slow vehicles and direct traffic into the counterclockwise flow around the center island.

Pedestrians are accommodated at pedestrian crosswalks around the perimeter of a roundabout.

Mini-roundabouts operate similar to roundabouts, but have a smaller footprint and typically fit within the existing right of way, or even the existing curb lines. Large trucks typically overrun the mountable center island.

The splitter medians at mini-roundabouts typically do not provide the same degree of refuge as those at roundabouts.

Bicyclists are generally as comfortable negotiating a roundabout as motorists but can also travel as a pedestrian.

NEED

Consider a roundabout or mini roundabout as an intersection design to improve safety. Single lane roundabouts designed for low-speed operation are one of the safest treatments available for at-grade intersections.²

DESIRED (STANDARD)

Use the slowest design entry and exit speed possible.

Use the smallest design and control vehicle appropriate for the project.

Single lane roundabouts are preferred.

MINIMUMS (CONSTRAINED)

Use Chapter 12 of the MnDOT Road Design Manual 3 to properly design the roundabout for non-motorized users. Include facilities appropriate for the project.

Use lessons learned such as FHWA's Making Roundabouts Work for Pedestrians and Bicycles⁴

BENEFITS

In addition to the safety benefits to vehicles, roundabouts have additional benefits, described below.

A roundabout:

- Increases the likelihood of drivers yielding to pedestrians (compared to an uncontrolled crossing).
- Makes crashes with pedestrians and bicyclists less frequent and less severe.
- Simplifies pedestrian crossings; allows people walking to cross one direction of traffic at a time on each leg of the roundabout.
- Uses geometric design rather than traffic control to provide traffic calming.
- Provides the opportunity for a gateway treatment for a community, providing space for landscaping and other aesthetic treatments.
- Signifies a transition area by reinforcing a change in the driving environment.

General design characteristics for speed and traffic are:¹

	Mini-roundabout	Single-lane roundabout	Multi-lane roundabout
Entry speed	15 to 20 mph	20 to 25 mph	25 to 30 mph
Typical daily traffic	up to 15,000	up to 25,000	up to 45,000 (two-lane roundabout)



Mini-roundabout in Shakopee, MN. Source: <https://www.google.com/maps/@44.7834643,-93.5201076,115m/data=!3m1!1e3>

1, 2 NCHRP Report 672. Roundabouts: An Informational Guide 2nd Ed. 2010. <http://www.trb.org/Publications/Blurbs/164470.aspx>

3 <https://roaddesign.dot.state.mn.us/>

4 https://safety.fhwa.dot.gov/intersection/innovative/roundabouts/case_studies/rounds4peds.pdf

SHARED PAVED SHOULDERS

A shared paved shoulder is a section of the roadway alongside the driving lane that is continuous and on the same level as the regular travel lanes. It is available for use by bicycles and pedestrians and directional on both sides of the highway.

A shared paved shoulder can range in width from 4 to 8 feet of smooth surface outside of the rumble strips.

Widths narrower than 4 feet are not navigable for people riding a bicycle. If less than 4 feet of width is provided expect people walking or bicycling to use the travel lane and weigh safety risks accordingly.

Rumble strips and rumble stripe placement is a critical component of the shared paved shoulder.¹ See the strategy sheet on Bicycle Friendly Edgeline Rumbles, as well as the MnDOT technical memorandum² for installation guidance.

Shared paved shoulders can be marked as a bicycle lane only if it meets bicycle lane criteria. Bicycle lane markings are not required because use is encouraged by both people walking and bicycling when no other adjacent facilities are available.

¹ FHWA. Rumble Strips and Rumble Stripes. https://safety.fhwa.dot.gov/roadway_dept/pavement/rumble_strips/accommodating-all-users.cfm

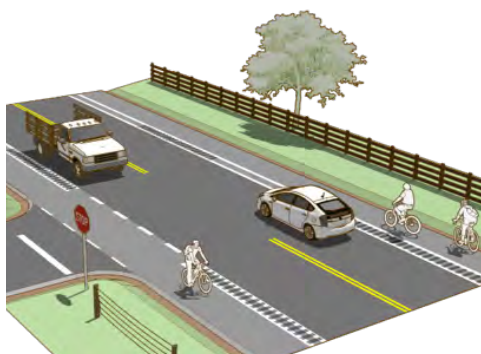
² Rumble Strips and Stripes on Rural Trunk Highways. MnDOT Technical Memorandum No. 17-08-T-02. August 2017. <https://techmemos.dot.state.mn.us/>



Source: MnDOT. <http://www.dot.state.mn.us/trafficeng/safety/rumble/images/RumbleBars.jpg>



Source: FHWA. https://safety.fhwa.dot.gov/geometric/pubs/mitigationstrategies/chapter4/images/figure_32.jpg



Source: Small Town and Rural Multimodal Networks. December 2016. <http://ruralsdesignguide.com/visually-separated/paved-shoulder>

NEED

Provide shared paved shoulders to balance the needs of all transportation users and achieve “complete streets.”

Use the guidance on the following page to help include an appropriately sized shoulder for the project and users of the roadway.

BENEFITS

Paved shoulders improve conditions for people walking and biking on roadways with higher speeds or traffic volumes to varying degrees based on the width of the shoulder. Shared paved shoulders also increase motorist comfort by providing consistent separation between people and passing vehicles.

Because shared paved shoulders provide a separate space for people walking and biking, they reduce “walking along roadway” and “struck from behind” crashes.³

Shared paved shoulders provide a higher bicycle level of service as defined by AASHTO, Transportation Research Board Highway Capacity Manual and the updated MnDOT Bikeway Facility Design Manual.

The higher level of service provided with wider shoulders can equate to increased comfort, security, and higher quality of life for vulnerable users, and therefore more non-motorized use of the facility.

Other benefits of 8-ft shoulders can include:

- Longer pavement life
- Use by farm equipment
- Use by Amish populations including horse and buggies
- Use by Native American and Tribal communities with high non-motorized and ATV use

³ Small Town and Rural Multimodal Networks. December 2016. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_tg.pdf

SHARED PAVED SHOULDERS CONTINUED



SHOULDER WIDTH PLANNING AND OTHER CONSIDERATIONS

Sizing a shared paved shoulder appropriately involves a number of considerations. Right of way and costs are important considerations; however, the long-term plan for the roadway and community should be considered.

Shared paved shoulders with 8 feet of smooth usable surface are ideal. If 8-ft shoulders are considered necessary, also evaluate a separated shared use path due to costs.

Consider striping bicycle facilities through turn lanes if use is anticipated to be high for people bicycling. Refer to *Small Town and Rural Multimodal Networks*.⁴

Place drainage structures outside of the shared paved shoulder width.

The minimum shared paved shoulder width is 4 feet from the rumble strip to the outside edge of the paved shoulder.^{5,6}

The greatest benefit is provided by an 8-ft. wide shared paved shoulder; however, a 4 to 6-ft. shoulder can be considered if:

- The roadway average daily traffic is less than 2,000 vehicles. Use Table 4-2 in the Bikeway Facility Design Manual for guidance on traffic volumes and speeds.⁷
- The roadway is not included in a District Bicycle Plan route.
- The roadway is not being considered for other bicycle designations such as a future United States Bicycle Route.
- The project is not connected to a Bicycle Friendly Community or a Safe Route to School plan.
- The roadway is not connected to a state or regional trail.
- There is a nearby facility with more separation.⁸
- Motor vehicle speeds are less than 50 mph.
- There is lower than average heavy trucks, buses or recreational vehicles.
- The right side of the roadway is free from static obstructions.⁹
- The community is not actively seeking to increase the quantity and quality of their bicycle and pedestrian facilities through trail groups, active living planning, non-motorized committees or other organizations.
- The roadway is not adjacent to a high volume of origins and destinations for people walking and bicycling.

⁴ *Small Town and Rural Multimodal Networks*. December 2016. Shared Paved Shoulders: pg. 50-57. https://www.fhwa.dot.gov/environment/bicycle_pedestrian/publications/small_towns/fhwahep17024_lg.pdf

⁵ *Minnesota's Best Practices for Pedestrian/Bicycle Safety*. September 2013. <http://www.dot.state.mn.us/research/TS/2013/201322.pdf>

⁶ *Shoulder Width Standards for State Highways*. MnDOT Technical Memorandum No. 17-12-TS-05. December 2017. <https://techmemos.dot.state.mn.us/>

⁷ <http://www.dot.state.mn.us/bike/pdfs/manual/Chapter4.pdf>

⁸ *Small Town and Rural Multimodal Networks*. December 2016. <http://ruralsdesignguide.com/visually-separated/paved-shoulder>

⁹ *Minnesota's Best Practices for Pedestrian/Bicycle Safety*. September 2013. <http://www.dot.state.mn.us/research/TS/2013/201322.pdf> pg. 35

SIDEWALKS

Sidewalks are walkways that are separated from the travel lanes and bicycle facilities that improve the safety of people walking or wheeling.

A sidewalk that is at least 5 feet wide allows people to walk side by side. Wider sidewalks allow for passing and two-way traffic.

Separation between the sidewalk and higher speed traffic increases people's comfort and safety on the sidewalk.



WHY PROVIDE SIDEWALKS?

Walking is an essential part of our transportation system and an important contributor to the health of Minnesota residents.¹

Providing sidewalks makes walking more viable for people.

Research indicates that 40 percent of community health outcomes are related to features in the local environment.² Providing sidewalks improves the local environment.

“Design for all: Plan and design streets so that all people are able to safely and comfortably walk or roll to their desired destinations. If a sidewalk is not provided, people will walk in the street to get to their destination, putting them at risk of being hit.”

— *Minnesota Walks*³

Minnesota Walks⁴ is a useful resource to help create walkable communities that are safe, convenient and desirable for all.

NEED

Sidewalk should be added when:

- There are sidewalk network gaps with missing, non-ADA compliant or non-traversable walking space.
- There is evidence of people walking (desire lines) in areas without sidewalk, depicting the desired path where there is not existing sidewalk.
- There are destinations that people commonly walk to, like schools, convenience or grocery stores, parks or anywhere people want to go.

BENEFITS

The safety benefit of sidewalks comes from providing people walking or wheeling with their own travel space that is separated from the traffic on a roadway.

Sidewalks on both sides of a street reduce occurrences of “walking along the roadway” crashes by 88%, and therefore reduce all levels of crash risks.⁵

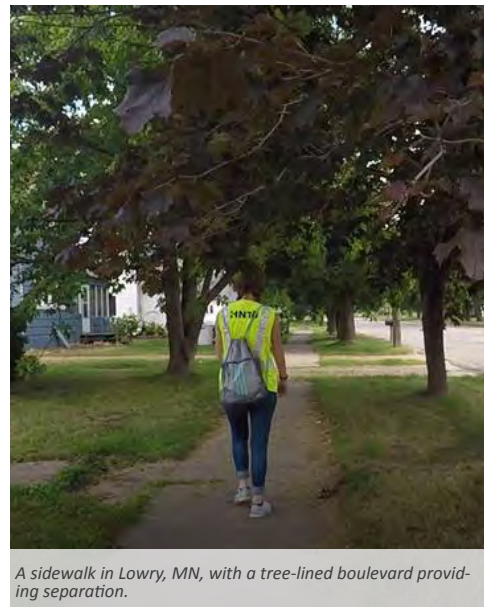
¹ Charles Zelle in *Minnesota Walks*. www.dot.state.mn.us/peds/plan/index.html

² Ross C.E., Mirowsky, J., 2008

^{3, 4} *Minnesota Walks*. www.dot.state.mn.us/peds/plan/index.html

⁵ *Minnesota's Best Practices for Pedestrian/Bicycle Safety*. September 2013. www.dot.state.mn.us/research/TS/2013/201322.pdf

**SIDEWALKS
CONTINUED**



DESIRED* (STANDARD)

A 5-foot wide, continuous ADA compliant sidewalk on both sides of the street.

If the sidewalk is adjacent to buildings an additional 1 to 3 feet is needed as a door zone.

Sidewalk should extend to the city limits, the edge of the residential area or higher density development or a logical destination.

Minimize driveway crossings or other points of conflict with vehicular traffic.

Refer to MnDOT’s ADA standards⁶ for more detail.

MINIMUM (CONSTRAINED)

A 5-foot wide ADA-compliant sidewalk to origins and destinations in the area.

SEPARATION

A separated ADA compliant sidewalk facility on both sides of the street is ideal.

A curb and gutter is the minimum separation, and does not provide a comfortable distance from vehicle traffic, especially at higher speeds.

A boulevard or furniture zone provides additional separation width from the roadway to increase people’s comfort.

- A minimum furniture zone is typically 3 feet wide to allow for a light pole base and the top of the curb and gutter.
- For healthy tree growth, a 6-foot wide furniture zone is recommended. Tree grates need to be located 1 foot from the face of curb.
- With a 6-foot boulevard, other amenities like benches can then be provided.

Separation can also be accomplished in other ways, like parking or bicycle lanes on the roadway.

⁶ www.dot.state.mn.us/ada/pdf/mndot-ada-standards.pdf

* Depends on engineering standards for roadway type and class

SPEED REDUCTION MEASURES (TRAFFIC CALMING)

Speed reduction measures, or traffic calming, is the combination of mainly physical measures that reduce the negative effects of motor vehicle use, alter driver behavior and improve conditions for non-motorized street users.¹ The information in this strategy sheet is mostly referenced from the Institute of Transportation Engineers website, ite.org.²

GOALS

Traffic calming goals include:

- Incorporating the preferences and requirements of the people using the area (e.g., working, playing, residing), along the street(s), or at intersection(s)
- Creating safe and attractive streets
- Promoting pedestrian, cycle and transit use
- Increasing the quality of life
- Helping to reduce the negative effects of motor vehicles on the environment (e.g., pollution, sprawl)

OBJECTIVES

Traffic calming objectives include:

- Achieving slow speeds for motor vehicles
- Reducing collision frequency and severity
- Increasing the safety and the perception of safety for non-motorized users of the street(s)
- Reducing the need for police enforcement
- Enhancing the street environment (e.g., street scaping)
- Encouraging water infiltration into the ground
- Increasing access for all modes of transportation
- Reducing cut-through motor vehicle traffic

TYPES

Physical traffic calming measures include:

- Street width reductions
- Horizontal deflections
- Vertical deflections
- Routing restrictions

Fact sheets for the different types of calming measures are available on the Institute of Transportation Engineers website.⁴

Other types of treatments or traffic control that have been used to reduce speeds include signing and marking, gateway treatments, streetscaping, landscaping, curb extensions, and radius reductions.

Education and enforcement are also components of a speed reduction plan.



Example of a city gateway treatment. Source: <https://jeanbourret.weebly.com/>



Traffic circle in Seattle, WA,³ an example of a horizontal deflection speed reduction measure.

BENEFITS

In addition to the goals listed, speed reduction measures encourage drivers to travel the speed limit. As speeds increase the risk of being injured in a crash increase. When non-motorized users are on the roadway their risk of being injured is much higher than people driving a car. Lowering the vehicle speeds creates a more forgiving roadway system.

NEED

Use speed reduction measures when:

- Vehicular travel speeds do not conform to posted speed limits.
- A roadway transitions from a rural roadway to an urban section with lower traffic speeds.

DESIRED (STANDARD)

The most effective way to lower vehicle speeds is to change driver's perception of the road environment through the application of speed reduction measures.

Apply the type of speed reduction measures for the roadway that meet the needs of the project and the community.

¹ Lockwood, Ian. *ITE Traffic Calming Definition*. ITE Journal, pg. 22. July 1997.

² <https://www.ite.org/technical-resources/traffic-calming/>

³ <http://www.seattle.gov/transportation/projects-and-programs/safety-first/traffic-operations/traffic-circles>

⁴ <https://www.ite.org/technical-resources/traffic-calming/traffic-calming-measures/>