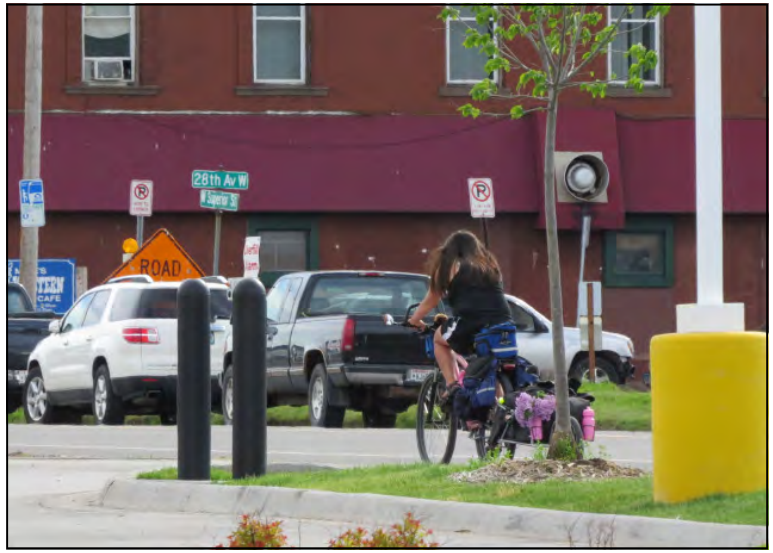


Image source: MIC (2015)

Figure 7.1 | Cyclist using the Cross City Trail along Superior Street

7. Active Transportation

Active transportation includes pedestrians, cyclists, and users of other non-motorized forms of transportation. As a concept, it emphasizes those modes as the principal means for making a trip. However, it has often been said that *all* trips, for any mode, begin and end with at least a pedestrian movement, and in that respect everyone is a user of active transportation.

Active transportation represents an important user group in the Lincoln Park neighborhood because it is a fairly dense urban environment that contains a mix of land uses and activity centers. It also has a heavily used transit system. This chapter assesses how well that user group is being served by active-transportation assets in the area: sidewalks, trails, and bikeway facilities. It considers issues of accessibility, connectivity, and the physical condition of those assets.

It is hard to know the true demand for active transportation amenities in Lincoln Park because, to date, no network-wide traffic data exists for pedestrians and cyclists like there does for motor vehicular traffic. It is, therefore, difficult to determine how to prioritize investments in sidewalks, trails, or bike infrastructure. What is known, is that citizen demand for that type of infrastructure has been growing across the U.S.. National survey data has shown growing interest among Americans for community designs that include walking trails, bike trails, and easy access to transit.[1] Similarly, U.S. Census data has shown that commuting by bike has more than doubled between the last two censuses.[2]

1. Handy, S., Sallis, J., Weber, D., Maibach, E. and Hollander, M. "Is support for traditionally designed communities growing? Evidence from two national surveys." *Journal of the American Planning Association*, (74):209–221, Spring 2008.

2. The number of trips made by bicycle in the U.S. more than doubled from 1.7 billion in 2001 to 4 billion in 2009. *U.S. Department of Transportation and Federal Highway Administration, 2009 - National Household Travel Survey*

It is also known that most walking trips are less than two miles, while the distances of bike trips can be much longer (tending to be within six miles).[3] For planning purposes, this suggests that the pedestrian context for demand, access, and connectivity is more internal to the study area, while for cyclists, it is more city-wide. Given these different contexts, the rest of this chapter takes a look at 1) the sidewalk network, 2) bikeways network and 3) trail assets individually. For each network, issues of accessibility, connectivity, and the condition of existing assets are considered.

Sidewalk Network

There is an estimated 50.3 miles of sidewalk in the Lincoln Park study area. This means that a little more than 48% of the neighborhood's line miles are matched with sidewalk. Most of the neighborhood's roadways (excluding I-35) have sidewalk on at least one side of the street. What follows is an assessment of where conditions of the existing sidewalks represent deficiencies relative to the patterns of pedestrian demand in the neighborhood.

Patterns of pedestrian demand:

Some idea of the levels of pedestrian demand in Lincoln Park can be gleaned from existing U.S. Census and DTA transit data. Those data sources, along with the outputs of a pedestrian demand model conducted by the MIC in 2011, also provide a picture of where that demand is the strongest in the neighborhood.

U.S. Census estimates suggest that 3.3% of the working population living in Lincoln Park walks to work, while another 5.6% are walking to bus stops to access transit. Together, these estimates would mean that, at a minimum, more than 400 people are using the sidewalk system daily. Such an estimate, however, totally ignores those in the population who are not necessarily working: senior citizens, disabled individuals, the unemployed. Furthermore, people can be making walking trips throughout the day that are for reasons other than getting to work.

Daily passenger data collected by the DTA indicates that walking trips are many times greater than the census estimates would suggest. Those data show that an average 6,500 people are getting on and off buses daily in the neighborhood. It can be assumed that the vast majority of those people are walking to and from those bus stops.

By comparing where riders are getting on and off buses in the neighborhood with census data regarding household density and car ownership, it can be discerned that some of the strongest pedestrian demand likely exists in sub-areas 5, 8, and 9. This is denoted by the darker shades of red in Map 7.1 on the following page. The darker shading indicates both a greater number of households and greater percentage of households with no vehicle ownership.

The patterns in Map 7.1 are also consistent with the results of the MIC's Pedestrian Demand model for the City of Duluth (see Figure 7.2 on page 83), which emphasized the areas around the neighborhood's two commercial nodes: the CBD in Sub-area 9 and around the intersection of Superior Street & 27th Ave W in Sub-area 10. The model incorporated a variety of trip generation, attraction, and detraction factors (e.g., population density, distance from transit, speed and volume of traffic, etc. – see the MIC's 2011 *Duluth Sidewalk Study* for methodology).

3. Iacono, M., Krizek, K., and El-Geneidy, A. "Access to Destinations: How Close is Close Enough? Estimating Accurate Distance Decay Functions for Multiple Modes and Different Purposes" *Access to Destinations Study – Report No. 4, Minnesota Department of Transportation, May 2008.*

Map 7.1 | Comparison of average daily boardings/ alightings at bus stops with "transit demand" rankings of neighborhood sub-areas.

Transit ridership and potential transit demand can be considered "proxy" measures for gauging the relative demand for pedestrian movements in an area. In this map, the sub-areas with the darkest shades of red are those with the greater concentrations of households with lower incomes and with no car ownership. It can be seen that the strongest potential for pedestrian movements to/from bus stops is in the sub-areas 5, 8, and 9.

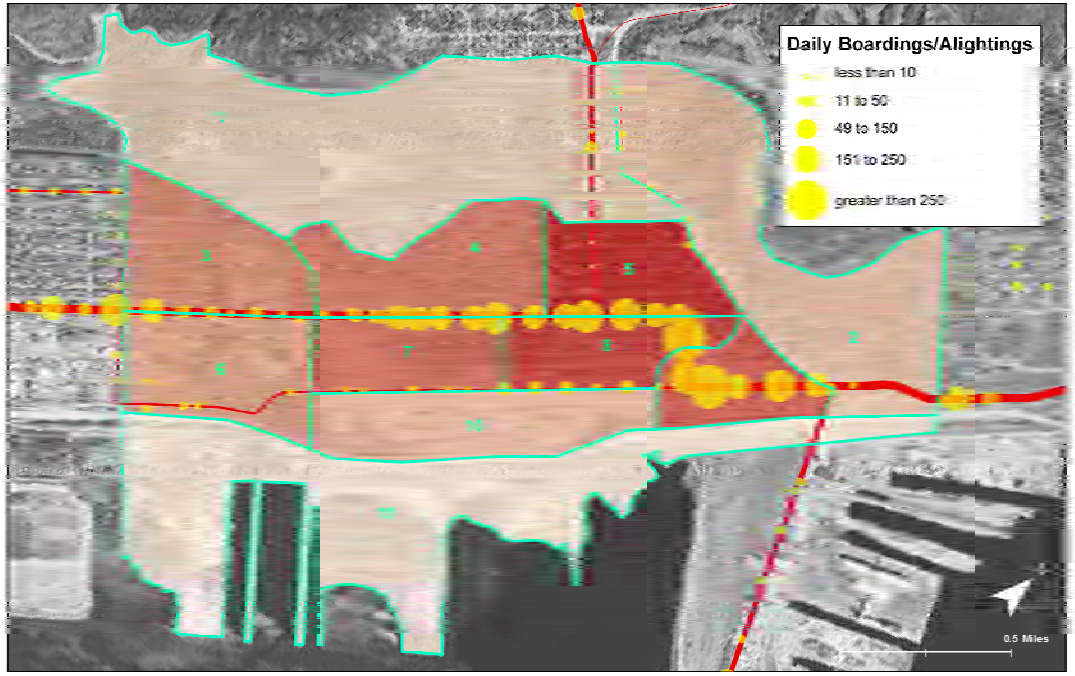
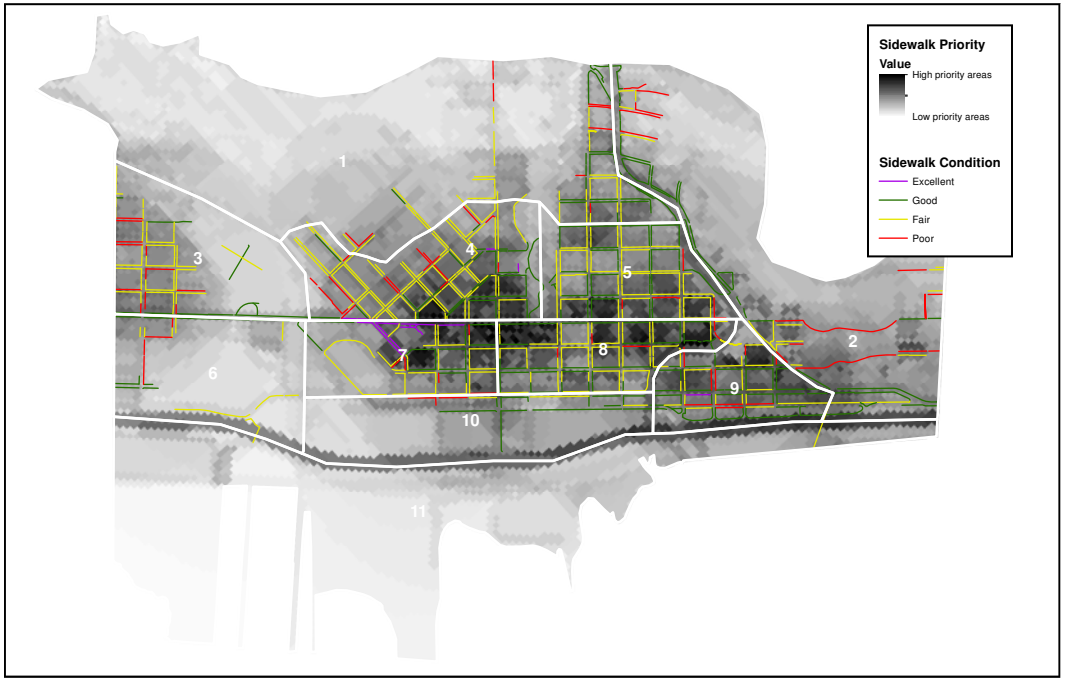


Figure 7.2 | Sidewalk priority areas identified in the 2011 Pedestrian Demand model and sidewalk conditions

The conditions of the existing sidewalks in the Lincoln Park neighborhood overlays the MIC's 2011 Pedestrian Priority model, which incorporates a wide variety of trip generation, attraction, and detraction factors (e.g. population density, distance from transit, speed and volume of traffic, etc.). The darker the areas represent the greatest concentration of factors that justify the presence of sidewalk. Segments of sidewalk identified in red are those segments that are in disrepair. Several segments of poor sidewalk exist in or next to areas with some of the strongest pedestrian demand.



Sidewalk condition:

There are more miles of sidewalk in "Good" or "Fair" condition (86%) than there are in "Poor" condition (12%) in the Lincoln Park neighborhood (see Figure 7.3 below). Overall, this is a decent balance of asset condition, but when looking at the specific locations where the poor sidewalk exists, some accessibility concerns arise. It is worth noting in Figure 7.2 on the previous page that a number of sidewalk segments in disrepair in the neighborhood (the segments in red) also exist in the areas with the greatest pedestrian demand.

Sidewalks in poor condition tend to result in uneven surfaces (see Figure 7.4) that can be challenging for people with ambulatory difficulties, such as many senior citizens and those with physical disabilities. Those challenges can be exaggerated when they exist on sidewalk that traverses slopes, such as found on a number of avenues in the Lincoln Park neighborhood.

Based on a general estimate of $264,000 per linear mile of sidewalk, it is anticipated that it would cost in excess of $1.5 million to replace all the sidewalk segments in poor condition, and that it would take more than $425,000 to replace just the poor sidewalk found just along the avenues. Given the funding challenges that the City of Duluth already faces with its road pavements (see Chapter 4), it is recommended that the city rank the sidewalk segments and seek opportunities to address those segments at the same time they do adjacent pavement or utility repairs, in order to optimize the cost of replacing those segments. A prioritization of specific sidewalk segments in poor condition is recommended in Chapter 9. That prioritization is based on the patterns of pedestrian demand, critical connections to important activity centers, and slope that were identified during this study.

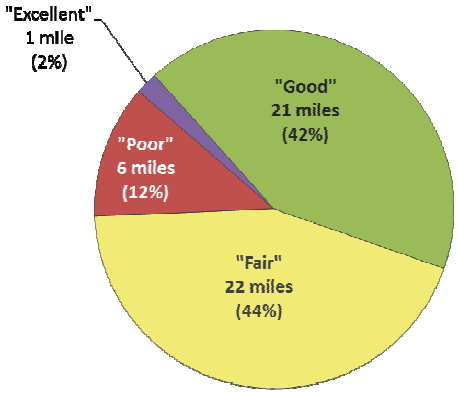


Figure 7.3 | Condition of sidewalks in the Lincoln Park neighborhood

There is a good balance of sidewalk conditions in the Lincoln Park neighborhood. Only 12% of the sidewalks are in poor condition.

Data source: MIC (2015)

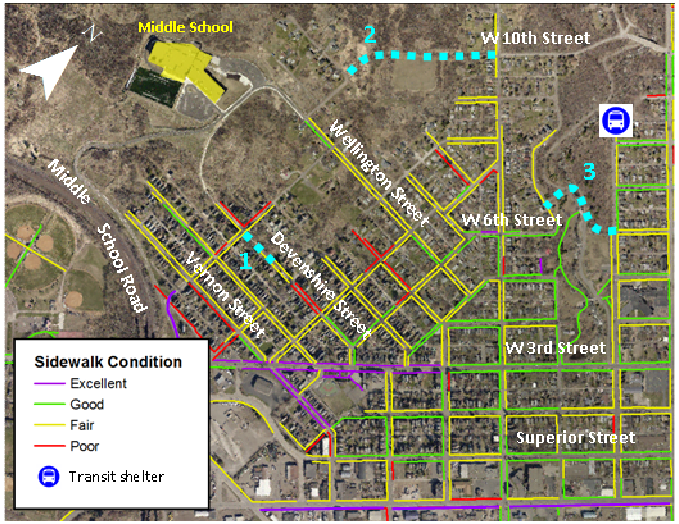
Accessibility and connectivity of the sidewalk network:

Since poor sidewalks can make traveling along them difficult for some users, they represent an issue of accessibility. The absence or the physical condition of curb ramps along those sidewalks can also present accessibility challenges. While an exhaustive survey of the curb ramps throughout the neighborhood was not feasible within the time and budget for this study, the patterns of pedestrian demand, asset condition, slope, connectivity to important activity centers, etc.

Image source: MIC (2015)

Figure 7.4 | Sidewalk in poor condition along 21st Avenue W

Much of the sidewalk that is in poor condition in the Lincoln Park neighborhood has uneven surfaces, making it hard for those with ambulatory difficulties to travel along them.



Map 7.2 | Sidewalk conditions and gaps near the Lincoln Park Middle School

There are a number of sidewalk segments in poor condition near the school, as well as three important gaps: 1) Devonshire Street, 2) W 10th Street; and 3) W 6th Street.

did help to identify a handful of key accessibility issues. These are summarized according to the specific activity centers below.

Pedestrian connections to the Lincoln Park Middle School: The new location of the neighborhood middle school presents a number of challenges for pedestrians. It is an isolated site on the hilltop, with minimal street connections. Even before the school's opening in 2013, a number of efforts have been undertaken to address the accessibility and connectivity issues associated with the new site. Among these were a neighborhood workshop and walkability audit in 2012 and the Lincoln Park "On the Move" Action Plan (2014), which made a number of assessments, involved neighborhood engagement, and made several recommendations. A number of those recommendations are reflected

Image source: MIC (2013)

Figure 7.5 | Devonshire Trail

A crushed limestone trail bridges the existing gap in Devonshire Street and provides a way for pedestrians to get to the middle school. The trail could be accessible to more users if it were paved and was matched by ADA compliant curb ramps.

in Map 7.2 which shows the limited sidewalk connections to the site, the condition of those sidewalks, and three important gaps in the sidewalk network. Those gaps are represented by the dotted aqua-colored lines. Among those is a paved connection that would bridge the gap that currently exists on Devonshire Street (noted as dotted line "1" in Map 7.2). Currently, there is a dirt path satisfying this connection, but the creation of a paved path could make this link ADA accessible and help residents south of the school to access the site. The creation of such a path should also be paired with upgrades to the sidewalk along Devonshire Street (Figure 7.5).

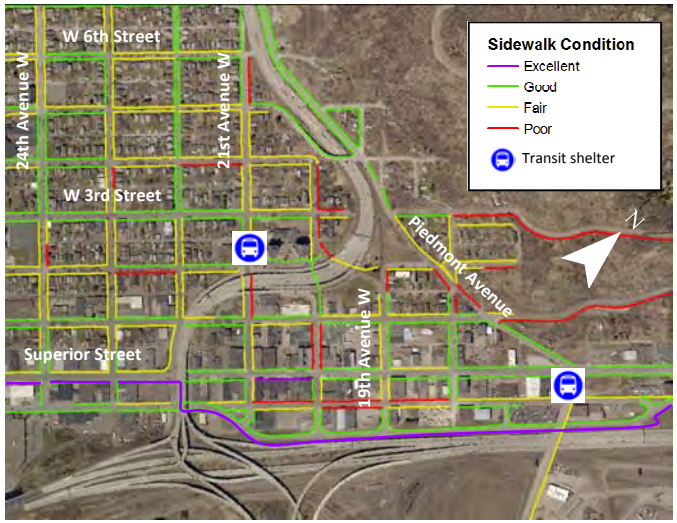
A paved connection linking Anson Avenue to W 10th Street (dotted line "2" in Map 7.2), as well as a path crossing approximately midway through the neighborhood's central park (noted as line "3") to connect W 6th Street. Creating paved paths at these locations would provide more direct connections between the school and the neighborhoods east of the park. They would also help pedestrians by minimizing both the distances and number of slopes they would need to navigate to access the school.

Pedestrian connections to the school are important, especially in light of national, statewide, and local Safe Routes to School (SR2S) objectives. Such connections are important for parents in Lincoln Park

too, considering that many of the neighborhood's residents are of low income and may have difficulties getting to and from meetings and events at the school. Some transit-based solutions to this problem have been discussed in Chapter 6.

Pedestrian connections in the central business district: The area with perhaps the greatest pedestrian demand in Lincoln Park is in and around the neighborhood's CBD. Yet, that area also has some of the greatest concentration of sidewalk in poor condition (see Map 7.3). There is a concentration of low-income households just north of the CBD, who travel south to access both the DTA transit shelters as well as the businesses in the area. It is recommended that these sidewalk segments be prioritized both for repairs but also upgraded curb ramps (Figure 7.6) in order to make the sidewalks in one of the busiest areas (for pedestrians and vehicles) more ADA compliant.

27th Avenue W commercial area: There is also heavy pedestrian activity in and around the commercial node of 27th Avenue W & Michigan Street and the residential areas to the north. Fast food restaurants, convenience stores, the post office, Salvation Army, and the No. 4 transit route each generate significant pedestrian trips. While the amount of sidewalk in poor condition is minimal, there are concerns about the comfort and safety of pedestrian movements in that area. Pedestrians are exposed to heavy traffic in the area and tend to cross multiple legs of the two busy intersections in the area (Figure 7.7).



Map 7.3 | Sidewalk conditions in and around the Lincoln Park Central Business District

One of the areas with the greatest potential for pedestrian movements also contains the highest concentration of sidewalks that are in poor condition.

Image source: Google Maps (2015)

Figure 7.6 | Non-ADA compliant sidewalk at Piedmont Avenue & W 2nd Street

A number of sidewalks in poor condition in the Lincoln Park neighborhood were also observed to lack ADA compliant curb ramps.

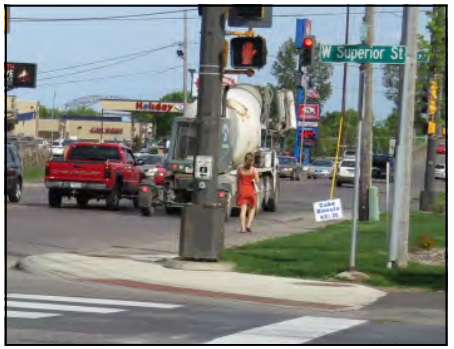
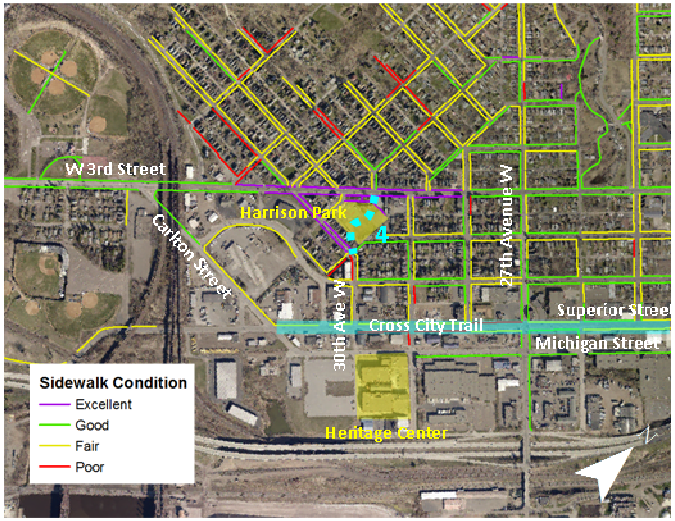


Image source: MIC (2015)

Figure 7.7 | Pedestrian activity in the 27th Avenue W commercial node

Many pedestrian movements occur in within the 27th Avenue W commercial node, where the sidewalk places pedestrians next to heavy traffic, and where many pedestrians cross streets in multiple places.

Pedestrian connections to recreational amenities: A segment of poor sidewalk along Michigan Street has recently been replaced by the paved Cross City Trail (the teal colored segment in Map 7.4), which is used by both pedestrians and cyclists. This trail provides a great active -transportation connection to the neighborhood's two commercial areas, as well as further to downtown. It is weak, however, in its lateral connections to the residential areas of the neighborhood. Line "4" shown in Map 7.4, for instance, shows how a paved connection through Harrison Park (matched with sidewalk repairs) could help to strengthen connections and accessibility between the residential area north of W 3rd Street and the Cross City Trail, Harrison Park, and the Heritage Center and Children's Museum.



Map 7.4 | Sidewalk conditions and gaps in the SW portion of the Lincoln Park neighborhood.

Connectivity between neighborhood the residential area above W 3rd Street and amenities like the Heritage Center and Cross City Trail in the southern part of the neighborhood could be improved by some sidewalk improvements and the creation of a path through Harrison Park.

Bikeways Network

The segment of the Cross City Trail that runs across the southern end of the study area represents the only off-street bike facility existing in the Lincoln Park neighborhood. Beyond that, there are approximately 10.5 miles of designated on-street bike routes. Together, these routes constitute an existing bike network in the neighborhood (see Map 7.5 on the page 88). What follows is an assessment of the demand for bike facilities in the neighborhood, as well as an evaluation of the accessibility and connectivity of the existing network.

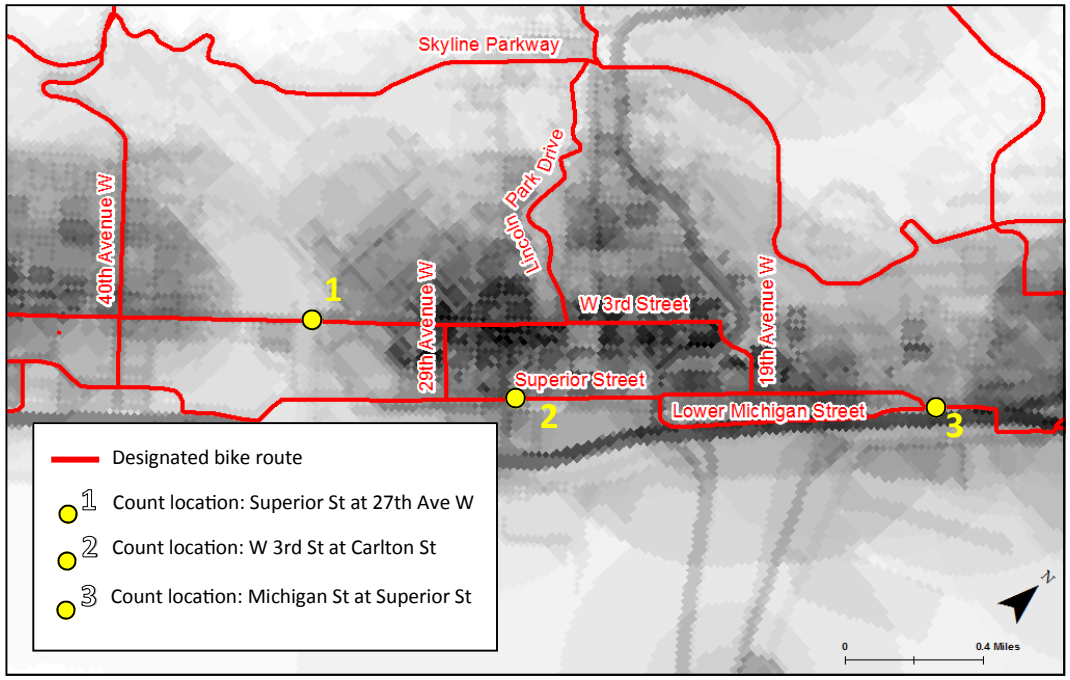
Patterns of cyclist demand:

Many cyclists were observed in Lincoln Park at various locations and times during the study (see Figure 7.8). It is difficult to know, however, what level of cycling demand there really is in the neighborhood, since data related to bike travel is even more limited than the data for pedestrians. While it is reasonable to assume that bike movements will also be concentrated in the areas of the neighborhood where the demand for pedestrian trips is strong, it is much more difficult to discern the demand for specific routes to and from those areas.

Image source: MIC (2015)

Figure 7.8 | Cyclists on 24th Avenue W in the Lincoln Park neighborhood

A large number of cyclists were observed on various streets and at various times throughout the study.



Map 7.5 | Comparison of designated bike routes and count locations with pedestrian demand model

The location of the designated bike routes in the neighborhood were compared to the output of the pedestrian demand model in order to get an idea of route connectivity to high-demand areas. The locations where bike counts have been done are also noted in the map. Those locations had been chosen in part because they were believed to be locations in which bike traffic gets concentrated.

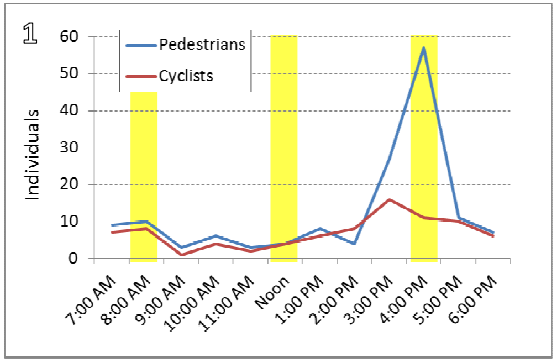


Figure 7.9 | Comparison of east– and westbound bike and pedestrian traffic on W 3rd Street at Carlton Street (Sept. 9, 2012)

12-hour bike and pedestrian counts were conducted at the intersection in September of 2012. Bike traffic remained about 75% of pedestrian traffic until around 4 PM, when the Denfeld High School running team came through.

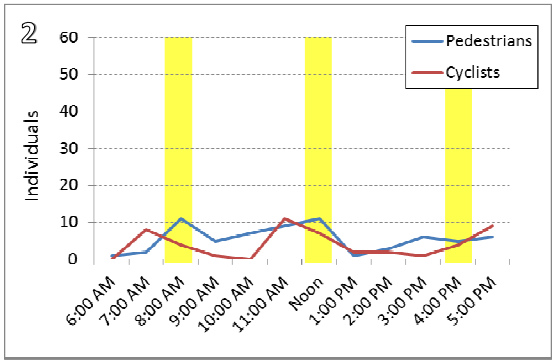


Figure 7.10 | Comparison of east– and westbound bike and pedestrian traffic on Superior Street at 27th Avenue W (Sept. 17, 2014)

12-hour bike and pedestrian counts were conducted at the intersection in September of 2014. On an hourly basis, more pedestrian movements were observed than bike movements.

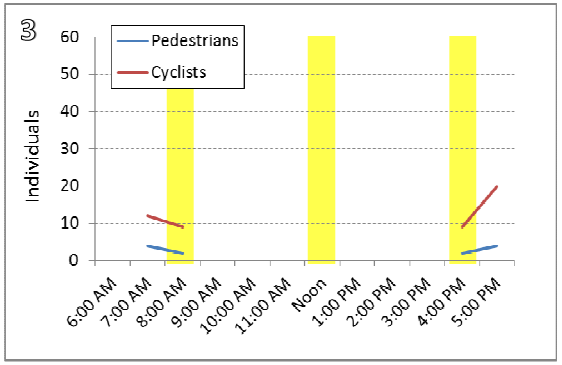


Figure 7.11 | Comparison of east– and westbound bike and pedestrian traffic on Michigan Street at Superior Street (July. 9, 2013)

2-hour bike and pedestrian counts were conducted in the AM and PM just east of the intersection in July of 2013. Bike traffic was observed at 4 times the level of pedestrian traffic.

A few bike and pedestrian counts have been conducted in the Lincoln Park neighborhood in recent years. The location of those counts are also shown in Map 7.5 on page 88, while the results of those counts are shown in the figures 7.9, 7.10, and 7.11 at the bottom of page 88.

The counts done on Superior Street at 27th Avenue W and on W 3rd Street at Carlton Street were conducted for 12 hours. They showed bike traffic to be around 75% of the amount of pedestrian traffic at those locations. The counts done on Superior Street near its split with Lower Michigan Street were, in contrast, only taken during the AM and PM peak hours, but indicated that substantially more bike traffic occurs there - a likely reflection of the challenging topography in that area. Traffic is funneled to Superior Street to get around the "Point of Rocks," and the alternative routes of W 1st Street and W 3rd Street to the northeast follow a series of steep slopes that make cycling much more difficult (Figure 7.12).

It can also be seen from the count data at the three locations that the patterns of bike traffic do not directly coincide with those of motorists or pedestrians. Peaks in the volumes of cyclists differ relative to the AM, noon, and PM hour peaks of motor vehicles (noted by the yellow bars in the graphs).

Figure 7.12 |

Cyclist at the intersection of Superior Street & Lower Michigan Street

The intersection below the "Point of Rocks" is the only "flat" route for cyclists to travel between downtown and West Duluth. It is believed that the intersection gets a lot of bike traffic for this reason.

While three counts are clearly not sufficient to gauge the true demand of demand for bike facilities in Lincoln Park, those counts do indicate that cyclist demand is, in some spots, equal or greater than pedestrian demand. With this in mind, some educated guesses can be made about which routes are likely to be preferred by cyclists in the neighborhood.

In the absence of motor vehicle traffic or steep slopes, it is likely that bike traffic would use the road network similar to the way motor vehicles do. Thus, variations in traffic characteristics, street design, and slope have a good deal of influence on how bike traffic routes itself through an area. A bike compatibility index (BCI) was created for Duluth roadways in 1999 based on those characteristics, and several multi-stakeholder planning processes that followed in subsequent years further built on those BCI findings to result in the designated bike route network presented in Map 7.5 on page 88.

The routes in Map 7.5 are shown on top of the pedestrian demand model, which suggests the designated routes provide a descent level of connectivity between the areas of concentrated demand. It is understood, however, that the network of designated routes does not provide direct access to every destination that cyclists desire to get to, and cyclists will take any route they feel comfortable going (as evidenced in the crash data presented in Chapter 8). For example, Lincoln Park Drive is the only vertical bike route designated in the neighborhood. This is because very few automobiles use it and it allows cyclists to climb the hill at a leisurely speed with minimal conflict with motorists. Lateral access from Lincoln Park Drive to the residential areas on either side of the park, however, is limited, and it is likely that bike movements up and down the hillside are not concentrated along any particular route.

Accessibility and connectivity of the bikeway network:

As mentioned earlier in this chapter, the majority of bike trips fall

within a maximum distance of six miles. That distance extends well beyond the neighborhood boundaries. So, assessing the efficacy of the network requires consideration for connections to activity centers in other parts of the city. Map 7.6 shows how the bike routes in Lincoln Park fit within Duluth's city-wide planned bikeway system. The map was created in 2013 as part of a effort to use community engagement to improve and build upon the original BCI routes. It can be seen from the map that the planned network has good connectivity to centers of activity (denoted by the blue stars), as well as the area's schools (denoted by the buildings with flags). It can also be seen, however, that the Lincoln Park neighborhood (area in yellow) has only a couple of connections on its northwest boundary and its northeast boundary. More than anything, this reflects the challenges of topography in those areas (as shown by the shaded areas in Map 7.7 below). The dotted lines on the southwestern boundary represent a few alternative alignments for an extension of the Cross City Trail, which was still undergoing preliminary planning at the time of this study. Those alternatives are discussed in more detail in the "Trails" section that follows on page 93.

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Another dotted line shown in Map 7.7 connects W 10th Street to Anson Avenue just southeast of the middle school. As with pedestrians, that link could improve accessibility for cyclists, and therefore should be designed to accommodate the shared use of both user groups.

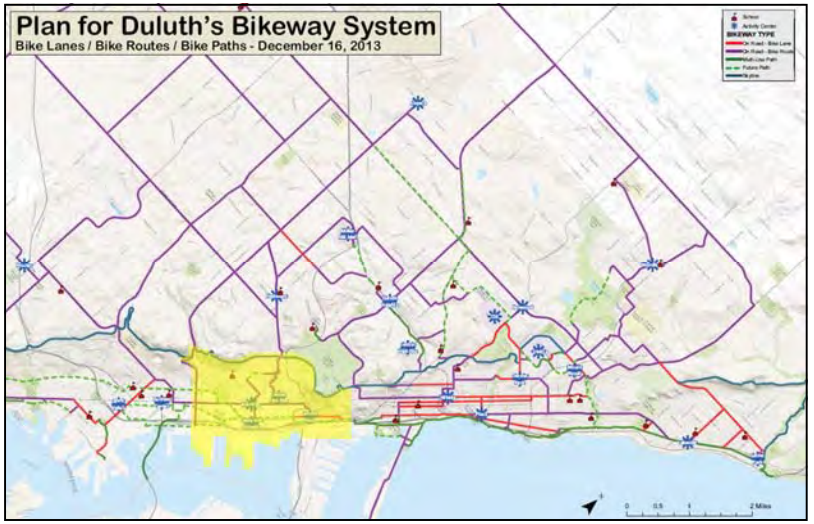
Types of bikeway facilities:

Map 7.7 also shows what types of bikeway facilities have been recommended as part of the 2013 Duluth Bikeways Plan. As can be seen, the plan calls for a mix of on-street signed routes, on-street painted lanes, and off-street shared-use paths. The suitability of these recommendations were re-evaluated as part of this study and, for the most part, they were deemed to be appropriate, with a few exceptions.

In general, continuing with on-street signed routes is appropriate for a

Map 7.6 | City of Duluth's planned bikeway system

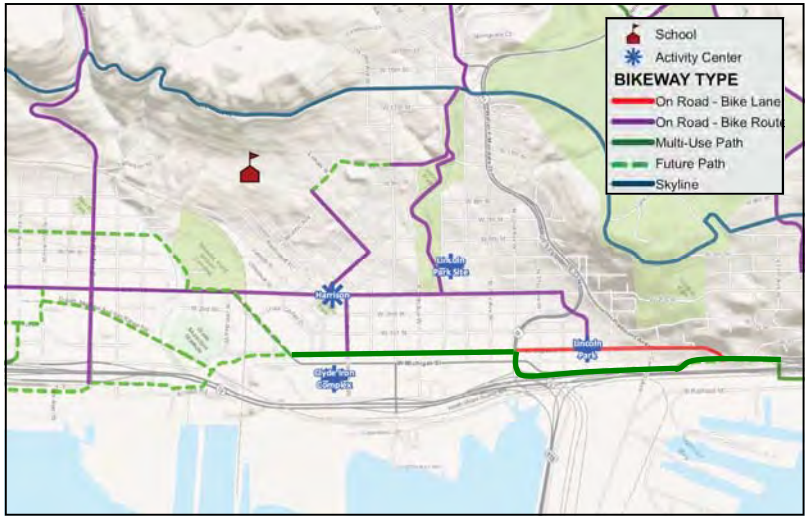
The recommended network of on-street and off-street bike facilities shown below was adopted by the Duluth City Council in 2013. The Lincoln Park study area is in yellow.



Source: MIC (2013)

Map 7.7 | City of Duluth's planned bikeway connections within Lincoln Park

Various types of on-street and off-street facilities make up the recommended bike network in Lincoln Park. The dotted green lines are future segments under consideration.



Source: MIC (2013)

Image source: Google Maps (2015)

Image source: Google Maps (2015)

Figure 7.13 | Street views of Skyline Parkway above the Lincoln Park neighborhood

Skyline Parkway is a scenic route that draws active transportation users, as well as motorists. By narrowing the travel lanes and installing additional pavement markings and signage, the roadway could better support cyclists and pedestrians.

Image source: NACTO (2015)

Figure 7.14 | Example of a sharrow marking

Sharrow markings could help to notify motorists (especially those not familiar with the route) of the potential for encountering pedestrians and cyclists around the road's tight corners.

majority of the route segments. Those routes should continue to be supported with adequate signage.

Certain segments of the on-street routes in the neighborhood would be better suited with marked, on-street bike lanes; in particular, those segments with high traffic volumes, high traffic speeds, or other safety concerns. From the perspective of safety, some locations along Grand Avenue/W 3rd Street, Superior Street, and 40th Avenue W were identified as being appropriate for painted bike lanes and other amenities. Each of those are discussed in more detail in Chapter 8.

One segment that was identified during this study as being especially in need of separated travel ways for both cyclists and pedestrians is Skyline Parkway. There are, however a number of conditions that limit what can be done along that route.

Skyline Parkway is a scenic route above the neighborhood that draws a lot of recreational pedestrian and bike traffic because of its majestic views of Lake Superior. These same views, however, also draw motorists. The 1.2 miles of Skyline Parkway between Haines Road and N 28th Avenue W is a narrow and windy roadway with very little shoulder space. Its dimensions vary according to location, but, on average, there is 26ft of pavement, with 13-foot wide travel lanes and a white fog line on the edge of the pavement (see Figure 7.13).

While there is not enough space to give pedestrians and cyclists a separate lane of pavement, a few things could be done. The travel lanes could be narrowed to 11 feet, which would give pedestrians and cyclists more room, but also have the effect of calming traffic speeds and making the roadway safer and more comfortable. The roadway may also be benefitted by the addition of sharrows (Figure 7.14) and high-visibility signage to notify motorists (especially visitors not familiar with the route) of the possibility of encountering cyclists or pedestrians around the bends.

Bike parking:

Another issue of accessibility for cyclists is having places to park their bikes nearby the activity centers they travel to. An in-depth assessment of the demand for bike parking in Lincoln Park was not done for this study, yet it is still safe to say that bike parking is not something that is readily available in the study area. Some logical sites where bike parking should be available, yet remain limited at present, are noted in Table 7.1. In a number of locations there is ample parking, but it is not appropriately located near the main points of entry to the site or building.

While providing bike parking at some of locations in Table 7.1 would be the responsibility of private entities, there are opportunities for the City of Duluth and ISD 709 to enhance the recreational areas and park within the study area. Given the fact that there is such a concentration of recreational amenities and centers of activity in the area, as well as the fact that the new Cross City Trail provides a strong link to these areas and the rest of the city's bikeway system, bike parking should be looked at as a way to both enhance and capitalize on the rich mix of these assets.

Conditions of existing bikeway facilities:

No significant issues with the physical conditions of the existing bikeway facilities were noted during this study. Most of the existing bikeway network in Lincoln Park consists of on-street routes. Therefore, much of the maintenance and upkeep of the neighborhoods bikeways could, and should be, paired with the maintenance of the pavements. Likewise, any on-street pavement markings should be routinely refreshed as part of the regular painting cycles for the other on-street markings. The maintenance of signs should be done as part of regular sign inventories (with a recommended schedule of every ten years), or when there may be changes to the route network.

Table 7.1 | Bike parking at key activity centers

Location	Existing Bike Parking?	Is there enough bike parking?	Is bike parking appropriately located?
Central Business District (CBD)	No	- -	- -
The 27th Avenue W commercial node	No	- -	- -
Clyde Iron/Heritage Center	Yes	Yes	Yes
Lincoln Park (central park)	No	- -	- -
Harrison Park	Yes	**No**	Yes
Lincoln Park Middle School	Yes	Yes	**No**
Community Action/Boys and Girls Club	Yes	Maybe	Yes/**No**
Wheeler Fields	**No**	- -	- -
Wade Stadium	Yes	**No**	Yes

Data source: MIC estimates

The cost of a pavement markings is considered minimal in comparison to the upkeep of pavement (e.g. an average $180/each marking; pavement mill and overlay at $1,000,000/mi)[4,5]. Such assets can be very beneficial in communicating conditions to both cyclists and motorists and should, therefore, continue to be both monitored and maintained for their visibility and effectiveness.

The cost of installing and maintaining bike racks throughout the neighborhood is also relatively inexpensive. Bike racks range from $60 to $3,600 per unit (depending on design)[4], with a replacement cycle of approximately ten years, and need minimal, if any, maintenance in between.

The biggest cost component of the bikeway network in the Lincoln Park area is the off-street paved segments of the Cross City Trail. Paved trails run approximately $480,000 per mile[4] to install, and about $2,500 per mile per year to maintain. The implications of these costs will be discussed further in the following section.

Trails

A number of trail connections, either existing or proposed, have already been mentioned in this chapter. Each exists as, or is intended to be, an ADA accessible, paved path for pedestrians, cyclists, and users of other non-motorized modes of transportation (e.g. rollerblades, skateboards, etc.). Each of the segments provides a missing connection to the existing sidewalk and/or bikeway network, or it improves access to specific activity centers or recreation areas.

4. Bushell, M. A., Poole, B. W., Zegeer, C. V., Rodriguez, D. A. (2013). Costs for pedestrian and bicyclist infrastructure improvements: A resource for researchers, engineers, planners, and the general public. UNC Highway Safety Research Center: http://vtransengineering.vermont.gov/sites/aot_program_development/files/documents/ltf/UNCReportOnCosts.pdf

5. Per-mile average from Duluth Area Transportation Improvement Program (TIP)

Cross City Trail and Skyline Parkway - Citywide Recreational Corridors:

At the time this study was underway, 1.8 miles of Duluth's Cross City Trail had just been constructed through the southern two-thirds of the Lincoln Park study area (Figure 7.15). The trail links with the City's Lakewalk Trail in Canal Park, and about six more miles are planned to be added westward over the coming decade. Once completed, there will be a paved trail that runs the entire length of the City of Duluth. Conceptually, the result will be a "trail highway" that runs across the city and connects with spur trails to other neighborhoods and communities in the area.

Skyline Parkway is recreational corridor that parallels the Cross City Trail on the northern end of the Lincoln Park study area which connects to other parts of the city and region. While the parkway is not a trail per se and does not provide the same degree of accessibility and connectivity as the Cross City Trail, it is nonetheless important to recognize the two corridors as Active Transportation backbones that Lincoln Park's sidewalk and bikeway networks should be effectively connected to. Better connections to these amenities will provide the

Figure 7.15 | The Cross City Trail in Lincoln Park

The Cross City Trail acts as a "trail highway", connecting the Lincoln Park neighborhood to the City of Duluth's Lakewalk to the Northeast and the Munger Trail to the southwest.

neighborhood's residents with greater opportunities for active transportation and will also draw in recreational users from outside of the neighborhood, bringing in potential economic activity to neighborhood businesses.

As Map 7.8 shows, Lincoln Park Drive can serve as a connecting corridor between the Cross City Trail and Skyline Parkway. A big benefit of this connection is that it is essentially a greenway that runs through the neighborhood's iconic central park. As a recreational corridor, however, the route could be better served with way-finding signage, as well as enhancements to the segments of 26th Avenue W and W 3rd Street between the park and the Cross City Trail at Superior Street (Figure 7.16). Enhancements to that segment could be as basic as marking the street pavement with a recreation lane and installing way-finding signs at its ends, but could also involve installing streetscaping elements to highlight the segment as unique corridor designated for active transportation users (see Figure 7.17 for examples).

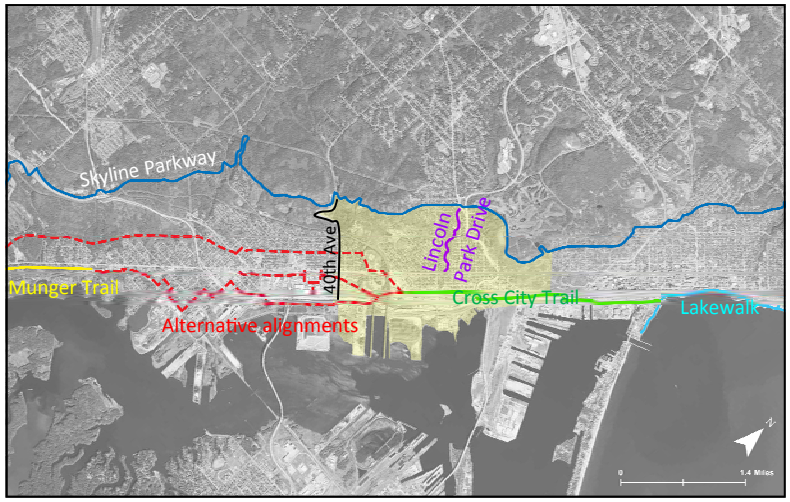


Image source: MIC (2015)

Map 7.8 | Recreational corridors and alternative alignments for an extension of the Cross City Trail

Image source: MIC (2015)

Figure 7.16 | 26th Avenue W connection between the Cross City Trail and Lincoln Park Drive

26th Avenue W could be enhanced as an active transportation connection between the Cross City Trail and Lincoln Park Drive.

Figure 7.17 | Street enhancement examples

A variety of enhancements could be made to the segments of 26th Avenue W and W 3rd Street that connect with Lincoln Park Drive in order to highlight the street as an active transportation corridor.

Image source: Caltrans (2014)

Image source: Oregon Metro (2015)

Another scenic route that links Skyline parkway to the future connection of the Cross City Trail is 40th Avenue W (a.k.a. Haines Road). While 40th Avenue W is a fairly busy roadway with traffic speeds in excess of 30mph, there are wide, paved shoulders, as well as a wide sidewalk to accommodate cyclists and pedestrians.

Also shown in Map 7.8 (previous page) are three alternative alignments for the westward extension of the Cross City Trail. These three alternatives were approved by the city council as part of the 2013 bikeways plan and were being evaluated by city staff at the time of this study. The southern alignment provides connection to the Munger Trail, while the other two alignments provide connection to other recreational amenities in the neighborhood. The middle alignment would connect the trail to the Wade Stadium ball fields, then connect to an on-street route along Grand Avenue. That alignment could also include a segment of greenway along Merritt Creek (see Figure 7.18). The northern alignment would connect the trail to Wheeler Fields, but then also route up into the residential area north of Grand Avenue and eventually link with the DWP trail, which the city has also been planning future enhancements for.

Whichever alignment is ultimately decided upon, it is apparent that the neighborhood is rich with recreational assets that can be effectively linked together in an integrated system of trails and active transportation corridors.

Other potential trail connections:

The desire for more greenways and green spaces was input that the MIC heard throughout the stakeholder outreach effort for this study. In addition to those already mentioned, other potential trail segments were noted during this study, which are identified below.

Along with more green spaces, residents of the neighborhood expressed a desire to have public access to waterfront on Lake Superior. Unfortunately, the existence of the I-35 prevents such access. The only real opportunity to create such a connection exists with MnDOT's future redesign of the Can of Worms (Figure 7.19). That

Image source: Google Earth, modified by the MIC (2015)

Figure 7.18 | Conceptual corridor for a possible extension of the Cross City Trail along Merritt Creek

Depending on the future choice of alignment of the Cross City Trail, there is a potential opportunity to create a greenway segment along Merritt Creek.

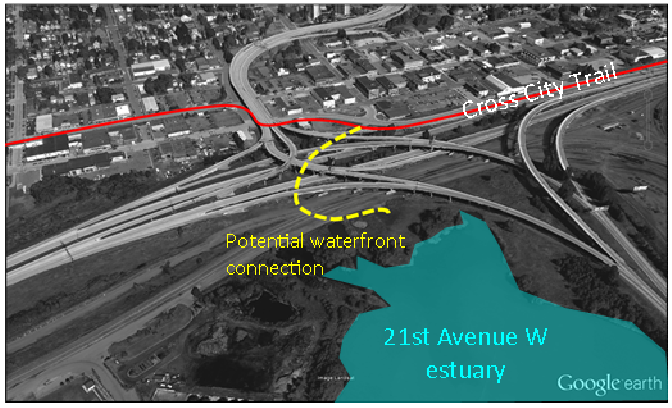


Image source: Google Earth, modified by the MIC (2015)

Figure 7.19 | Conceptual corridor for a possible future connection to the waterfront in the Lincoln Park neighborhood

Depending on the future redesign of the "Can of Worms" interchange, a connection could be created between the Cross City Trail and the waterfront.

connection would, however, have the benefit of connecting the Cross City Trail to the 21st Avenue estuary, a habitat restoration project currently underway. The redesign of the interchange also creates a possibility for a secondary access to the industrial activities west of the estuary, and such a connection would therefore need to be designed to allow the movement of heavy trucks and active transportation users to be appropriately integrated within the same corridor.

Two other potential trail segments were identified at the avenues adjacent to the 27th Avenue W commercial node. At present, 26th Avenue W and 28th Avenue W do not extend below Superior Street. However, right-of-way for street potential street extensions do exists, and many pedestrians were observed moving through those areas during the study, presumably to avoid the busy intersections at 27th Avenue W (Figure 7.20). Because of the available right-of-way, these segments could be formalized as pedestrian spaces with paved trail connections and streetscaping amenities to encourage pedestrians and cyclists to minimize their movements through the busier intersections and driveways along the segment of 27th Avenue W between Superior Street and Michigan Street. These spaces could be enhanced with vegetation and street furniture. The segment at 26th Avenue W could also be designed in a way that compliments any future corridor enhancements that might be made to 26th Avenue W between central park on W 3rd Street and the Cross City Trail on Superior Street.

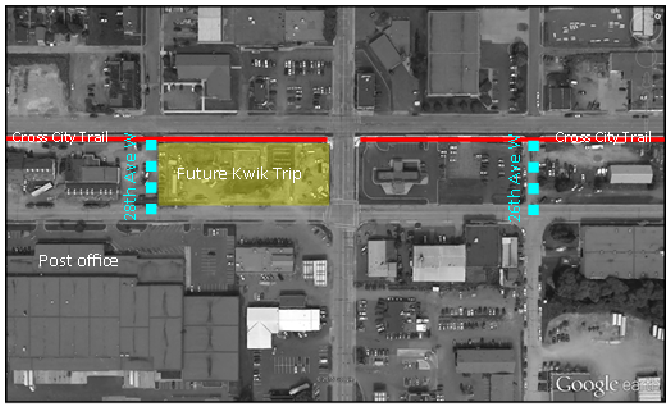


Image source: Google Earth, modified by the MIC (2015)

Figure 7.20 | Conceptual pedestrian spaces at 26th Avenue W and 28th Avenue W

Existing segments of right-of-way could be formalized as paved pedestrian ways that encourage pedestrians and cyclists to avoid the busy intersections on 27th Avenue W.

Winter Maintenance

Whether sidewalk, on-street bikeways, or off-street trails, the accumulation of snow, ice, and other debris during the winter months can create accessibility challenges for users of active transportation (as well as those trying to access transit stops). Snow and ice accumulation can be especially challenging for these users in the Lincoln Park area, given the many slopes in the neighborhood.

Concerns about snow removal were voiced by residents during the stakeholder outreach phases of this study. W 3rd Street and the segment of Michigan Street underneath US 53 were specifically identified. Both are areas heavily trafficked by pedestrians. W 3rd Street is a very busy transit route in particular, and during the stakeholder outreach for this study, even the DTA staff identified that corridor as a snow-removal priority.

The cost of winter maintenance can vary from year-to-year and be very unpredictable, contingent on the vagaries of the weather. Addressing winter maintenance of sidewalks, street edges, and trails can also be tricky when the parties responsible for clearing snow on the roadways are different than those clearing snow on the adjacent sidewalks or bikeways.

From the input received through stakeholder engagement, it became apparent that there are likely ways in which the existing snow removal

protocols of MnDOT, St. Louis County, the City of Duluth, and the DTA can be improved and better coordinated. Though it was beyond the scope of this study to explore such opportunities, snow removal was identified as an important issue of multi-modal accessibility within the study area. A general recommendation of this study, therefore, is that a study of city-wide snow-removal procedures be coordinated among the jurisdictions.

Chapter Conclusion

This chapter has outlined a wealth of existing and potential active transportation assets in the Lincoln Park neighborhood. In summary, the issues and opportunities identified have the following implications with respect to the three planning perspectives that were established in Chapter 1:

Multi-modal integration:

Given the fact that pedestrians, cyclists, and other active transportation users share many portions of the road network with motor vehicles and with each other, active transportation is very much a multi-modal issue in Lincoln Park. This chapter has recommended a number of additional shared connections, as well as other amenities that would enhance the multi-modal connectivity of on-street and off-street networks. It has also call out some specific locations, like the busy intersections of 27th Avenue W at Superior Street and Michigan Street, where careful attention to further development patterns would help improve the integration of these various modes.

From the perspective of active transportation, multi-modal integration extends beyond matters of connectivity and traffic operations to include winter season maintenance as well. Managing snow and ice removal without sufficient consideration for active transportation users can render the sidewalks, bikeways, and trails inaccessible for periods of time. Even though specific locations or strategies for improving winter maintenance were not identified as part of this study, a general finding has been that snow-removal is a concern of area stakeholders and demands further study and engagement of stakeholders in finding ways to improve winter maintenance in the neighborhood.

Public investment:

This chapter identified existing deficiencies in the conditions of certain sidewalk segments and other assets, while at the same time calling out specific ways that the existing sidewalk, bikeway, and trail networks could be improved by adding more assets. Building more assets, however, would mean additional investments and greater maintenance costs.

As has been acknowledged throughout this document, the City of Duluth continues to face challenges in maintaining its existing transportation assets. On the other hand, the City is already investing in extending the Cross City Trail through the neighborhood, and making strong connections between that trail, the existing networks, and they various activity centers and recreational amenities throughout the neighborhood could make the neighborhood more attractive as a "livable" neighborhood, and produce returns on investments in terms of attracting new residents and private investment.

Future Opportunities:

While it may be difficult to anticipate the potential returns on investment (economic and social) from additional trails and other amenities (e.g. signage, bike racks, etc.), what is known is that the Lincoln Park neighborhood is rich with recreational amenities. A number of potential trail segments have been identified in this chapter as a way to further capitalize on those amenities.

The desire for more trails, greenways, and green spaces was input that the MIC heard throughout the stakeholder engagement in this study. As a result, recommendations were made for creating a greenway by

routing the future Cross City Trail extension along Merritt Creek, creating a bike and pedestrian connection to the waterfront near 21st avenue W, and enhancing 26th Avenue W as an active transportation corridor between the Cross City Trail and the neighborhood's central park.

Image source: bike5280.org (2015)

Figure 8.1 | 1st Avenue, New York City

Multimodal integration can take many forms, but the aim is a well connected, efficient, and safe co-existence of multiple modes of transportation. This view of 1st Avenue in New York City shows how motorists, buses, cyclists, and pedestrians are all being accommodated in a busy street.

8. Integration & Safety

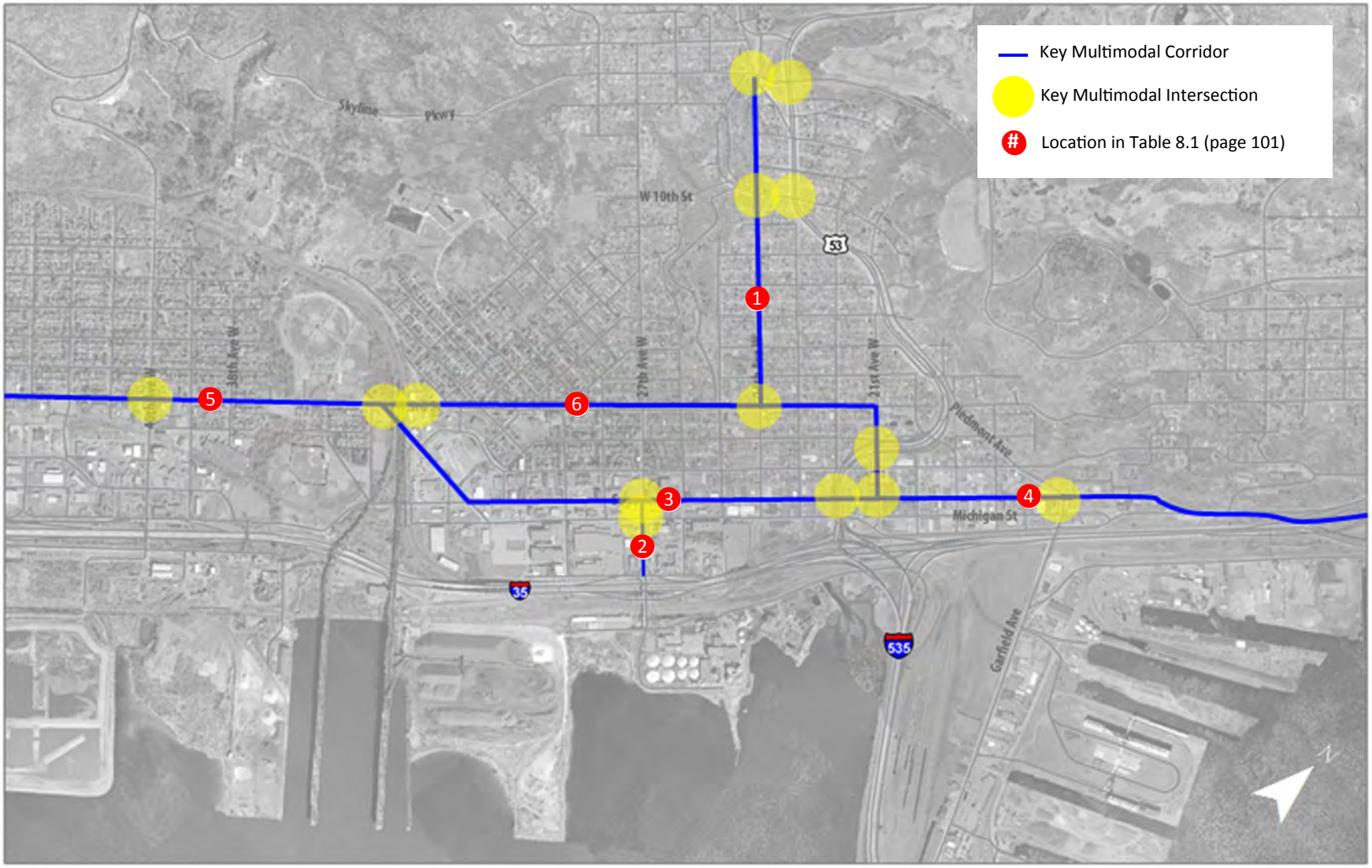
The previous chapters of this document have outlined issues and opportunities related to publicly owned transportation assets in the Lincoln Park neighborhood of Duluth, MN. Those issues and opportunities were assessed according to the separate transportation modes looked at with this study: motor vehicles, heavy trucks, public transit, and active transportation (e.g. bikes and pedestrians). In reality, each of those modes interacts with one another on the same surface transportation system. In certain corridors, the coexistence of those modes can result in operational conflicts and reduced safety. Roadway corridors can be designed, however - such as the example in Figure 8.1 - in ways that mitigate the potential for such conflicts.

This chapter provides an assessment of how well-integrated the modes of surface transportation are within the Lincoln Park study area. It identifies some potential problems and highlights ways in which the multimodal integration could be improved, in terms of both operations and safety.

Key Multimodal Corridors and Intersections

During this study, certain routes throughout the Lincoln Park neighborhood were recognized as facilitating more multimodal interactions than others, both in terms of the traffic volumes of different modes and the degree to which those modes mix directly. For instance, the W 3rd Street corridor is a heavily trafficked residential street that is both a designated on-street bike route and a transit route where lots of pedestrians cross the road. Whereas Lower Michigan, even as a both a designated bike route and heavy truck route, carries less traffic and has a separated facility for bike and pedestrian travel (i.e. the Cross City Trail).

Map 8.1 on the following page shows the key multimodal corridors in



Map 8.1 |

Key multimodal corridors and intersections in the Lincoln Park study area

During the study, particular attention was paid to the corridors and intersections highlighted in the map. They are street segments and intersections were it is known that a substantial amount of interaction is occurring between multiple modes of transportation. As such, they represent areas where targeted investments in improving multimodal integration would bring higher returns in terms of operations and safety. The numbers in red correspond to the locations listed in Table 8.1 on the following page.

the Lincoln Park neighborhood, as determined during this study. As such, the street segments and intersections that make up those routes have been deemed important and deserving of special considerations in lieu of future development or street improvement projects along it. In other words, the degree of multimodal interactions occurring in those areas strongly justify further consideration and investments aimed at making them more "complete streets". Complete streets is the concept that a roadway is designed to meet the mobility and safety needs of all the user groups of that roadway. The routes and intersections highlighted in Map 8.1 were deemed priorities for being improved and managed as complete streets. Throughout this study, particular attention was focused, in terms of assessing the level of service (LOS), safety, and quality of modal integration within these segments and intersections.

	Auto	Transit	Bike	Ped
1. **24th Ave W** - between W 7th St and W 6th St	LOS B 2.43	LOS C 3.41	LOS D 3.75	LOS B 2.5
2. **27th Ave W** - between Michigan St and Helm St	LOS B 2.53	*NA*	LOS F 5.31	LOS D 3.82
3. **Superior St** - between 26th Ave W and 27th Ave W	LOS B 2.43	LOS E 4.73	LOS D 3.51	LOS D 3.52
4. **Superior St** - between 18th Ave W and Garfield Ave	LOS B 2.42	LOS B 2.15	LOS D 4.23	LOS D 3.72
5. **Grand Ave** - between 39th Ave W and 38th Ave W	LOS C 3.01	LOS B 2.45	LOS C 3.39	LOS D 3.79
6. **W 3rd St** - 29th Ave W and 28th Ave W	LOS B 2.68	LOS B 2.08	LOS C 3.44	LOS D 3.72

Table 8.1 |
Multimodal level of service (mmLOS) scores for locations shown in Map 8.1 (page 100)

The six locations listed in the table correspond to the numbered locations in Map 1 on the previous page. For each of the locations, the Multimodal LOS methodologies outlined in NCHRP Report No. 616 (2008) were used to derive the LOS scores shown in the table.

Multimodal Level of Service (mmLOS) Assessment

In transportation planning, the concept of LOS has traditionally been used in reference to the remaining vehicle capacity of a roadway: LOS A indicating a lot of remaining capacity; LOS F signifying failing capacity. However, with an increasing awareness that roadway environments serve the movements of a variety of different users, efforts have been made to expand on the definition of LOS.

The 2010 version of the Highway Capacity Manual (HCM 2010) was expanded to include a collection of LOS measures for cyclists, pedestrians, and transit riders in addition to automobiles. These new measures go beyond the notion of capacity to reflect the safety, ease, and comfort of using a roadway from the perspectives of these other user groups. They are meant to be combined as a measure of multimodal level of service (mmLOS) to help evaluate "complete streets" or context sensitive design alternatives for a particular roadway. LOS scores are somewhat objective and can have slightly different implications from one application to another. For this study, LOS D and LOS E signify poor levels of service, and LOS F signifies that a facility is inadequate for that mode of transportation.

For this study, the methodology outlined in the NCHRP Report No. 616: *Multimodal Level of Service Analysis for Urban Streets* was used to derive the LOS scores for individual modes at sample locations along the key multimodal corridors identified in Map 8.1 (page 100). Those scores are shown in Table 8.1, with the numbered locations corresponding to the numbered dots in Map 8.1. Additional information on the methodology used can be found on pages 134 and 135 in Appendix B.

Auto LOS:

For each of the six locations, motor vehicle LOS achieved the best scores, indicating more than sufficient capacity even under peak

hour conditions. The exception to this was at Location 5 (on Grand Avenue), which had a slightly poorer score, in the LOS C range. Both LOS B and LOS C are considered good levels of service for the mobility of motor vehicles. So, the sample locations collectively suggest that existing conditions within the key multimodal corridors allow for good traffic operations for motor vehicles and heavy trucks. It needs to be stated that this is a generalization, of course. For example, the short block distance between Superior Street and Michigan Street at 27th Avenue W has already been cited in chapters 4 and 5 as a location with site-specific conditions that can impede traffic operations. The analyses that follow help to, in part, better zero in on such locations along the key multimodal corridors that should be given greater attention for possible improvements.

Transit LOS:

Of the six locations analyzed in the mmLOS assessment, only one (Location 3) had what was considered a poor transit LOS score (an LOS D or poorer). Location 2 (27th Ave W between Michigan St and Helm St) did not receive a score because there is no transit service there.

The LOS E at Location 3 (Superior Street between 26th Ave W and 27th Ave W) was largely influenced by the fact that the daily transit service averages only around one bus per hour, despite the estimated motor vehicle and pedestrian traffic in the area, *and* has no shelters or benches at the bus stops for riders with the longer wait times.

Bike LOS:

Four of the six locations had Bike LOS values of LOS D or poorer, and Location 2 (27th Ave W between Michigan St and Helm St) scored an LOS F. In each case, the lack of a designated bike lane or unimpeded shoulder space - in addition to the levels of motor vehicle traffic - had the biggest impact on the resulting score. The density of ingress/egress points for motor vehicles that crossed the bikeway also had an impact, which was the case at Location 3 (Superior St - between 26th Ave W and 27th Ave W). Despite the presence of an off-street multi-use path there (i.e. the Cross City Trail), the number of accesses and street intersections crossing it led to a score of LOS D for bikes.

Pedestrian LOS:

All but one of the six locations sampled for mmLOS scored poorly for pedestrian LOS. The scoring was influenced by the volumes of traffic, the total space between the traffic lane and the pedestrian path, the width of the pedestrian path, and the length of "Walk" times at signalized intersections. Location 1 (24th Ave W - between W 7th St and W 6th St) scored LOS B mostly because of its lower traffic volume and its more than 16' of space between the travel lanes and sidewalk there. Location 2 (27th Ave W between Michigan St and Helm St), by contrast, had the poorest score because of the high volume of traffic there and a distance of less than 5 feet between that traffic and the sidewalk.

Assessment of Crash Data

Even though those roadways and intersections highlighted in Map 8.1 (page 100) have been identified as the key multimodal segments of the neighborhood's transportation network, it is also understood that the interaction of different modes occurs in all segments and intersections in the study area to some degree. Significant conflicts between modes can, therefore, occur even in less trafficked locations. To help assess the degree of conflict between modes might exist on those facilities, an analysis of historical crash data was used. Crash data was evaluated on every roadway in the study except I-35 and the "Can of Worms" (I-35/I-535/US 53) interchange, since those facilities are grade-separated and do not contain a great deal of multimodal interaction beyond that of passenger vehicles and heavy

trucks (i.e. they are not DTA transit routes, and cyclists and pedestrians are prohibited on them).

Traffic crashes are assessed in terms of exposure and severity. If, for instance, a specific intersection has averaged one severe injury for every million vehicles entering (MVE) the intersection, it is considered more of a concern than one that has averaged two "fender-benders" per 1 million MVE. This is the perspective from which determinations were made as to the potential for conflicts between modes on the various network segments in the Lincoln Park study area, especially in comparison to statewide averages for roadway facilities of similar types (e.g. street design, traffic control, vehicle speeds, etc.). More information about the process used to calculate and evaluate the crash– and severity rates in the study area can be found on page 139 in Appendix B of this document.

What follows are summaries of five years of crash data between 2009 and 2013 for each of the modes studied. Those five years represent the most recent data available at the time of the study and thus better reflect of the road network as it currently exists.[1]

Motor vehicle crashes:

As can be seen from the stacks shown in Figure 8.2, there has been many vehicle crashes within the Lincoln Park neighborhood over the past decade. Many of those crashes have occurred along 27th Avenue W between 3rd Street and I-35, and many have occurred along the W 3rd Street corridor - both important multimodal corridors. However, when comparing the crash data in the study area to statewide averages for facilities of similar type, only eight locations were found to exceeded average rates of crash severity in the years assessed. Those locations are shown in Table 8.2 on page 105. The letters attributed

1. Some land use changes have occurred in the study area over the five years which has influenced transportation patterns in ways that might not be sufficiently reflected in the crash data. Two of the most significant changes have been the opening of the Lincoln Park Middle School and the Kwik Trip convenience store at Superior Street & 27th Avenue W.

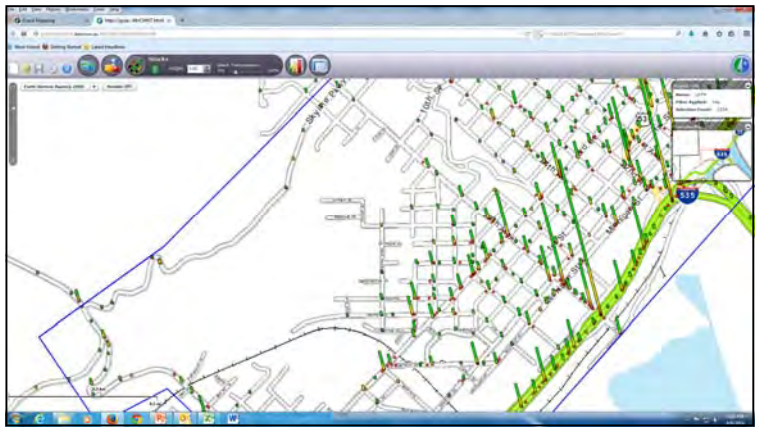


Image source: MIC (2015)

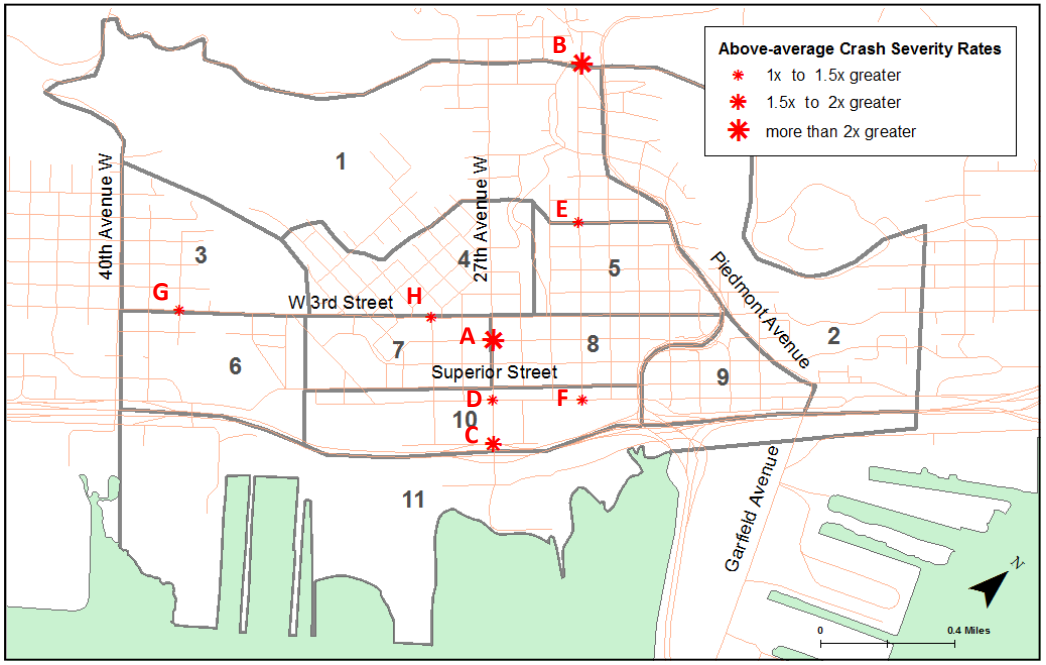
Figure 8.2 | Screen image of MnCMAT coverage of the Lincoln Park study area

MnDOT's Crash Mapping Analysis Tool (MnCMAT) displays 10 years of crash data using a "stacker" function to help highlight locations where a lot of crashes have occurred.

each of the eight locations listed in Table 8.1 (page 101) correspond to the locations shown in Map 8.2 on page 104. The size of the stars displayed on the map signify the degree to which the crash severity at those locations exceeded the statewide average for intersections of similar characteristics.

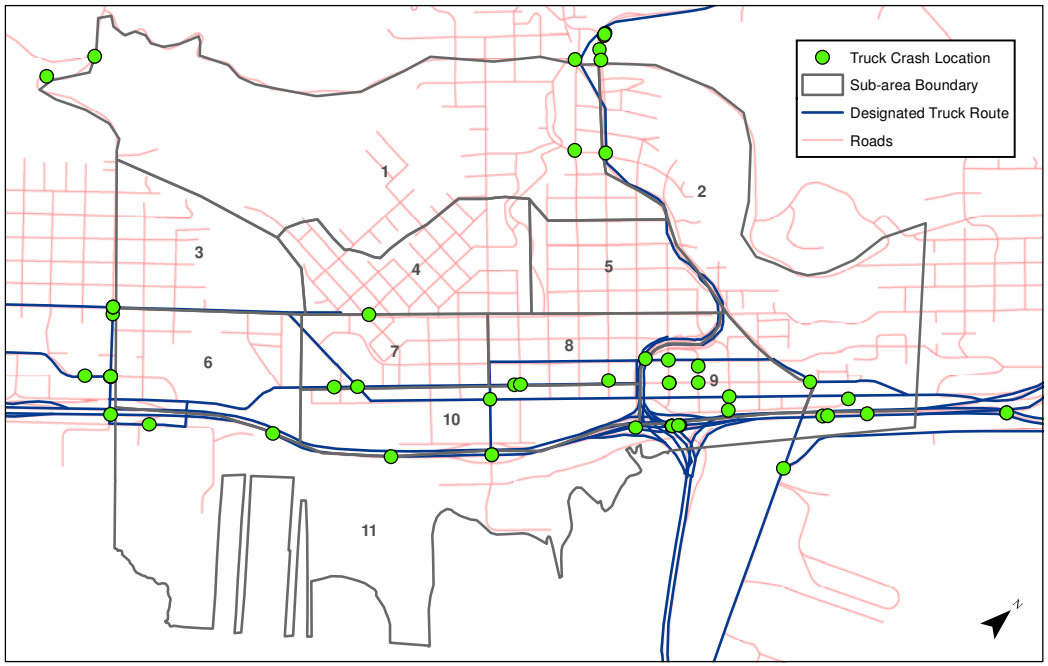
Upon studying Map 8.2, it can be seen that the locations with the highest crash severity (implying greater potential for more serious crash incidents) occurred along segments that were identified as key multimodal corridors in Map 8.1 on page 100: W 3rd Street, 24th Avenue W, and 27th Avenue W.

Each of the locations identified in Table 8.1 and Map 8.2 warrant continued monitoring and analysis going forward, but two of the locations stand out as having notably high severity rates: the intersection of 2nd Street & 27th Avenue W (point "A" in Map 8.2) and Skyline Parkway & 24th Avenue E (point "B"). Both intersections



Map 8.2 | Intersections with crash rates or severity rates that exceed statewide averages (2009 - 2013)

The eight locations in this map represent the locations that were found to have either crash rates and/or crash-severity rates that exceed the statewide averages for intersections of similar types. The intersections represented by the bigger starts are those in which the average severity of crashes have been the greatest relative to the amount of traffic there.



Map 8.3 | Location of heavy truck crashes (2009 - 2013)

The green dots represent locations where heavy trucks were involved in vehicle crashes. Comparing these locations the those identified in Map 8.2, it can be seen that truck crashes have occurred in a few of the locations with higher-than-average severity rates. It is also worth nothing that a number of heavy truck crashes have occurred in the CBD at the northeastern section of the neighborhood (Sub-area 9).

Table 8.2 | Intersections with high crash or severity rates (2009-2013)

Intersection	Traffic Control Type	Crash Rate[1]	MN Avg. Crash Rate[2]	Severity Rate[3]	MN Avg. Severity Rate
A. W 2nd St & 27th Ave W	2-way stop	0.66	0.20	1.11	0.30
B. Skyline Pkwy & 24th Ave W	2-way stop	0.73	0.20	1.04	0.30
C. Helm St & 27th Ave W	2-way stop	0.55	0.20	0.80	0.30
D. Michigan St & 27th Ave W	Traffic signal	1.33	0.50	1.74	0.70
E. W 7th St & 24th Ave W	2-way stop	0.29	0.20	0.76	0.30
F. Michigan St & 24th Ave W	2-way stop	0.46	0.20	0.73	0.30
G. Grand Ave & 38th Ave W	2-way stop	0.42	0.20	0.64	0.30
H. W 3rd St & 29th Ave W	2-way stop	0.38	0.20	0.60	0.30

Data source: MnDOT Crash Mapping Analysis Tool (MnCMAT) 2015

1. Number of crashes per million vehicles entering (MVE) the intersection.
2. Average rate for intersections of similar characteristics.
3. Number of "property damage equivalent" crashes per MVE.

facilitate movements from all the modes studied and both have experienced crashes involving most of those modes.

Crashes involving heavy trucks:

Map 8.3 on page 104 shows the locations of crash incidents involving heavy trucks in the neighborhood between 2009 and 2013. That map shows that truck crashes have also occurred at the two intersections noted above, but it also shows that a number of truck crashes have occurred in and around the neighborhood's central business district (CBD), where there is a lot of interaction between the multiple modes of transportation.

When looking more closely at details in the individual crash reports, it was noted that sideswipe crashes were overwhelmingly the largest crash type represented. Nearly half (47%) of the truck related crashes in the neighborhood were sideswipe crashes; 41% of truck crashes in the CBD were sideswipes. Though no specific street, time of day, or seasonal factor seemed to be significant, a number of these sideswipe crashes did involve trucks or other vehicles traveling in an improper lane or improperly passing, which suggests that congestion and space limitations may play a significant role in heavy truck crashes in the neighborhood. This is especially the case in areas where trucks are typically making turning movements.

Crashes involving buses:

There were 23 crashes involving full-sized buses in the study area between 2009 and 2013. These crashes occurred throughout the neighborhood, and no specific routes, road types, or intersections were disproportionately represented in the data, with the exception of W 3rd Street, where six of the bus crashes (26%) occurred. W 3rd Street is the principal DTA route in the neighborhood.

Approximately 65% of the bus related crashes occurred at an intersection, and approximately 26% were sideswipe crashes. Interestingly, there were no bus crashes at any of the eight crash locations identified in Table 8.2 and Map 8.2 (page 104). The crash data also showed no strong patterns regarding any factors reported to have contributed to crashes involving buses.

Lastly, there is no distinction in the crash data between crashes involving DTA buses versus those involving other buses. It is known that a significant number of school buses are moving throughout the neighborhood, as the School District's bus garage is located in the southwest portion of the neighborhood

Crashes involving cyclists and pedestrians:

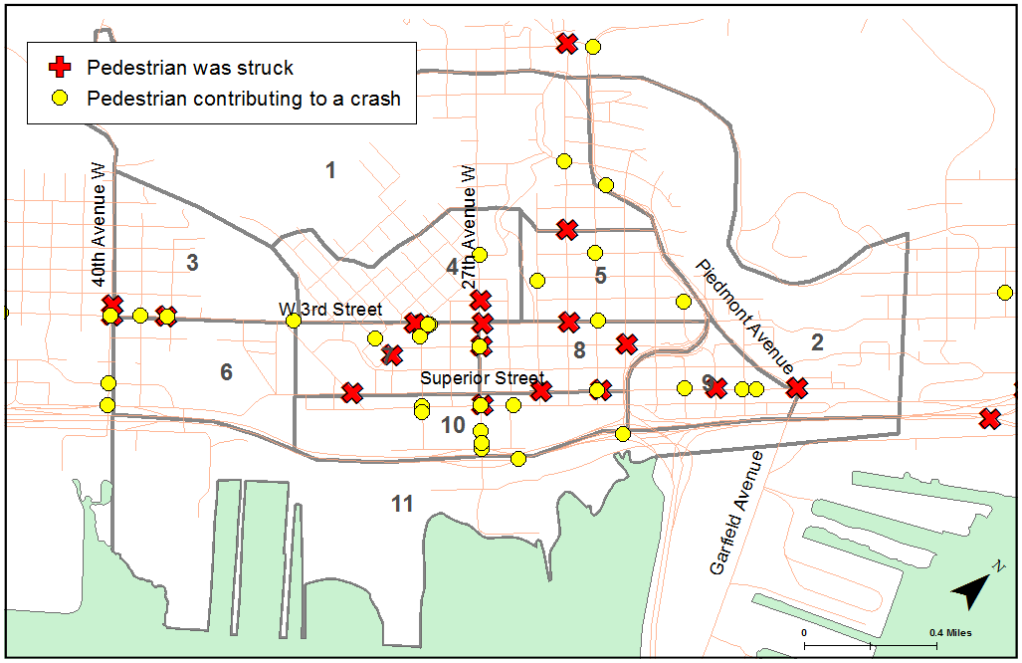
It might be assumed that crashes involving either cyclists or pedestrians would follow similar patterns to each other and be concentrated in and around denser areas of the neighborhood where more activity occurs, such as in the CBD and around the 27th Avenue W commercial node. This was not found to be the case in this study.

When looking over the data presented in Map 8.4 and Map 8.5 (page 107), it can be seen that bike and pedestrian crashes (or crashes in which the acts of cyclists or pedestrians contributed) occurred throughout the entire study area. It is also apparent that, except for in a few locations, the concentration of bike and pedestrian crashes have been in different areas.

There were 53 crash incidents involving pedestrians between 2009 and 2013. Of those incidents, 21 involved pedestrians being struck by a vehicle, and six (28%) of those were reported as resulting in significant injury to the pedestrian. While the age of the pedestrian was not reported for all incidents, of the incidents in which a pedestrian was struck, four (19%) were below the age of 16, and one (5%) was older than 65.

The majority of locations of crash incidents that involved pedestrians occurred at locations along the key multimodal corridors that were identified in Map 8.1 (page 100). Eighteen (34%) of the pedestrian incidents and seven (33%) of pedestrian strikes occurred at one of the eight high-severity intersections identified in Map 8.2 (page 104). It is noteworthy that a lot of the crash incidents occurred along W 3rd Street and along the segment of Superior Street in the CBD - both segments that produce some of the strongest ridership for the DTA. It is also noteworthy that a lot of incidents line up along 27th Avenue W from the residential area above W 2nd Street down to the commercial area below Superior Street.

There were 30 crash incidents involving cyclists between 2009 and 2013. In fourteen (47%) of those incidents, cyclists were struck by a vehicle. Of those crashes in which a pedestrian was struck, seven (50%) were below the age of 16, and six (43%) were over the age of



Map 8.4 | Pedestrian related crashes (2009-2013)

There were 53 pedestrian related crashes in the Lincoln Park study area between 2009 and 2013. Of those incidents, 21 involved pedestrians being struck by a motor vehicle. Many of these incidents were concentrated along W 3rd Street, along 27th Avenue W below W 3rd Street, and along Superior Street in the CBD (Sub-are 9).

50, and eight (57%) involved significant injury.

As with the pedestrian related crashes that occurred in within the study area, the majority of bike related happened on one of the key multimodal routes identified in this study. Unlike with the pedestrian related crashes, however, only two occurred at one of the high-severity intersections.

The bike related crashes were somewhat more spread out across the neighborhood than pedestrian related crashes. A small cluster of incidents were noted in the section of W 3rd Street between 40th Avenue W and 38th Avenue W. Another cluster of incidents were also noted near the merge of Lower Michigan Street and Superior Street at the northeastern corner of the neighborhood. It is important to recognize that bike traffic gets funneled into both those locations because of a lack of alternative flat routes. The recent installation of the Cross City Trail has ameliorated much of the risk of collisions at the Lower Michigan Street and Superior Street merge, but the segment of W 3rd Street remains an on-street bike route.

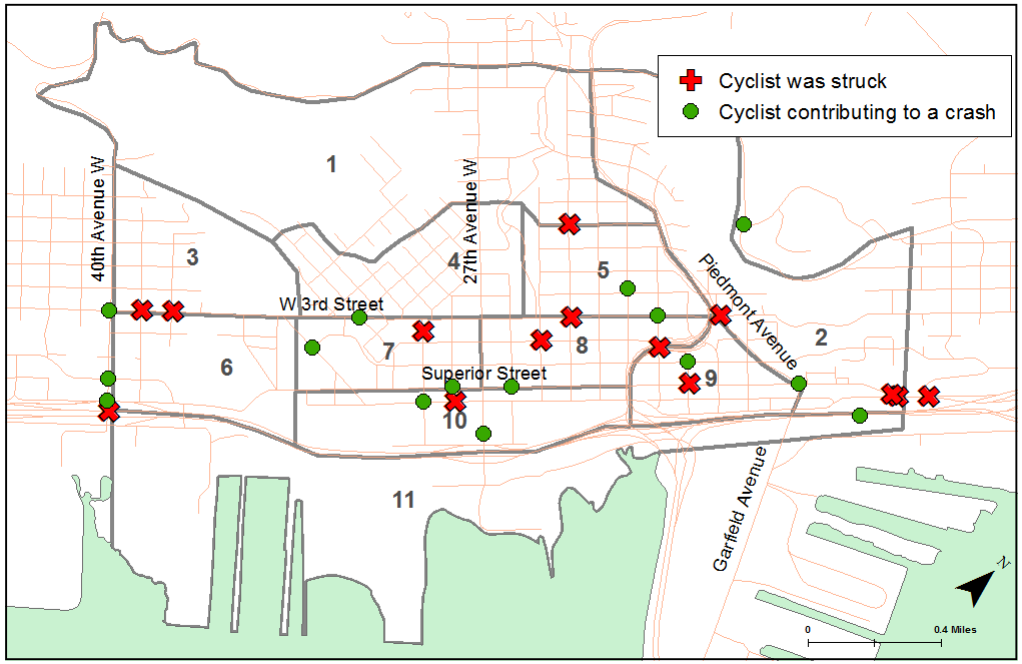
Lastly, it is worth noting that the crash data shows that many of the crashes involving children younger than 16 - both pedestrians and cyclists - occurred along W 3rd Street. It is very much a residential street, and a lot of youth were observed outside along the corridor during the study. This aspect, arguably, makes W 3rd Street even more of a candidate for investments in multimodal improvements.

Additional Observations

In addition to using mmLOS scores and crash data to assess the quality and safety of multimodal integration in the Lincoln Park study area, MIC area staff observed a number of specific

Map 8.5 | Bike related crashes (2009 - 2013)

There were 30 bike related crashes in the Lincoln Park study area between 2009 and 2013. Of those incidents, 14 involved a cyclist being struck by a motor vehicle. Incidents were concentrated on W 3rd Street near the intersection of 40th Avenue W (Sub-area 3) and on Superior Street near its merge with Lower Michigan Street (Sub-area 2).



opportunities to improve the safety and operations between modes. In many cases, the data from the assessments steered staffs' attention toward those improvements. In some instances, the input from stakeholders helped the staff to become aware of potential opportunities for improvement. What follows are summaries of the potential opportunities that were noted during the study.

Studying and monitoring specific locations:

Comparing the mmLOS scores with the findings from the crash data, as well as information from the previous chapters, a handful of segments and intersections stand out as potentially having multiple issues related to safety and operations. Table 8.3 identifies these locations and summarizes the areas of potential concern. Because it was beyond the scope of this study to investigate specific location in finer detail, it is recommended that the locations in Table 8.3 continue to be monitored and undergo study in coming years to determine specific issues and improvements appropriate for those locations.

Planning for a future redesign of 27th Avenue W:

One of the locations in Table 8.3 that should be given attention sooner rather than later is the segment of 27th Avenue W between W 3rd Street and Helm Street. Throughout this study, this segment has been shown to contain multiple concerns related to both safety and operations. It is also the most heavily trafficked segment of the neighborhood's local street network, used heavily by all the modes studied. Furthermore, it links a growing commercial node to direct access to I-35. As this area has the potential to undergo rapid transformation, it would befit local jurisdictions to try and influence the character and design of that transformation in ways that will enhance the integration of multiple modes, not create additional conflicts (Figure 8.3).

The challenge for the City of Duluth will be to find ways in which to

Table 8.3 | Locations with multiple indicators of poor integration

Location Type	Location	Poor mmLOS scores	Issues noted in other chapters	Patterns noted in crash data
Intersection	Skyline Parkway & 24th Avenue W	- -	Adjacent poor LOS noted in TDM model (Chapt 4)	Auto
Intersection	Superior Street & Garfield Avenue	Bike, Ped	- -	Bike, Ped
Street Segment	Grand Avenue: *Between 40th Avenue W and 38th Avenue W*	Ped	- -	Bike, Ped
Street Segment	W 3rd Street: *Between Lincoln Park Middle School Road and Exeter Street*	Ped	- -	Ped
Street Segment	27th Avenue W: *Between W 3rd Street and Helm Street*	Bike, Ped	Poor LOS in TDM model (Chapt 4) Short queue lengths (Chapt 4)	Auto, Bike, Ped

Source of images: MIC (2015)

Figure 8.3 | Current characteristics of the 27th Avenue W corridor

Because of its close proximity to I-35 access and the concentration of commercial activities there, the segment of 27th Avenue W below W 1st Street generates a lot of traffic from all modes of transportation. The area will face operational challenges under future traffic growth. It is also poorly suited to bike and pedestrian movements.

Image source: MIC (2015)

Figure 8.4 | Cross City Trail at 27th Avenue W

The use of stop signs for trail users at 27th Avenue W creates conflicting messages with the traffic signal.

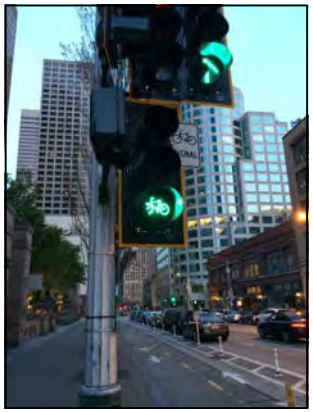


Image source: MIC (2015)

Figure 8.5 | Bike-specific signal head

It is recommended that bike-specific signal heads be added to the traffic signals at Superior Street & 27th Avenue W

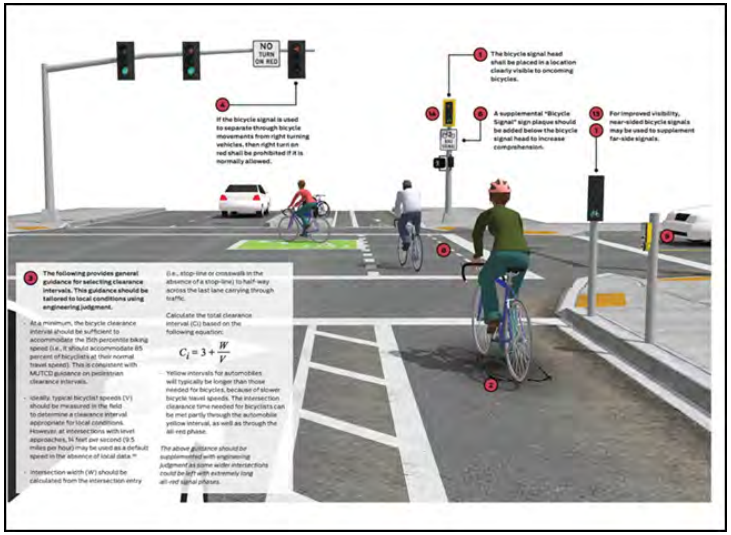


Image source: NACTO (2014)

Figure 8.6 | NACTO recommendations for bikeway crossings at signalized intersections

The National Association of City Transportation Officials (NACTO) has published guidance for how to design crossings similar to that of the Cross City Trail at 27th Avenue W.

accommodate future increases in motor traffic, while at the same time making the area more supportive for pedestrians, cyclists, and transit users. These are both conditions that the city's vision for rezoning is likely to encourage (see Chapter 3). To that end, it is recommended that the city work to identify an optimal, multimodal design for the corridor within the next few years in order to get ahead of redevelopment with a plan and to enable the city's Planning and Engineering departments to work with future developers to help implement that planned redesign.

Improvements to the Cross City Trail:

One of the City's most recent infrastructure investments running through the W 27th Avenue commercial node is the multi-use Cross City Trail. As mentioned in Chapter 7, there are many accesses for motor vehicles that cross the trail. The greater the number of access points, the greater the potential for operational and safety conflicts. Any redevelopment project along the trail represents an opportunity to consolidate or relocate some of these access points off of the trail, and it is a recommendation of this study that this should be an ongoing objective for the city's Planning and Engineering staffs.

A very specific location of concern on the Cross City Trail is its intersection with 27th Avenue W. Small stop signs were installed along the trail to direct cyclists to stop at each intersection with a street, and those sign were likewise installed at 27th Avenue W (Figure 8.4) . That intersection, however, has a traffic signal, which implies a different order of traffic operations. It is recommended that the stop signs be removed at that location and replaced with signal heads specific to cyclists on the trail (Figure 8.5) designed to the specifications - and accompanied with pavement markings - as recommended by the National Association of City Transportation Officials (NACTO) (see Figure 8.6). In addition, the signal operations at 27th Avenue W should be re-timed to give a protected phase to the cyclists in order to

minimize conflicts between their turning movements and those of motorists at this busy intersection.

Other potential issues of poor integration along the Cross City Trail exist where there are transit stops for the DTA buses. At present, trail users and people waiting for buses have to share the same surface (see Figure 8.7), which could lead to conflicts if a significant group of riders are congregating at a specific stop. It is recommended that the DTA work with city Planning and Engineering departments to identify the busiest stops along the trail and seek opportunities to install separate, off-trail waiting areas for the transit riders at those locations (see Figure 8.7 as a potential example).

Lastly, there are locations along the Cross City Trail that could benefit from curb-cut improvements. One such location noted during the study was the access point to the spur trail to the Clyde Iron/Heritage Center. At present, the spur trail ends in a raised curb at Superior Street (Figure 8.8). Though it is flanked by two aprons for motor vehicle accesses, cyclists would be better served by a ramped curb at this location. Similarly, the segment of the Cross City Trail next to Lower Michigan Street, from 18th Avenue W to 21st Avenue W (Figure 8.9) could be improved with curb cuts spaced at each avenue. This would allow wheeled users (cyclists and wheelchair users alike) easier and more direct access to Lincoln Park's CBD from the trail.

Encouraging integration-supportive urban forms in key corridors:

The very characteristic of an area's urban form can also be considered an amenity in regards to multimodal integration. Specifically, urban form that has been strategically designed to provide walkable corridors, easy access to a variety of uses and activities, close proximity to transit, and parking opportunities for both motor vehicles and bicycles best serves the goal of integration. This, however, requires the intention of a community to pursue and protect such form(s).

Image source: MIC (2014)

Figure 8.7 | Bus stop at 27th Avenue W

Bus stops along the Cross City Trail pose a potential space conflict between cyclists and those waiting for their bus.

Image source: MIC (2015)

Figure 8.8 | Curbed terminus of spur trail

The spur trail at 30th Avenue W ends in a curb at Superior Street, which is not ideal for cyclists.

Image source: MIC (2015)

Figure 8.9 | Lack of curb cuts along Lower Michigan Street

The absence of curb ramps along Lower Michigan Street are inconvenient for trail users wishing to access the central business district.

Image source: MIC (2015)
Location: Lincoln Park, Duluth, Minnesota

Figure 8.10 | Bike racks on DTA buses

Each DTA regular route bus is equipped with a bike rack.

Image source: mountainline.com (2015)
Location: Missoula, Montana

Figure 8.11 | Bike parking at a bus stop

The opportunity to link bus trips with bike trips can be enhanced by creating more bike parking opportunities near bus stops.

Image source: pedbikeinfo.org (2015)
Location: Indianapolis, Indiana

Figure 8.12 | Pairing bus and bike facilities

Bus, bike, and trail amenities will tend to encourage greater multimodal trip chaining (and thus greater use overall) if placed in close proximity to each other.

Arguably, the best place to start, is with those areas where such forms already exist. Within the Lincoln Park study area, those forms are found along the Superior Street and W 3rd Street transit corridors. The City of Duluth, therefore, should seek to encourage and protect the continuance of the forms in those corridors through the land use ordinances and policies which direct the activities of the city's Planning and Engineering departments. The city should also aim to encourage the creation of such form along segments of the transit corridors where it currently does not exist. This is the reason for the transit overlay zoning district that was recommended in Chapter 6.

Encouraging multimodal trips through "Integration" amenities

Multimodal transportation can be enhanced through the addition of what is being termed here as, "integration amenities." The range of such amenities is broad and can include things such as benches, bike racks, pedestrian refuge islands, etc.: things that can make it more convenient for people to choose to use alternative modes of transportation, or combining different modes to make their trips. It is a general recommendation of this study that the City of Duluth and its transportation partners seek to maximize the presence of such amenities in the Lincoln Park neighborhood.

The DTA, for instance, is already doing a lot to encourage multimodal trips; each bus is equipped with a bike rack (Figure 8.10). Those multimodal assets could be further supported by creating bike parking opportunities next to, or near bus shelters. Figure 8.11 offers an example of this strategy, which could be especially effective for bus stops that are near the Cross City Trail, as is suggested with the example shown in Figure 8.12.

Another integration strategy that would be particularly effective is to strategically space benches at transit stops on the 24th Avenue W route up the hillside. This would not only benefit transit users, but could

also encourage more pedestrian movements in general if people had places to stop and rest. This is strategy could also further enhanced with bike parking also at those locations, which could give people the option to use transit to get up the hill but bike for their return trip downhill.

One other amenity for multimodal integration that should be pursued in the Lincoln Park study area is the creation of vehicle parking at key access points to the Cross City Trail. This will encourage greater use of the trail overall, but it will also create an opportunity for people to drive to such locations and then complete their commute to, say, Downtown Duluth or to Canal Park by bike. Likewise, bike parking opportunities should also be created at such areas. One suggested location for this type of a parking area is near the Cross City Trail's intersection with Superior Street, which could be incorporated into a project to enhance the public parking spaces in and around the US-53 overpass there (see Chapter 3).

Chapter Conclusion

The mmLOS assessment, analysis of crash data, and other observations summarized in this chapter suggest the following implications regarding the three planning perspectives outlined in Chapter 1 of this study.

Multimodal integration:

The mmLOS assessment that was conducted as part of this study showed that some of the neighborhood's key multimodal corridors serve some modes poorly. Superior Street, for instance, received a poor score with respect to transit LOS, and 27th Avenue W (between Michigan and Helm Street) received a failing score with respect to bike LOS. It appeared that more can be done to improve conditions for pedestrian travel in nearly all of the neighborhood's key multimodal corridors.

Transportation safety can also be enhanced along a number of the key multimodal corridors. In particular, efforts to mitigate conflicts between modes in segments of W 3rd Street, 24th Avenue W, and 27th Avenue W may help to reduce the continuance of the high crash rates and crash severity rates observed from the crash data. Further study and monitoring of operations and safety in areas of each of these corridors is warranted.

Other observations made during this study revealed a number of specific improvements that could be made in an effort to better integrate pedestrian and cyclist movements specifically, and to improve both operations and safety along the key multimodal corridors.

Public investment:

As mentioned in previous chapters, the funding for infrastructure improvements is limited, and it is not feasible to implement every possible improvement identified in the neighborhood. What this chapter has attempted to convey, however, is that corridors and intersections can be prioritized according to 1) the numbers of different modes using it, 2) the degree of potential operational and safety deficiencies noted, and 3) opportunities to create synergies between amenities.

Future opportunities:

An investment strategy going forward should be to seek opportunities to create such synergies by coordinating the planning and investments of different transportation partners (e.g. City of Duluth, DTA, MnDOT, etc.), as well as engaging in negotiations with private developers in helping to implement specific visions and designs that the city may have developed as parts of a redesign plan for specific corridors, as has been recommended for the segment of 27th Avenue W below W 1st Street. Ultimately, it cannot be the work

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