

4. Recommendations

The recommendations contained in the following pages have been developed with information collected through stakeholder engagement and technical analysis. They were developed with the goal of finding context sensitive solutions that can be both incorporated as part of MnDOT's highway resurfacing project scheduled for 2015-2016 and as stand-alone improvements in subsequent years. The majority of these recommendations were developed with a sensitivity to future capacity needs and current fiscal constraints, but some recommendations included relate to important opportunities versus critical needs.

The following pages contain general recommendations that are applicable to the entire 5-mile corridor between Beck's Rd and I-35. Those recommendations are then followed by others tailored specifically for the conditions found in each of the individual context zones that were identified during the study. Together these recommendations represent a package of options to be considered for implementation by MnDOT, the City of Duluth, and the Duluth Transit Authority (DTA).

Corridor-wide Recommendations

It has been established that the vehicle capacity of Highway 23 should be protected for future demand. Yet, stakeholder input has also identified a demand for a safer pedestrian environment and room for bikes as well. The same reason that lane capacity should be protected is the same reason pedestrian and bike travel should also be accommodated: Highway 23 is the sole arterial connection between all the neighborhoods and commercial activity west of I-35. Both the

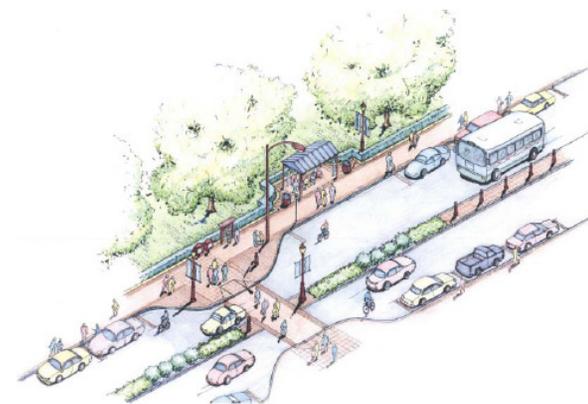


Image source: Institute of Transportation Engineers (2006)

Figure 4.1 | Illustration of context sensitive design

A context sensitive approach aims to provide for all modes of surface transportation and balance competing objectives of different user groups.

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Figure 4.2 | Missing sidewalk

Because of the long distances, speed of traffic, and importance of the corridor as a transit route, it is recommended sidewalk be installed on both sides of the corridor.

stakeholder input summarized in Chapter 2 and the technical analysis summarized in Chapter 3 indicated that the current roadway environment does not sufficiently support these non-motorized modes.

Highway 23 is also an important route for transit. It is part of the DTA’s busiest bus line; ridership data shows that significant passenger activity exists at bus stops all along the corridor. A number of these stops lack sidewalk connections or even level, ADA accessible spaces to stand and wait for a bus.

Sidewalks

For the reasons listed above, it is recommended that sidewalk be installed anywhere that there are gaps, where the width of existing sidewalk is insufficient, or where the current sidewalk is in disrepair. Sidewalk should exist on both sides of the highway, at least from the Morgan Park neighborhood eastward to I-35. Going west from Morgan Park, continuous sidewalk should exist on the southeastern side of the highway all the way to Gary/New Duluth in anticipation that more development will be occurring there in coming years.

A width of five feet is recommended for sidewalk along Highway 23 in order to be consistent with the majority of sidewalk infrastructure already in place. ADA accessible curb ramps should be installed at all intersections, bus pads, and any marked crosswalks.

Specific sidewalk improvements are also identified for each zone in the pages that follow.

Lane widths and bike lanes

Because the width of the roadway and vehicle speeds are concerns for pedestrian crossing safety along the highway, a reduction in lane widths

from their current 12-foot width down to 11-foot lanes is recommended. Doing this would have the potential to calm speeds through drivers' perceptions of a more restricted space. Just as important, it would allow for the shoulders to be increased to 6 feet on both sides of the highway, thus creating a six-foot wide space that could serve bike travel and also shorten the length that pedestrians are required to cross to get out of the lanes of traffic. In addition, six-foot shoulders would also provide more room for buses to pull out of traffic and allow more visibility and room for other vehicles to negotiate around them. Figure 4.3 illustrates the recommended lane configuration.

It is also recommended that the shoulders be designated as bike lanes with pavement markings throughout the entire five-mile corridor (Figure 4.4). This will help to dissuade people from parking cars in this space.

Figure 4.3 | Recommended lane widths

Reducing travel lanes to 11 feet wide would provide for wider shoulders to accommodate bike traffic and improve safety for pedestrians and transit riders.

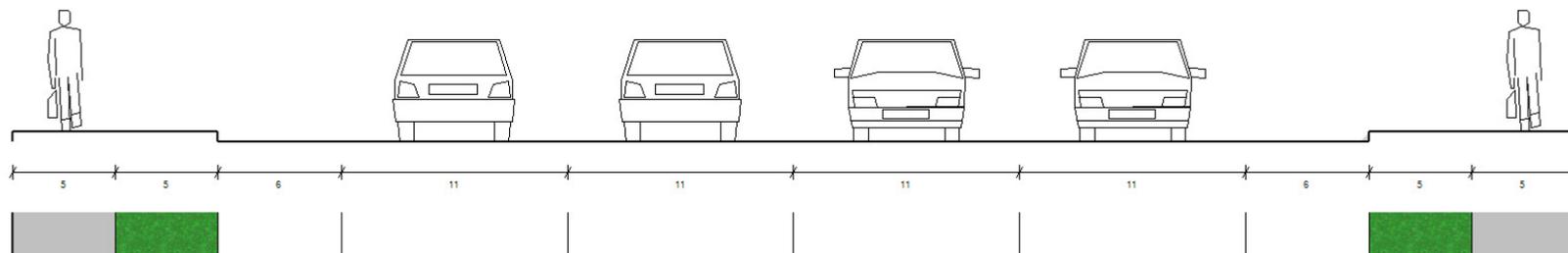


Image source: FHWA.gov (2013)

Figure 4.4 | Pavement to the curb

An even surface should be provided in the shoulders for safer cycling.



Image source: FHWA.gov (2013)

Figure 4.5 | Orientation of grates

Storm sewer grates should have their openings oriented perpendicular to the roadway.

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Figure 4.6 | Prioritize snow removal

Because of Grand Avenue’s importance as a multimodal corridor and sole arterial connector, it should be a priority route for snow removal.

Edge treatment and storm sewer grates

It is also recommended that MnDOT take the following steps to improve bike safety in the shoulders of the highway. It is recommended that MnDOT pave over the gutter pans, bringing the pavement all the way to the curb. In addition, MnDOT should ensure that the openings of all storm sewer grates are oriented to be perpendicular with the travel lanes (Figure 4.5, page 75) and set as flush with the pavement surface as possible.

Snow Removal

Because of the highway’s importance as a transit route, a pedestrian corridor, and a bike commuting corridor, keeping the shoulders, sidewalks, and bus stops clear of snow throughout the winter should remain a priority of MnDOT, the City of Duluth, and the DTA. Based on the cooperative agreement between MnDOT and the City of Duluth, ensuring snow removal from the sidewalks will be the City’s responsibility. It is recommended that the City prioritize the sidewalk in the Highway 23 corridor to be among the first plowed following a snowfall.

It is understood that MnDOT, the City of Duluth, and the DTA all have limited resources and that the deployment of those resources is often dictated by a variety of conditions encountered throughout their systems. These agencies can occasionally become overwhelmed with successive snowfall events, and the timing and coordination of plowing activities is often not possible. Nevertheless, it is a general recommendation that the three agencies continue to seek ways to coordinate snow removal activities along Highway 23 to ensure accessibility and mobility for pedestrians, bike commuters, and transit riders during the winter months.

Table 4.1 | Summary of corridor-wide recommendations for Highway 23 / Grand Avenue

Implementation Timeframe	Recommended Improvements	Implementation Agency
Short Range (2015—2020)	1. Reduce widths of travel lanes to 11 feet and create six-foot shoulders for pedestrian and bike commuting safety.	MnDOT
Short Range (2015—2020)	2. Ensure continuous sidewalk on both sides of the highway from I-35 to Arbor Drive (Morgan Park Entrance). Continue sidewalk on southeastern side of the highway	MnDOT
Short Range (2015—2020)	3. Bring curb ramps and points of access to bus stops into compliance with ADA design standards.	MnDOT/ City of Duluth
Short Range (2015—2020)	4. Designate highway shoulders as bike lanes via pavement insignia.	MnDOT
Short Range (2015—2020)	5. Pave roadway surface to the curb to provide an even surface for bike travel.	MnDOT
Short Range (2015—2020)	6. Orient openings in storm sewer grates to be perpendicular to the travel lanes.	MnDOT
Ongoing	7. Prioritize Highway 23 sidewalks for snow removal.	City of Duluth
Ongoing	8. Seek ways to coordinate and optimize snow removal activities along Highway 23.	MnDOT/ City of Duluth/ DTA

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Recommendations for Zone 1



It is recommended that sidewalk be installed on both sides of the highway between Clyde Avenue and Arbor Drive (88th Ave W). From there, continuous sidewalk should be provided on at least one side of the highway to Becks Road. The southeastern side of the highway is preferred in order to serve current residences and future development on that side of the corridor (1-a, page 79).

Arbor Drive is currently a signalized intersection with a pedestrian crossing phase. As a pedestrian crossing area, this intersection could be enhanced with a high-visibility, wide-block crosswalk pattern using a longer-lasting material such as polyurethane plastic (1-b).

Because additional industrial and commercial development is being anticipated for the segment of the highway between Idaho Street and Becks Road, the City of Duluth should develop an interior circulation plan (1-c) and access management plan (1-d) in advance of that growth. This will help manage the placement of accesses and reduce the potential for future congestion and traffic hazards.

It is anticipated that this segment of the highway will see increased truck traffic. A right-turn bay for northbound vehicles should be installed at Nick Glumac Drive as future traffic levels begin to warrant it (1-e). This should be designed to accommodate the lengths and turning radii of trucks in order to avoid the obstruction of northbound traffic.

Finally, the City of Duluth should investigate the feasibility of installing a paved trail connection to the Munger Trail within dedicated right-of-way at the end of Zimmerly Avenue (1-f). This would provide residents of the Smithville and Morgan Park neighborhoods an opportunity to access the Munger Trail in this area.



Figure 4.8 | High-visibility crosswalk

A high visibility crosswalk is recommended for the Arbor Street (88th Ave W) crossing in this more rural section of Grand Avenue.

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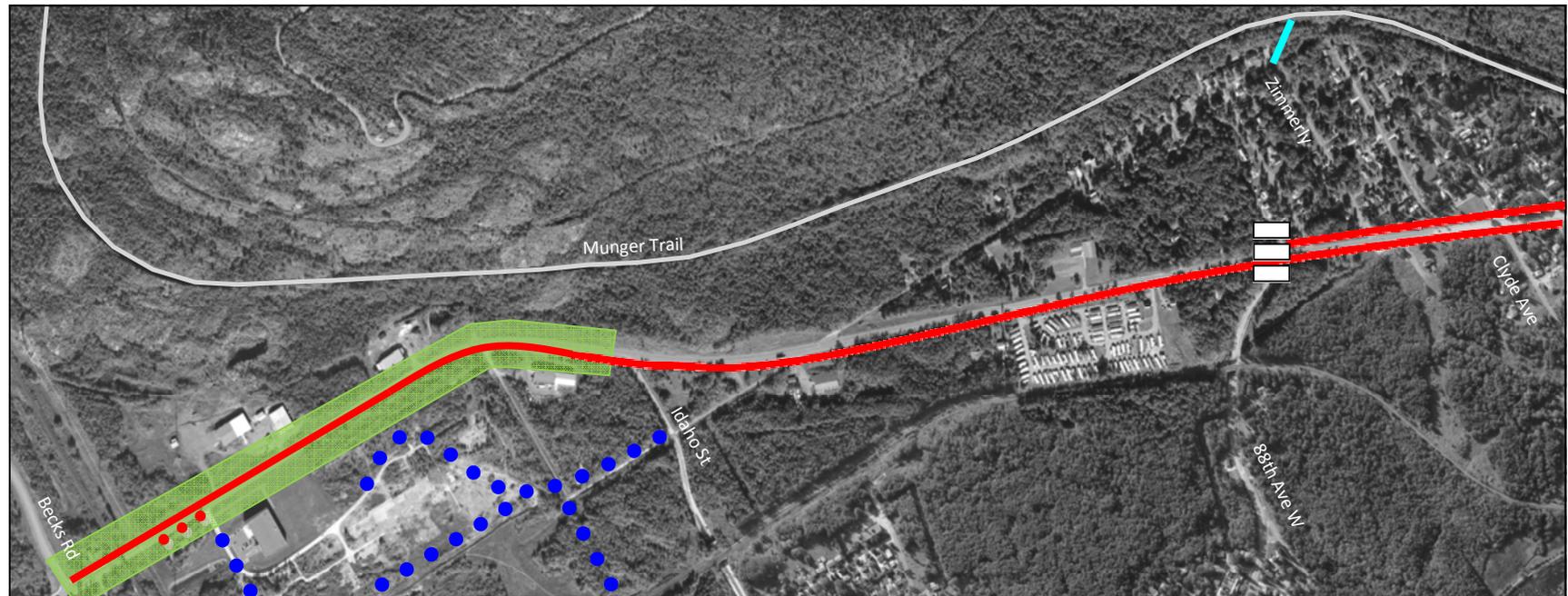
Table 4.2 | Recommended Improvement Plan for Context Zone 1 (Becks Rd to Clyde Ave)

Implementation Timeframe	Recommended Improvements	Map Symbol	Cost Estimate ¹	Implementation Agency
Short Range (2015—2020)	1-a Install sidewalk, curb and gutter (southeastern side)		\$500,000	MnDOT
	1-b Paint high-visibility crosswalk		\$600	MnDOT
	1-c Develop an interior circulation plan for industrial park		NA	City of Duluth / Developers
	1-d Develop an access management plan to limit and direct the location of additional accesses.		NA	City of Duluth
Mid Range (2020—2025)	1-e Install Right-turn bay at Nick Glumac Drive, designed to accommodate the queuing and turning movements of semi-trailer trucks .		\$35,000	City of Duluth
	1-f Create a paved trail link in existing ROW (between Munger Trail and Zimmerly Ave (approx. 500 ft)		\$30,000	City of Duluth

1. Estimates in 2013 dollars - includes 20% for design, construction, and contingencies. Estimates do not reflect costs associated with continued maintenance.

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Map 4.1 | Recommended Improvement Plan for Context Zone 1 (Becks Rd to Clyde Ave)



Recommendations for Zone 2



Because traffic on Highway 23 is traveling at speeds over 45 mph in Zone 2 and is not subject to stop controls anywhere in the segment, crossing the highway in Zone 2 is a challenge for pedestrians. The intersection of Grand Avenue Place is of particular concern because of sight limitations due to the curvature in the roadway. It is for this reason especially that a pedestrian-activated flashing beacon, placed atop a mast arm over the roadway (Figure 4.9), is recommended for this location (2-c, page 81), as well as a high-visibility crosswalk (2-b) to help delineate the crossing. It is also recommended that the raised centerline median found at the Grand Avenue Place intersection be cut back from the intersection (2-d) to allow for a more level, less obstructed path across the roadway.

Sidewalk is absent on the southeastern side of highway in the segment between the Munger Trail overpass and the Grand Avenue Place intersection. It is recommended that sidewalk be installed there in order to provide sidewalk connection to the bus shelter at Grand Avenue Place.

Lastly, three paved connections to the Munger Trail are recommended (2-e). Despite being visible as a roadway overpass, the Munger Trail is not easily accessible in this area. It is recommended that ramp connections be made between the overpass and the sidewalk on both sides of the highway. This will not only allow for access to the trail, but will create a grade-separated crossing opportunity for pedestrians wishing to cross the highway. There is also an opportunity to create a short connection at 93rd Ave W., which will provide Smithville residents who live north of the highway more direct access to the Munger Trail.



Image source: Safety.FHWA.dot.gov (2013)

Figure 4.9 | Overhead flashing beacons

Because of the wide, four-lane roadway and speeds in excess of 45 mph, an enhanced pedestrian crossings with ped-activated, overhead flashing beacons is recommended for the intersection of Highway 23 and Grand Avenue Place.

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Table 4.3 | Recommended Improvement Plan for Context Zone 2 (Clyde Ave to Grand Ave Place)

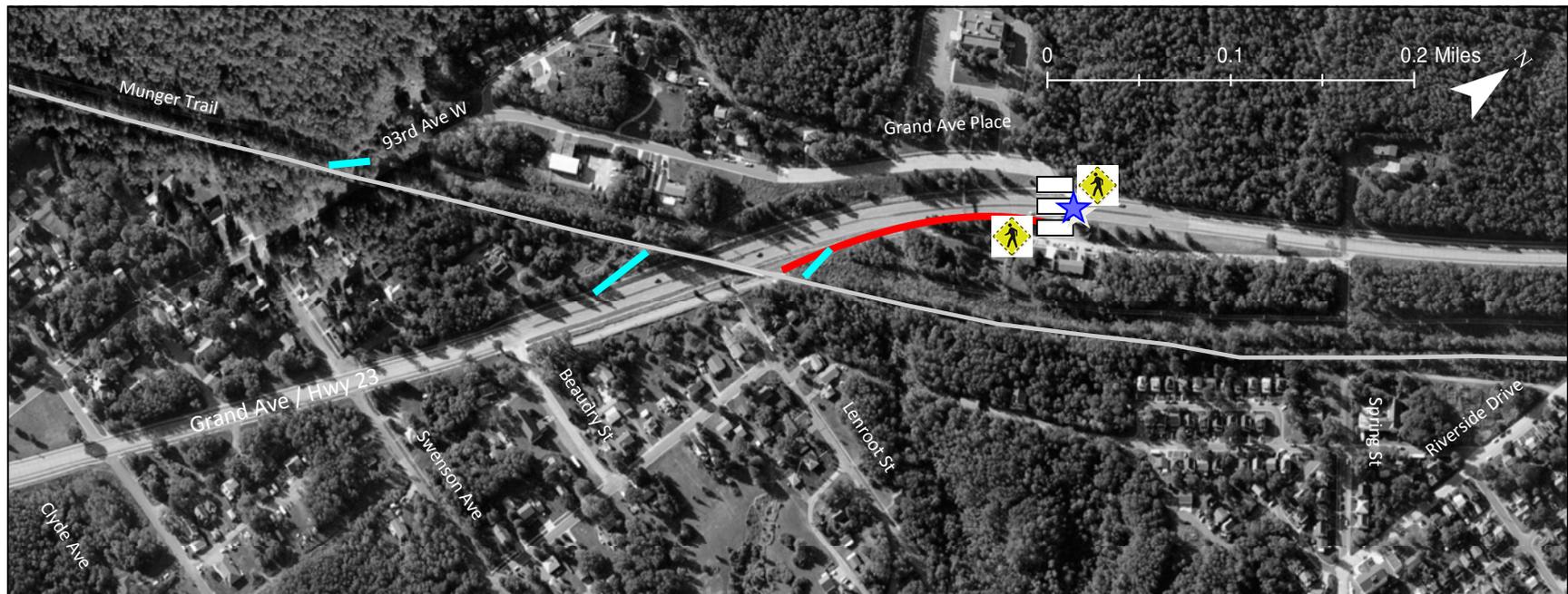
Implementation Timeframe	Recommended Improvements	Map Symbol	Cost Estimate ¹	Implementation Agency
Short Range (2015—2020)	2-a Install sidewalk		\$25,000	MnDOT
	2-b Paint crossing blocks at Grand Ave Place		\$600	MnDOT
	2-c Install a set ² of pedestrian-activated, high-visibility, flashing crossing signs on overhead mast arm at Grand Ave Place		\$100,000	MnDOT
	2-d Remove centerline median from crosswalk area		\$200	MnDOT
Mid Range (2020—2025)	2-e Create paved trail links to the Munger Trail		\$50,000	City of Duluth

1. Estimates in 2013 dollars - includes 20% for design, construction, and contingencies. Estimates do not reflect costs associated with continued maintenance.

2. Two advance warning signs, plus two ped-activated flashing signs on mast arms, and power supply.

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Map 4.2 | Recommended Improvement Plan for Context Zone 2 (Clyde Ave to Grand Ave Place)



Recommendations for Zone 3



Most of Zone 3 lacks sidewalk, yet year-round recreational activities at the new Spirit Mountain facility are bringing more pedestrian and bike movements to this segment of the highway. Meanwhile, the DTA is reporting greater ridership from the new Spirit Mountain facility and reports people walking and waiting in the roadway. For these reasons, it is recommended that sidewalk be installed on both sides of the highway, as well as along one side of Warwick Street up to the chalet (3-a, page 83).

DTA buses are also experiencing longer waits at Warwick Street due to skiers and bikers loading and unloading equipment. The installation of bus pull-outs are recommended at that location (3-e) to allow buses to get completely out of the way of traffic and to put more space between passing vehicles and riders unloading bikes.

Driver awareness of non-motorized users is a concern in Zone 3, and so pedestrian-activated flashing beacons (3-c) and high visibility crosswalk patterns (3-b) (Figure 4.10) are recommended for the intersections of Riverside Drive and Warwick Street, where there are higher numbers of transit boardings. When flashing, they would alert drivers of a pedestrian’s intention to cross. Even when not flashing, they would communicate the message to drivers that pedestrians are significant users of even this more rural segment of the corridor.

Input from stakeholders also indicates that the new Spring Street intersection lacks visibility at night. The installation of street lighting is recommended for that intersection to improve traffic safety there (3-d).

Finally, three paved links to the Munger Trail are also recommended in this segment of the highway (3-f) to improve access to Spirit Mountain and the neighborhoods.



Image source: TheCityFix.com (2013)

Figure 4.10 | Recommended crosswalk patterns

Large block crosswalk designs are recommended for increased visibility, with clear stop bar markings set back from the crossing.

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Table 4.4 | Recommended Improvement Plan for Context Zone 3 (Grand Ave Place to 85th Ave W)

Implementation Timeframe	Recommended Improvements	Map Symbol	Cost Estimate ¹	Implementation Agency
Short Range (2015—2020)	3-a Install sidewalk (including excavation & retaining wall)		\$420,000	MnDOT/City of Duluth/ Private Partner
	3-b Paint crossing block at Warwick St		\$600	MnDOT
	3-c Install two sets ² of pedestrian-activated, high-visibility, flashing crossing signs at Riverside Drive and Warwick St		\$20,000	MnDOT
	3-d Install street lights to improve visibility of Spring Street intersection		\$12,000	MnDOT
	3-e Install bus pullouts near the Spirit Mountain entrance		\$80,000	City of Duluth / DTA
	3-f Develop an access management plan to help limit and direct the locations of additional accesses in the area.		NA	City of Duluth
Mid Range (2020—2025)	3-g Create paved trail links to the Munger Trail		\$60,000	City of Duluth

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1. Estimates in 2013 dollars - includes 20% for design, construction, and contingencies. Estimates do not reflect costs associated with continued maintenance.

2. Two advance warning signs, plus two ped-activated flashing signs, and power supply.

Map 4.3 | Recommended Improvement Plan for Context Zone 3 (Grand Ave Place to 85th Ave W)



Recommendations for Zone 4

Inefficiencies and potential hazards exist with the current traffic signal serving the zoo entrance at 71st Ave W. This signal is especially important for the DTA’s transit operations and for seasonal increases in traffic with events at the zoo. There is interest in seeing 72nd Ave W become the new main entrance for the zoo. This would provide an opportunity to relocate the signal there and reprogram it for longer crossing times (4-d, page 85), ameliorating the current problems at 71st Ave W but also allowing the City of Duluth to capitalize on a number of added opportunities for recreational tourism.

A confluence of the Munger, Western Waterfront, and future Cross City trails occur in the vicinity of 72nd Ave W, and a traffic signal would create a protected crossings for pedestrians, cyclists, and snowmobilers there. The City of Duluth should investigate the feasibility of creating a Park-and-Ride lot with trailhead features (4-e) (Figures 4.11 and 4.12), but also design it to serve as a new turn-around spot for DTA buses. A new, well defined pathway on the other side of the highway (4-g) would also connect this recreational node to the DWP Trail to the northwest.

In the meantime, access to the Munger Trail can be improved for the residents of the Norton Park neighborhood by creating new paved connections between the trail and the highway (4-f), and pedestrian travel in general in Zone 4 would be better served by upgrading and filling in sidewalk gaps on the northern side of the highway and by installing sidewalk on the southern side (4-a).

Lastly, pedestrian safety has long been a concern for seniors living at the St. Eligius Health Center. It is recommended that the flashing pedestrian signs currently at 77th Ave W be replaced with pedestrian-activated signs (4-c) to increase the effectiveness of the flashing beacon.



Image source: RRMdesign.com (2013) Image source: TheProwersJournal.com (2013)

Figures 4.11 and 4.12 | Trailhead features

72nd Ave W presents an opportunity to create tourism parking with an information kiosk and a gateway monument to the various trails that converge there.

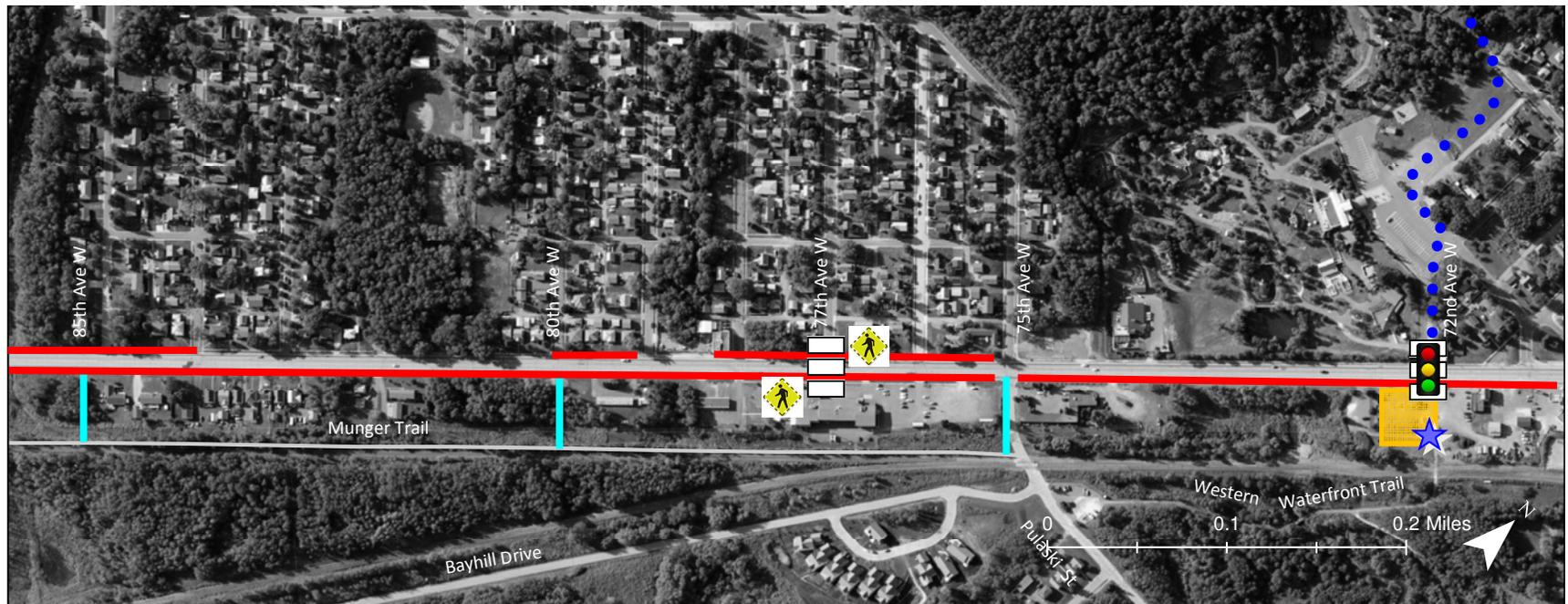
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Table 4.5 | Recommended Improvement Plan for Context Zone 4 (85th Ave W to 72nd Ave W)

Implementation Timeframe	Recommended Improvements	Map Symbol	Cost Estimate	Implementation Agency
Short Range (2015—2020)	4-a Install/replace sidewalk		\$150,000	MnDOT
	4-b Paint crossing blocks at 77th Ave W and 72nd Ave W		\$1,000	MnDOT
	4-c Install a set of pedestrian-activated, high-visibility, flashing crossing signs at 77th Ave W		\$12,000	MnDOT
	4-d Relocate traffic signal to 72nd Ave W; install new signal equipment, and reprogram for longer crossing times.		\$250,000	MnDOT
Mid Range (2020—2025)	4-e Expand existing public parking lot; design for bus turnaround; enhance existing trailhead.		\$300,000 to \$500,000	City of Duluth / DTA
	4-f Create paved trail links to the Munger Trail		\$50,000	City of Duluth
	4-g Create a well-defined trail connection to the DWP trail; design for snowmobile use; install way-finding signage		NA	City of Duluth/ Private Partner

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Map 4.4 | Recommended Improvement Plan for Context Zone 4 (85th Ave W to 72nd Ave W)



Recommendations for Zone 5



Based on this zone’s traffic volumes and high number of transit boardings, sidewalk should be installed on the south side of the highway and sections of existing sidewalk in poor condition on the north side of the highway should be replaced (5-a, page 87). These improvements should be accompanied by pedestrian ramps and crossing surfaces that are constructed to ADA standards. It is also recommended that the traffic signal at Raleigh Street be upgraded and the current pedestrian phase be lengthened (5-d).

Even though Raleigh Street has a traffic signal to support pedestrian crossings, more pedestrians are crossing at Redruth Street, according to DTA data. It is therefore recommended that this intersection be enhanced with pedestrian-activated flashing beacons (5-c) and high-visibility crosswalk markings (5-b).

The prevalence of angled intersections in Zone 5 do not support safe traffic operations. It is recommended that the City of Duluth and MnDOT plan for and seek out opportunities to address a number of these intersections. One such opportunity is the ample space available to line up Sherburne Street with S 67th Ave W on the south side of the highway (5-e). Another opportunity is the intersection of 67th Ave W, which is suitable for closure . Freemont Street would also be an intersection suitable for closure if the traffic signal and DTA turnaround gets moved to 72nd Ave W. Any street closures should be done by installing curb and sidewalk across the intersections at those locations (Figures 4.13 and 4.14).

Freemont Street also represents an opportunity for a future paved trail connection south of the highway (5-g). Creating this link would provide access to the Munger Trail, Western Waterfront Trail, and future Cross City Trail.



Image source: FHWA.dot.gov (2013)

Image source: ohio bikeways.net (2013)

Figures 4.13 and 4.14 | Intersection closures

Intersection closures can be accomplished with a combination of raised curb and bollards. Wherever this occurs on Highway 23 / Grand Ave, sidewalk should also be installed.

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Table 4.6 | Recommended Improvement Plan for Context Zone 5 (72nd Ave W to Raleigh St)

Implementation Timeframe	Recommended Improvements	Map Symbol	Cost Estimate	Implementation Agency
Short Range (2015—2020)	5-a Install/replace sidewalk; upgrade curb ramps		\$150,000	MnDOT
	5-b Paint crossing blocks at Redruth St and Raleigh St		\$600	MnDOT
	5-c Install a set of pedestrian-activated, high-visibility, flashing crossing signs at Redruth St		\$12,000	MnDOT
	5-d Install new signal equipment; lengthen pedestrian crossing times		\$250,000	MnDOT
Mid Range (2020—2025)	5-e Realign Sherburne St		\$200,000	City of Duluth
	5-f Close intersections; install curb and sidewalk		\$150,000	City of Duluth
	5-g Create a well-defined trail connection to the Cross City Trail and Western Waterfront trail; install wayfinding signage		\$30,000	City of Duluth/ Private Partner

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Map 4.5 | Recommended Improvement Plan for Context Zone 5 (72nd Ave W to Raleigh St)



Recommendations for Zone 6

Zone 6 is the segment with presumably the most pedestrian traffic, yet 73% percent of the area’s sidewalks are in poor condition. It is recommended that this sidewalk be replaced and that all curb ramps be brought into compliance with ADA standards (6-a, page 89).

Based on transit boarding numbers, the intersection of 63rd Ave W has been identified as one of the busiest pedestrian crossings in the corridor, and stakeholders report that this intersection may often be challenging for transit riders trying to catch their buses. For these reasons, pedestrian-activated flashing beacons (6-c) and high-visibility crosswalks (6-b) are recommended for this location. The higher traffic volumes and speeds of vehicles coming off I-35 to the north, as well as a potential for drivers jockeying for lanes and speeding up to beat the traffic signal at Raleigh Street, might create unsafe situations frequently enough to justify mounting flashing beacons over the roadway.

It is also recommended that MnDOT and the City of Duluth investigate the feasibility of closing three intersections on the northern side of the highway (6-d) to address inefficiencies and potential hazards related to the prevalence of angled intersections in Zone 6. Closing 65th Ave W will convert a 5-legged intersection to a 4-legged intersection and improve conditions for the signal operations there. Closing the Polk Street intersection would both reduce access density and create an opportunity to provide parking for businesses there (6-e) (Figure 4.15). The closure of 62 Ave W is recommended for safety. That intersection is experiencing higher crash severity rates than should be expected, and patterns in the crash records suggest that the speeds of vehicles coming off of the I-35 ramp just to the north may not be mixing well with turning movements there. It is recommended that all three street closures be accomplished with the installation of curb and sidewalk.



Image source: City of Duluth (2013)

Figure 4.15 | Polk Street closure concept sketch

Closing Polk Street could create parking spaces for retail businesses in the area.

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Table 4.7 | Recommended Improvement Plan for Context Zone 6 (Raleigh St to 62nd Ave W)

Implementation Timeframe	Recommended Improvements	Map Symbol	Cost Estimate ¹	Implementation Agency
Short Range (2015—2020)	6-a Install/replace sidewalk; upgrade curb ramps		\$30,000	MnDOT
	6-b Paint crossing blocks at Raleigh St		\$600	MnDOT
	6-c Install a set ² of pedestrian-activated, high-visibility, flashing crossing signs on overhead mast arm at 63rd Ave W		\$100,000	MnDOT
Mid Range (2020—2025)	6-d Close intersections; install curb and sidewalk		\$200,000	City of Duluth
	6-e Create parking area for businesses		\$5,000	City of Duluth/ Private Partner

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1. Estimates in 2013 dollars - includes 20% for design, construction, and contingencies. Estimates do not reflect costs associated with continued maintenance.
2. Two advance warning signs, plus two ped-activated flashing signs on mast arms, and power supply.

Map 4.6 | Recommended Improvement Plan for Context Zone 6 (Raleigh St to 62nd Ave W)



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