

Highway 371 Bike/Pedestrian Crossing Study



Information contained in this document is for planning purposes and should not be used for final design of any project. All results, recommendations, concept drawings, and commentary contained herein are based on limited data and information, and on existing conditions that are subject to change. Existing conditions have not been field-verified. Further analysis, community engagement, and engineering design are necessary prior to implementing the recommendations contained herein.

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Introduction

Study Purpose & Framework

The purpose of this study is to understand existing conditions and to evaluate the feasibility of ways to improve safe bike/pedestrian crossings on State Trunk Highway 371 (Highway 371) between Highway 210 and north of Wolda Road in Baxter. This study also explores the feasibility of a Highway 371 bike/pedestrian grade-separated crossing. This report documents the existing conditions and issues along the corridor and recommends a range of potential strategies to address these issues. Recommendations are provided for consideration by the city.

Figure 1. Project Location Map



Understanding the Context

Highway 371 is an important arterial roadway that runs north-south through the City of Baxter with commercial land use to the east and west of the corridor. It is a principal arterial, four-lane divided roadway with turn lanes at intersecting roadways. Further, it is an Interregional Corridor specifically identified by MnDOT as having significant importance in the transportation system for the movement of goods and services throughout the region. It contributes to the commerce of the region providing efficient mobility for motorists and heavy commercial vehicles. The posted speed limit along the corridor is 50 miles per hour (mph) from south of College Road to Clearwater Road and transitions to 60 mph north of Clearwater Road. The average daily traffic volumes along the corridor range from 21,100 vehicles per day (vpd) to 31,500 vpd, with the highest volumes just north of Highway 210. Traffic volumes significantly increase during the cabin months of summer-time, as does the recreational movement of bikes/pedestrians through the area. The combination of high vehicular speeds and high traffic volumes make pedestrian/bicyclist crossings of Highway 371 challenging.



Study website



<http://www.baxtermn.gov/state-highway-371-bike-and-pedestrian-crossing-study-overview/>

While this roadway provides significant utility for the movement of vehicular traffic, goods, and services it is also a barrier for bike/pedestrian crossings. Within the study area, there are existing traffic signals on Highway 371 at Highway 210, Excelsior Road, Woida Road, and Pine Beach Road/Wise Road, all of which have at-grade, marked pedestrian crosswalks and pedestrian signal indications. These intersections are spaced far apart forcing pedestrians to walk long distances, in an inhospitable environment, to cross Highway 371.

There are currently no sidewalks or trails that connect with Highway 371 (except for a short trail segment on the south side of Excelsior Road between Highway 371 and Dellwood Drive). Based on a review of the city's planned projects along Excelsior Road and Woida Road, as well as the city's Comprehensive Plan, future trails at Excelsior Road, Clearwater Road and Woida Road, have been identified. These trails would provide multimodal connections to and across Highway 371. These future trails are critical as they provide multimodal options for community members (and visitors of the community) to access the Highway 371 corridor and potentially cross it as a bicyclist/pedestrian. In addition to providing bike/pedestrian access to commercial businesses, once constructed the Clearwater Road trail connection will provide a link to the existing trail on Clearwater Road west of Inglewood Drive to Whipple Beach and beyond to the trail network to the west, connecting to the trails to the east on Cypress Drive as well as the Paul Bunyan State Trail, the Northland Arboretum, and the City of Brainerd.

Existing Conditions

Within the study area, there are existing traffic signals on Highway 371 at the Excelsior Road and Woida Road intersections. These signals are spaced approximately one mile apart. Design Road and Clearwater Road also intersect Highway 371, both intersections are unsignalized with three-quarter access and no pedestrian crossings. While traffic signals are provided at the Excelsior Road and Woida Road intersections, there is no sidewalk/trail to connect bikes/pedestrians to the intersection (except for a short segment on the south side of Excelsior Road west of Highway 371). Further, there are no existing north-south bike/pedestrian facilities for bikers/pedestrians to use to access the businesses along Highway 371. The lack of multi-modal connectivity makes it uncomfortable for bikes/pedestrians to travel along, and cross, Highway 371.

Existing conditions such as pedestrian generators, bike/pedestrian amenities, bike/pedestrian counts, safety analysis, and key issues were reviewed to establish a baseline for identifying any issues or areas of concern along the study corridor. These findings helped shape the study recommendations, which are discussed throughout this report.

Safety is a key concern with respect to multimodal transportation within the corridor and throughout the community. A detailed analysis of crash data was conducted as part of this study to understand the current conditions in the area (see section regarding *Existing Safety Analysis*). Herein it is identified that issues exist and the City of Baxter should work with local partners to address the perception and reality of safety issues along Highway 371 and throughout the community. Helping to stop the observed pedestrian and bicyclist “portaging” across Highway 371 will go a long way to making the corridor safer.

Bike/Pedestrian Generators

Bike/pedestrian generators on the west and east side of Highway 371 were identified to better understand where bikes/pedestrians are likely to want to cross. As shown in Figure 2, the city has hotels, restaurants, retail, residential areas, and regional trail/park systems on both the west and east sides of Highway 371, all of which are potential bike/pedestrian generators. The Paul Bunyan Trail, Whipple Beach, and the Northland Arboretum were also identified as bike/pedestrian generators. This not only speaks to the recreational desire to cross but the commercial and business attractions of the corridor; there is a significant percentage of service jobs on the east side of Highway 371 and a large percentage of work force housing on the west side of (or west of) the corridor.

Bike/Pedestrian Amenities

The existing intersection amenities at the four intersection roadways along Highway 371 north of Highway 210 to Woida Road are summarized in Table 1.

Figure 2. Pedestrian Generators

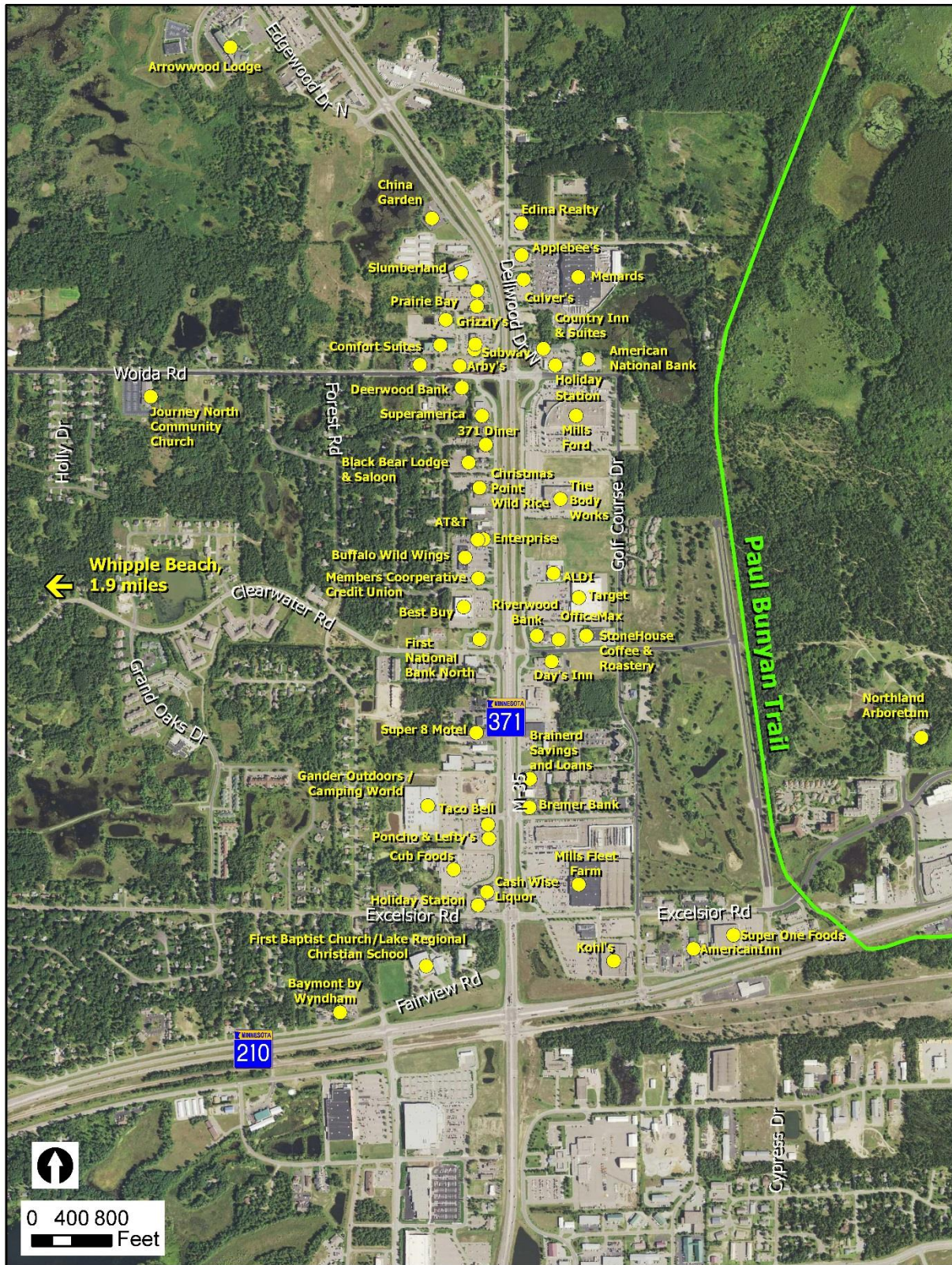


Table 1. Existing Bike/Pedestrian Amenities at Intersecting Roadways along Highway 371

Existing Conditions	Excelsior Rd	Design Rd	Clearwater Rd	Woida Rd
<i>Pavement Markings</i>				
Marked crosswalk	✓	No pedestrian crossing	No pedestrian crossing	✓
Stop bar for traffic				
<i>Signal Treatment</i>				
Pedestrian Signal Head	✓	N/A	N/A	✓
Push-button activators	✓	N/A	N/A	✓
Push-button activator on separate pole	✓	N/A	N/A	✓
Pedestrian countdown timers	✓	N/A	N/A	✓
Accessible Pedestrian Signals (APS)		N/A	N/A	
Walk Time Clearance to Cross Both Directions	✓	N/A	N/A	✓
<i>Crossing Configuration</i>				
Median pedestrian refuge				✓
Truncated domes	✓			✓
Trail connectivity	SE Quadrant			

Bike/Pedestrian Counts

Video equipment was deployed at three locations along the corridor to observe the number of bike and pedestrian crossings along Highway 371 at Excelsior Road, Clearwater Road, and Woida Road. Bike/pedestrian counts were collected on Thursday, August 16, 2018 and Saturday, August 18, 2018, which was the weekend of the Brainerd International Raceway (BIR) and is typically one of the busiest weekends of the year. Supplemental counts collected for a MnDOT signal timing project on Thursday, August 23, 2018 at the Highway 371/Excelsior Road and Highway 371/Woida Road intersections were compared to the BIR weekend counts to understand typical summer weekday bike/pedestrian activity at the signalized intersections.

A summary of the bike/pedestrian counts is provided in Table 2. In general, more bikes than pedestrians are crossing Highway 371.

Table 2. Bike/Pedestrian Highway 371 Crossing Counts

Highway 371 Intersection	Mode	Crossing Highway 371		
		Thursday, August 16, 2018 (13-Hour Counts)	Saturday, August 18, 2018 (13-Hour Counts)	Thursday, August 23, 2018 (13-Hour Counts)
Excelsior Rd	Pedestrians	9	8	1
	Bikes	22	21	0
Clearwater Rd	Pedestrians	8	1	
	Bikes	6	6	
Woida Rd	Pedestrians	3	1	4
	Bikes	10	17	6

Existing Safety Analysis

Crash data was reviewed using a combination of crash data provided by MnDOT from January 1, 2016 through December 31, 2017 and data readily available through the Minnesota Crash Mapping Analysis Tool (MnCMAT) from January 1, 2013 through December 31, 2015. Combined, this represents the most recent five-year period of available data. Crash data was reviewed for the Highway 371 intersections at Excelsior Road, Clearwater Road, and Woida Road.

There was a total of 82 intersection crashes at Excelsior Road, 51 intersection crashes at Clearwater Road, and 133 intersection crashes at Woida Road within the five-year study period. Approximately 65 percent of the crashes were rear-end crashes and the remaining included sideswipe, runoff road, and angle type collisions. Reported crashes occurring along the study corridor and at the key intersections over the analysis period are summarized by type in Table 3.

Table 3. Crash Type

Highway 371 Intersections	Rear-End	Side-swipe	Runoff Road	Angle	Other	Total
Excelsior Road	55	7	0	10	10	82
Clearwater Road	41	3	1	3	3	51
Woida Road	103	11	1	8	10	133

A crash rate analysis was conducted to review the intersection crash rates. The purpose of reviewing crash rates is to determine the statistical significance of the number of crashes. Crash rates were calculated and then compared to typical crash rates for intersections/segments with similar characteristics. Table 4 summarizes the corresponding crash rates.

Table 4. Crash Rate Summary

Highway 371 Intersections	Total Crashes	Calculated Crash Rate	Typical Crash Rate	Critical Crash Rate
Excelsior Road	82	1.29	0.45	0.68
Clearwater Road	51	0.98	0.18	0.35
Woida Road	133	2.70	0.45	0.71

Results of the crash analysis indicate that all three intersections have a crash rate above the typical crash rate for intersections with similar characteristics. Higher than typical crash rates do not necessarily indicate a significant crash problem. Therefore, the critical crash rate was calculated to determine the statistical significance of the above average crash rates. If the calculated crash rates are below the critical crash rates, crashes that occurred are likely due to the random nature of crashes and not necessarily a geometric design or traffic control issue. If the calculated crash rates are above the critical crash rates, there is a significant number of crashes above normal to warrant further review or mitigation. Based on this approach, all three intersections also have a crash rate above the critical crash rate.

The Highway 371/Excelsior Road and Highway 371/Woida Road intersections are both in the top 100 statewide intersection crash locations (number 53 and 75, respectively). While not within the scope of this study, the city/MnDOT should review the crash analysis/trends to identify if there is opportunity in the future to improve safety.

In the five-year period, there were two bike related crashes reported within the study area, both occurred at the Highway 371/Excelsior Road intersection in the year 2017. For one of the crashes, a vehicle failed to yield the right-of-way to the biker when making a right-turn. The other occurred when a biker failed to obey the traffic signal and traveled the wrong way down the road.

Key Issues

Key issues were identified through a combination of observations, discussions with city Staff, and input from City Council and Focus Group meetings. Two Focus Group meetings were held at the Northland Arboretum in November 2018 and March 2019, with presentations given to the City Council in January and June of 2019. Some of the key issues identified along Highway 371 are included below; a full summary of the comments received at the Focus Group meetings is provided in Appendix B.

1. **Safety/comfort issues.** Highway 371 is scary to cross (multiple lanes, high speeds); vehicles making a right-turn on red do not always yield to pedestrians; it feels safer to cross on the south side of Woida Road.
2. **Connectivity issues.** It is a long distance between Excelsior Road and Woida Road for a bike/pedestrian to travel; sidewalk/trail does not lead to Highway 371 and is not provided along Highway 371.

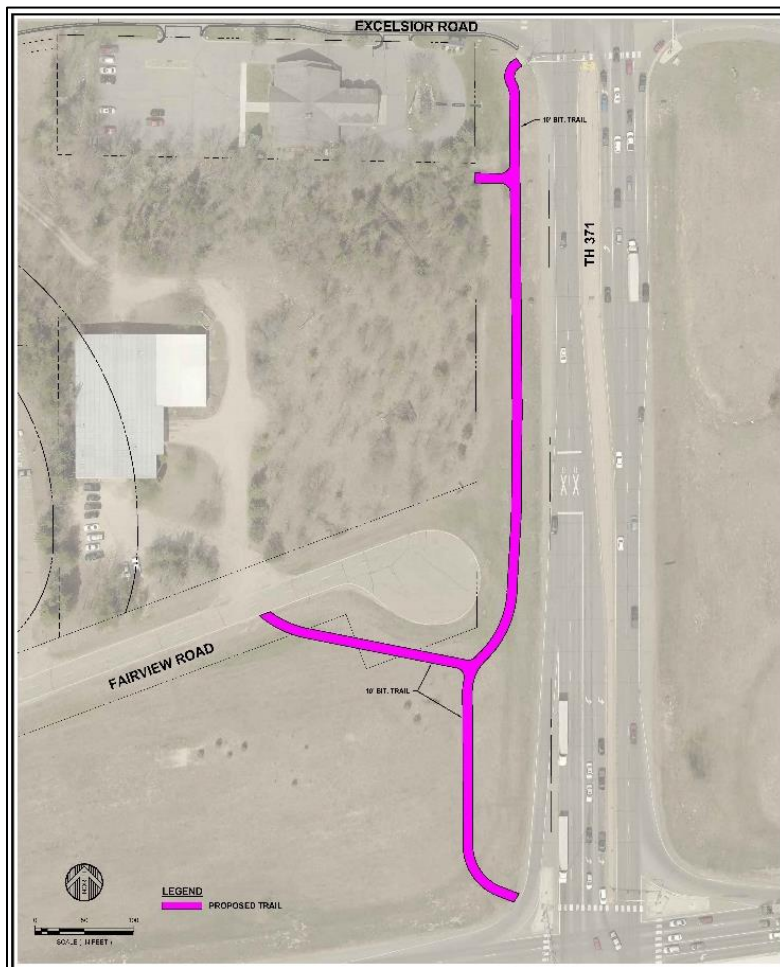
3. **Context of the corridor does not encourage bike/pedestrian activity.** The businesses along Highway 371 are designed for vehicles and are not bike/pedestrian friendly (parking lots are in front and the building entrances are set back from the road).
4. **Desire for a grade-separated crossing.** Would like a protected grade-separated crossing, but concerned there would be ground water issues if done as an underpass; an overpass may block view of businesses.

Planned Projects

The following summarizes the current projects and ongoing efforts to construct trail segments along Excelsior Road, Clearwater Road, and Woida Road.

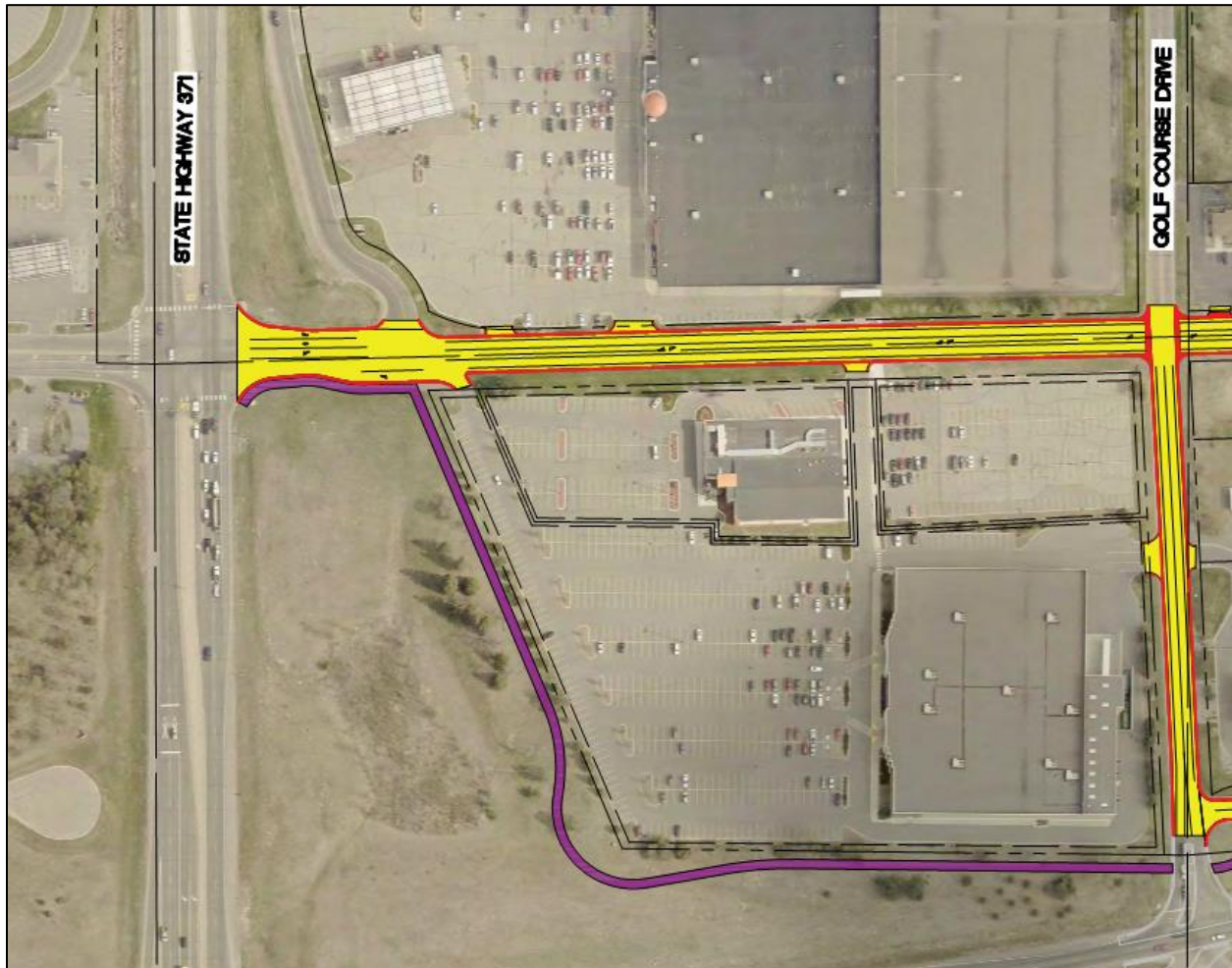
Excelsior Road Intersection Area Trail Improvements: The city plans to construct a trail south of Excelsior Road west of Highway 371 connecting to Fairview Road. On the east side of Highway 371, a year 2020 project plans to extend the trail from the southeast quadrant of the TH 371/Excelsior Road intersection to the south side of Fairview Road approximately 700 feet east of Golf Course Drive as well as to restripe Excelsior Road to provide on-street bike lanes east of Dellwood Drive. Illustrations of the planned improvements are shown in Figure 3 and 4.

Figure 3. Excelsior Road Intersection Area Project (West of Highway 371)



* WSN graphic from previous work.

Figure 4. Excelsior Road Intersection Area Project (East of Highway 371)



Clearwater Road Intersection Area: The city has no current projects to construct trail along Clearwater Road connecting the existing trail segment west of Inglewood Drive to Cypress Drive. However, the city has been acquiring easements along the south side of Clearwater Road east of Highway 371.

Woida Road Intersection Area: In year 2023 or later, the city intends to connect Cypress Drive from the current terminus approximately one-quarter mile north of Clearwater Road to Woida Road at the intersection of Golf Course Drive. In addition to the extension, the city plans to construct trail on the north side of Woida Road east of Highway 371. An illustration of the planned improvement is shown in Figure 5.

The City of Baxter Policy Study has also identified priority bike/pedestrian connections for the city network. Figure 6 that follows shows that in addition to the trail segments on Excelsior Road, Clearwater Road, and Woida Road, future bike/pedestrian facilities along the frontage roads of Highway 371 (Edgewood Drive and Dellwood Drive) have been identified as priority connections.

Figure 5. Woida Road/Cypress Road Connection (East of Highway 371)

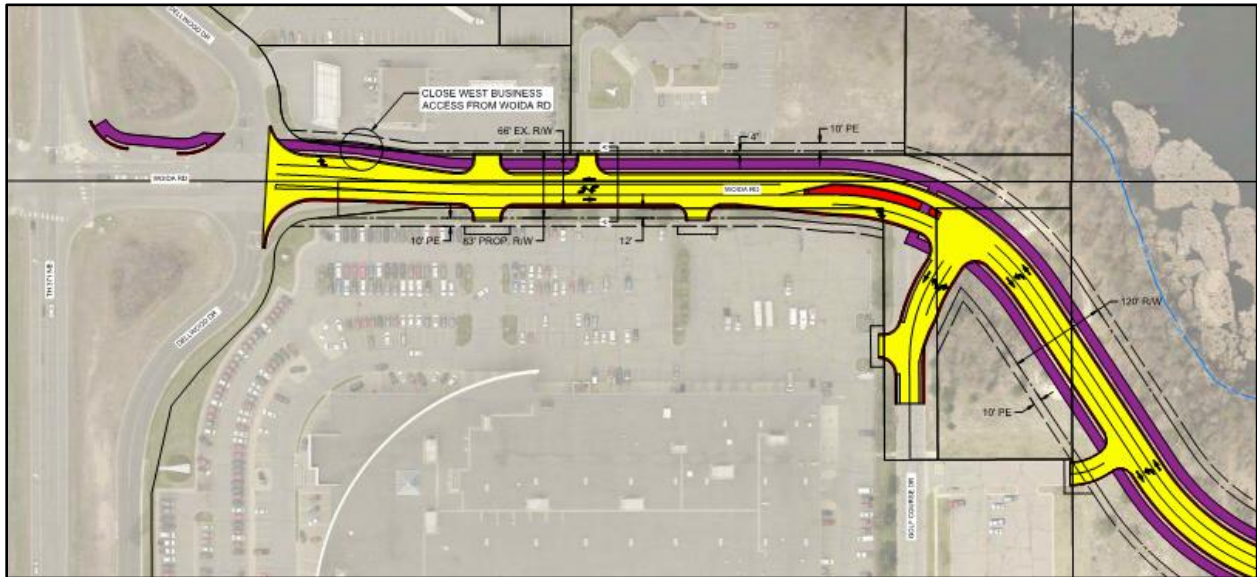
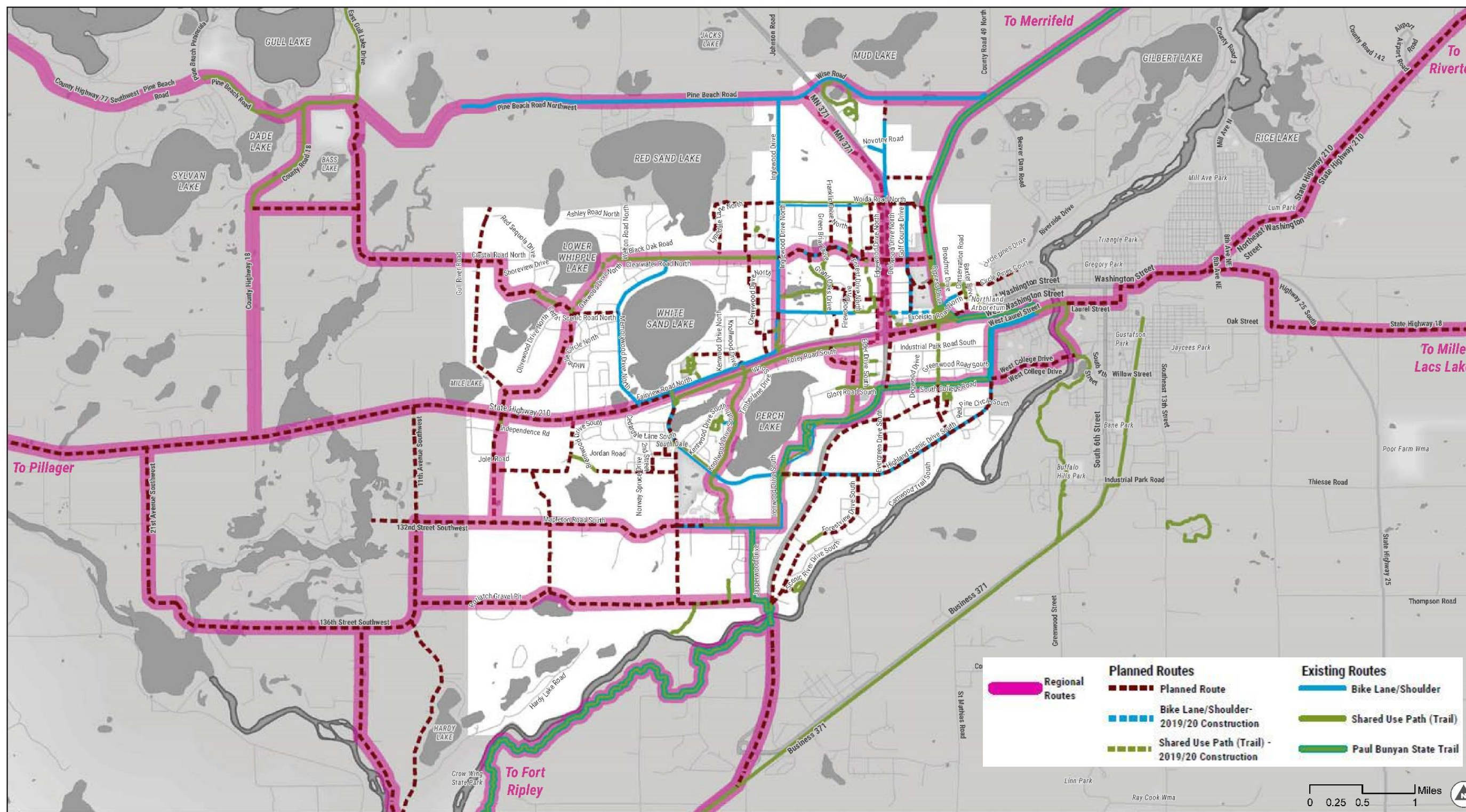


Figure 6. City of Baxter Bike/Pedestrian Existing and Planned Network



* Toole Design Group graphic from Baxter Bike/Pedestrian Guidance document.

Grade-Separated Crossing

The high speeds and volumes on Highway 371 create a barrier for bikes/pedestrians crossing between the east and west sides of the city. As part of this review the need and feasibility of a grade-separated crossing on Highway 371 was considered.

Based on comments received from the Focus Group and city staff, the need for the grade-separated crossing is to address the lack of options for a safe pedestrian crossing. Previous studies have suggested that the grade-separated crossing be located near Clearwater Road, since Clearwater Road provides regional connectivity between Whipple Beach and the Paul Bunyan Trail, and because it will provide future regional connectivity to the Gull Lake trails and Pillsbury State Forest to the west, plus the City of Brainerd and eventually the Cuyuna County State Recreation Area. When considering potential locations for the grade-separated crossing the following was considered:

- **General Feasibility/Cost** – To construct a grade-separated crossing, there is a need for right-of-way on both sides of Highway 371 to accommodate the structured approaches. Additional consideration was also given to the feasibility of constructing trail connection from the roadway network to/from the grade-separated crossing.
- **Encourage bike/pedestrian usage** – The largest residential area in Baxter is located west of Highway 371 and north of Highway 210. Providing a central location where residents can easily access the trail from their homes will likely encourage pedestrians/bicyclist to use the crossing. High pedestrian/bicyclist generators include the commercial businesses along Highway 371, Paul Bunyan Trail, Whipple Beach, Cypress Drive South to College Road (future trail connection), Camp Ripley Veterans Trail, and the Northland Arboretum.
- **Connectivity** – Local sidewalk, trail, and/or bike paths should be constructed to the grade-separated crossing to provide safe connecting routes to/from points of interest. If the grade-separated crossing provides regional connectivity, more bikes/pedestrians are expected to use it. The Gull Lake trail is a regionally designated trail system connecting the Gull Lake area to the Paul Bunyan Trail from Nisswa to Baxter.
- **Long-term planning** – When planning a regional connection such as a grade-separated crossing, it is important to consider previous planning studies that have considered a bike/pedestrian crossing along Highway 371 or future transportation projects such as a Highway 210/371 grade-separated intersection. While the project and timeline for the Highway 210/371 grade-separated intersection is unknown at this time, this project will likely have impacts to the north along Highway 371 to near Excelsior Road. There is also potential that the Highway 210/371 project could construct a bike/pedestrian grade-separated crossing as well.

The segments along Highway 371 north of Woida Road, between Woida Road and Excelsior Road, and south of Excelsior Road were considered based on the four criteria listed above and summarized in the evaluation matrix shown in Table 5.

Table 5. Grade-Separated Crossing Location – Evaluation Matrix

Criteria	Near or North of Woida Road	Between Woida Road and Excelsior Road	Near or South of Excelsior Road
Cost	Narrow ditch between frontage road and Highway 371 on west side (limited space to construct); potential building/ROW/ access impacts	Potential to construct structured approaches in the ditch or bridge can span across the frontage roads; potential building/ROW/access impacts	Potential to construct structured approaches in the ditch or bridge can span across the frontage roads; potential building/ROW/access impacts
Bike/Ped Usage	Low usage	High potential usage	High potential usage
Connectivity	No planned trail connections	Planned trails; clearwater road provides the most strategic regional and local connectivity; addresses missing gap in multi-modal network	Existing and planned trails
Long-Term Planning	Not consistent with long-term planning	Consistent with long-term planning to construct crossing in this area	Potentially impacted by MnDOT future plans to construct Highway 210/ 371 grade separated intersection; if bike/ pedestrian bridge constructed here; the project should coordinate with the MnDOT project

Based on a review of feasibility, potential to generate higher pedestrian/bicyclist use, connectivity, and consistency with long-term planning - a grade-separated crossing between Woida Road and Excelsior Road was identified for further consideration.

Estimated Bike/Pedestrian Usage

To estimate the daily number of bike/pedestrian users on the future bike/pedestrian bridge, trail count data on the Paul Bunyan Trail as well as bike/pedestrian crossing counts at signalized intersections in Baxter/Brainerd were reviewed.

Information provided in MnDOT’s *2015 State Trail User Count*, estimated that the average daily bike/pedestrian usage along the Paul Bunyan Trail near the Northland Arboretum trail junction in Brainerd to be between 125 and 293 users between April and October. Approximately 53 percent of users were bikes and the remaining were walkers, runners or skaters. The weekend to weekday ratio was estimated to be 182 percent.

Additional traffic count data available from a MnDOT project in the area was also reviewed to provide further context regarding potential use (data is from Thursday, August 23, 2018 at seven locations along Highway 371 and Highway 210). A summary of the bike/pedestrian counts are provided in Table 6. As shown, bike/pedestrian counts were highest at locations with sidewalk or trail connections to/from the intersection and near commercial areas. It should be noted that the Paul Bunyan Trail crosses on the south approach of the Highway 371/College Road intersection.

Table 6. Bike/Pedestrian Counts at Highway 371 and Highway 210 Intersections

Intersection	Crossing Highway 371 or Highway 210		
	Pedestrians	Bikes	Total
Highway 371/Wolda Road	4	6	10
Highway 371/Excelsior Road	1	0	1
Highway 371/College Road *	9	25	34
Highway 210/8th Street *	69	48	117
Highway 210/6th Street *	25	0	25
Highway 210/4th Street *	53	19	72
Highway 210/4th Street NW *	22	9	31

* Intersections have sidewalk or trail connections leading to/from them.

Based on a review of the bike/pedestrian count information on the trail system and at intersections with sidewalk and/or trail connections, once trail connections are provided along **Clearwater Road between Inglewood Drive and Cypress Drive the bike/pedestrian bridge is expected to have a daily use of 50 to 100+ bikes/pedestrians**. Bikes/pedestrians using the bridge are expected to use it for multiple trip purposes including regional connectivity to the Paul Bunyan trail or east/west across the city (comparable to the Paul Bunyan Trail Counts and the Highway 371/College Road count) as well as trips to/from the commercial businesses along Highway 371 (comparable to the Highway 210 counts shown in Table 6).

Alignment Options and Evaluation

The following assumptions/parameters were assumed when developing the grade-separated crossing alignment options:

- Accessible to all pedestrians, including those in wheelchairs.
- Crossing should be located/designed to minimize the travel required to access it.
- The grade-separated crossing was assumed to be a bridge and not an underpass due to water table and drainage issues along Highway 371.
- Future trail along Clearwater Road was assumed to be on the north side to tie into the existing trail segment west of Inglewood Drive. Further, based on available space within the Highway 371 ditches as well as space near the Edgewood Drive and Dellwood Drive roadways, the bridge was assumed to be located north of Clearwater Road.
- The structured approaches were assumed to be approximately 400 feet.
- Structured ramps on piers were assumed rather than a structured embankment with retaining walls. A structured ramp with piers is preferred in this area for better sightlines and drainage around the structure, especially if the ramps are located within the existing ditch.
- Due to major wet utilities, the concepts avoided placing substructures in the ditch area east of Highway 371.
- Concepts assume that right-of-way to locate structure and ramps can be acquired.
- To support the bridge space, a pier was assumed to be in the median between northbound/southbound Highway 371.
- Concepts assume that future pedestrian facilities (sidewalk or trail) will be provided along the west side of Edgewood Drive and the east side of Dellwood Drive.

Seven (7) alignment options were developed for a bike/pedestrian bridge north of Clearwater Road and are provided in Appendix B. The benefits and challenges of each alignment option are summarized in Appendix C. The alignment options were developed in coordination with city and MnDOT staff. City and MnDOT staff were presented preliminary options for consideration prior to finalizing a set of options to carry forward to the Focus Group for feedback. Two meetings were held with MnDOT to review issues, needs, and preliminary options. During these meetings ideas were discussed, along with potential for other activities in the area. Following the second meeting it was agreed that the options should be carried forward to the Focus Groups for input/feedback.

The alignment options were then presented to the Focus Group in March 2019. Key discussion items from the Focus Group included:

- **Avoid sharp turns.** Sharp 90-degree turns and switchbacks to a lesser extent are challenging for bikers to navigate. Additional concerns with bikers making a wide turn around and potentially hitting a pedestrian or another biker.

- **Bikers prefer direct routes.** In general, most of the bikers in the focus group prioritized traveling thru to the regional network (such as Paul Bunyan Trail) rather than prioritizing accessing the businesses along Highway 371.
- **Provide access to the frontage roads.** Focus Group members noted the importance of pedestrians being able to access the frontage roads (Edgewood Drive and Dellwood Drive) and reducing the distance traveled for pedestrians crossing from the east to the west and vice versa. It was noted that stairs should be considered in addition to the ADA ramps to provide an option that reduces the walking distance to access the frontage road.
- **Reducing visual obstructions.** The proposed bridge alignment options all obstruct the businesses visually. It was noted that the switchback option blocks businesses more than the structured ramps.
- **No at-grade crossings at the frontage roads.** Focus Group members preferred options where the bridge would span across both frontage roads and not the options with an at-grade crossing at Edgewood Drive.

Option #7 (see Figure 7) was identified to be the locally preferred alignment by the Focus Group since it provides a relatively direct route for bikers across Highway 371 continuing along Clearwater Road, as well as an opportunity to provide a direct route for pedestrians to access the businesses along the frontage road (either via a trail along Edgewood Drive or Dellwood Drive or via a backage trail system). In addition, the bridge in Option #7 spans both frontage roads.

Option #1 was also identified as an option by some members of the Focus Group; however, there was one small group that identified Option #1 as their least favorite option due to the lack of pedestrian access to the businesses along the frontage roads (see Appendix B for Option #1 image). In addition, Option #1 potentially creates sightline issues for vehicles turning from Highway 371 and traveling on the frontage road, may have greater utility impacts in the northeast quadrant of the Highway 371/Clearwater Road intersection which would require relocating utilities at an additional cost to the project, and requires access closure along Clearwater Road to the developments in the northwest and northeast quadrants. Therefore, Option #1 was not recommended for further evaluation.

Drainage and utility conflicts with the preferred alignment were identified as part of this project. A graphic illustrating the conflicts as well as potential mitigation and associated costs for the impacts are summarized in Appendix B. **The estimated cost for the locally preferred overpass alignment is \$5,500,000, which includes construction costs, engineering design, and construction administration.** Additional information regarding design standards, potential lighting mitigations, right-of-way and utility impacts, feasibility and cost estimates are provided in Appendix B.

Figure 7. Option 7 - Locally Preferred Grade-Separated Crossing Alignment



Expected Maintenance

Bridges are designed for a service life of 50 to 75 years, but many of them can last longer if well-maintained. Regular bridge inspection (typically at 2-year intervals) can help determine what maintenance items are needed. Typical preventative maintenance, such as flushing the bridge deck, joints, bearings and other superstructure elements to remove corrosive salts are minimal and in the range of \$500 per year. Other maintenance costs, such as crack sealing or steel structure painting, are highly dependent on the structure type and structure condition. Crack sealing costs can range from \$10,000 to \$15,000 and can be anticipated to occur at 10 year intervals. Steel structure repainting needs and costs range greatly between bridges, from spot painting in the range of \$20,000 to a full structure repainting in the range of \$100,000 to \$200,000 at 25 to 50 year intervals.

Funding and Implementation Strategy

Funding opportunities are available which may assist the city with the construction cost of the preferred trail bridge crossing. These can range from involving local funding partners such as private local businesses and Crow Wing County to State and Federal grant programs.

Federal Funds

BUILD Grant (Better Utilizing Investments to Leverage Development Transportation Discretionary Grants Program): Previously known as the TIGER program, these federal grants are to be used by communities to revitalize their surface transportation systems, with a focus on projects in rural areas.

INFRA Grant (Infrastructure for Rebuilding America Discretionary Grants Program): Previously known as the FASTLANE Program, these federal grants are to be used to construct or rehabilitate America's transportation infrastructure. Compared to the FASTLANE Program, INFRA grants have a much greater emphasis on innovation, private sector participation, and economic vitality and competitiveness. It is anticipated that these factors will make freight and intermodal projects excellent candidates for this program.

Federal Transit Administration Formula Grants for Rural Areas: This program provides capital, planning, and operating assistance to states to support public transportation in rural areas with populations less than 50,000, where many residents often rely on public transit to reach their destinations. Eligible bicycle activities include routes to transit, bike racks, shelters and equipment for public transportation vehicles.

State Funds

MN Department of Natural Resources (DNR) Federal Recreational Trail Program: Encourages the maintenance and development of motorized, non-motorized, and diversified trails by providing funding assistance.

MN DNR Regional Trail Grant Program: Eligible projects include acquisition and development of trail facilities outside the seven-county metropolitan area that are considered of regional or statewide significance.

MN DNR Local Trail Connections Program: To provide grants to local units of government to promote relatively short trail connections between where people live and desirable locations, not to develop significant new trails.

MN DNR Parks and Trails Legacy Grant Program: Provides funding for parks and trails of regional significance outside of the seven-county metropolitan area.

Statewide Health Improvement Partnership (SHIP): SHIP is designed to improve health by reducing the risk factors that contribute to chronic disease, thereby reducing health care costs. In 2017, 115 communities were successful in making a change to increase access to facilities for walking and biking. Residents now have access to 40 new or improved bike lanes, 31 new or improved sidewalks, 42 new or improved crosswalks, and 51 enhancements to signage and lighting

State Transportation Improvement Program (STIP) is the state's four-year transportation improvement program. It includes local transportation projects with federal funding and state funded transportation projects and updated on an annual basis. Through an application process, local projects may be awarded grant funding for construction costs up to 80% of a project with a 20% local match commitment. The local match can be compiled of local funding partners and may be supplemented in some instances with state funding assistance. Regular application cycles are scheduled for future grant programs. More information is available at the following web address: <https://www.dot.state.mn.us/planning/program/stip.html>.

Intersection Assessment and Recommendations

To address the bike/pedestrian crossing issues identified at the Excelsior Road and Wolda Road signalized intersections along the Highway 371 corridor, a range of design tactics/strategies were considered. When evaluating the tactics, consideration was given to reduction in vehicle speed, sight distance/visibility of the crossing, pedestrian/bicyclist exposure to vehicle traffic, pedestrian/bicyclist comfort, connectivity, and vehicle traffic flow. Ease of implementation and cost were also considered in the evaluation process.

The potential mitigation options at the signalized intersections were discussed with city Staff, the Focus Group members, and City Council to assess applicability, appropriateness, and positive and negative attributes. A summary of this process is included in Appendix C. Based on this assessment, the following improvements and implementation outline are recommended:

Highway 371/Excelsior Road

The short and long-term proposed intersection improvements are illustrated in Figure 8 and 9.

- Modify the eastbound/westbound left-turns on Excelsior Road at Highway 371 to protected only left-turn phasing. A protected left turn eliminates the possibility that a driver will misjudge the gaps in road and sidewalk traffic; the driver simply turns when there is a green arrow. **Short-term**
- Install a blank out sign stating “Watch for Pedestrians” at the Highway 371/Excelsior Road intersection. The signs are activated when a pedestrian is crossing via a pedestrian push button or detection. **Short-term**
- Add stop bars to all approaches at the Highway 371 intersection. Stop bars will reduce the likelihood of vehicles stopping on the crosswalk, blocking pedestrians crossing. **Short-term**
- Add bike push buttons along the trail to make it easier for bikers to activate the pedestrian crossing signal timing phase. **Short-term**
- Provide a designated crossing to transition the planned on-street bike lanes on Excelsior Road east of Dellwood Drive to the off-street multi-use trail on the south side of Excelsior Road. As an optional improvement, a rectangular rapid flashing beacon (RRFB) could be installed to increase visibility of the crossing. Two options are shown one that keeps the Kohl’s access open and a second option that closes the Kohl’s access. **Short-term**
- Consider enhanced intersection and corridor lighting to improve visibility. **Short-term**
- Modify the intersection turning radii to reduce vehicle turning speed and create additional space for bikes/pedestrians to queue while waiting for the pedestrian phase at the signal. **Long-term**
- If/when a sidewalk/trail connection is provided along the east side of Dellwood Drive, consider providing a trail segment on the north side of Excelsior Road to connect the Dellwood Drive facility to Highway 371. **Long-term**

Figure 8. Highway 371/Excelsior Road Short-Term Improvement Concept

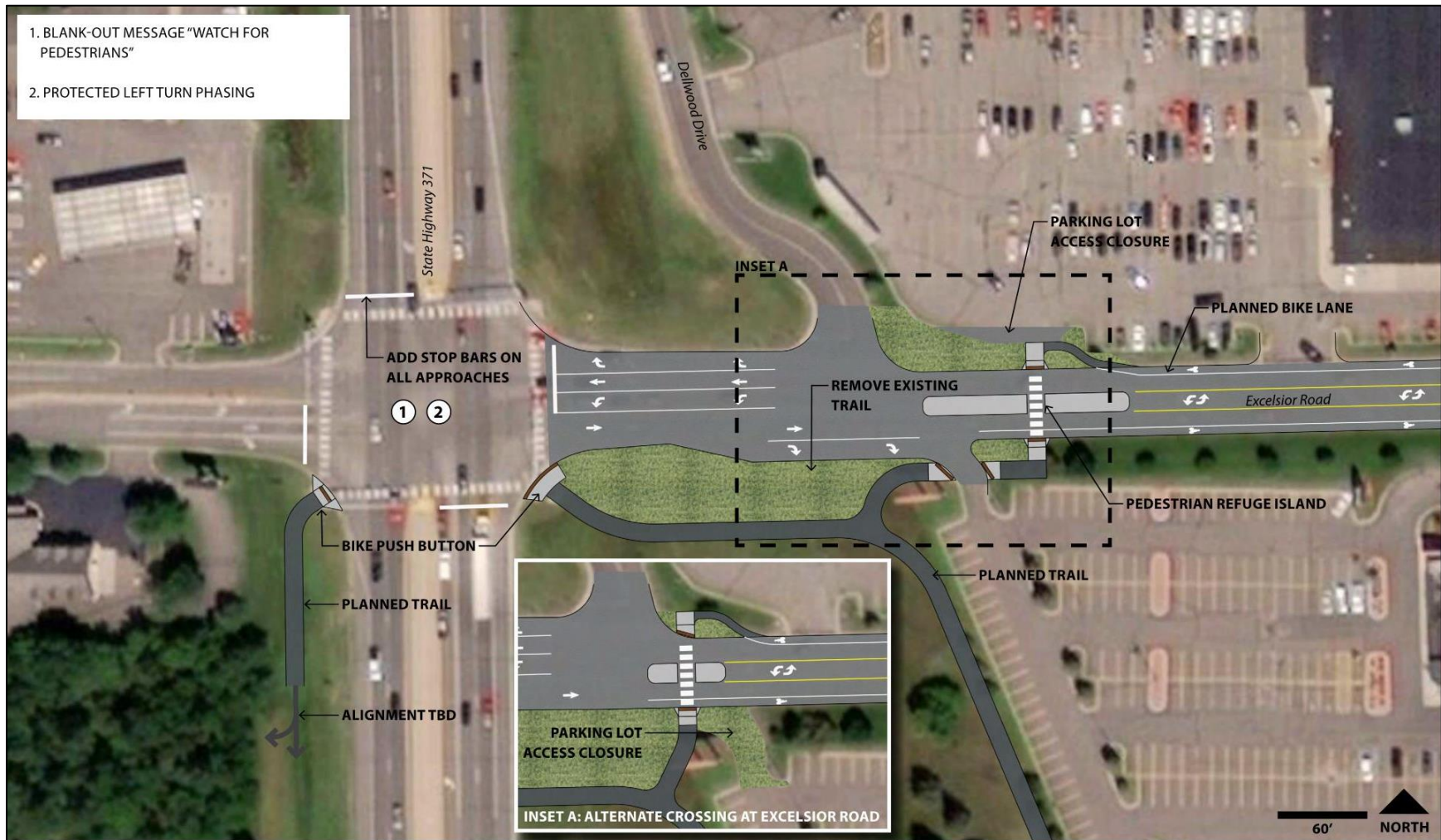
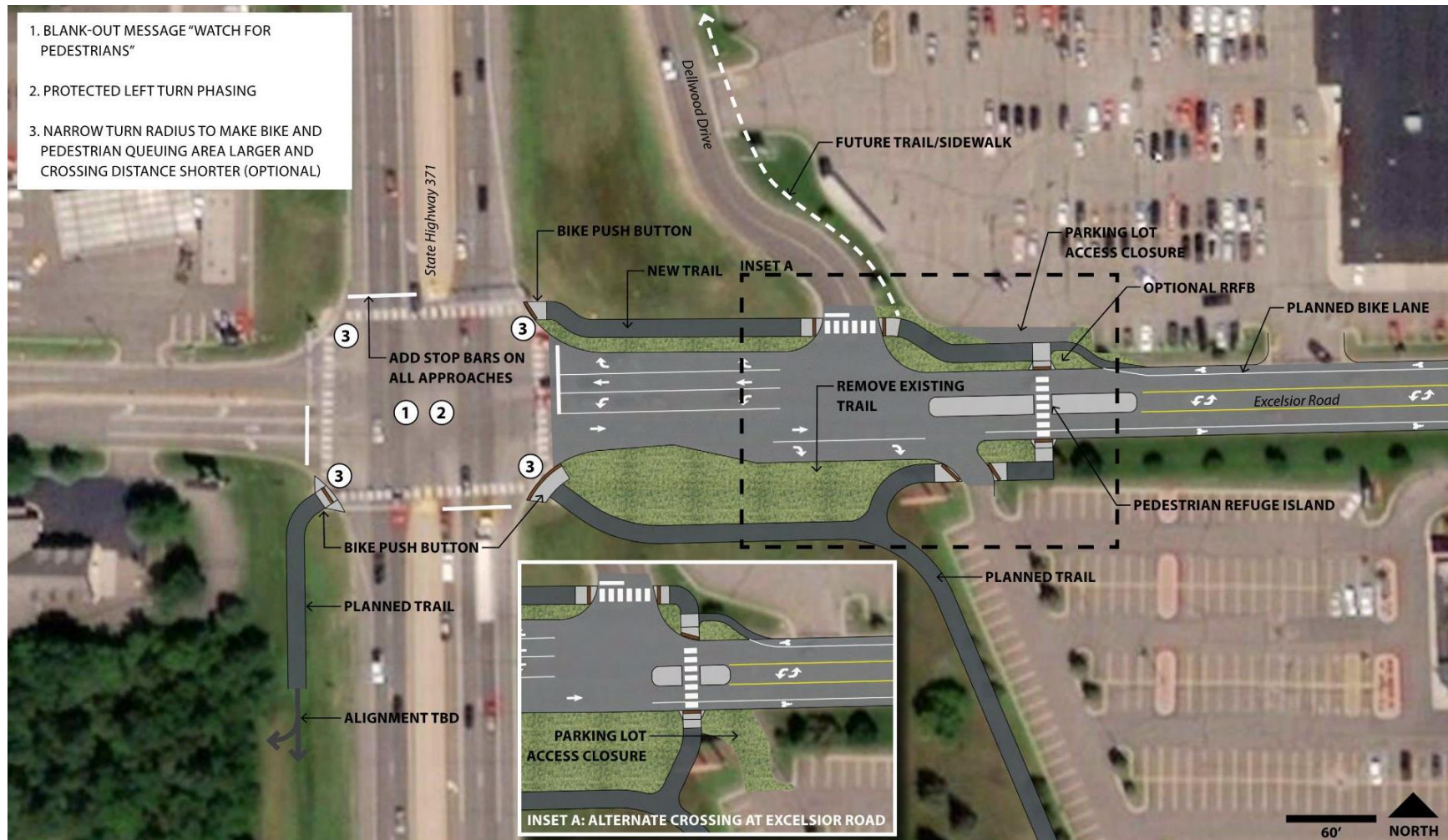


Figure 9. Highway 371/Excelsior Road Long-Term Improvement Concept



Highway 371/Woida Road

The short and long-term proposed intersection improvements are illustrated in Figure 10 and 11.

- Reduce the skew of the north crosswalk at the Highway 371/Woida Road intersection by modifying the northwest turning radii and developing left- and right-turn lanes at the Edgewood Drive/Woida Road intersection. **Short-term**
- Modify the eastbound/westbound left-turns on Woida Road at Highway 371 to protected only left-turn phasing. **Short-term**
- Install a blank out sign stating “Watch for Pedestrians” at the Highway 371/Woida Road intersection. **Short-term**
- Add stop bars to all approaches at the Highway 371/Woida Road intersection. **Short-term**
- Add bike push buttons along the trail to make it easier for bikers to activate the pedestrian crossing signal timing phase. **Short-term**
- Construct a trail on the north side of Woida Road between Lynwood Drive and Highway 371. **Short-term**
- Consider enhanced intersection and corridor lighting to improve visibility. **Short-term**
- Modify the intersection turning radii to reduce vehicle turning speed and create additional space for bikes/pedestrians to queue while waiting for the pedestrian phase at the signal. **Long-term**
- If/when a sidewalk/trail connection is provided along the west side of Edgewood Drive and/or east side of Dellwood Drive, provide a designated pedestrian crossing with a pedestrian refuge island. As an optional improvement, RRFB would increase visibility of the crossing(s). **Long-term**
- If/when a sidewalk/trail connection is provided along the west side of Edgewood Drive and east side of Dellwood Drive, consider providing a trail segment on the south side of Woida Road to connect Edgewood Drive and Dellwood Drive. **Long-term**

Figure 10. Highway 371/Woida Road Short-Term Improvement Concept

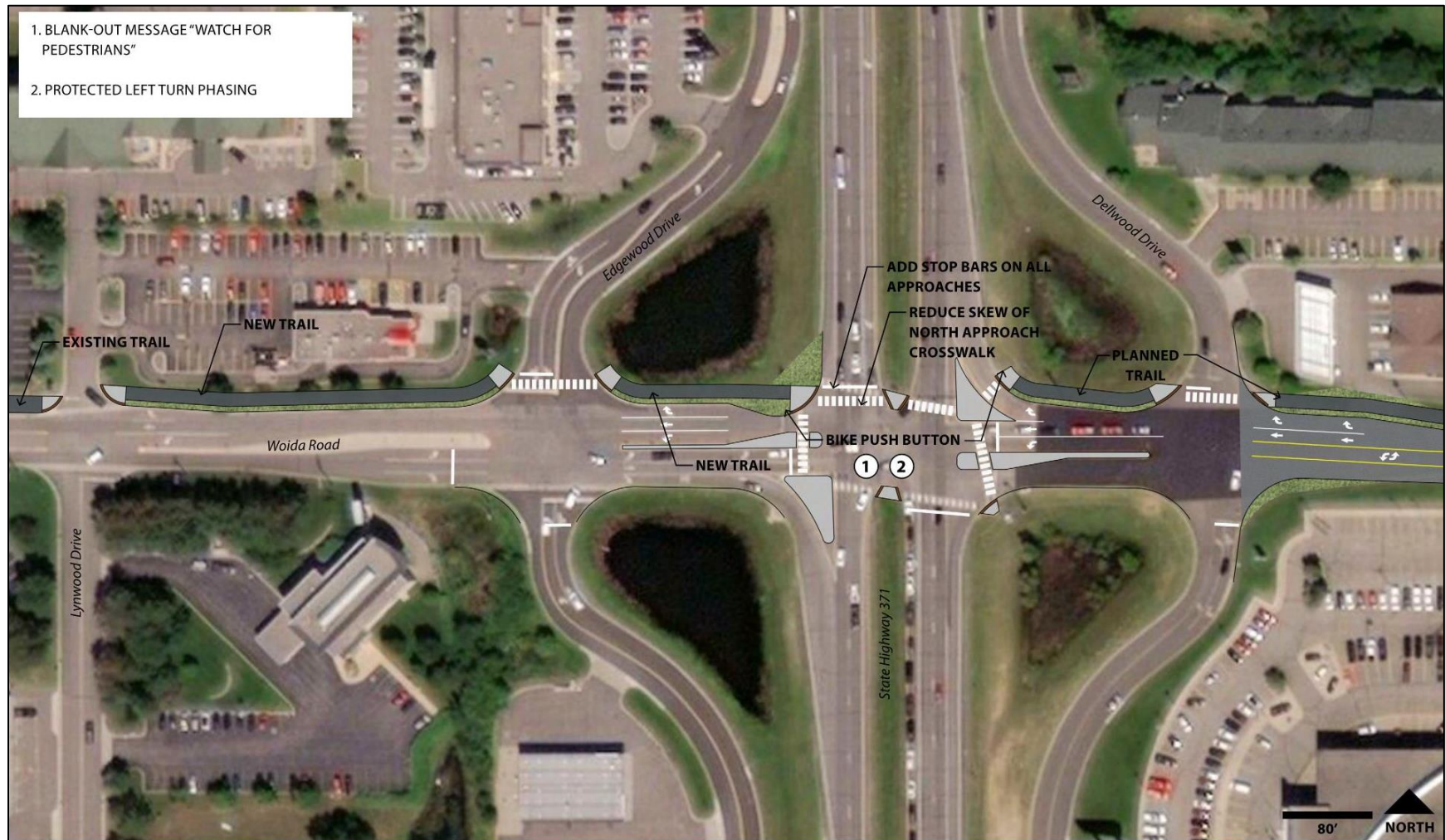
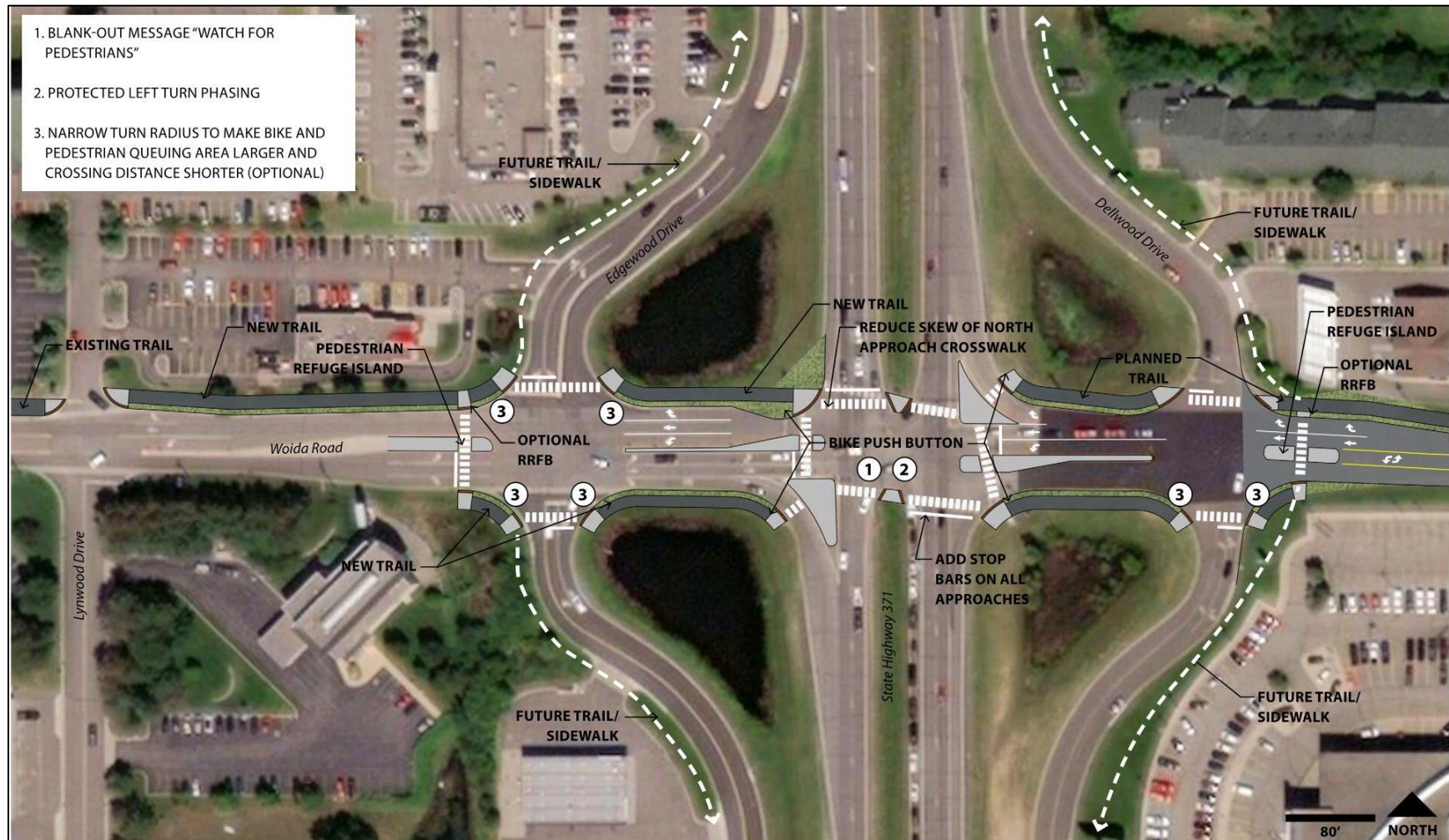


Figure 11. Highway 371/Woida Road Long-Term Improvement Concept



Cost Summary

Detailed cost estimates for the hardscape recommended improvements at the Highway 371/Excelsior Road and Highway 371/Woida Road intersections are provided in Appendix D. Summarized cost estimates are:

Intersection	Excelsior Road	Woida Road
Short Term	\$120,000	\$520,000
Long Term *	\$180,000	\$740,000

* Includes short- and long-term costs

Conclusions/Next Steps

There were several bike and pedestrian improvement options reviewed as part of this study - mainly grade-separated and at-grade improvement options along Highway 371 between Highway 210 and north of Woida Road in Baxter. Based on review of the existing conditions and issues identified along the corridor, a range of potential strategies have been recommended to address these issues and improve safety for bicyclists and pedestrians in this area.

Through the analysis contained herein and engagement with a Focus Group as part of this effort it was determined that safety issues currently exist at key intersections along Highway 371. Focus Group members also expressed feedback to support this issue. Improving the at-grade intersections with additional amenities for bicyclists and pedestrians to cross the roadway in an environment that is more conducive to them will help to improve the users' perception of safety. A grade-separated crossing constructed at, or near Clearwater Road will also improve user safety in that area; removing the bicyclists and/or pedestrians from conflicting with the vehicular traffic is the utmost improvement to safety.

Next Steps

Local partners should continue to monitor conditions along Highway 371 and evaluate opportunities to implement all and/or a portion of the improvements identified as part of this study to ensure the long-term viability of bike/pedestrian activity.

The following steps should be considered by the study partners to move toward implementation:

- 1) Consider construction of some or all the at-grade intersection improvements identified herein.
- 2) Meet with adjacent land owners near the intersections where improvements may impact their right-of-way. This is most critical for the property owners adjacent to the grade-separated option #7 at Clearwater Road.
- 3) Consider conducting a formal feasibility study for the preliminary design and construction of the grade-separated crossing at Clearwater Road.
- 4) Further investigate funding options and coordinate discussions with agency partners to pursue funding.

Appendix A – Comments from Focus Group Meetings

Focus Group Meeting #1 was held at the Northland Arboretum on Wednesday, November 14, 2018; 16 people attended the meeting. The following summarizes comments received regarding current issues with bike/pedestrian crossings along Highway 371 (paraphrased from comments heard).

Small Group Discussion

Why do so few people walk/bike across Highway 371 today? and What are the key issues along the corridor?

1. Safety/comfort issues:
 - a. All three crossings of Excelsior, Clearwater and Woida Road are scary to cross (multiple lanes to cross, high vehicle speeds, not comfortable to cross).
 - b. Excelsior feels the safest of the three intersections, but it doesn't connect to anything.
 - c. The eastbound right-turn at Excelsior Road conflicts with on-street bikers/pedestrians.
 - d. Right-turn on red is permitted; vehicles do not yield to pedestrians.
 - e. If you cross at Woida Road, you better cross on the south side.
 - f. Uncertainty about rules/laws and enforcement.
 2. Connectivity issues
 - a. Large distance between Excelsior Road and Clearwater Road intersections.
 - b. Sidewalk/trail does not lead to Highway 371 (currently) and there is a lack of sign/wayfinding to instruct bikers/pedestrians on what side of the road they should be located or how they should access Highway 371 after the trail dead-ends.
 - c. There is no connectivity to cross Highway 371 but also to access the business along Highway 371; if residents wanted to walk/bike the infrastructure is not there to safely access.
 - d. Investments in improving just the east/west connections may be short-sighted; need to also consider north/south bike/pedestrian connections along/near Highway 371 (i.e. Dellwood or Edgewood).
 3. The context of the corridor doesn't indicate bike/pedestrian activity.
 - a. The businesses along Highway 371 are designed for vehicles and are not bike/pedestrian friendly (parking lots are in front and the building entrances are set back from the road; no sidewalk/trail connections).
 4. Underpass would have ground water, drainage and safety concerns.
-

What are critical pedestrian/bicycle connections near/across Highway 371?

1. Critical to have regional connectivity with the crossing (Paul Bunyan Trail, Baxter Parks and Trails – Whipple Beach, Cypress Drive south to College Road, Camp Ripley Vets Trail, Arboretum).
2. Residential connectivity to businesses near Highway 371 corridor (Target, Taco Bell, Stone House Coffee & Roastery, Caribou, Starbucks, Clearwater Apartments).
3. Hotel connectivity to local businesses and restaurants.
4. Provide wayfinding signage on Paul Bunyan Trail to draw in regional trail users to use Baxter businesses.

Large Group Discussion

On which corridors should we prioritize facilities? Are the current planned facilities in the right locations?

Focus group members were asked to take home the map of existing/planned routes and identify high priority bike/pedestrian routes.

What types of bicycle and pedestrian facilities are you comfortable on?

Images of bike facilities were presented to the group during the meeting. For each bike facility type the focus group was asked to respond with a “thumbs-up” if they felt comfortable biking on that type of facility, a “thumbs-down” if they were not comfortable, or in the middle if they were in between. Results are as follows:

- Shared use path through a park – all thumbs up
- Shoulder lane
 - Not busy road – split results
 - Busy road – mostly thumbs-down
- Buffered bike lane – mostly all thumbs-up
- Painted bike lane on road – split results
- Sharrow (Shared Lane Arrow) – mostly thumbs-down

What are some example intersections where you’ve had a positive experience walking or biking?

Crossings mentioned:

- The pedestrian beacon at the Excelsior Road/Conservation Drive intersection.
 - The pedestrian beacon along Isle Drive near Essentia Health.
 - Paul Bunyan Trail bridge crossing of Excelsior Road.
 - When asked if there was an example like crossing Highway 371, no example intersections were provided.
-

What three locations along Highway 371 should we identify for improvement?

Focus group members were asked to respond via email after the meeting with their input. At the meeting, we discussed considering Woida Road, Clearwater Road, and Excelsior Road, but comments were also made that we should not just focus on these three existing crossings, but look for potential crossings where there is vacant land as well to construct a grade-separated crossing.

Word Cloud Activity

What is your vision for Highway 371 specifically for people that walk or bike the corridor?



What are the pros and cons of pedestrian and bicycle network activity?



Focus Group Meeting #2 was held at the Northland Arboretum on Tuesday, March 26, 2019; 12 people attended the meeting. The following summarizes comments received regarding the Highway 371 grade-separated crossing and intersection improvement concepts (paraphrased from comments heard).

Seven (7) Highway 371 grade separated crossing options were presented to the focus group near the Clearwater Road intersection. The small groups were asked 1) What options are you most likely to use? 2) Any issues with any of the options? 3) Prioritize the options (pick-up favorite and least favorite options).

5. Key discussions items (Focus Group members split into three small groups):

- a. Sharp right-turns and switchbacks (although to a lesser extent) are challenging for bikers to navigate (sharp right turns or switchbacks proposed on Options 2, 3, 4, 5, and 6). Concerns with bikers making a wide turn around and potentially hitting a pedestrian or another biker.
- b. Bikers prefer direct routes. In general, most of the bikers in the focus group prioritized traveling thru to the regional network (such as Paul Bunyan Trail) rather than prioritizing access to the businesses along Highway 371.
- c. Focus Group members noted the importance of pedestrians being able to access the frontage road and reducing the distance traveled for pedestrians crossing from the east to the west and vice versa. Multiple groups asked if stairs could be added in addition to the ADA ramps to provide an option that reduces the walking distance to access the frontage road.
- d. All three groups discussed how the proposed bridge would obstruct the businesses visually. It was noted that the switchback option block businesses more than the structured ramps.
- e. All three groups favored options that the proposed bridge would span across both frontage roads and not options that proposed an at-grade crossing at Edgewood Drive.

6. Favorite Options

- a. All three groups identified Option #7 as a preferred option.
 - i. Provides a relatively direct route for bikers across Highway 371, continuing to Clearwater Road as well as an opportunity to provide a direct route for pedestrians to access the businesses along the frontage road (either via a trail along Edgewood Drive or Dellwood Drive or via a backage trail system).
 - ii. Bridge spans across both frontage roads, which was identified to be a safer condition than at-grade crossings on the frontage road(s).
 - iii. Visually blocks businesses for vehicles traveling southbound. However, all bridge options had some visual obstruction.
 - b. Two groups identified Option #1 as a preferred option. Option #1...
 - i. Similar to Option #7, provides a direct route (more direct than Option #7) and has a bridge that spans across both frontage roads. Option #1 also visually blocks business; this option blocks businesses for vehicles traveling northbound.
-

- c. One group identified a combination of Option #4 (west side of Highway 371) and Option #7 (east side of Highway 371) as a preferred option. The group preferred Option #4 over Option #7, if the distance across and the overall cost was less than Option #7.

7. Least Favorite Options

- a. One group identified Option #1 as their least favorite option due to the lack of pedestrian connections to the frontage roads
- b. One group identified Options #2 and #3 as their least favorite options
- c. One group identified Options #2, 3, 4, 5, and 6 as their least favorite options

At-grade intersection improvement concepts at the Highway 371/Excelsior Road and Highway 371/Woida Road intersections were presented to the focus group. The small groups were asked:

- 1) Are you more likely to cross at Excelsior Road or Woida Road with the improvements?**
- 2) What are your general thoughts on the concepts?**
- 3) Other ideas to improve/add to the concepts?**

1. Comments provided for the Woida Road concepts:

- a. The three-way stop at the Edgewood Drive intersection that was recently installed was noted to be an improvement. Consideration should be given to installing a three-way stop at the Dellwood Drive intersection (pending review of traffic operations).
- b. Crossing north/south along Woida Road at the frontage roads feels safer than crossing the north approaches. Vehicles turning from Highway 371 onto Woida Road are traveling fast and not looking for pedestrians/bicyclists, especially when they are turning onto Edgewood Drive or Dellwood Drive.
- c. Any improvements to the current condition would help.
- d. In general, the comments received were that the concepts presented were the best that could be done. However, people still have hesitation/concerns with walking/biking through this area.
- e. Consider also adding lighting improvements to the street and intersections.

2. Comments provided for the Excelsior Road concepts:

- a. As a pedestrian or bicyclist, traveling along Excelsior Road feels safer than Woida Road due to the slower vehicle speeds.
 - b. In general, the comments received were that the concepts presented were the best that could be done.
 - c. Consider also adding lighting improvements to the street and intersections.
-

Appendix B – Grade-Separated Crossing Alignments and Technical Review

The locally preferred location for a multi-use trail grade-separated crossing of Highway 371 was determined to be at the Clearwater Road intersection. The initial conceptual investigation considered alternative locations, varying alignments, and multiple layouts of structured approaches.

Early consideration was given to a trail underpass of Highway 371 in lieu of an overpass structure. However, due to the high-water table elevation and major utility impacts, that option was not advanced for consideration. This report focuses on identifying a preferred alignment for a trail overpass structure.

Design Standards

Geometric criteria for the overpass structure includes ADA compliance and accessibility, MnDOT LRFD Bridge Design Manual, State Aid Minimum Bicycle Path Standards, and the MnDOT Bikeway Facility Design Manual. These standards identify the geometric requirements with respect to trail width, slope, vertical and lateral clearance requirements, and facility design speed. Critical geometry requirements include:

- Preferable maximum grade of five (5) percent along the trail alignment (8.33 percent with landings is allowable)
- Two (2) percent maximum cross slope
- 12-foot wide minimum structure clear width
- 17'-4" minimum vertical clearance over Highway 371 (All study options assume Highway 371 is not a house moving route. If Highway 371 is used as a house moving route, additional vertical clearance may be required.)

For the alignment options that utilize a switchback or 90-degree turn in the structured ramp, the alignment will not meet the minimum horizontal curve radius of 100-feet required for a standard 20-mph design speed per State Aid. For these alternatives, a design exception may be required.

Otherwise, a standard 20-mph design speed with a minimum horizontal curve radius of 100-feet was used for layout, which will not necessitate a design exception from State Aid trail facility standards.

Site Constraints and Geometry Considerations for Grade-Separated Crossing

The existing at-grade intersection of Clearwater Road and Highway 371 also includes crossings for the frontage roads parallel to Highway 371, Edgewood Drive on the west side of Highway 371 and Dellwood Drive on the east side. The closely spaced intersections make it difficult for vehicular traffic to navigate, and adding pedestrian and bicycle traffic through the intersection could introduce safety concerns.

While all layout options considered include a grade-separated crossing of Highway 371 and the east frontage road, Dellwood Drive, some of the layout options utilize an at-grade crossing of Edgewood Drive. To minimize safety concerns for pedestrians by reducing traffic conflicts where Edgewood

Drive crosses Highway 371, at-grade crossings of the frontage road were located north of the Clearwater Road intersection.

The businesses in the northwest quadrant of the Clearwater Road and Highway 371 intersection are First National Bank North and Best Buy. There is a small pond between the two buildings and their respective parking lots. RiverWood Bank, StoneHouse Coffee & Roastery, and Target are in the northeast quadrant of the intersection. RiverWood Bank and StoneHouse Coffee share a building and parking lot, which is separated from Target by an access road that connects to Dellwood Drive. The proximity of the businesses to Clearwater Road and the frontage roads offers minimal space to locate a structured crossing and the necessary structured approach ramps. Thus, layouts considered assume that parking or access road space can be repurposed as needed. The City indicated that the west side of the Target parking lot or the access road between Target and StoneHouse Coffee/RiverWood Bank may be available to locate the structured ramps, with some mitigation of parking or business access. Depending on the layout selected, the overpass and the ramps could visually block part of one or more of these businesses from vehicular traffic. If determined in final design, some mitigation in the form of new signage could be considered if appropriate.

All grade-separated crossing layouts assume the approach ramps will connect to a future sidewalk or trail connection along the north side of Clearwater Road. All options assume the necessary right of way can be acquired.

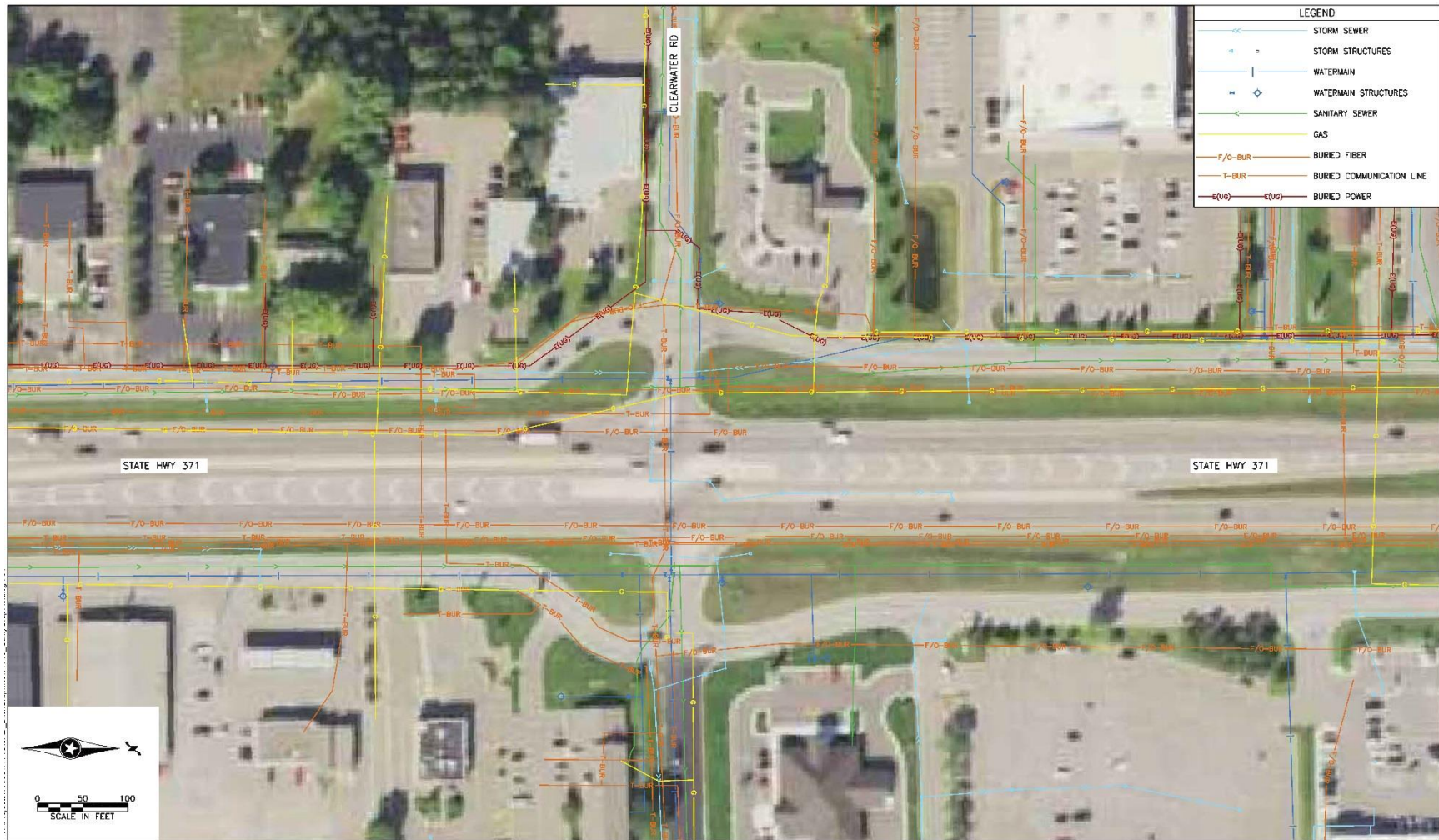
Utility Considerations

A Gopher State One Call (GSOC) design locate for as-built records of existing utilities was requested in October 2018 (Ticket No. 182883169). As-built utility information received was compiled into a site utility file. A graphic was generated which reflects the existing utilities near the proposed crossing (see Figure B1). Additional utility information was received in March 2019 from the Highway 371 Ditch Cleaning project, which was done with the recent construction of Aldi, north of the Clearwater intersection. These plans confirmed some of the existing utility information that was received with the GSOC. A summary of utility considerations follows below.

The west ditch between Highway 371 and Edgewood Drive contains a gas line and fiberoptic lines running parallel to Highway 371. It was assumed that these utilities could be relocated. Along the west side of Edgewood Drive, there are additional gas, electric, and fiberoptic utilities, as well as wet utilities like storm and sanitary sewers and a watermain. Because these utilities are more expensive to relocate, the structured ramps and crossing were located away from this area.

The east ditch between Highway 371 and Dellwood Drive contains major wet utilities, including a major watermain (10" DIP), sanitary sewer (10" PVC), and a new storm sewer (24" RCP). These utilities would likely be cost-prohibitive to relocate. As a result, there are no bridge structures in the east ditch, and the longest span of the structure crosses Highway 371 northbound, the east ditch, and Dellwood Drive.

Figure B1. Clearwater Road and Highway 371 Intersection - Utility Data



Other buried utilities such as power, fiber optic, telephone lines, etc., can be temporarily protected and supported during construction. Although they may be impacted, they likely will not require service disruptions or permanent relocation. Future design should build on this existing utility information and look to confirm or update utility impacts identified in this report, as the number and location of utilities can vary over time.

Structure Type

Only a trail overpass was considered for the grade-separated crossing of Highway 371. Due to high water tables in the area, an underpass is not practical.

The trail bridge needs to cross, at a minimum, Highway 371 southbound and northbound, the ditch east of Highway 371, and Dellwood Drive, resulting in a minimum bridge length of approximately 280-feet. Some of the layouts considered resulted in a bridge length of up to 500-feet. The practical maximum span for a pedestrian bridge is approximately 150-feet for pre-stressed concrete beams, and about 200-feet for a prefabricated steel truss. Therefore, all layouts assume a multi-span bridge, with a pier located in the Highway 371 median. This study considered a series of prefabricated steel truss sections for the bridge spans, but a pre-stressed concrete beam bridge could be considered for this crossing.

A pedestrian overpass needs to meet a minimum vertical clearance of 17-feet 4-inches from the bottom of the bridge to the roadway surface. At a minimum, depending on superstructure type, the trail surface is approximately 3-feet above the bottom of the bridge, putting the walking surface approximately 20-feet 6-inches to 21-feet above the roadway below. At a five (5) percent maximum trail grade, a minimum approach ramp of 400-feet is required. For this study, structured ramps on piers were assumed rather than a structured embankment with retaining walls. A structured ramp with piers is preferred in this area for better sightlines and drainage around the structure, especially if the ramps are located within the existing ditch.

Future Bridge Maintenance

Bridges are designed for a service life of 50 to 75 years, but many of them can last longer if well maintained. Regular bridge inspection, typically at two (2) year intervals, can help determine what maintenance items are needed. Typical preventative maintenance, such as flushing the bridge deck, joints, bearings and other superstructure elements to remove corrosive salts, concrete crack sealing, and steel structure repainting, are typically performed according to an assigned frequency and can help extend the life of a bridge. Costs of preventative maintenance, such as flushing the bridge superstructure, are minimal and in the range of \$500 per year. Other maintenance costs, such as crack sealing or steel structure painting, are highly dependent on the structure type and structure condition. Crack sealing costs can range from \$10,000 to \$15,000 and can be anticipated to occur at 10-year intervals. Steel structure repainting needs and costs range greatly between bridges, from spot painting in the range of \$20,000 to a full structure repainting in the range of \$100,000 to \$200,000 at 25 to 50-year intervals.

Summary of Options

The scope of this study includes identifying a concept alignment for the grade-separated trail crossing that will encourage use of the crossing in lieu of crossing Highway 371 at grade. Factors considered when developing the layouts options include:

- Locating the crossing to minimize the travel distance required to access it
- Utility impacts
- Minimizing at-grade crossings
- Minimizing impacts to businesses, including partial land acquisitions, access impacts and visual impacts
- Simplifying bridge geometry for a cost-effective structure

Several alignment options were developed and presented to a Focus Group for input. A brief description of the options follows.

Preferred Alternatives

Based on feedback from the City of Baxter, MnDOT, and the local Focus Group, Options 1 and 7 were identified as preferred alternatives. Both Options 1 and 7 eliminate at-grade crossings for trail users, and have an alignment without design exceptions and sharp turns, which is preferred by users and simplifies bridge geometry for a cost-effective structure. Both options locate the crossing on or just off the desired travel route along Clearwater Road.

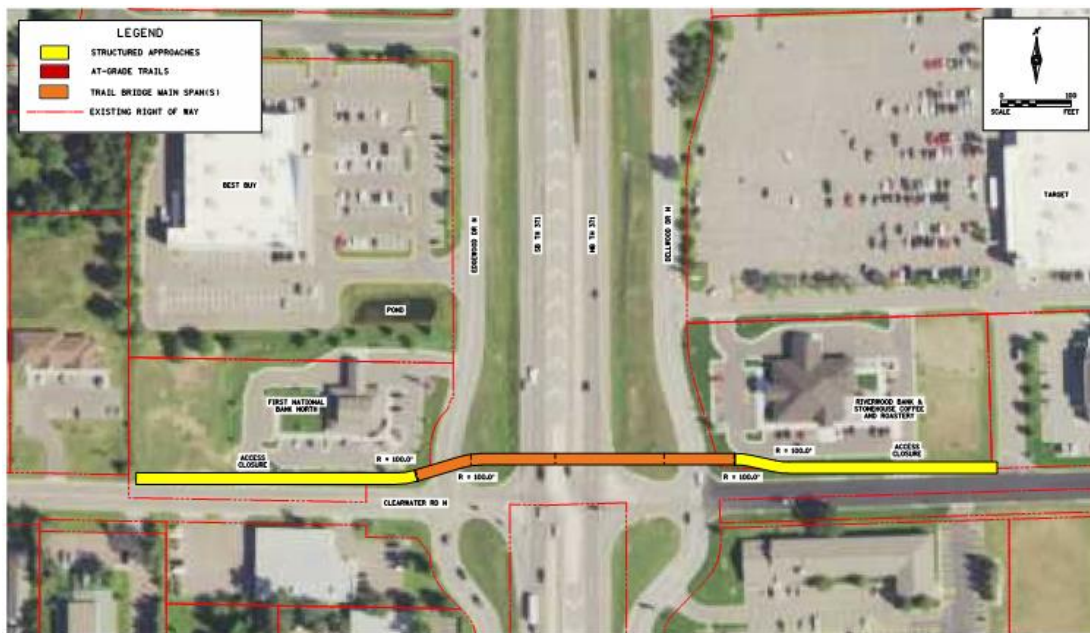
Although Option 1 is the most direct route for trail users, it creates challenges with potential sightline issues, there is limited width to place the structure, and the layout likely has the most utility impacts. Option 7 has a similar benefit to Option 1 in that the alignment directly connects users with their desired destination, with minimal extra travel required to access the crossing. Option 7 also keeps the ramp and bridge piers away from the existing Clearwater and Highway 371 intersection, minimizing potential sightline challenges, and likely has fewer utility impacts than Option 1. **The preferred alignment selected by the project management team is Option 7.**

Additional feedback from the Focus Group inquired whether stair towers could be added to the bridge in addition to the structured ramps for alternate access to the bridge. A stair tower is feasible if the final layout has adequate space for additional structure, but would add cost to the project. However, because the scope of this study was to identify a preferred structure alignment, the location and cost for a stair tower option was not specifically studied for this report.

Option 1

Option 1 is a 4-span bridge spanning over Edgewood Drive, Highway 371, and Dellwood Drive with straight structured ramps.

Benefits	Challenges
Structure spans over both Edgewood and Dellwood frontage roads, eliminating all at-grade crossings for trail users	Sightline concerns at the Clearwater intersection due to piers in the ditches of Highway 371, the median of Highway 371, and on either side of the frontage roads
Alignment is closest to Clearwater of all options presented, the most direct route for trail users	Available width along the north side of Clearwater for structured ramps limits lateral clearance from roadway to ramp piers
Straight ramp and bridge alignment simplifies bridge construction	Structured ramps may partially block view of businesses from traffic on Clearwater
Straight alignment preferred by bicyclists	Utility relocation likely required due to piers in ditches on either side of Highway 371
No anticipated design exceptions from State Aid standards	Closes two (2) commercial driveway accesses: from Clearwater Road to First National Bank, and RiverWood Bank and StoneHouse Coffee. Frontage road access would remain open.
No impact to existing business parking lots	Impacts portions of three (3) private parcels



Option 7

Option 7 is a 3-span bridge spanning over Edgewood Drive, Highway 371, and Dellwood Drive, with curvilinear ramps.

Benefits	Challenges
Structure spans over both Edgewood and Dellwood frontage roads, eliminating all at-grade crossings for trail users	West ramp and its substructures may impact the existing pond, potentially requiring mitigation or regrading of pond
Crossing is Closer to Clearwater than Option 2, increasing user awareness and likely usage of structure	May require closing access road between Target and StoneHouse Coffee/RiverWood Bank and/or driveways to the businesses. If access is impacted, possible mitigation with new access points may be considered.
Minimal visual impact to businesses from Highway 371 and Clearwater	Impacts portions of three (3) private parcels
Alignment can tie directly into future sidewalk on north side of Clearwater on both the east and west ramps, providing reasonable direct connection for trail users.	
Alignment allows pedestrian and bicyclists to be smoothly diverted to crossing structure, discouraging the at-grade crossing of Highway 371	
Long curves without sharp turns preferred by bicyclists and pedestrians	
No impact to Target parking lot, with no loss of parking stalls	



Other Alternatives

Option 2

Option 2 is a 2-span bridge spanning over Highway 371, and Dellwood Drive with straight structured ramps, with an at-grade crossing of Edgewood Drive.

Benefits	Challenges
<p>Straight ramps simplify bridge construction</p> <p>Straight ramp in the existing Target parking lot has narrowest footprint of options presented, minimizing impact to Target parking</p> <p>Shortest bridge structure of options presented (similar to Option 3)</p> <p>No commercial driveway impacts</p>	<p>Crossing is farthest away from Clearwater of all options presented, reducing the perception of direct access to the crossing. Increasing travel distance to the bridge may reduce usage of structure</p> <p>Structured ramp on west approach is in the ditch between Edgewood and Highway 371, using up some of the ditch area currently used for drainage</p> <p>Three at-grade pedestrian crossings: across Edgewood Drive, across First National Bank driveway, and across the access road between Target and StoneHouse Coffee/RiverWood Bank.</p> <p>Long, straight ramps may visually block Target and Best Buy from Highway 371 traffic</p> <p>90-degree turn at top of ramps requires design exceptions and may be difficult for bicyclists to navigate</p> <p>Impacts portions of four (4) private parcels</p>



Option 3

Option 3 is a 2-span bridge spanning over Highway 371, and Dellwood Drive with switchback ramps, and an at-grade crossing of Edgewood Drive.

Benefits	Challenges
<p>Crossing is Closer to Clearwater than Option 2, reducing perceived travel distance to the bridge, which could increase user awareness and usage of structure</p>	<p>Although closer to Clearwater than Option 2, crossing location requires an at-grade path away from Clearwater, increasing travel distance to the bridge, which may reduce usage of bridge crossing.</p>
<p>Switchback ramps are more compact than the straight ramp options, visually blocking less length of Target and Best Buy from Highway 371 traffic</p>	<p>Switchback ramp on west approach is in the ditch between Edgewood and Highway 371, using up some of the ditch area currently used for drainage.</p>
<p>Shortest bridge structure of options presented (similar to Option 2)</p>	<p>The switchback ramp geometry takes up most of the ditch width on the west side of Highway 371, limiting lateral clearance from roadway</p>
<p>No commercial driveway impacts</p>	<p>The switchback ramp for the east approach in the existing Target parking lot is wider than Option 2, increasing impact to Target parking lot and loss of parking stalls.</p>
	<p>Three at-grade pedestrian crossings: across Edgewood Drive, across First National Bank driveway, and across the access road between Target and StoneHouse Coffee/RiverWood Bank.</p>
	<p>Sharp turns at switchback ramps require design exceptions and may be difficult for bicyclists to navigate.</p>
	<p>Impacts portions of four (4) private parcels</p>



Option 4

Option 4 is a 3-span bridge spanning over Edgewood Drive, Highway 371, and Dellwood Drive with a curvilinear ramp on the west and a switchback ramp on the east.

Benefits	Challenges
<p>Eliminates at-grade pedestrian crossing of Edgewood Drive</p> <p>Crossing is Closer to Clearwater than Option 2, reducing perceived travel distance to the bridge, which could increase user awareness and usage of structure</p> <p>The west ramp structure doesn't visually block any businesses from Highway 371 traffic</p> <p>The east switchback ramp is more compact than the straight ramp options, visually blocking less length of Target from Highway 371 traffic</p> <p>No commercial driveway impacts</p>	<p>Although closer to Clearwater than Option 2, crossing location still requires an at-grade path away from Clearwater, increasing travel distance to the bridge, which may reduce usage of bridge crossing.</p> <p>The switchback ramp in the existing Target parking lot is wider than the straight ramp option, increasing impact to Target parking lot and loss of parking stalls.</p> <p>Two at-grade pedestrian crossings: across First National Bank driveway, and across the access road between Target and StoneHouse Coffee/RiverWood Bank.</p> <p>Sharp turns at curved ramp and switchback ramp require design exceptions and may be difficult for bicyclists to navigate</p> <p>West ramp and its substructures may impact the existing pond, potentially requiring mitigation or regrading</p> <p>Impacts portions of four (4) private parcels</p>



Option 5

Option 5 is a 4-span bridge spanning over Edgewood Drive, Highway 371, Dellwood Drive, and the Target access road with switchback ramps.

Benefits	Challenges
<p>Eliminates at-grade pedestrian crossing of Edgewood Drive</p> <p>Crossing is Closer to Clearwater than Option 2, reducing perceived travel distance to the bridge, which could increase user awareness and usage of structure</p> <p>The west ramp structure doesn't visually block any businesses from Highway 371 traffic</p> <p>The east switchback ramp is more compact than the straight ramp options, visually blocking less length of Target from Highway 371 traffic</p> <p>No commercial driveway impacts</p>	<p>Although closer to Clearwater than Option 2, crossing location still requires an at-grade path away from Clearwater, increasing travel distance to the bridge, which may reduce usage of bridge crossing.</p> <p>Longest bridge structure of options presented</p> <p>The switchback ramp for the east approach in the existing Target parking lot is wider than the straight ramp option, increasing impact to Target parking lot and loss of parking stalls.</p> <p>Two at-grade pedestrian crossings: across First National Bank driveway, and across the access road between Target and StoneHouse Coffee/RiverWood Bank.</p> <p>West ramp and its substructures may impact the existing pond, potentially requiring mitigation or regrading of pond</p> <p>Sharp turns at switchback ramps require design exceptions and may be difficult for bicyclists to navigate</p> <p>Impacts portions of four (4) private parcels</p>



Option 6

Option 6 is a 3-span bridge spanning over Edgewood Drive, Highway 371, and Dellwood Drive, with a switchback ramp on the west and a curvilinear ramp on the east.

Benefits	Challenges
<p>Eliminates at-grade pedestrian crossing of Edgewood Drive and the access road between Target and StoneHouse Coffee/RiverWood Bank</p> <p>Crossing is Closer to Clearwater than Option 2, reducing perceived travel distance to the bridge, which could increase user awareness and usage of structure</p> <p>East ramp alignment could tie directly into future sidewalk on north side of Clearwater, providing direct access to the structure to trail users without diverting from desired route</p> <p>The west ramp structure doesn't visually block any businesses from Highway 371 traffic</p> <p>No commercial driveway impacts</p>	<p>Although closer to Clearwater than Option 2, crossing location still requires an at-grade path away from Clearwater on the west approach, increasing travel distance to the bridge, which may reduce usage of bridge crossing.</p> <p>One at-grade pedestrian crossing: across First National Bank driveway</p> <p>West ramp and its substructures may impact the existing pond, potentially requiring mitigation or regrading of pond</p> <p>Sharp turns at switchback ramp require design exceptions and may be difficult for bicyclists to navigate</p> <p>Structured ramp on east side may visually block StoneHouse Coffee/RiverWood Bank from Highway 371 and Clearwater traffic</p> <p>Impacts portions of three (3) private parcels</p>



Cost Estimate

A conceptual cost estimate has been prepared for the locally preferred alternative grade-separated crossing (Option 7) and is summarized in the table below:

Item Description	Unit	Concept Quantity	Unit Cost	Total Cost
Pedestrian Bridge	SQ FT	6,100	\$250	\$1,525,000
Structured Approaches	SQ FT	13,250	\$220	\$2,915,000
Bituminous Trail	SQ FT	4,020	\$25	\$100,500
Subtotal				\$4,540,000
Engineering & Construction Administration (20%)				\$908,100
ESTIMATED COST FOR PROJECT PLANNING (Includes Consideration for Incidentals)				\$5,500,000 *

* Does not include utility relocation

The unit cost associated with the “Pedestrian Bridge” item includes all materials and labor to furnish and install the prefabricated steel truss, piers and footings for the main bridge spans. The unit cost associated with “Structured Approaches” item includes all materials and labor to furnish and install the superstructure, substructures and footings for the structured ramps. Items not included are aesthetic enhancements such as lighting and concrete formliners, and possible stairs.

The unit cost associated with the item “Bituminous Trail” includes all materials to furnish and install 4” base aggregate Class 5, a 3-inch section of bituminous trail, grading, excavation and backfill, erosion control, and turf establishment. Items not included are enhanced landscaping features, drainage systems and structures, storm water BMP’s, and traffic control and staging. The quantity includes the distance needed from the ends of structured ramps to a future sidewalk or trail on the north side of Clearwater Road.

Costs for municipal adjustments have not been included in the conceptual estimate below. Municipal adjustments necessary may include, but are not limited to, relocating closed business access, loss of parking stalls, mitigating visual impacts to businesses due to structure by providing new signage, and regrading drainage pond at northwest quadrant of intersection.

Cost contingencies have not been considered in the cost estimate in this report for any utility relocations or Right-of-Way acquisitions as these can be negotiated costs. A contingency for these items is recommended for planning purposes by the City. Further, a detailed feasibility study should be conducted to determine construction, right-of-way, and other costs associated with constructing this pedestrian bridge.

Costs are reported in 2019 dollars. Consideration for future planning should provide for annual cost inflation depending on the anticipated year of construction.

Appendix C – At-Grade Intersection Assessment

Highway 371/Excelsior Road



Existing Crossing Conditions	Assessment	Potential Mitigation Options
<p>Marked crosswalk</p> <p>Trail in the SE quadrant</p> <p>Push button activators</p> <p>Push button activator on separate pole</p> <p>Truncated domes</p> <p>Pedestrian countdown timers</p>	<p>Walk time MUTCD compliant</p> <p>Planned trails on the south side of Excelsior west of Highway 371</p> <p>Planned on-street bike lanes on Excelsior Road east of Dellwood Drive</p> <p>No planned crossing to transition on-street bike lanes to the trail</p> <p>Low bike/pedestrian crossing volumes (likely due to no trail connectivity to/from Highway 371)</p> <p>Comments provided that vehicles frequently do not look for bikes/pedestrian crossings</p>	<p>Add protected left-turn phasing on Excelsior Road at Highway 371</p> <p>Add stop bars at Highway 371/Excelsior Road</p> <p>Add blank out signage stating “watch for pedestrians” at Highway 371/Excelsior Road</p> <p>Reduce turning radii and increase queuing storage area for bike/pedestrians</p> <p>Add easily accessible bike push buttons on the trails</p> <p>Add a crossing with a pedestrian refuge island crossing Excelsior Road east of Dellwood Drive to transition to the bike lanes to the trail onto the south side</p> <p>Add a trail on the north side of Excelsior Road connecting Dellwood Drive and Highway 371</p>

Highway 371/Woida Road



Existing Crossing Conditions	Assessment	Potential Mitigation Options
<p>Marked crosswalk</p> <p>Push button activators</p> <p>Push button activator on separate pole</p> <p>Truncated domes</p> <p>Pedestrian countdown timers</p> <p>Pedestrian Refuge Island</p>	<p>Walk time MUTCD compliant</p> <p>Planned trails on the north side of Woida Road east of Highway 371</p> <p>Low bike/pedestrian crossing volumes (likely due to no trail connectivity to/from Highway 371)</p> <p>Comments provided that vehicles frequently do not look for bikes/pedestrian crossings</p> <p>Crosswalk skewed on the north side, increasing crossing distance</p>	<p>Reduce the skew of the north crosswalk by modifying the NW radii and developing left- and right-turn lanes at the Edgewood Drive/Woida Road intersection</p> <p>Add protected left-turn phasing on Woida Road at Highway 371</p> <p>Add stop bars at Highway 371/Woida Road</p> <p>Add blank out signage stating “watch for pedestrians” at Highway 371/Woida Road</p> <p>Reduce turning radii and increase queuing storage area for bike/pedestrians</p> <p>Add easily accessible bike push buttons on the trails</p> <p>Add a crossing with a pedestrian refuge island crossing Woida Road west of Edgewood Drive and east of Dellwood Drive to provide a north/south crossing</p> <p>Add a trail on the south side of Woida Road connecting Edgewood Drive and Dellwood Drive</p>

Appendix D – Cost Estimates

ENGINEER'S ESTIMATE - SHORT TERM CONCEPTS								
NOTES	ITEM NUMBER	ITEM DESCRIPTION	UNIT	ESTIMATED UNIT PRICE	EXCELSIOR		WOIDA	
					ESTIMATED QUANTITY	ESTIMATED COST	ESTIMATED QUANTITY	ESTIMATED COST
	2021.501	MOBILIZATION	LUMP SUM	VAR.	1	\$6,000.00	1	\$25,000.00
2	2104.518	REMOVE BITUMINOUS PAVEMENT	SQ FT	\$2.00	4050	\$8,100.00	3160	\$6,320.00
	2104.503	REMOVE CURB & GUTTER	LIN FT	\$5.00	420	\$2,100.00	1580	\$7,900.00
	2104.518	REMOVE CONCRETE WALK	SQ FT	\$2.00		\$0.00	5380	\$10,760.00
	2105.507	EXCAVATION - COMMON	CU YD	\$7.00	90	\$630.00	210	\$1,470.00
	2123.610	STREET SWEEPER (WITH PICKUP BROOM)	hour	\$150.00	10	\$1,500.00	10	\$1,500.00
3	2211.507	AGGREGATE BASE (CV) CLASS 5	CU YD	\$30.00	40	\$1,200.00	190	\$5,700.00
1	2360.509	TYPE SP 12.5 NON WEAR COURSE MIXTURE (3,B)	TON	\$150.00	17	\$2,550.00	65	\$9,750.00
1	2360.509	TYPE SP 12.5 WEARING COURSE MIXTURE (3,C)	TON	\$150.00	17	\$2,550.00	65	\$9,750.00
	2411.618	MODULAR BLOCK RETAINING WALL	SQ FT	\$35.00		\$0.00	1670	\$58,450.00
	2521.518	6" CONCRETE WALK	SQ FT	\$10.00	1250	\$12,500.00	6700	\$67,000.00
	2521.518	3" BITUMINOUS WALK	SQ FT	\$4.00	1420	\$5,680.00	5690	\$22,760.00
	2531.503	CONCRETE CURB AND GUTTER DESIGN B624	LIN FT	\$35.00	420	\$14,700.00	1580	\$55,300.00
	2531.618	TRUNCATED DOMES	SQ FT	\$50.00	150	\$7,500.00	320	\$16,000.00
	2574.507	COMMON TOPSOIL BORROW	CU YD	\$50.00	15	\$750.00	55	\$2,750.00
	2582.518	PAVEMENT MESSAGE PAINT	SQ FT	\$18.00	520	\$9,360.00	2350	\$42,300.00
		CONTINGENCIES						
		CONTINGENCY (DRAINAGE, TRAFFIC CONTROL, TURF, SIGNING)			10.0%	\$11,700.00	5.0%	\$26,000.00
		RIGHT OF WAY IMPACTS			5.0%	\$5,900.00	5.0%	\$26,000.00
		UTILITY CONFLICTS			1.0%	\$1,200.00	4.0%	\$20,800.00
		ENGINEERING AND DESIGN			20.0%	\$23,400.00	20.0%	\$104,000.00
PROJECT TOTAL						\$117,320.00		\$519,510.00

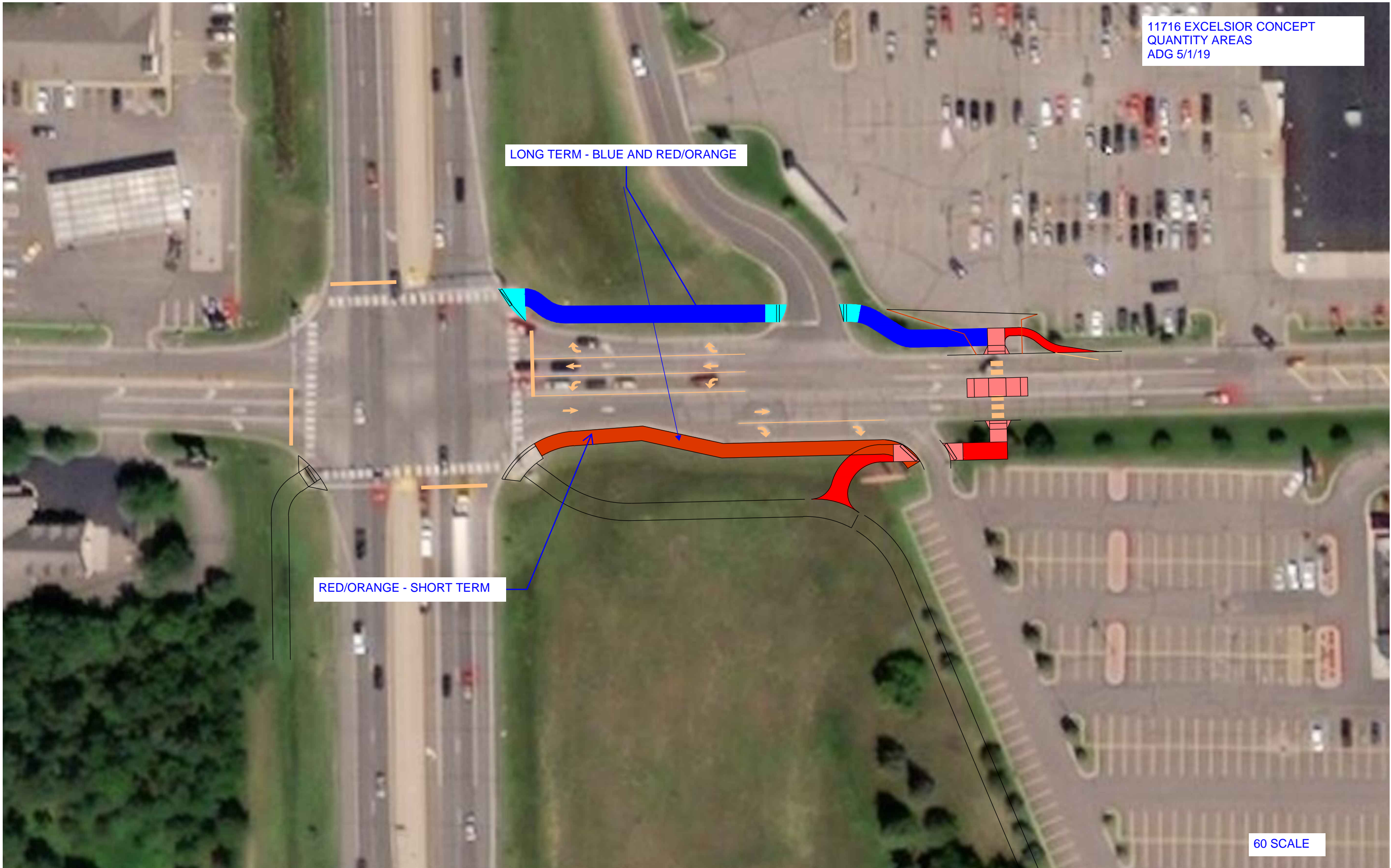
NOTES:

- 1 2 FOOT SECTION ADJACENT TO MEDIANS
- 2 INCLUDING BITUMINOUS TRAIL REMOVAL
- 3 ASSUMES REUSE OF AGGREGATE UNDER REPLACED CURB AND ROADWAY PAVEMENT

ENGINEER'S ESTIMATE - LONG TERM CONCEPTS								
NOTES	ITEM NUMBER	ITEM DESCRIPTION	UNIT	ESTIMATED UNIT PRICE	EXCELSIOR		WOIDA	
					ESTIMATED QUANTITY	ESTIMATED COST	ESTIMATED QUANTITY	ESTIMATED COST
	2021.501	MOBILIZATION	LUMP SUM	VAR.	1	\$9,000.00	1	\$35,000.00
2	2104.518	REMOVE BITUMINOUS PAVEMENT	SQ FT	\$2.00	4183	\$8,366.00	4200	\$8,400.00
	2104.503	REMOVE CURB & GUTTER	LIN FT	\$5.00	540	\$2,700.00	2200	\$11,000.00
	2104.518	REMOVE CONCRETE WALK	SQ FT	\$2.00		\$0.00	5380	\$10,760.00
	2105.507	EXCAVATION - COMMON	CU YD	\$7.00	170	\$1,190.00	421	\$2,947.00
	2123.610	STREET SWEEPER (WITH PICKUP BROOM)	hour	\$150.00	10	\$1,500.00	20	\$3,000.00
3	2211.507	AGGREGATE BASE (CV) CLASS 5	CU YD	\$30.00	110	\$3,300.00	340	\$10,200.00
1	2360.509	TYPE SP 12.5 NON WEAR COURSE MIXTURE (3,B)	TON	\$150.00	22	\$3,300.00	86	\$12,900.00
1	2360.509	TYPE SP 12.5 WEARING COURSE MIXTURE (3,C)	TON	\$150.00	22	\$3,300.00	86	\$12,900.00
	2411.618	MODULAR BLOCK RETAINING WALL	SQ FT	\$35.00		\$0.00	1670	\$58,450.00
	2521.518	6" CONCRETE WALK	SQ FT	\$10.00	1800	\$18,000.00	10520	\$105,200.00
	2521.518	3" BITUMINOUS WALK	SQ FT	\$4.00	4570	\$18,280.00	9885	\$39,540.00
	2531.503	CONCRETE CURB AND GUTTER DESIGN B624	LIN FT	\$35.00	530	\$18,550.00	2200	\$77,000.00
	2531.618	TRUNCATED DOMES	SQ FT	\$50.00	260	\$13,000.00	364	\$18,200.00
	2574.507	COMMON TOPSOIL BORROW	CU YD	\$50.00	45	\$2,250.00	105	\$5,250.00
	2582.518	PAVEMENT MESSAGE PAINT	SQ FT	\$18.00	780	\$14,040.00	4200	\$75,600.00
		CONTINGENCIES						
		CONTINGENCY (DRAINAGE, TRAFFIC CONTROL, TURF, SIGNING)			10.0%	\$18,000.00	5.0%	\$36,900.00
		RIGHT OF WAY IMPACTS			5.0%	\$9,000.00	5.0%	\$36,900.00
		UTILITY CONFLICTS			1.0%	\$1,800.00	4.0%	\$29,600.00
		ENGINEERING AND DESIGN			20.0%	\$36,000.00	20.0%	\$147,600.00
PROJECT TOTAL						\$181,576.00		\$737,347.00

NOTES:

- 1 2 FOOT SECTION ADJACENT TO MEDIANS
- 2 INCLUDING BITUMINOUS TRAIL REMOVAL
- 3 ASSUMES REUSE OF AGGREGATE UNDER REPLACED CURB AND ROADWAY PAVEMENT



LONG TERM - BLUE AND RED/ORANGE

RED/ORANGE - SHORT TERM

60 SCALE

RED/ORANGE - SHORT TERM

LONG TERM - BLUE AND RED/ORANGE

80 SCALE