FINAL REPORT

Cottage Grove Elementary School Safe Routes to School Engineering Plan

Prepared for

Washington County Public Works

Funded through a MnDOT Federal Safe Routes to School Planning Assistance Grant

March 3, 2017

CH2M HILL, Inc.
1295 Northland Drive
Mendota Heights, MN 55120

Contents

Section Page

Acronyms and Abbreviations v

1 Introduction/Background 1-1
1.1 Project Background 1-1
1.2 What Is the Safe Routes to School Program? 1-2

2 Existing Conditions 2-1
2.1 Cottage Grove Elementary School Site Layout and Walking Zones 2-1
2.1.1 Site Layout 2-1
2.1.2 Walking Zones 2-1
2.2 Surrounding Street System Characteristics 2-5
2.3 Intersections/Crossings and Traffic Control 2-5
2.4 Pedestrian Infrastructure—Sidewalks and Crosswalks 2-5
2.4.1 Sidewalks Adjacent to County Roadways 2-5
2.4.2 Marked Crosswalks in County Roads 2-6
2.5 Pedestrian Infrastructure—Offstreet Trails/Walking Paths 2-7
2.6 Traffic Profile 2-7
2.6.1 Traffic Characteristics 2-8
2.6.2 Crash History and Characteristics 2-8

3 Evaluation of Walking and Crossing Suitability 3-1
3.1 Suitability Classifications 3-1
3.2 Identification and Summary of Deficiencies 3-5

4 Identification and Evaluation of Potential Alternative Pedestrian Safety Strategies 4-1
4.1 Lower the Speed Limit 4-1
4.2 Post a “School Speed Limit” Sign 4-2
4.3 Conversion to a Three-lane Cross-section 4-2
4.4 Reconstruct 65th Street as an Urban Section 4-4
4.5 Build Out the Sidewalk System 4-4
4.6 Sign or Mark a New Crosswalk on 65th Street 4-5
4.7 Enhance the Crosswalks for Safety 4-6
4.8 Use Adult Crossing Guard for Safety 4-8
4.9 Enhance the Visibility of Students Using Crosswalk 4-8

5 Identification and Evaluation of Potential Alternative Strategies 5-1
5.1 Suggested Short-term Projects 5-1
5.2 Suggested Long-term Projects 5-7

6 Conclusions 6-1
6.1 Project Options 6-1

7 References 7-1

Appendix

A SRTS Data Compilation
- Figure A-1 Locations of Crossings and Intersections
- Table A-1 Summary Description of Walking Zones
- Table A-2 Intersections, Crossings and Traffic Control (Table 2-2, Crosswalk Amenities for Pedestrians)
- Table A-3 Assessment for Suitability for Pedestrians–Segments (Section 3-2)
- Table A-4 Evaluation of Recommended Projects – Detailed (Section 5-1) (See Figure 2-2 for Walking Zones)

Tables

2-1 Crosswalk Features for Pedestrians 2-6
3-1 Qualitative Ratings Definitions of Roadway Segments and Crossings 3-1
4-7 Summary of the effectiveness of Alternative Strategies 4-8
5-1 Recommended Short-term Projects (See Table A-4 in Appendix for additional breakdown.) 5-6
6-1 Options and Effectiveness 6-1

Figures

1-1 One-mile Radius from Cottage Grove Elementary School 1-3
2-1 Walking Zones, Existing Pedestrian Facilities, and Residence Locations 2-3
2-2 Southward View Along Hinton Avenue 2-7
2-3 Northward View Along Hinton Avenue 2-7
3-1 Route Suitability along Route Segments 3-3
4-1 Refuge island at 10th Avenue, White Bear Lake near Tartan High School 4-3
4-2 Refuge Island on Stillwater Avenue, Lake Elmo, Lake Elmo Elementary School 4-3
4-3 Conversion to a Three-lane Two-way Left-turn Lane 4-3
4-4 Potential Design for a TWLTL near the School Entrance 4-4
4-5 Example Sidewalk/Trail Design: Adjacent to Subdivision Street (Hardwood Avenue) 4-5
4-6 Example Sidewalk/Trail Design: Adjacent to Hinton Avenue (North of 65th Street) 4-5
4-7 Pedestrian Crash Rate 4-6
4-8 Rapid Rectangular Flashing Beacon 4-7
5-1 Recommended Short-term Projects 5-3

Acronyms and Abbreviations

ADT	average daily traffic
CGES	Cottage Grove Elementary School
CIP	Capital Improvement Plan
CR	County Road
CSAH	County State Aid Highway
FHWA	Federal Highway Administration
HAWK	high-intensity activated crosswalk
MnCMAT	Minnesota Crash Mapping and Analysis Tool
MnDOT	Minnesota Department of Transportation
mph	miles per hour
PDO	property damage only
Plan	Safe Routes to School Plan
RRFB	rapid rectangular flashing beacon
SAFETEA-LU	Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users
SRTS	Safe Routes to School
TA	Transportation Alternative
TAP	Transportation Alternatives Program
TRB	Transportation Research Board
TWLTL	two-way left-turn lane
VPD	vehicles per day

SECTION 1

Introduction/Background

A *Safe Routes to School (SRTS) Plan (Plan)* (South Washington County School District, 2013) was previously prepared for the South Washington County School District to address pedestrian and bicycle access to Cottage Grove Elementary School (CGES). CGES is located along the south side of Washington County Road (CR) 74 (65th Street) near the intersection with County State Aid Highway (CSAH) 13 (Hinton Avenue) and north of CSAH 22 (70th Street). Figure 1-1 presents a view of a 1-mile radius surrounding CGES. Washington County is partnering with the Minnesota Department of Transportation (MnDOT) to conduct a sample review of the SRTS planning process as part of an overall program to achieve the following:

- Refine and enhance infrastructure recommendations based on rigorous traffic engineering analysis
- Improve the level of implementation of effective pedestrian safety strategies – with a focus on strategies considered to be either PROVEN effective or TRIED and where the preponderance of evidence indicate documented crash reductions

1.1 Project Background

The Plan, which was published in 2013, provides background information for the SRTS Program partnership between the South Washington County School District and CGES, as funded with a grant from MnDOT. The 2013 Plan provides a general assessment of the current conditions at CGES with background data and initial infrastructure and program recommendations to address barriers to walking and biking at CGES. To evaluate the types of improvements (infrastructure, staffing, and educational tools) that could be most effective in a SRTS program, the 2013 Plan conducted a walking audit, reviewed current school facilities, and held meetings with the school staff and community.

CH2M HILL, Inc. (CH2M) was contracted to conduct a study of operational and physical improvements to the infrastructure surrounding CGES. From this information, CH2M will develop a concept-level design for implementable engineering and infrastructure recommendations for the area surrounding CGES. This project is an effort by MnDOT to put past plans through a traffic engineering analysis to help determine what components of the plan are realistic to implement and which infrastructure projects might be good candidates for state funding. This would help enhance the process for future SRTS plans around the state. This new effort does not replace the original plan, but provides an independent traffic engineering review of the 2013 Plan to generate a priority list of upgrades such as crosswalks, signals, and additional actions. It may also suggest other improvements that the original plan did not contemplate.

The review of the previous Plan identified a number of traffic engineering limitations. In this study, discussions of existing safety and operation characteristics determine how deficiencies in the surrounding infrastructure could be linked to specific safety strategies. Insight about design upgrades, existing capital improvement projects, and effectiveness of potential alternative strategies lead to a detailed priority list for working with local governments to prioritize local funding for improvements and applying for funding from other sources.

CH2M initiated an additional study to provide data that document safety and operation conditions necessary to identify possible deficiencies along the surrounding roads, at intersections, and at the site access driveways. This included assembling an inventory of roadway, intersection, and pedestrian features; documenting historic crash data; and establishing basic performance measures for the operations of the intersections.

1.2 What Is the Safe Routes to School Program?

SRTS is a program with an important goal: helping more children get to school by walking and bicycling. "Safe Routes to School" is a concept that started in the 1970s with emphasis on the safety of children walking and bicycling to school. As the program expanded throughout the United States, Congress funded pilot projects through the National Highway Traffic Safety Administration, resulting in SRTS projects initiated successfully. Congress created the Federal-Aid Safe Routes to School Program in 2005 through comprehensive transportation legislation. SRTS began as a program to make kids safer when they walk or ride to school, but the benefits extend beyond safety. SRTS is a way to reduce congestion and vehicle emissions. It is also a way to encourage students to engage in additional physical activities. Approaches to developing an SRTS project vary from community to community and the specific conditions unique to the surroundings, as well as existing infrastructure. A successful SRTS Plan should include understanding of applicable traffic and safety engineering implications. Engineering considerations add an operational dimension to a community assessment of walking and biking safety. These include documented effectiveness of alternative strategies and recommendations, which should be relevant to the school's existing conditions.

MnDOT's SRTS program began with passage of the federal transportation bill formally named "The Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users," (SAFETEA-LU) in 2005. In 2012, the Minnesota Legislature created the state SRTS program and provided funding for non-infrastructure activities. The SRTS program had the following funding sources:

- Federal: Remaining SAFETEA-LU funds will be used through 2016 for SRTS planning assistance and statewide technical assistance.
- State: SRTS infrastructure projects are eligible for funding under MnDOT's Transportation Alternatives Program (TAP). MnDOT also used TAP funding for SRTS solicitations in 2014 and will do so once more in 2016.
  - The 2013 transportation finance omnibus bill increased existing state funding to $1 million over the biennium for non-infrastructure SRTS activities under Minnesota Statute 174.40, Subdivision 7a
  - In 2015, the state legislature made a one-time, $1 million investment in state infrastructure funding for SRTS

Since 2005, MnDOT has awarded more than $20 million to Minnesota communities for SRTS planning and implementation projects. These projects will affect more than 538 schools across Minnesota.

In 2014, MnDOT awarded nearly $1 million in federal SAFETEA-LU spending for SRTS planning assistance grants. More than 100 schools developed, or will develop, SRTS plans from this solicitation. Additional SAFETEA-LU funding was used for program administrative costs and to develop an engineering pilot study to look at SRTS plan implementation.

In addition to the regional TAP solicitations, MnDOT leadership set aside a portion of the TAP funding in 2014 for a 2015-2016 SRTS statewide infrastructure solicitation. Another statewide SRTS solicitation using TAP funds will take place in 2016 for 2017 projects (MnDOT, 2016).

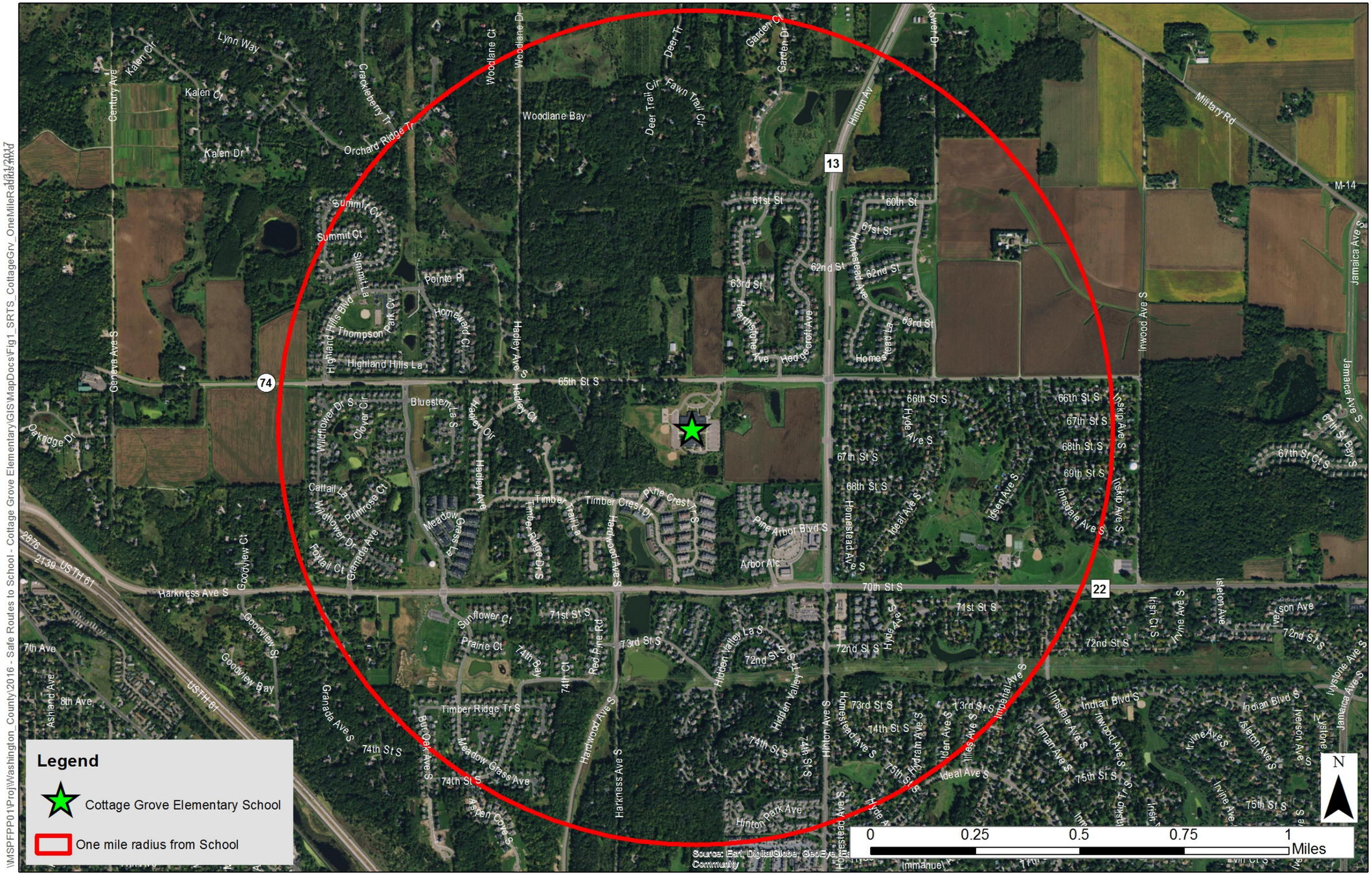


Figure 1-1. One-mile Radius from Cottage Grove Elementary School

Cottage Grove Elementary School Safe Routes to School Engineering Plan

SECTION 2

Existing Conditions

CGES (7447 65th Street) is located in an area with a mix of low-density (single family residential), medium-density (multi-unit townhomes and twin homes), and agricultural land use (Figure 1-1). CGES is located on the south side of 65th Street, west of Hinton Avenue. School enrollment for the 2015-2016 school year was 560 students, kindergarten through 5th grade.

The Study Area was delineated as an area approximately 1-mile from the school. According to School District policy, elementary students living further than 1 mile from their assigned school would be bused. Current School District policy also does not allow students to cross roads with posted speed limits over 30 miles per hour (mph), even when additional traffic controls such as stop signs, signals, or roundabouts are present.

Currently, no students walk or bike to school (South Washington County School District, 2013).

2.1 Cottage Grove Elementary School Site Layout and Walking Zones

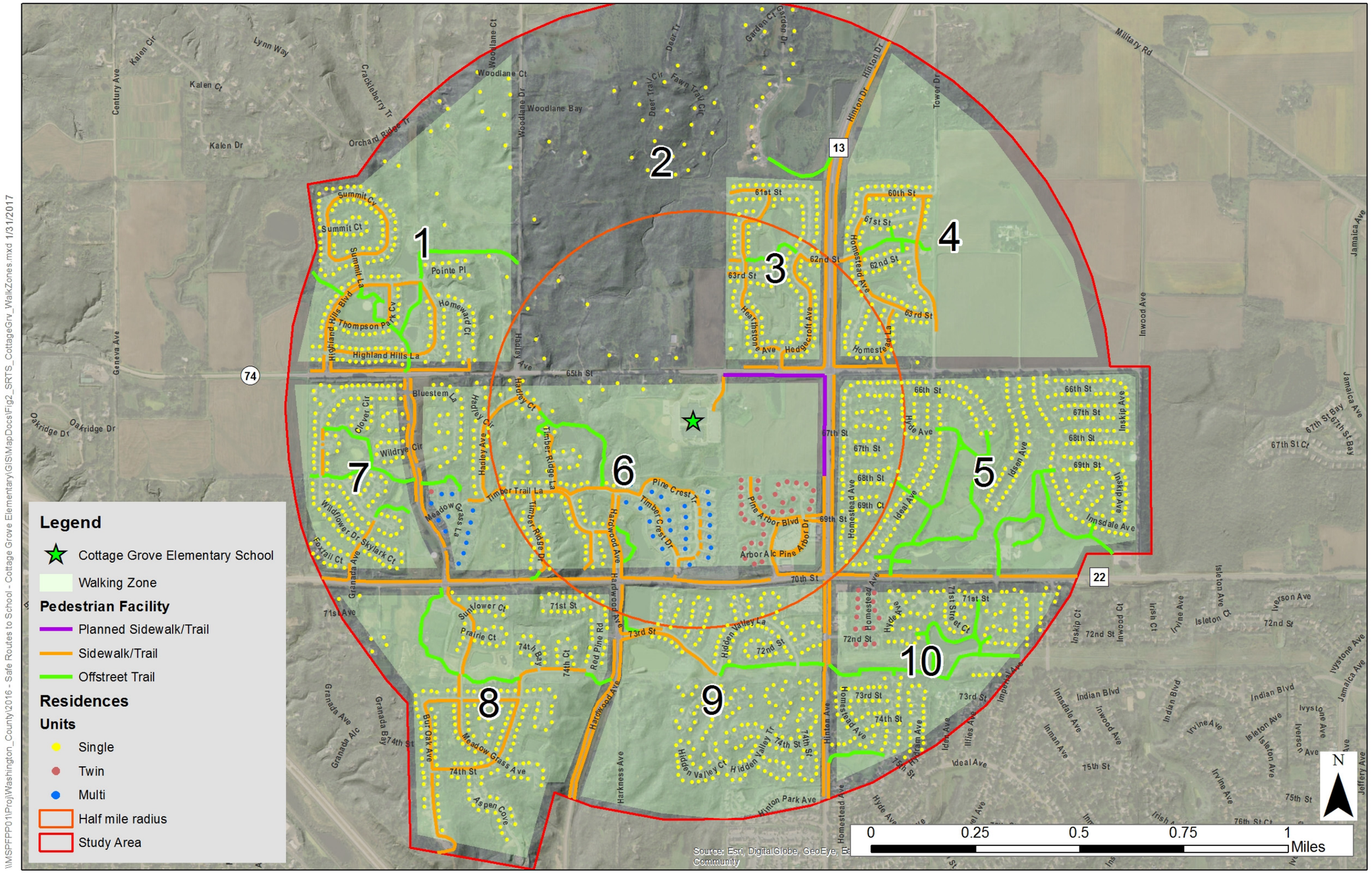
2.1.1 Site Layout

The school building is set back south of 65th Street approximately 400 feet. The campus has a single driveway access on the north to 65th Street with the driveway winding into a dropoff area. The trail along the driveway does not connect to any surrounding pedestrian infrastructure. The driveway also accesses a parent parking lot on the east side and a bus lot on the west side of the school. Playfields and a playground are located on the west side of the campus.

2.1.2 Walking Zones

Ten distinct neighborhoods, within a 1-mile radius of CGES, are proposed for the analysis of pedestrian walking trips to CGES. Using major streets (Hinton Avenue, 65th Street, 70th Street, Hadley Avenue, and Meadow Grass Avenue) to delineate the neighborhoods, the neighborhoods were then designated as potential walking zones. The Walking Zones, Study Area boundary, pedestrian facilities (sidewalks and offstreet trails), and residence locations are shown in Figure 2-1.

Walking Zones 1 through 10, are listed and described in Appendix A, Table A-1.



\\MSPFPP01\Proj\Washington_County\2016 - Safe Routes to School - Cottage Grove Elementary\GIS\MapDocs\Fig2_SRTS_CottageGrv_WalkZones.mxd 1/31/2017

Figure 2-1. Walking Zones, Existing Pedestrian Facilities, and Residence Locations

Cottage Grove Elementary School Safe Routes to School Engineering Plan

2.2 Surrounding Street System Characteristics

65th Street, north of CGES, exhibits the design characteristics of a two-lane rural road:

- Narrow gravel shoulders
- Drainage in ditches
- 50 mph speed limit

From the perspective of pedestrian accommodation and safety, the rural road design and rolling topography represent a potential deficiency. The road environment reinforces the perception that 65th Street is a rural road where many drivers feel safe selecting higher speeds. Higher operating speeds are generally thought to be less comfortable (and/or less safe) for accommodating pedestrians both walking along and crossing the road. There are also gaps in the sidewalk system along the segment of highway west of Hinton Avenue (Figure 2-1).

70th Street, the major east-west roadway south of CGES, exhibits similar design characteristics as 65th Street, but also features traffic signal control at two intersections (Meadow Grass Avenue and Hardwood Avenue).

Hinton Avenue, to the east of CGES has an urban design with curb and gutter. The roadway design of Hinton Avenue transitions to a city street with a 35-mph speed limit south of 70th Street.

2.3 Intersections/Crossings and Traffic Control

A listing of intersections and crossings with type of traffic control is found in Table A-2 in Appendix A. There are two intersections with all-way stop control—Hinton Avenue/65th Street and Hinton Avenue/70th Street. There are two intersections with traffic signals—on 70th Street at Meadow Grass Avenue and at Hardwood Avenue. Right- and left-turn lanes are in place at many of the intersections.

Upcoming improvements to the county highway system are listed in Washington County's Capital Improvement Plan (CIP) for 2017-2021. At the Hinton Avenue/70th Street intersection, for example, a roundabout is planned.

2.4 Pedestrian Infrastructure—Sidewalks and Crosswalks

Figure 2-1 shows the location of sidewalks in the Study Area; the crosswalk features are listed in Table 2-1. Within the context of this study, sidewalks are considered to be any walkway that is parallel to a roadway - concrete or asphalt. Offstreet trails are characterized as an asphalt pathway that does not parallel or follow a roadway but traverses through the neighborhood. While most of the sidewalks provide adequate separation from the highway (at least 3 feet from the roadway, with curb), there are a few exceptions. The sidewalk along 70th Street is an exception. There is no separation of the sidewalk from the roadway, as well as no curb, thus providing an instance of a pedestrian facility but with a lesser degree of safety and comfort.

2.4.1 Sidewalks Adjacent to County Roadways

The inventory of roadway and pedestrian infrastructure identified sidewalks adjacent to the roadways with higher speeds and volumes (Figure 2-1):

- Along the north side of 65th Street east of Hinton Avenue to a point approximately 200 feet east of CGES's east property line
- Along both sides of Hinton Avenue north of 65th Street

- Along the east side of Hinton Avenue south of 65th Street
- Along the north side of 70th Street

The residential subdivisions vary in the percent of streets that have a sidewalk system. Walking Zones 1, 3, 4, 6, and 8 have sidewalk systems in place for over approximately 90 percent of the streets. The sidewalk system in these zones also provide connections to the main roadways (e.g., 65th Street and Hinton Avenue). Zone 10 has no sidewalks along the residential streets. There is one sidewalk in Zone 9. Zone 2 has no sidewalks. All Zones have offstreet trails.

2.4.2 Marked Crosswalks in County Roads

Out of the four main intersections inventoried on the county highways (65th Street at Hinton Avenue, and 70th Street – at Hinton, Hardwood, and Meadow Grass Avenues), all four of these intersections had crosswalks that were marked completely or partially:

- There are marked crosswalks on the east and south legs of the 65th Street intersection with Hinton Avenue (All-way STOP control). However, no sidewalks extend east or west from the south crosswalk.
- There are marked crosswalks on all legs at the 70th Street intersections at Hinton Avenue, Hardwood Avenue, and Meadow Grass Avenue.

Table 2-1 presents crosswalk features in the area. In addition to these features, there is overhead lighting at a number of these intersections.

Table 2-1. Crosswalk Features for Pedestrians
Cottage Grove Elementary School Safe Routes to School Engineering Plan

Location	Cross Street	Marked (leg)	Refuge Island (leg)	Control
East-West	***North-South***			
65th Street	Hadley Avenue	None	None	Through Stop
65th Street	Hinton Avenue	South, East	North, South	All-way Stop
65th Street	Ideal Avenue	None	None	Through Stop
70th Street	Meadow Grass Avenue	All	North and South	Signals
70th Street	Hardwood Avenue	North, East	North and South	Through Stop
70th Street	Hinton Avenue	All	None	All-way Stop
62nd Street	Hinton Avenue	None	None	Through Stop
Pine Arbor Boulevard 69th Street	Hinton Avenue	None	West	Through Stop
72nd Street	Hinton Avenue	None	West (landscaped but not necessarily a pedestrian refuge)	Through Stop
Offstreet trail (Figures 2-2, 2-3)	Hinton Avenue	All	None	RRFB, “Stop when pedestrian is in crosswalk” sign, 35 mph speed limit

2.5 Pedestrian Infrastructure—Offstreet Trails/Walking Paths

There are a number of offstreet trails within the 1-mile radius from CGES (Figure 2-1):

- Southwest of the school; an offstreet trail through the woods provides a connection between Timber Crest Drive and Hadley Avenue; this trail is located on School District property.
- Offstreet trails in Walking Zone 8 are located in a residential area and are oriented east-west to connect to subdivision sidewalks and then to Hardwood Avenue.
- Trails located in Walking Zone 5 are accessible by residents (Highlands Park and west of Highlands Park) and provide connectivity to Ideal Avenue and sidewalks along 70th Street.
- Offstreet trails are located in Walking Zone 10, generally following the transmission line, continuing west into Walking Zone 9, where the trail connects with sidewalks on 73rd Street to Hardwood Avenue and continues north.

An offstreet trail connects Zones 9 and 10, crossing Hinton Avenue (south of 72nd Street and following the transmission line). Figures 2-2 and 2-3 are photos that illustrate the type of traffic control used.

Figure 2-2. Southward View Along Hinton Avenue
Cottage Grove Elementary School Safe Routes to School Engineering Plan

Figure 2-3. Northward View Along Hinton Avenue
Cottage Grove Elementary School Safe Routes to School Engineering Plan

Refer to Figure 2-1 for additional detail regarding the general location and extent of the offstreet trails.

2.6 Traffic Profile

Traffic characteristics, including speed profiles, daily volumes and the number, type and severity of crashes provide objective measures of the quality of operations and the level of safety provided in the roadways providing access to CGES. This kind of information also provides insight about potential system deficiencies and possible mitigation measures.

Traffic speed and volume data for the three highways within the 1-mile radius in the Study Area were obtained from Washington County and crash data were obtained from the Minnesota Crash Mapping and Analysis Tool (MnCMAT). Speed and volume data are available for 65th Street, 70th Street, and Hinton Avenue. The designation of Hinton Avenue as a CSAH ends at 70th Street. South of 70th Street, Hinton Avenue is designated a city street.

2.6.1 Traffic Characteristics

The traffic characteristics associated with the three highways around CGES include the following:

- 65th Street:
  - Speed limit along the 65th Street corridor is 50 mph throughout the Study Area, with the exception of 65th Street east of Hinton Avenue (40 mph).
  - 85th percentile speed near the school along 65th Street is 53 mph eastbound and 54 mph westbound.
  - Current traffic counts indicated a daily traffic volume of 2,050 vehicles per day (VPD).
  - These 85th percentile speeds are in the low end of the range for similar roads and are consistent with the 50-mph speed limit.
- 70th Street:
  - Average daily traffic (ADT): 7,900 VPD east of Hardwood Avenue; 9,400 VPD west of Hardwood Avenue.
  - Speed Limit: 50 mph throughout.
- Hinton Avenue:
  - ADT: 6,000 VPD south of 65th Street; 6,800 VPD north of 65th Street.
  - Speed Limit: 45 mph south of 65th Street; 55 mph north of 65th Street.

2.6.2 Crash History and Characteristics

Crash history was retrieved from MnCMAT. The primary objective of this effort was to determine if any crashes were school related and if so, what potential safety counter measures should be considered.

Since the original SRTS Plan was published in 2013, there has been one possible injury (severity level "C") pedestrian crash along this corridor. The officer-reported pedestrian action was "walking/running in road with traffic."

- Crash occurred at night (9:51 p.m. dark with no streetlights) and not during the school year (Thursday in July).
- Pedestrian victim was age 50, female.

Given these specific characteristics, it appears reasonable to conclude that there have not been any school related pedestrian crashes in the immediate vicinity of CGES. Additional safety analysis considered the 10-year period from 2006 through June 2015. Thirty-five crashes were geolocated in MnCMAT along 65th Street between Geneva Ave and Hinton Avenue (1.73 miles). Of these crashes, 23 occurred between Hadley Avenue and Hinton Avenue.

The primary crash types include (*Traffic Safety Fundamentals Handbook,* MnDOT, 2015):

- 13 (57%) Multivehicle (All coded as intersection-related)
  - 5 (38%) Right Angle (compared to an expected 41%)
  - 2 (15%) Rear-End (compared to an expected 13%)
  - 1 (8%) Left Turn (compared to an expected 5%)
  - 1 (8%) Head-On (compared to an expected 4%)
  - 4 (17%) Fixed Object (run-off-road)

- 10 (43%) Single-vehicle
  - 1 (4%) Pedestrian (compared to an expected less than 1%)
  - 5 (22%) Deer Hit (compared to an expected 17%)
  - 4 (17%) Fixed Object/Run-Off-Road (compared to an expected 11%)

During the 10-year study period there were no severe (fatal or serious injury) crashes along 65th Street, but six (26 percent) of these crashes involved minor injuries. The remaining 74 percent are all Property Damage Only (PDO).

The crash rate along this segment of 65th Street is 2.7 crashes per million vehicle miles of travel. The MnDOT crash records system was searched to find a suitable comparison and only two possibilities were found – rural county roads (average Crash Rate – 1.2) and urban two-lane trunk highways (average crash rate – 1.8). A review of the characteristics of 65th Street suggest that neither of these are a good match. 65th Street has a rural design but its location within the city limits of Cottage Grove makes it unlike most rural county roads. Similarly, the rural design of 65th Street and the relatively high speed and low volume of traffic make 65th Street unlike other urban trunk highways.

From a safety perspective, it can be concluded that the crash rate along 65th Street is higher than the average for either rural county roads or urban trunk highways. However, neither of these are an appropriate match for 65th Street. In addition, the actual crash rate along 65th Street is not statistically significantly different from either the rural county or urban highway average, which suggests that the difference is likely not due to the roadway features along this segment of 65th Street.

SECTION 3

Evaluation of Walking and Crossing Suitability

An inventory of key walking routes and roadway crossing locations was completed. Table A-2 in Appendix A provides the inventory.

This section examines the routes that have been determined as travel corridors between student's residences and CGES. The routes – divided into segments and crossings – have received an evaluation of "GOOD", "FAIR", and "POOR" based on factors discussed below.

3.1 Suitability Classifications

An evaluation component was added to the inventory based on the level of safety elements that are in place. The evaluation for segments and crossings was divided into three qualitative categories: GOOD, FAIR, and POOR. The basic notion is that it is more acceptable for pedestrians and vehicles to interact in the roadway if traffic speeds and volumes are low and less acceptable for this interaction if speeds and volumes are high. Segments and crossings considered POOR due to traffic speeds and volume would be identified as being deficient for accommodating pedestrian activity and candidates for deployment of improvement strategies.

The rating assigned for **segments** was based primarily on two elements, 1) whether or not the pedestrians (students and their families) would have a sidewalk or trail separate from the roadway and 2) the roadway characteristics. It is well known and research shows that roadways with higher speeds contribute to higher severity crashes and a less safe environment for pedestrians and bicyclists (MnDOT, 2013).

The rating assigned for **crossings** was based on site factors such as controls present and traffic characteristics such as speed and volume.

The crossings selected for a suitability rating were based on the projected amount of pedestrian traffic, or likelihood for use, as a route to CGES. Therefore, suitability evaluations were focused on the county highways that are within the approximate 1-mile Study Area (65th Street, Hinton Avenue, and 70th Street).

The adopted definitions for the qualitative rating of roadway segments and crossings are provided in Table 3-1.

Table 3-1. Qualitative Ratings Definitions of Roadway Segments and Crossings
Cottage Grove Elementary School Safe Routes to School Engineering Plan

	Segments	Crossings
GOOD	Separated sidewalks, offstreet trails	Controlled
FAIR	In-Street Speeds <= 30 mph and Volume <= 2,000 VPD	Through/STOP Speeds <= 30 mph and Volume <= 2,000 VPD
POOR	In-Street Speeds >30 mph and Volume > 2,000 VPD	Uncontrolled

Figure 3-1 shows the pedestrian routing to CGES with segment suitability and crossing suitability. Section 5 evaluates the probability for pedestrians traveling to CGES using the routes shown in combination with recommended projects. Table 5-1 provides a summary of the number of residents who could walk/bike to CGES when provided with routes and crossings with a good suitability rating.

Additional detailed information about the condition of the sidewalks and their proximity to the roadways, for example, was not examined at this assessment level. This may be a supplementary exercise as projects are in final review stages for the CIP, e.g., sidewalks along the west side of Hinton Avenue and along the south side of 65th Street west of Hinton Avenue.

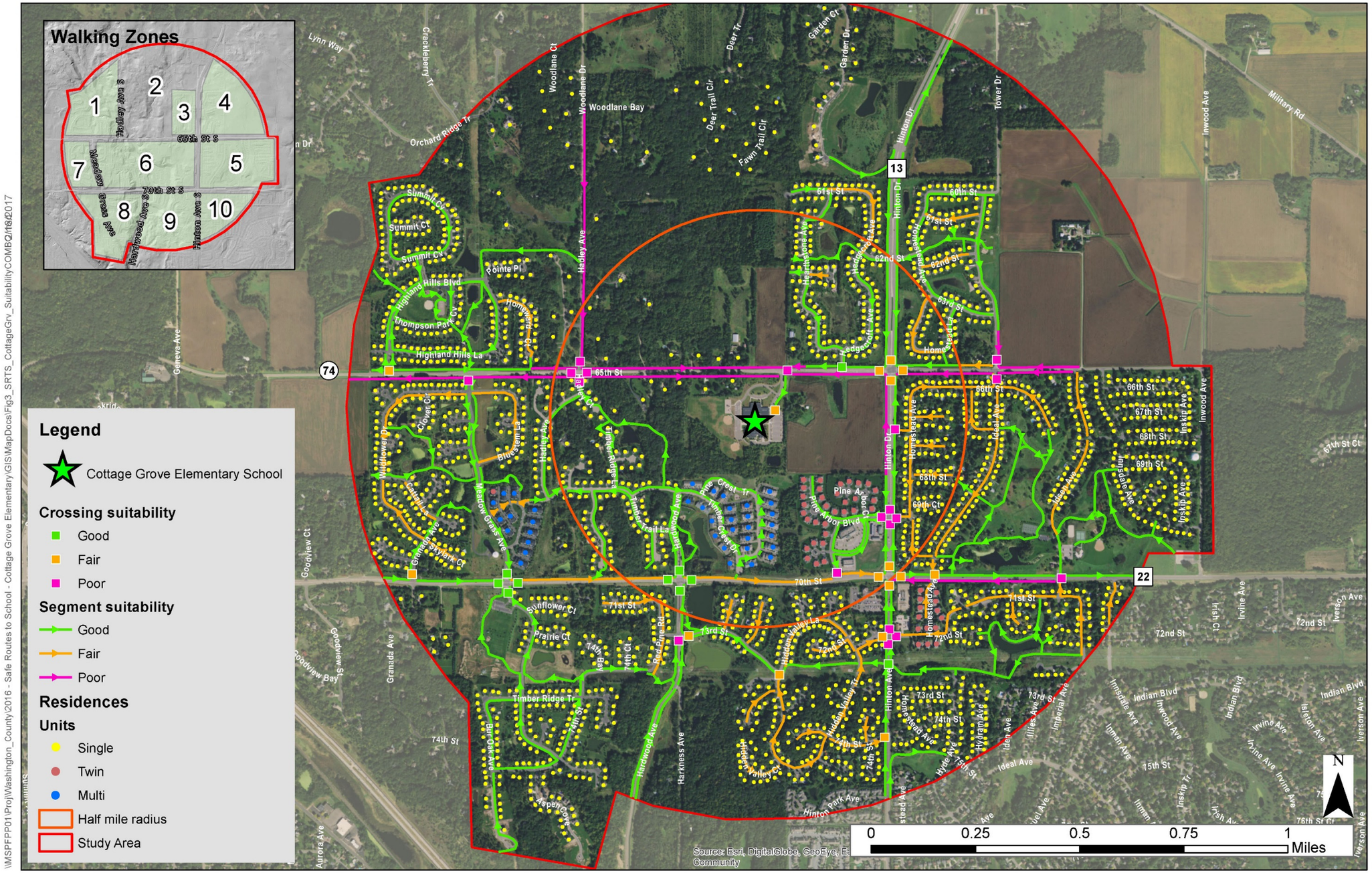


Figure 3-1. Route Suitability along Route Segments

Cottage Grove Elementary School Safe Routes to School Engineering Plan

3.2 Identification and Summary of Deficiencies

The in-place system of pedestrian features is fragmented and discontinuous. The lack of a complete and connected system of pedestrian features does not support the notion of actively increasing the number of students walking to school due to safety concerns. Circuitous pedestrian routes resulting from the development pattern of the residential subdivisions adds distance and reduces the directness of the route. The addition of offstreet trails creating pedestrian short-cuts between the residents and CGES would improve walkability.

The qualitative rating criteria was applied to each roadway segment and the pedestrian crossing locations on the main highways. The detailed results of this effort are documented in Table A-3 in Appendix A and shown on Figure 3-1. The following bullet points summarize the deficiencies:

Segments

- Walking along 65th Street is considered POOR due to high traffic speeds and volumes and the lack of a separated sidewalk/trail (with the exception of the north side adjacent to Walking Zones 1, 3, and 4).
- Walking along Hinton Avenue is considered GOOD due to the presence of a separated sidewalk/trail (with the exception of the west side between 65th Street and 68th Street Court where there is no sidewalk/trail).
- Walking along 70th Street is considered GOOD along the north side of the roadway due to the presence of a separated sidewalk/trail. The south side is considered POOR due to speed, volume and the absence of a sidewalk/trail. A segment along 70th Street that would be an exception to the GOOD rating is between Hinton Avenue and Meadow Grass Avenue. The sidewalk along this segment is adjacent to the roadside edge (no boulevard) with a mountable curb.
- Walking along residential streets with the presence of sidewalks is considered GOOD when combined with low speeds and low volumes. Walking along residential streets with no separated sidewalk (as well as lower speeds and lower volumes) would be considered FAIR.

Crossings

- Established pedestrian crossings at the intersections of 70th Street at Hardwood Avenue, 70th Street at Meadow Grass Avenue are considered GOOD due to the presence of traffic signals.
- Established pedestrian crossings at the intersections of Hinton Avenue at 65th and 70th Streets are considered FAIR due to the number of lanes to cross combined with the lack of traffic signals, or a full complement of pedestrian amenities such as crosswalk markings on all legs, crosswalk lighting, or e.g. crossing islands. Washington County will be adding crosswalk markings to all legs of these intersections in 2017.
- Potential crossing locations within 300 feet of CGES are considered FAIR or POOR due to high traffic speeds and volumes, the lack of pedestrian amenities (refuge islands, and curb extensions) or the fact that through traffic is uncontrolled.

The result of this analysis is the conclusion that NO child from any of the more than 2,000 residences in the 10 Walking Zones can walk to CGES along designated walking paths adjacent to area roadways or using crossings rated entirely as GOOD. All potential walkers would eventually encounter a road segment or crossing rated POOR.

SECTION 4

Identification and Evaluation of Potential Alternative Pedestrian Safety Strategies

To address the identified deficiencies associated with high speeds, the lack of a complete sidewalk system, and the absence of pedestrian amenities at potential crossing locations, a broad list of potential alternative strategies was developed, including:

- Lower the "24/7" speed limit in the vicinity of the school
- Post a school speed limit in the vicinity of the school
- Convert 65th Street to a three-lane cross-section
- Reconstruct 65th Street as an urban cross-section
- Build out the sidewalk system along 65th Street
- Sign and mark a new crosswalk on 65th Street
  - Enhance the crosswalk on 65th Street by adding improvements:
    - Street lights
    - Rapid rectangular flashing beacons (RRFBs)
    - A high-intensity activated crosswalk (HAWK)
    - Median refuge islands
  - Enhance the crosswalk of 65th Street through the use of adult crossing guards
- Enhance the visibility of students through the use of reflective tags, belts, or vests

Prior to recommending strategies, an evaluation of each was conducted to assess its expected benefit to the overall SRTS network, including its expected effectiveness. The key evaluating criteria is effectiveness at reducing pedestrian related crashes based on the use of research results, including published Crash Reduction Factors. Other considerations beyond expected safety performance may include maximized accessibility to student residences and conduciveness of walking routes.

4.1 Lower the Speed Limit

From a strictly pedestrian safety perspective, it is true that for pedestrian involved crashes, lower speeds of impact are associated with greater survivability but a key challenge is how to achieve an actual reduction in vehicle operating speeds.

In Minnesota, state statutes assign the establishment of speed zones to the Commissioner of Transportation in order to achieve a consistency across all roads. Speed zones are established based on an analysis of existing vehicle speeds along a segment of roadway and a variety of information describing the road environment (cross-section, rural vs. urban design features, access density, land use, etc.). Experience has shown that from a safety perspective, the most effective speed limits are close to the 85th percentile speed and in the upper end of the 10 mph pace. The data indicate that where vehicle speeds are in the range of 5 to 10 mph above the average speed (which approximates the 85th speed in most speed profiles) crash rates are the lowest. Speed data for 65 Street indicated an 85th percentile speed of 54-mph and a 10-mph pace between 45 and 55 mph. The current 50-mph speed limit is consistent with these guidelines. This suggests that unless major changes were made to the road

environment, merely lowering the speed limit would not change driver's perceptions of the road environment and therefore, would not result in lower actual speeds. As a result, it can be concluded that artificially lowering the speed limit would not be an effective pedestrian safety strategy or be an encouragement for children to walk because there is no evidence to support an expectation that drivers would actually slow down.

4.2 Post a "School Speed Limit" Sign

Minnesota statutes allow local authorities to establish school speed limits within school zones. Key provisions of the law include:

- School speed zones must be based on the findings of an engineering and traffic investigation.
- School speed limits may not be more than 30 mph below the established 24/7 speed limit, and not lower than 15 mph.
- The school zone is defined as that section or roadway that abuts school property or where there is an established school crossing with advanced school signs that define the area.

Local authorities establishing a school speed limit should be aware that simply posting the signs designating a school speed limit does not guarantee either that a majority of drivers will actually lower their speed or that children will be safe. The presence of children during the school arrival and departure is an obvious change in the road environment and it has been observed that drivers will voluntarily lower their speeds when children are present. However, if the school is not immediately adjacent to the roadway or if children do not walk to school, there may be no children visible to drivers. In either case, techniques for addressing driver compliance include:

- Make the school speed limit signs dynamic with flashers that operate only on days when school is in session and hours when children are likely to be present.
- Partner with law enforcement to occasionally provide a visible presence.

Washington County's experience has been that establishing school speed limits in the absence of pedestrian traffic or other substantial changes to the driving environment is not an effective safety strategy. Where this strategy has been tried, paired with flashing yellow lights that operated during school peak hours, only a small reduction in prevailing speeds was observed. Also, the overall prevailing speeds remained far above the posted school speed limit. The signs did however create a wide variation in speeds, with some drivers slowing to the posted school limit while most others ignored the signs and traveled at normal midday speeds. This wide differential in speeds increases conflicts between vehicles (such as passing and tailgating) and can make it more difficult for drivers and pedestrians to properly select gaps. Therefore, an overall benefit to safety was not achieved.

4.3 Conversion to a Three-lane Cross-section

Converting two- or four-lane undivided roadway configurations to a three-lane undivided design comprised of one through lane in each direction and a center two-way left-turn lane (TWLTL) (Figure 4-1) is a PROVEN effective safety strategy. This strategy is commonly referred to as a road diet. Road diets reduce the number of conflict points, particularly those with left-turn movements, by removing the turning vehicles from the through lane. Fewer conflict points along a section of road with a TWLTL ultimately reduces the total number of crashes.

Potential applications of the road diet strategy include; extending the widened cross-section on 65th Street between Hinton Avenue and Hedgecroft Avenue to the west, past the school driveway (replacing the westbound by-pass lane with an exclusive left turn lane).

A three-lane conversion also commonly provides the option to provide shoulders or bike lanes on one or both sides of the thru lanes. The bicycle enhancements coupled with a reduced number of conflict points along a corridor results in a safer and more complete environment for drivers as well as pedestrians. Most importantly from a pedestrian safety perspective reallocation of roadway lanes or space provides the opportunity to add a pedestrian refuge island (Figures 4-1 and 4-2), which is a proven strategy to improve pedestrian safety allowing pedestrians to cross each through lane independently. The following images are examples of median refuge islands that were installed and have been effective in increasing safety for pedestrians in Washington County. Figures 4-3 and 4-4 show conversion to a three-lane, two-way, left-turn lane and the potential design for a TWLTL near the school entrance, respectively.

Figure 4-1. Refuge island at 10th Avenue, White Bear Lake near Tartan High School
Cottage Grove Elementary School Safe Routes to School Engineering Plan

Figure 4-2. Refuge Island on Stillwater Avenue, Lake Elmo, Lake Elmo Elementary School
Cottage Grove Elementary School Safe Routes to School Engineering Plan

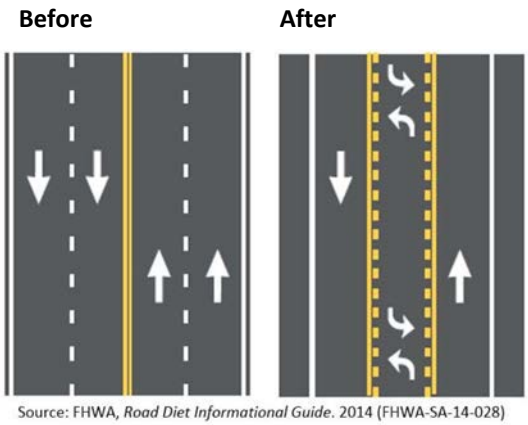


Figure 4-3. Conversion to a Three-lane Two-way Left-turn Lane
Cottage Grove Elementary School Safe Routes to School Engineering Plan

Figure 4-4. Potential Design for a TWLTL near the School Entrance
Cottage Grove Elementary School Safe Routes to School Engineering Plan

4.4 Reconstruct 65th Street as an Urban Section

A section of roadway such as Hinton Avenue south of 70th Street is an example of an urban cross-section; e.g., sidewalks, curb and gutter, grassy boulevard, and landscape design (planted strip) in the corridor. Design and infrastructure can influence the operating speed of drivers where addition of one or all of these design features can affect speeds and safety.

4.5 Build Out the Sidewalk System

This strategy would involve adding links to the existing sidewalk system to connect critical gaps in the neighborhoods. These additional sidewalks would provide walking routes that create operational and physical improvements that increase the comfort and appeal of using the sidewalk and trail system. The evaluation criteria used to prioritize the implementation of a sidewalk and trail build-out would focus on the following:

- Access for the most students (based on number of residences in a Walking Zone)
- Effective engineering designs
- Safe crossings

In other words, the focus is on removing barriers and shortening circuitous routes that are preventing students and their families from being comfortable with walking to and from school.

Sidewalks are exclusive paths for pedestrian travel that are separated from roadway traffic lanes by a buffer (boulevard) and/or curb and gutter on urban sections. The safety benefits of sidewalks come from the ability to provide pedestrians with their own travel space that is separated from traffic on the roadway.

Sidewalks are considered a PROVEN (effective) safety strategy. Sidewalks along both sides of streets have been found to significantly reduce occurrences of “walking along the road” compared to locations

where sidewalks do not exist. Walking along the roadway represents a pedestrian crash risk – the probability of a pedestrian being struck is higher if a sidewalk in not present. Research has found an 88 percent reduction in walking along the roadway pedestrian crashes with the installation of sidewalk and/or walkways on both sides of the road (FHWA, 2002a). Figures 4-5 and 4-6 show the example sidewalk/trail design adjacent to the subdivision and adjacent to Hinton Avenue, respectively.

Figure 4-5. Example Sidewalk/Trail Design: Adjacent to Subdivision Street (Hardwood Avenue)
Cottage Grove Elementary School Safe Routes to School Engineering Plan

Figure 4-6. Example Sidewalk/Trail Design: Adjacent to Hinton Avenue (North of 65th Street)
Cottage Grove Elementary School Safe Routes to School Engineering Plan

4.6 Sign or Mark a New Crosswalk on 65th Street

A marked crosswalk is a type of pavement marking that indicates to pedestrians the recommended location to cross the roadway and alerts approaching drivers as to where pedestrians may be crossing the street. In Minnesota, a legal crosswalk does not necessarily have to be marked. State laws (Minnesota Statute 169.011, Subdivision 20 and Statute 169.21, Subdivision 2) define a legal crosswalk as the extension of the sidewalks across a street, whether it has a marked crosswalk or not. Marked crosswalks are often provided at signal controlled intersections, at school crossings and at un-signalized locations where it is determined that there is enough pedestrian usage to justify the marked crossing. Crosswalks may be marked at midblock crossing locations as well as at intersections.

A variety of marking patterns may be used at the crosswalk. For example, high-visibility markings (continental and ladder styles) are more visible to drivers than the standard parallel lines. A standard package of advance warning signs and signs at the crossing are typically used to supplement the markings to better alert drivers to the presence of the crosswalk and the possibility of encountering pedestrians.

The addition of marked crosswalks alone, without any enhancements, has not been found to reduce pedestrian crash rates and in certain cases (multilane roads and roads with traffic volumes greater than 12,000 vpd) have been found to present a significantly increased crash risk (Figure 4-7).

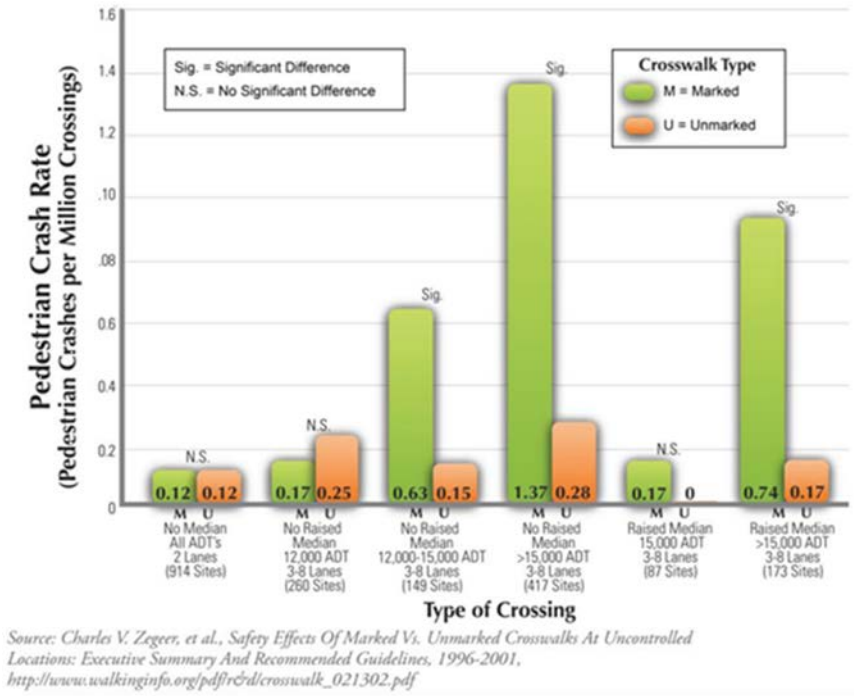


Figure 4-7. Pedestrian Crash Rate
Cottage Grove Elementary School Safe Routes to School Engineering Plan
Source: FHWA, 2002b

4.7 Enhance the Crosswalks for Safety

Since marked crosswalks at uncontrolled intersections are not a safety strategy when used without other safety enhancements, it is also important to consider the addition of a variety of possible enhancements, such as the following:

- Street lighting: Streetlights at crosswalks contribute to safety by providing an advanced warning to drivers that they are approaching a point of potential conflict. The literature suggests that streetlights also improve driver recognition of pedestrians during periods of darkness by making the pedestrians easier to see. The use of streetlights at rural intersections has been studied extensively and is considered a PROVEN effective safety strategy for reducing a variety of crash types across a range of severities, including: nighttime crashes, head-on crashes, road departure and vehicle-pedestrian crashes. Cited crash reductions for vehicle-pedestrian crashes are in the range of 40 to 80 percent.
- Raised crosswalks: Raised crosswalks involve elevating the crosswalk above the level of the adjacent roadway and gently ramping the traffic lanes up to and then down from the level of the crosswalk. This technique encourages/requires traffic to slow down on the approaches to the crosswalk in order to navigate the raised table without a harsh reaction to the change in elevation and bottoming the vehicle on the pavement. This technique is considered a PROVEN effective strategy at slowing vehicles on the approaches but there is no documentation of vehicle-pedestrian crash reduction. This strategy may not be suitable on roadways with long wheel base vehicles, such as buses or emergency responders due to enhanced reaction to the change in elevation caused by the long

wheel base. A more appropriate location for a raised crosswalk would be within the school site (e.g., at the existing crosswalk used to cross from the sidewalk to the building).

- Median Refuge Islands: Median refuge islands are raised areas that are constructed in the center portion of the roadway that can serve as a place of refuge for pedestrians. Median refuge islands provide a simplified crossing maneuver by allowing pedestrians to cross one direction of traffic at a time, creating the equivalent of two narrow one-way streets instead of a wide two-way street. Medians refuge islands are considered a PROVEN safety strategy with reported crash reductions in pedestrian/vehicle crashes in the range of 39 to 46 percent.
- Pedestrian hybrid beacons: Pedestrian hybrid beacons (HAWK) are typically used at mid-block locations and consist of both vehicle indications (two, side-by-side red lenses and a single yellow lens) and a typical pedestrian signal head. The beacon remains dark until a pushbutton is activated by a pedestrian, at which point the system flashes a sequence of yellow warnings followed by a red indication (STOP) that requires approaching vehicles to stop for the pedestrian attempting to use the crosswalk. The purpose of the HAWK system is to provide gaps in vehicular traffic in order to allow pedestrians to cross safely. Currently the HAWK system is considered a TRIED safety strategy due to the low number of installations. However, initial evaluations are promising – research indicates a 97 percent compliance rate (approaching vehicles stopping at the crosswalk) and a 69 percent reduction in vehicle-pedestrian crashes. The research also notes one additional key point. The HAWK system appears to be most effective where there is a high rate of pedestrian activity (more than 20 pedestrians per hour) and vehicular traffic is high (more than 750 vehicles per hour), indicating a condition where there are not enough natural gaps in traffic for pedestrians attempting to cross.
- Rapid rectangular flashing beacons (RRFB): At locations where the levels of pedestrian activity and vehicular traffic are too low to justify the use of a HAWK system but additional crosswalk enhancement is desired, an RRFB (Figure 4-8) can be used. The RRFB has two rapidly and alternatively flashing rectangular yellow indications attached to supplement the typical pedestrian warning sign (W11-2) or school crossing sign (S1-1) at the crosswalk. The RRFB system is activated by a push button and uses an irregular flash pattern similar to the flashers on emergency vehicles. As was the case with the HAWK, RRFB systems are considered a TRIED safety strategy due to a low number of installations. The research notes that RRFBs have increased yielding/stopping compliance rates from around 15 percent to almost 80 percent. However, no crash reduction factors have yet been documented. The research also suggests that RRFBs can be used on multi-lane facilities to help address concerns about the multiple-vehicle threat situations where a stopped vehicle can block the line of sight between pedestrians and other moving traffic (FHWA, 2010).

Figure 4-8. Rapid Rectangular Flashing Beacon

Cottage Grove Elementary School Safe Routes to School Engineering Plan

4.8 Use Adult Crossing Guard for Safety

Adult crossing guards are typically stationed at crosswalks near schools and are trained how to interrupt the flow of traffic and monitor childrens' crossing behavior so they can safely cross the roadway. The use of adult crossing guards is considered a TRIED safety strategy since there have been almost no evaluation of the safety effectiveness. However, the research does note that well-trained adult crossing guards present during school arrival and departure periods has resulted in reduced vehicle speeds, better compliance with school speed zones, improved pedestrian behavior and a reduction in vehicle-pedestrian crashes (but without documenting a Crash Reduction Factor) (TRB, 2004).

4.9 Enhance the Visibility of Students Using Crosswalk

Increasing the conspicuity of pedestrians with the use of reflective tags for backpacks, vests, or belts is considered a TRIED safety strategy due to the lack of any documentation of results. However, the costs associated with providing students with this reflective gear is low and an analogy can be made to requiring maintenance and construction personnel working in or near the road to wear highly reflective material. Students and staff wearing safety vests or other reflective items are more visible to motorists during low-light conditions.

Table 4-7 provides a subjective summary of the effectiveness of the alternative strategies listed in Sections 4.1 through 4.9.

Table 4-7 Summary of the effectiveness of Alternative Strategies
Cottage Grove Elementary School Safe Routes to School Engineering Plan

Strategy	Effectiveness	Crash Reduction Factor	TRIED/PROVEN
Lower the posted speed limit	None	Not associated with crash reduction	TRIED
Post "School Speed Limit" sign	Low	NA	TRIED
Convert undivided road to three-lane cross-section	Medium	30%	TRIED/PROVEN
Reconstruct 65th St as urban section	Unknown	NA	Unknown
Build out the sidewalk system	High	50 – 90% reduction in "walking in roadway" ped crashes	PROVEN
Marked crosswalk	None[1]	-350% (increase)	PROVEN ineffective
Street lighting	High	33 to 44%	PROVEN[2]
Raised crosswalk	Unknown	NA	TRIED
Median Refuge Island Curb extensions	High High	39 – 46% 39 – 46%	PROVEN PROVEN
HAWK	High	60%	TRIED
RRFB	High	78 to 100% (yield to peds)	TRIED
Adult Crossing Guard	Unknown	NA	TRIED
Reflective tags and safety vests	Unknown	NA	TRIED

[1] 'None' without additional crosswalk enhancements

[2] Use of street lights at rural intersections has been studied. 65th Street has a rural design.

SECTION 5

Identification and Evaluation of Potential Alternative Strategies

5.1 Suggested Short-term Projects

The 2013 SRTS Plan listed seven locations within one-quarter mile of CGES where infrastructure issues were identified and accompanied by general project recommendations to address barriers to walking and biking. Six of the seven projects are components of the nine recommended Projects listed below.

A list of suggested projects that could be implemented in the short-term (short-term refers to projects that could be constructed within a time frame of less than 1 year) is provided herein, based on an assessment of engineering and safety applicability and effectiveness. Figure 5-1 shows the location of the project recommendations and Table 5-1 provides details regarding each suggested project.

As discussed in the 2013 Plan, school district and school administrators have an important role in implementing the recommendations contained with this SRTS Report. This Report can be used to prioritize the recommendations and discuss enhancements and procedures that would best fit the school's culture and population. The support of district officials will be important in maintaining the program over time.

A variety of enhancements could be implemented to support the recommended projects. For example, crossing guards at the school's crosswalk location at the northeast entrance/exit during school arrivals and departures would be a valuable strategy to help students reach school safely. Curb extensions and median island refuges are upgrades to crossings, could also be considered.

Recommendations

Short-term Projects (Figure 5-1):

- <u>Recommendation 1: Sidewalk construction</u>
  Build sidewalk along the south side of 65th Street between CGES and Hinton Avenue crossings (Figure 5-1) Note: Sidewalk construction at this location is planned for 2017 (Washington County, 2016)
- <u>Recommendation 1A: Intersection improvements</u>
  Upgrade Hinton Avenue crossing to consist of the following elements based on the traffic safety engineering considerations that have been reviewed and found to be effective: a) marked crosswalk for all road legs (added crosswalk markings are scheduled for 2017) with the additional enhancements of; b) street lighting; and c) crossing guard.
- <u>Recommendations 2, 3, and 4: Offstreet trail construction</u>
  2: Build an offstreet trail between the school and Pine Arbor Boulevard.
  3: Build an offstreet trail between the school and Pine Crest Trail (south central area of Zone 6).
  4: Build an offstreet trail connecting the school to the existing trail (the existing trail is located in the wooded hills between Hadley Court and Timber Crest Drive).
- <u>Option 5: Sidewalk construction and crossing</u>
  Adjust the existing sidewalk west of Hedgecroft Avenue on the north side of 65th Street to line up with a crossing approximately 300 feet east of the school driveway and sidewalk. Construct a safe crossing from the west end of the sidewalk across 65th Street to the sidewalk along the south side of

65th Street (scheduled for 2017 construction) extending to the school sidewalk along the east side of school driveway entrance/exit).

- Recommendation 5A: Street configuration
  Reconfigure 65th Street to a three-lane section from west of the school entrance to Hedgecroft Avenue (Figure 4-4).
- Recommendation 6: Sidewalk construction and crossing
  On the north side of 65th Street, east of the Homeward Court trail extension (that connects Homeward Court with 65th Street); extend existing sidewalk along 65th Street east to Hadley Avenue. Construct a safe crossing[3] on 65th Street, in order to access the sidewalk along Hadley Court. The sidewalk then continues to the Recommendation 4 offstreet trail.
  - Recommendation 6 Alternative strategy
    The crossing at 65th Street could be grade separated. See details in Section 5.2, Long-Term Projects.

In conjunction with Recommendations 1 and 1A, and Recommendation 6, create a school speed limit along the segment of 65th Street under the condition that a pedestrian crossing is installed and it is being used on a daily basis. Effective school speed limits would be those that match the prevailing behaviors during peak times of school start and dismissals. Coordinating with local law enforcement to ensure compliance with safe route strategies could help to reduce unsafe driving behaviors.

[3] Safe crossing could consist of marked crosswalks and crosswalk enhancements e.g. speed reduction measures, lighting.

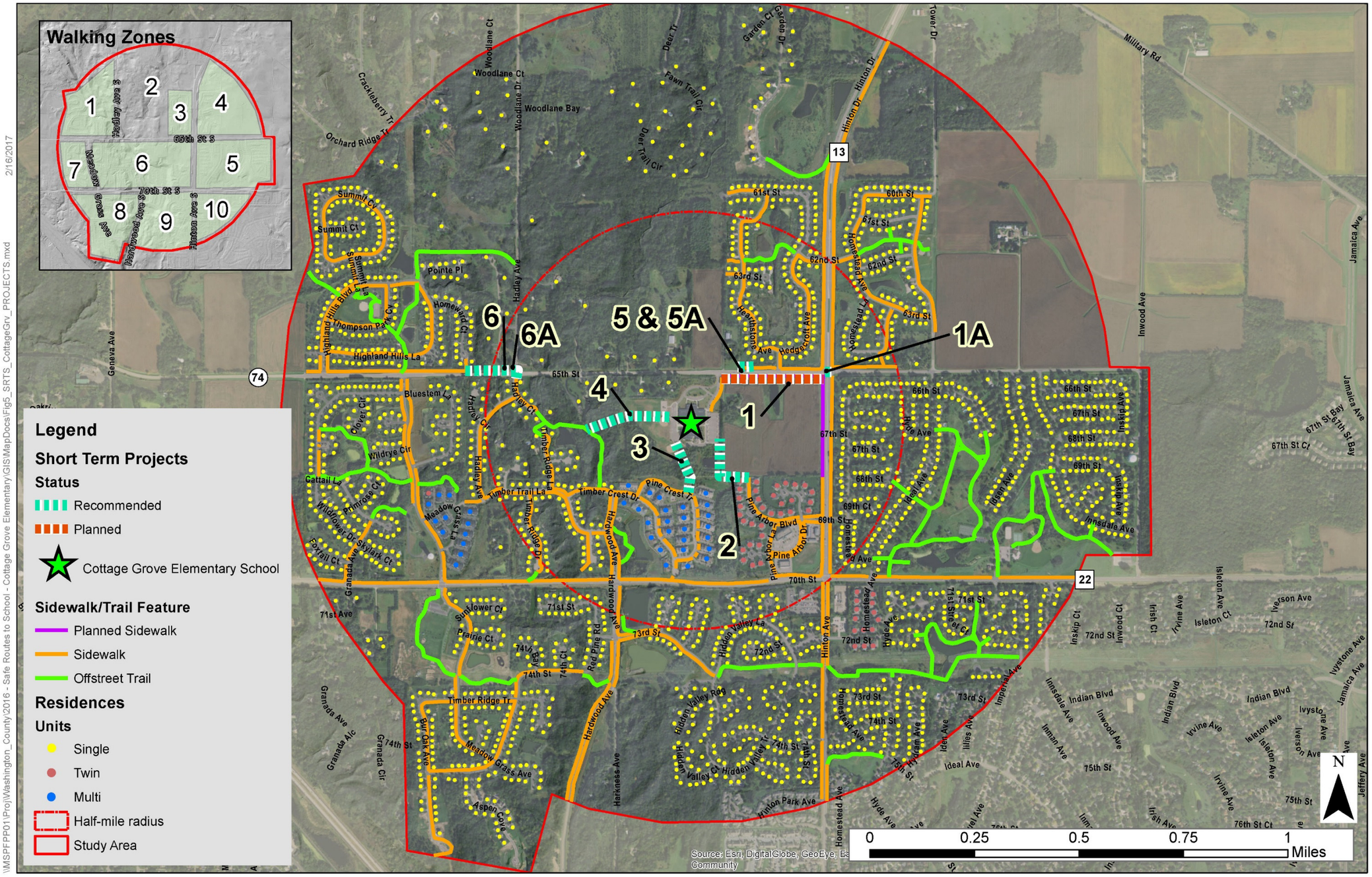


Figure 5-1. Recommended Short-term Projects

Cottage Grove Elementary School Safe Routes to School Engineering Plan

Table 5-1 summarizes the suggested short-term projects and approximates the number of residences that could be provided a safe route to the school. Table A-4 in Appendix A further evaluates the safety level rating before and after the implementation of the suggested Project. For example, a segment rating of POOR could be increased to GOOD with the construction of an offstreet trail.

SEE TABLE A-4 IN THE APPENDIX FOR A DETAILED EVALUATION OF RESIDENT ACCESS

The rating system describes the route in terms of "probability" (HIGH, MEDIUM, and LOW) that students and their families would use the route. There is not necessarily a "best" or "worst" route, instead an opportunity is presented for an improved route to CGES. By improving a route, with the introduction of a safer crossing and a more secure sidewalk or trail, the neighborhood residents would use them to walk or bike to CGES.

Students would not need to cross 65th Street, Hinton Avenue, or 70th Street in three of the suggested strategies. All three suggested recommendations use existing subdivision sidewalks and/or streets, in combination with subdivision street crossings (low speed-low volume). These are Project Numbers 2, 3, or 4.

HIGH probability: includes routes that cross no highways (65th Street, Hinton Avenue, or 70th Street), have a GOOD or FAIR suitability rating of all sidewalks, offstreet trails, and crossings.

MEDIUM probability: includes the routes which must cross 65th Street, Hinton Avenue, or 70th Street at least one time and sidewalks and crossings with a GOOD or FAIR suitability rating. The assumption is that families may be less comfortable with elementary students crossing wider roadways with higher speeds and higher volumes even with safety amenities.

HIGH probability includes routes that cross no highways (65th Street, Hinton Avenue, or 70th Street), have a GOOD or FAIR suitability rating of all sidewalks, offstreet trails, and crossings.

MEDIUM probability includes the routes which must cross 65th Street, Hinton Avenue, or 70th Street at least one time and sidewalks and crossings with a GOOD or FAIR suitability rating. The assumption is that families may be less comfortable with elementary students crossing wider roadways with higher speeds and higher volumes even with safety amenities.

LOW probability includes routes that have one or more highway crossing (65th Street, Hinton Avenue, or 70th Street)and would affect residents who are farther than 0.5-mile (when the variations of navigating the subdivision roads and trails have been added up).

LOW probability: includes routes that have one or more highway crossings (65th Street, Hinton Avenue, or 70th Street) and would affect residents who are farther than 0.5-mile (when the variations of navigating the subdivision roads and trails have been added up).

The number of residences affected by individual projects was calculated to assess the outcome of a project (Table 5-1). Calculations of the number of residents affected by new facilities were made with no overlap in resident numbers for the individual projects. It is possible, for example, if Recommendation 2 were implemented that residents in the immediate neighborhood (on Pine Arbor Boulevard and Pine Arbor Drive) would gain access and there could be additional residents from Walking Zones 5, 9, or 10 (Figure 2-1) who could access the offstreet trail (even without other recommendations implemented). See Table A-4 in Appendix A for estimates of the number of residences gaining access from a recommended project.

Table 5-1. Recommended Short-term Projects (See Table A-4 in Appendix for additional breakdown.)
Cottage Grove Elementary School Safe Routes to School Engineering Plan

Project	Solution	High Probability (Number of Residences)	Medium Probability (Number of Residences)	Low Probability (Number of Residences)	Total Number of Residences Possible	Estimated Cost
1 and 1A	1. Build sidewalk along south side of 65th Street 2. Enhance pedestrian safety features at the 65th St and Hinton Av crossings	0	126 (Zone 3) 118 (Zone 4) 188 (Zone 5, west portion)	0	High: 0 Med: 432 Low: 0 432	$150,000 $210,000
2	Offstreet trail from terminus of Pine Arbor Blvd to School	64 (Zone 6, southeast corner)	63 (Zone 9, northeast corner)	91 (Zone 10, north half) 132 (Zone 9, south half) 84 (Zone 10, south half)	High: 64 Med: 63 Low: 307 434	$140,000
3	Offstreet trail from Pine Crest Trail to School	176[a] (Zone 6, south central area w/ multi-unit residences)	32 (Zone 9, northwest corner)		High: 176 Med: 32 Low: 0 208	$150,000
4	Offstreet trail extending from existing offstreet trail (located between Hadley Ct and Timber Crest Dr) to School	224 (Zone 6, western half)	150 (Zone 7) 80 (Zone 8, northern half)	138 (Zone 8, southern half)	High: 224 Med: 230 Low: 138 592	$160,000
5 and 5A	Sidewalk extension along 65th St west of Hedgecroft Av; with improved 65th St crossing Combine with 3-lane configuration added to Project		See Project 1 for number of residents. (Zone 3, 126 residences; Zone 4, 118 residences; Zone 5, 188 residences)		Same total as Project 1 and 1A: 432	$90,000 $220,000
6	1. Extend sidewalk along 65th Street from Homeward Ct trail spur to Hadley Av 2. Construct crosswalk at Hadley Av intersection	0	103 (Zone 1, southern half)	71 (Zone 1, northern half)	High: 0 Med: 103 Low: 71 174	$130,000 $50,000
All					**1,840**	

The first project option, including the sidewalk along the south side of 65th Street, west of Hinton Avenue scheduled for construction in 2017, would serve approximately 432 residences.

With the three project recommendations (Projects 2, 3, and 4) of offstreet trails, approximately 440 residences could have walking access to CGES without having to cross any of the three surrounding highways.

5.2 Suggested Long-term Projects

In terms of prioritizing projects that could be effective in providing an encouraging environment to increase the safety of students walking or biking to CGES, there are larger scale projects that could be discussed for future implementation.

Long-term

- Complete a sidewalk system along both north and south sides of a reconstructed 65th Street east of Hadley Avenue to CGES driveway, and entryway on the west side of the school's driveway.
- Construct a sidewalk segment between the Hadley crossing of 65th Street and the sidewalk that ends approximately 600 feet west of Hadley Avenue (also see Recommended Project 6).
- Complete a pedestrian link, sidewalk or offstreet trail, which connects the west end of the Timber Trail Lane sidewalk (along the northwest side of Meadow Grass Lane) to Meadow Grass Avenue. With the planned middle school to the west of Walking Zone 7, this link could have benefits for students at both CGES and the planned school. An enhanced crosswalk at Meadow Grass Avenue would increase the effectiveness of the link.
- Construct a crossing of 65th Street at Hadley Avenue. An option for a safe crossing at this location is a pedestrian tunnel.
  - Recommendation 6 Alternative: a grade separated crossing on 65th Street. The hilly topography, at approximately 400-500 feet east of Hadley Avenue, along this segment of the highway creates a low spot. A safer alternative to an at-grade crosswalk and one that would be conducive to maintaining traffic flow would be construction of a pedestrian tunnel.

SECTION 6

Conclusions

6.1 Project Options

Three main opportunities for projects are presented: 1) construction of one to three offstreet trails with no other improvements, would provide pedestrian or bicycling access with no highway to cross; 2) a sidewalk constructed along the south side of 65th Street between CGES and the intersection at 65th Street/Hinton Avenue (planned for 2017 construction by the County); and 3) Improvements along 65th Street, that would involve constructing a safe highway crossing, along with roadway improvements. Project options and effectiveness are provided in Table 6-1. (See also Table A-4 in Appendix A.)

Table 6-1. Options and Effectiveness
Cottage Grove Elementary School Safe Routes to School Engineering Plan

Project Option	Effectiveness	Cost	Residences	Priority	Prerequisites	Project Summary
1, 1A	High	High $360 K	432 Medium	High	Stand Alone	Complete sidewalks along south side of 65th St with enhanced crossing at Hinton Av.
2	High	Low $140 K	64 High 370 Medium and Low	High	Stand Alone	Offstreet trail
3	High	Low $150K	176 High 32 Medium and Low	High	Stand Alone	Offstreet trail
4	High	Low $160K	224 High 368 Medium and Low	High	Stand Alone	Offstreet trail
5, 5A	Medium	High $310K	Same as 1	High	Option 1A	Enhanced ped crossing from sidewalk along north side of 65th St near CGES driveway
6, 6A	Medium	High $180K	174 Medium and Low	Low	Option 4	Extend sidewalk along north side of 65th St from Homeward Ct to Hadley Av with enhanced ped crossing at 65th St.

As discussed in Section 3.2, the result of this analysis is that NO child from any of the more than 2,000 residences in the 10 walking zones can currently walk or bike to CGES along designated walking paths adjacent to area roadways or crossings rated entirely as GOOD. All potential walkers would eventually encounter a road segment or crossing rated POOR. Upon evaluation of the deficiencies encountered and then creating a suitability-rating process enables the community and county to review a range of options that encourage students to walk or bike to school with increased safety. This is a result of the implementation of proven effective safety strategies, including separated sidewalks, off-street trails, and enhanced pedestrian crossings. If all of the above options are constructed, then approximately 1,840 residences within one mile would have a walking or biking route available without encountering a segment or crossing rated as 'POOR', and 1,068 residences would have a route available classified entirely as "GOOD".

SECTION 7

References

Federal Highway Administration (FHWA). 2002a. Patrick J. McMahon, Charles V. Zegeer, Chandler Duncan, Richard L. Knoblauch, J. Richard Stewart, and Asad J. Khattak. *An Analysis of Factors Contributing to "Walking Along Roadway" Crashes*, Report No. FHWA-RD-01-101. Available online at: http://ntl.bts.gov/lib/19000/19900/19995/PB2003102002.pdf. Accessed on November 4, 2016.

Federal Highway Administration (FHWA). 2002b. Zegeer, c.v.; J.R. Stewart; H.H. Huang; P.A. Lagerwey. *Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations*. FHWA-RD-01-075. http://www.pedbikeinfo.org/collateral/PSAP%20Training/gettraining_references_Effects_Un_MarkedCrosswalks_Summary.pdf. Accessed November 4, 2016.

Federal Highway Administration (FHWA). 2010. Jim Shurbutt and Ron Van Houten. *Effects of Yellow Rectangular Rapid-Flashing Beacons on Yielding at Multilane Uncontrolled Crosswalks.* Report FHWA-HRT-10-043. Available online at: http://www.fhwa.dot.gov/publications/research/safety/pedbike/10043/index.cfm. Accessed November 4, 2016.Minnesota Department of Transportation (MnDOT). 2013. *Minnesota's Best Practices for Pedestrian/Bicycle Safety*. Available online: http://www.dot.state.mn.us/research/TS/2013/201322.pdf. Accessed January 2017.

Minnesota Department of Transportation (MnDOT). 2015. *Traffic Safety Fundamentals Handbook.* Available online at: http://www.dot.state.mn.us/trafficeng/publ/fundamentals/2015-mndot-safety-handbook-reduced.pdf. Accessed December 2016.

Minnesota Department of Transportation (MnDOT) State Aid. 2016. *Safe Routes to School in Minnesota*. Additional information available online at: http://dot.state.mn.us/saferoutes/about.html. Accessed November 30, 2016.

South Washington County School District. 2013. *Safe Routes to School Plan*. Prepared by Alta Planning and Community Design Group. Published by MnDOT.

Transportation Research Board (TRB). 2004. National Cooperative Highway Research Program (NCHRP) 500 Report Volume 10, *A Guide for Reducing Collisions Involving Pedestrians*. Edited by Charles V. Zegeer, et al. Available online at: https://www.nap.edu/download/23425. Accessed October 2016.

Washington County, Minnesota. 2016. *Washington County Capital Improvement Plan (CIP)*. Draft CIP 2017-2021. Available online at: https://www.co.washington.mn.us/1257/Capital-Improvement-Plans. Accessed October 28, 2016.

Appendix A
SRTS Data Compilation

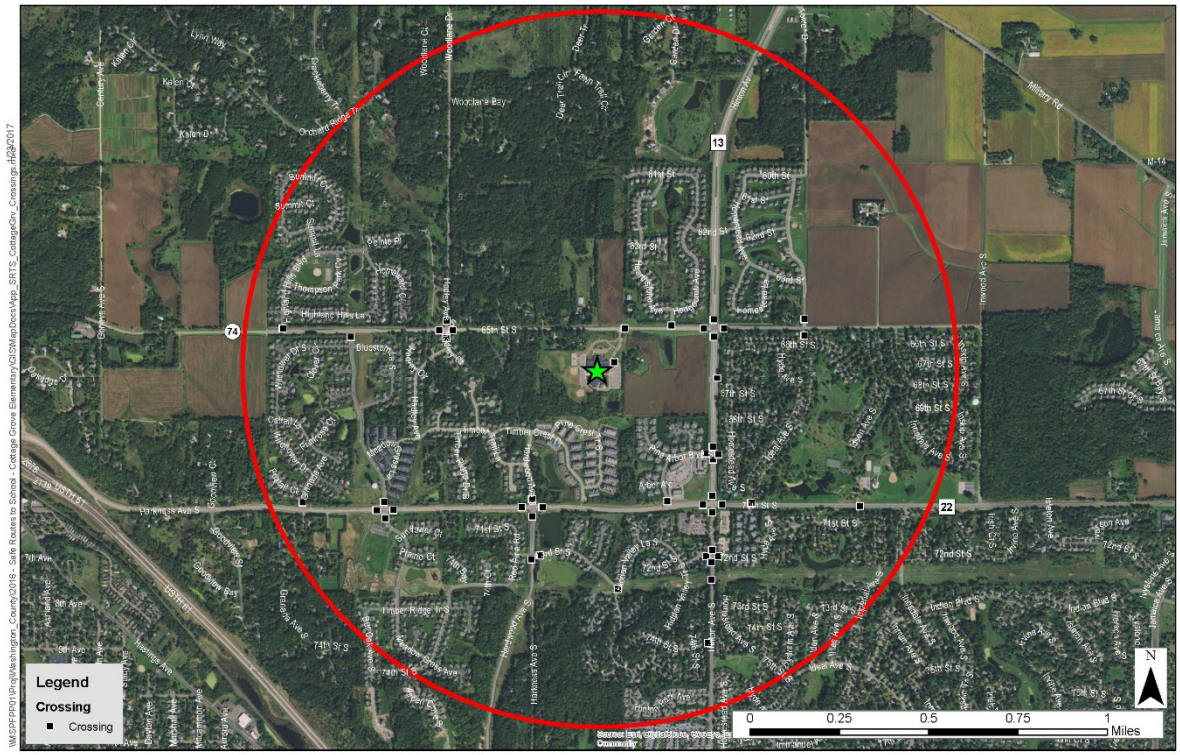


Figure A-1. Locations of main Crossings and Intersections, Cottage Grove Elementary School, Washington County, MN

Appendix A – SRTS Data Compilation

Table A-1. Summary Description of Walking Zones, See Figure 2-1

Appendix A – SRTS Data Compilation

Walking Zone Subdivisions	Boundaries	Sidewalks or Trails	Residences (Approximate)
1 Highland Hills	North of 65th Street and west of Hadley Avenue	Sidewalk along north side of 65th Street between Highland Hills Boulevard and trail spur from Homeward Court. Sidewalks parallel all subdivision streets except Homeward Court, Summit Court, and Pointe Place, and ultimately connect to 65th Street. Offstreet trails connect the sidewalks and the park, and ultimately connect to 65th Street. The sidewalk adjacent to and separated from 65th Street ends at the trail extension from Homeward Court. No improved crossing along 65th Street.	189
2 Edgewood Estates Woodhaven Unplatted	North of 65th Street and between Hadley Avenue and Hearthstone Avenue	No sidewalks or trails, except one offstreet trail that connects a recently built subdivision to Hilton Avenue north of 61st Street. No improved crossing at 65th Street.	48
3 Silverwood	North of 65th Street between Hearthstone Avenue S. and Hinton Avenue	Sidewalks parallel all subdivision streets except the northwest section of Hedgecroft Avenue and a section of 63rd Street east of Hearthstone Avenue. Sidewalk along the north side of 65th Street west of Hedgecroft Avenue continues west to the edge of the subdivision and then ends. Offstreet trail connects 62nd Avenue in the center area of the neighborhood. No improved crossing at 65th Street.	126
4 Pinecliff	North of 65th Street and east of Hinton Avenue	Sidewalk along both sides of Hinton Avenue and north side of 65th Street. Offstreet trail connects Ideal Avenue with Homestead Avenue between 61st and 62nd Streets. Improved crossing on south leg of Hinton Avenue/65th Street intersection.	118
5 Highlands	South of 65th Street and east of Hinton Avenue.	Sidewalk along east side of Hinton Avenue. Offstreet trails are located throughout the central part of the Zone making connections to Ideal Avenue and to 70th Street. Improved crossing on south leg of Hinton Avenue/65th Street intersection.	378
6 Pine Summit 6th Pine Arbor Timber Ridge Unplatted	South of 65th Street and between Hinton Avenue and Meadow Grass Avenue	Sidewalks parallel all subdivision streets except Bluestem Lane, Meadow Grass Lane, and a section of Hinton Avenue north of (approx.) 68th Street. Planned sidewalks along a) south side of 65th Street between CGES and Hinton Avenue and b) west side of Hinton Avenue from 65th Street south to existing sidewalk. a) Offstreet trail connects Timber Crest Drive to Hadley Court.	138 single 32 twin (64 residences) 38 multiunit (268 residences) 470 residences

Table A-1. Summary Description of Walking Zones, See Figure 2-1

Appendix A – SRTS Data Compilation

Walking Zone Subdivisions	Boundaries	Sidewalks or Trails	Residences (Approximate)
		Improved crossing on south leg of Hinton Avenue/65th Street intersection, all legs of Hinton Avenue /70th Street, all legs of Meadow Grass Avenue/70th Street, all legs Hardwood Avenue/70th Street.	
7 Pine Summit 1st – 5th	South of 65th Street, between Meadow Grass Avenue and Wild Flower Drive and, north of 70th Street	Sidewalk along north side of 70th Street. Sidewalks parallel both sides of Meadow Grass Avenue, except the west side of Meadow Grass Avenue south of the water tower service road. Sidewalks are limited within the subdivision. Offstreet trails traverse the center of the neighborhood from Wildflower Avenue connecting to Meadow Grass Avenue. No improved crossing along 65th Street or 70th Street.	150
8 Pine Summit 7th Timber Ridge Timber Ridge 3rd and 5th Oak Cove Everwood	South of 70th Street and west of Hardwood Avenue	Sidewalk along north side of 70th Street and along both sides of Hardwood Avenue to 73rd Street. North of 73rd Street sidewalk is along the east side of Hardwood Avenue. Over half of the subdivision streets have sidewalks. Offstreet trail connects West Draw Park, across Meadow Grass Avenue, with 74th Street. Improved crossing at all legs of Meadow Grass Avenue and all legs of Hardwood Avenue.	224
9 Hidden Valley	South of 70th Street between Hardwood Avenue and Hinton Avenue	Sidewalk along north side of 70th Street (with minimal if any, separation from the highway). Sidewalk along both sides of Hardwood Avenue to 73rd Street. North of 73rd Street sidewalk is along the east side of Hardwood Avenue. Sidewalk along both sides of Hinton Avenue. Improved crossing at the north and east legs of 70th Street and Hardwood Avenue and at all legs of 70th Street and Hinton Avenue. Offstreet trail between Hinton Avenue and Hidden Valley Lane south of 72nd Street. Connects with sidewalk along 73rd Street. Controlled crossing of Hinton Avenue for this trail.	227
10 Highland Town Homes Summer Hills Rolling Hills Pinetree Pond 4th	South of 70th Street and east of Hinton Avenue	Sidewalks along both sides of Hinton Avenue between offstreet trail to 70th Street. Sidewalk along west side of Hinton Avenue south of the offstreet trail. Offstreet trail (east-west) through center of Zone. Residents can connect to the trail from Hyde Avenue, Imperial Avenue Circle, Imperial Avenue, 71st Street, and 72nd Street. Controlled crossing of Hinton Avenue for the offstreet trail.	185+
Total Residences			**2,115**

[a] *2017-2021 Washington County Capital Improvement Plan*

Table A-2. Intersections, Crossings, and Traffic Control (Table 2-2, Crosswalk Amenities for Pedestrians)
Appendix A – SRTS Data Compilation

Important Intersection	LEG	Roadway/Crossing Characteristics	Traffic Control	Additional Description
Meadow Grass Ave & 65th Street & Trail	North	Trail (from Highland Hills Lane)	None	
	South	Residential street, 30 mph	Through stop median separated	
	East	Rural road, 50 mph	None. WB bypass	
	West	Rural road, 50 mph	None	
Hadley Ave & 65th Street	North	Rural road, 30 mph	Through stop	
	South	Residential street, 30 mph	Through Stop	Street light: SE corner
	East	Rural road, 50 mph	Right-turn lane	
	West	Rural road, 50 mph	Right-turn lane	
School entrance & 65th Street	North	No roadway	NA	
	South	Driveway	Through Stop	3 lanes
	East	Rural road, 50 mph	By-pass lane	3 lanes wide, shoulder adjacent to exit lane
	West	Rural road, 50 mph	Right-turn lane	
Hedgecroft Ave & 65th Street	North	Residential street, 30 mph	Through Stop	Street light
	South	No road	NA	
	East	Rural road, 50 mph	Right-turn lane	Striped median
	West	Rural road, 50 mph	By-pass lane	Striped median one-lane increasing to three-lanes approach to Hinton Avenue intersection
Hinton Ave & 65th St.	North	Four-lane Rural road, 55 mph	All-way Stop Right and left turn-lane Center raised median	
	South	Four-lane Rural road, 45 mph	All-way Stop Right and left turn-lane	

Table A-2. Intersections, Crossings, and Traffic Control (Table 2-2, Crosswalk Amenities for Pedestrians)
Appendix A – SRTS Data Compilation

Important Intersection	LEG	Roadway/Crossing Characteristics	Traffic Control	Additional Description
			Center raised median Marked crosswalk	
	East	Two-lane Rural road, 40 mph	All-way Stop Pavement signage, Right and left turn-lane Marked crosswalk	
	West	Two-lane Rural road, 50 mph	All-way Stop Right and left turn-lane	
Meadow Grass Ave & 70th Street	North	Residential street 30 mph	Traffic signals Right-turn lane Through/left turn lane Median: raised, landscaped	Street light NE corner)
	South	Residential street 30 mph	Traffic signals Right-turn lane Median: raised, landscaped	Street light (SW corner)
	East	Two-lane Rural road, 50 mph	Traffic signals, Right and left turn-lane	
	West	Two-lane Rural road, 50 mph	Traffic signals, Right and left turn-lane	
Hardwood Ave & 70th Street	North	Residential street, 30 mph	Traffic signals Right-turn lane and through-left turn lane Median: raised, landscaped Marked crosswalk	At intersection: Suburban road with curb and gutter, ADA corners Street light (NE corner)
	South	Residential street, 30 mph	Traffic signals Right and Left turn lanes Median: raised, landscaped	
	East	Two-lane Rural road, 50 mph	Traffic signals Right and Left turn-lanes Marked crosswalk	Street light (SE corner)

Table A-2. Intersections, Crossings, and Traffic Control (Table 2-2, Crosswalk Amenities for Pedestrians)
Appendix A – SRTS Data Compilation

Important Intersection	LEG	Roadway/Crossing Characteristics	Traffic Control	Additional Description
	West	Two-lane Rural road, 50 mph	Traffic signals Right and Left turn-lanes	Street light (NW corner)
Hinton Avenue and 70th Street	North	Three-lane suburban road,45 mph	Pavement signage ("STOP AHEAD") Marked crosswalk All-way Stop (Dual Stop Signs) Right and Left turn lanes	Planned for 2019: Roundabout replaces all-way stop[4] Street light (NW corner)
	South	Three-lane suburban road (curbs), 35 mph	All-way Stop (Dual Stop Signs) Left turn lane, through/right-turn lane Marked crosswalk	Street light (SW corner)
	East	Two-lane rural road, 50 mph	All-way Stop (Dual Stop Signs) Left turn lane Marked crosswalk	
	West	Two-lane rural road, 50 mph	All-way Stop (Dual Stop Signs) Right turn lane Marked crosswalk	
Pine Arbor Blvd & Hinton Avenue 69th St & Hinton Avenue	North	Three-lane suburban road (curbs) 45 mph	Left turn lane Right turn lane	
	South	Two-lane suburban road (curbs) 45 mph	Left turn lane Right turn lane	
(69th St)	East	Residential street < 30 mph	Through Stop	
(Pine Arbor Blvd)	West	Commercial/residential street < 30 mph	Through Stop Median: raised, landscaped	Street light (SW corner)

[4] 2017-2021 Washington County Capital Improvement Plan

Table A-3. Assessment for Suitability for Pedestrians – Segments (Section 3-2)

Appendix A – SRTS Data Compilation

	Segment	Separated Sidewalk or Trail	Speed	Volume	Rating	Evaluation
	Walking Zone 1					
1	Within the subdivision	Yes	<=30 mph	<= 2,000 VPD	GOOD	
	Within the subdivision	No	<=30 mph	<= 2,000 VPD	FAIR	
2	Northside 65th Street: From Highland Hills Blvd to Homeward Ct east (trail)	Yes	>30 mph	> 2,000 VPD	GOOD	Extend sidewalk to 65th Street school crossing
3	Northside 65th Street: From Homeward Ct trail to School	No	>30 mph	> 2,000 VPD	POOR	Build sidewalk to school crossing
	Walking Zone 2	NONE				
	Walking Zone 3					
1	Within the subdivision	Yes	<=30 mph	<= 2,000 VPD	GOOD	
	Within the subdivision	No	<=30 mph	<= 2,000 VPD	FAIR	
2	Northside 65th Street: From end of existing sidewalk to School	No	>30 mph	> 2,000 VPD	POOR	Extend sidewalk approx. 200' to 65th Street school crossing. Provide access to 126 residences
	Westside Hinton Avenue	Yes	>30 mph	> 2,000 VPD	GOOD	Connects to sidewalk on northside of 65th Street. Provide access for up to 118 residences
	Walking Zone 4					
1	Within the subdivision	Yes	<=30 mph	<= 2,000 VPD	GOOD	
	Within the subdivision	No	<=30 mph	<= 2,000 VPD	FAIR	
2	Northside 65th Street: From trail extending south from Homestead Ln to sidewalk continuing west to Hinton Avenue	Yes	>30 mph	> 2,000 VPD	GOOD	Needs improved crossing at Hinton Avenue. Provide access for up to 118 residences
	Northside 65th Street: From Ideal Av to trail extending south from Homestead Ln	Yes	>30 mph	> 2,000 VPD	POOR	
3	Eastside Hinton Avenue: sidewalk from 62nd Street south to 65th Street	Yes	>30 mph	> 2,000 VPD	GOOD	Optional crossing of Hinton Avenue at 62nd St.

Table A-3. Assessment for Suitability for Pedestrians – Segments (Section 3-2)

Appendix A – SRTS Data Compilation

	Segment	Separated Sidewalk or Trail	Speed	Volume	Rating	Evaluation
						Provide access for up to 118 residences
	Walking Zone 5					
1	Within the subdivision	No	<=30 mph	<= 2,000 VPD	FAIR	
2	Southside 65th Street: From Ideal Av west to Hinton Avenue	No	>30 mph	> 2,000 VPD	POOR	Construct sidewalk
3	Eastside Hinton Avenue: from 69th Street north to 65th Street	Yes	>30 mph	> 2,000 VPD	GOOD	OPTION: Construct crossing of Hinton Av at 69th St. Provide access to a portion of the 378 residences
4	Eastside Hinton Avenue: from 69th Street south to 70th Street	Yes	>30 mph	> 2,000 VPD	GOOD	
5	Northside 70th Street: from Inwood Av west to Hinton Avenue	Sidewalk, but little to no separation from road	>30 mph	> 2,000 VPD	FAIR	Two crossings of residential streets (Idsen and Ideal Av's)
	Walking Zone 6 – northern border					
1	Southside 65th Street: Hinton Avenue to School	No	>30 mph	> 2,000 VPD	POOR	
2	Southside 65th Street: School to Meadow Grass Av	No	>30 mph	> 2,000 VPD	POOR	
	Walking Zone 6 – western border					
3	Within the subdivisions (east of Meadow Grass Av and north of 70th Street)	Yes	<=30 mph	<= 2,000 VPD	GOOD	
4	Northside 70th Street: Meadow Grass Av east to Hardwood Av	Sidewalk, but no separation from road	>30 mph	> 2,000 VPD	FAIR	
5	Northside 70th Street: Hardwood Av east to Hinton Avenue	Sidewalk, but no separation from road	>30 mph	> 2,000 VPD	FAIR	
	Walking Zone 7					
1	Within the subdivision	Limited to one sidewalk and offstreet trails	<=30 mph	<= 2,000 VPD	FAIR	

Table A-3. Assessment for Suitability for Pedestrians – Segments (Section 3-2)
Appendix A – SRTS Data Compilation

	Segment	Separated Sidewalk or Trail	Speed	Volume	Rating	Evaluation
2	Southside 65th Street: Western edge of subdivision to Meadow Grass Av	No	>30 mph	> 2,000 VPD	POOR	
3	Northside 70th Street: Western edge of subdivision (approx. Granada Av) to Meadow Grass Av	Yes	>30 mph	> 2,000 VPD	GOOD	
	Walking Zone 8					
	Southside 65th Street: Granada to Hardwood Av	No	>30 mph	> 2,000 VPD	POOR	
	Within the subdivision	No	<=30 mph	<= 2,000 VPD	FAIR	
	Within the subdivision	Yes	<=30 mph	<= 2,000 VPD	GOOD	
	Hardwood Av – west side 1 mi buffer to 73rd St	Yes	<=30 mph	<= 2,000 VPD	GOOD	Crossing to east side at 73rd St creates connectivity
	Hardwood Av – west side 1 mi buffer to 73rd St	No	<=30 mph	<= 2,000 VPD	POOR	
	Walking Zone 9					
	Westside Hinton Av					
	Southside 65th Street Hardwood Av to Hinton Avenue	No	>30 mph	> 2,000 VPD	POOR	
	Hardwood Av: east side, 1 mi border to 70th Street	Yes	<=30 mph	<= 2,000 VPD	GOOD	Crossing at 73rd St
	Walking Zone 10					
	Within the subdivision	Offstreet trails, but no sidewalks	<=30 mph	<= 2,000 VPD	FAIR	Trail connects with Zone 9, and with sidewalks on west side of Hinton Av
	Eastside Hinton Av	Yes. North of offstreet trail (at powerline)	>30 mph	> 2,000 VPD	GOOD	
	Southside 70th Street	No	>30 mph	> 2,000 VPD	POOR	

Table A-4. Evaluation of Recommended Projects – Detailed (Section 5-1) (See Figure 2-2 for Walking Zones)
Appendix A – SRTS Data Compilation

Project Walking Zone	Deficiencies	Improvement Strategy	Safety Level Rating BEFORE and AFTER	# of Residences (Approximate) and Probability of Walking/Biking[a]	Map with residences affected by recommended Project (highlighted in turquoise)
	OFFSTREET TRAILS				
Project 2 Zone 6 Zone 9 Zone 10	Sidewalks or offstreet trails do not provide access from neighborhood to School.	1. Build offstreet trail from sidewalk end (Pine Arbor Blvd) to School	1. POOR to GOOD	**HIGH PROBABILITY: 64** Walking access for 64 residences (32 twin homes). No major highway crossings, subdivision street crossings only.	 HIGH probablity, Zone 6 (Twin homes)
			2. POOR to GOOD	**MEDIUM PROBABILITY: 63 additional** Walking access for 63 residences in Zone 9 in the northeast corner (using the sidewalk along Hinton Av to the crossing at 70th St).	 MEDIUM probability, Zone 9
			3. POOR to GOOD	**LOW PROBABILITY: 91 additional** Walking access for 91 residences in Zone 10 farther than ½ mile, but with access to sidewalk along east side of Hinton Av (north of the offstreet trail (that follows the power line) to the crossings at 70th St and Hinton Av.	 LOW probability, Zone 10

Table A-4. Evaluation of Recommended Projects – Detailed (Section 5-1) (See Figure 2-2 for Walking Zones)
Appendix A – SRTS Data Compilation

Project Walking Zone	Deficiencies	Improvement Strategy	Safety Level Rating BEFORE and AFTER	# of Residences (Approximate) and Probability of Walking/Biking[a]	Map with residences affected by recommended Project (highlighted in turquoise)
			4. POOR to FAIR	**LOW PROBABILITY: 84 additional** 84 residences south of the offstreet trail have access to the trail via a spur from Hyde Av.	 LOW probability, Zone 10
			5. POOR to FAIR	**LOW PROBABILITY: 132 additional** residences located in the southern half of Zone 9 could use subdivision streets to connect to sidewalks along the west side of Hinton Av and continue north to the sidewalks in Zone 6.	 LOW probability, Zone 9
Project 3 Zone 6 Zone 9	Sidewalks or offstreet trails do not provide access from neighborhood to School.	1. Construct offstreet trail from sidewalk (Pine Crest Trail) to School	1. POOR to GOOD	**HIGH PROBABILITY: 176** Walking access for 176 residences. No highway crossings, subdivision street crossings only.	 HIGH probability, Zone 6 (multi-unit residences)

Table A-4. Evaluation of Recommended Projects – Detailed (Section 5-1) (See Figure 2-2 for Walking Zones)
Appendix A – SRTS Data Compilation

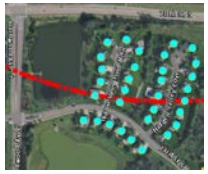
Project Walking Zone	Deficiencies	Improvement Strategy	Safety Level Rating BEFORE and AFTER	# of Residences (Approximate) and Probability of Walking/Biking[a]	Map with residences affected by recommended Project (highlighted in turquoise)
			1. POOR to FAIR	**MEDIUM PROBABILITY: 32 additional** Walking access for 32 residences in Zone 9, northwest corner (using Hardwood Av and crossing 70th St).	 MEDIUM probability, Zone 9 (NW corner)
Project 4 Zone 6, Zone 7, Zone 8	Sidewalks or offstreet trails do not provide access from neighborhood to School.	1. Construct offstreet trail from existing offstreet trail to School	1. POOR to GOOD	**HIGH PROBABILITY: 200** Walking access for 200 residences (13 multi-unit homes and 105 single-family). No highway crossings, subdivision street crossings only.	 HIGH probablity, Zone 6
			2. POOR to GOOD	**MEDIUM PROBABILITY: 150 additional** Walking access for 150 residences in Zone 7. No highway crossings, only subdivision street crossings (including Meadow Grass Av).	 MEDIUM probablity, Zone 7

Table A-4. Evaluation of Recommended Projects – Detailed (Section 5-1) (See Figure 2-2 for Walking Zones)

Appendix A – SRTS Data Compilation

Project Walking Zone	Deficiencies	Improvement Strategy	Safety Level Rating BEFORE and AFTER	# of Residences (Approximate) and Probability of Walking/Biking[a]	Map with residences affected by recommended Project (highlighted in turquoise)
			3. POOR to GOOD	**MEDIUM PROBABILITY: 80 additional** Walking access for 80 residences in the north half of Zone 8 using sidewalks along Meadow Grass Av or Hardwood Av and one highway crossing at 70th St.	 MEDIUM probablity, Zone 8, northern half
			4. POOR to FAIR	**LOW PROBABILITY: 138 additional** Walking access for 138 residences in the south half of Zone 8 using sidewalks along Meadow Grass Av or Hardwood Av and one highway crossing at 70th St.	 MEDIUM probablity, Zone 8, southern half

Table A-4. Evaluation of Recommended Projects – Detailed (Section 5-1) (See Figure 2-2 for Walking Zones)
Appendix A – SRTS Data Compilation

Project Walking Zone	Deficiencies	Improvement Strategy	Safety Level Rating BEFORE and AFTER	# of Residences (Approximate) and Probability of Walking/Biking[a]	Map with residences affected by recommended Project (highlighted in turquoise)
	SIDEWALKS AND CROSSINGS				
Project 1 & 1A Zone 3 Zone 4 Zone 5	No sidewalk along south side of 65th Street. Limited safety enhancements at 65th Street/Hinton Ave nue intersection crossings.	1. Construct sidewalk along southern side of 65th Street between Hinton Avenue and CGES. 1A. Construct crosswalk improvements.	1. POOR to GOOD	**MEDIUM PROBABILITY: 126** Walking access for 126 residences. One highway crossing at 65th Street (enhance safety control for the crossings at 65th St and Hinton Av as appropriate).	 HIGH probablity, Zone 3
			2. POOR to GOOD	**MEDIUM PROBABILITY: 118 additional** Walking access for 118 residences in Zone 4 using sidewalks and streets within the neighborhood and along Hinton Av and/or 65th St with two highway crossings; Hinton Av and 65th St.	 MEDIUM probablity, Zone 4

Table A-4. Evaluation of Recommended Projects – Detailed (Section 5-1) (See Figure 2-2 for Walking Zones)
Appendix A – SRTS Data Compilation

Project Walking Zone	Deficiencies	Improvement Strategy	Safety Level Rating BEFORE and AFTER	# of Residences (Approximate) and Probability of Walking/Biking[a]	Map with residences affected by recommended Project (highlighted in turquoise)
			3. POOR to FAIR	**MEDIUM PROBABILITY: 188 additional** Walking access for residences in west side of Zone 5 using neighborhood streets to Hinton Av sidewalk to 65th St crossing of Hinton Av.	MEDIUM probability, Zone 5, western half

Table A-4. Evaluation of Recommended Projects – Detailed (Section 5-1) (See Figure 2-2 for Walking Zones)
Appendix A – SRTS Data Compilation

Project Walking Zone	Deficiencies	Improvement Strategy	Safety Level Rating BEFORE and AFTER	# of Residences (Approximate) and Probability of Walking/Biking[a]	Map with residences affected by recommended Project (highlighted in turquoise)
Projects 5 and 5A Zones 3 Zone 4 Zone 5	Extend existing sidewalk on north side of 65th Street to new crossing at CGES driveway.	1. Sidewalk extension from edge of subdivision to new 65th St crossing 2. Reconfigure roadway and construct crossing to CGES driveway See Figures 4-1 thru 4-4 for example of three-lane section with crosswalk)	1. POOR to GOOD	SEE PROJECTS 1 AND 1A FOR THE NUMBER OF RESIDENTS THAT WOULD GAIN ACCESS. THIS PROJECT OPTION WOULD SERVE SIMILAR NEIGHBORHOODS.	
Project 6 and 6A Zone 1 (Prerequisite is Project 4 – offstreet trail)	Sidewalk along north side of 65th St ends approx. 3,000 feet west, short of, Hadley Av. intersection.	1. Sidewalk extension; approx. 3,000 feet 2. Crossing at Hadley Av / 65th St intersection 3. Construct offstreet trail from existing offstreet trail to School (Project 4)	1. POOR to FAIR 2. POOR to FAIR	**MEDIUM PROBABILITY: 103** Walking access for 103 residences connecting to the sidewalk along 65th Street, continuing to the Hadley Av crossing of 65th Street. The remainder of the route uses sidewalk and offstreet trails. One highway crossing **LOW PROBABILITY: 71** Walking access for 71 residences nearly one-mile from CGES. Connecting to the sidewalk along 65th Street, continuing to the Hadley Av crossing of 65th Street. The remainder of the route uses sidewalk and offstreet trails. One highway crossing	 MEDIUM probability, Zone 1, southern area LOW probability, Zone 1, northern area

Note:

[a] Not all residences will have students attending Cottage Grove Elementary School.